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SEARCH

Welcome to the Controversial Chem Lab. Here at the Chem Lab you can find information on a large number of chemicals that have a certain stigma attached to them. Chemicals such as explosives, drugs, and pesticides are vitally important for the survival of our civilization. Unfortunately, the scientific elite jealously hoards the knowledge on using and preparing these chemicals. Adding to the confusion is the scientific ignorant who fear chemistry and think these chemicals are dangerous. As my chemistry professor used to say about what they think, "chemistry equals bad."

The Controversial Chem Lab was created to be a free reference on how to synthesize chemicals. It is also a virtual laboratory skills manual, complete with descriptions on how to conduct laboratories, and a visual database on many different kinds of laboratory apparatus. While the Chem Lab is written for the non-chemist audience, it does require a basic understanding of laboratory skills. Of course, all of the information needed to acquire a basic understanding of lab skills is included within the site.

The Chem Lab even goes the extra mile in providing information on how to synthesize many of the chemicals used in making explosives, etc. It also provides information on where to acquire certain chemicals and apparatus. While all of this information is perfectly legal, it may be against the law in certain areas to prepare some of these chemicals without the proper license.

To find your way through the site, just use the navigation bar at the left of the page. Each section is organized to provide more details as to what it contains, and has more navigational choices.

The Controversial Chem Lab is the work of only one man, so please do not be surprised if some information is incomplete. This is a work in progress with no end in sight. If you find any inaccurate or incomplete information, please email me as soon as you can with the correct data. I may be conacted via the Rogue Science contact forms. Every attempt has been made by me to insure the accuracy of all information, but there are always mischievous computers that like to change things for their twisted pleasure. If you feel that you have some valuable information to add to this website, please drop me a line. Watch out, you might learn something here.

Megalomania's Controversial Chem Lab ©1997-2004 /homepage/ revised December 24, 2003
Last Site Revision March 11, 2004

Explosives

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SEARCH

This section contains detailed information on how to synthesize 89 different explosive compounds in the lab. With the exception of two or three mixtures, every one of these explosives is a unique molecular substance. These labs range from common explosives used by the military and industry, to rare rocket and shell propellants, to recently discovered experimental explosives. Although quite large compared to other Internet resources, this list represents only a tiny fraction of all explosive compounds.

Each of the labs contained herein should only be performed by a person thoroughly familiar with proper laboratory technique. It is also illegal to prepare any explosive without a license. Although any chemistry lab can be dangerous, the nature of these chemicals is such that the dangers are exacerbated because they are explosives! Strict adherence to all instructions, and safety procedures is strongly recommended.

Just click on the links in the following alphabetized index to get to the lab of your choice. Each explosive lab is arranged with a table highlighting certain physical characteristics, a little bit of background on the explosive, a table listing all of the equipment and chemicals that are needed in its preparation, and finally the method of synthesis itself. The initial mention of any chemical or apparatus is linked to its relevant section elsewhere in the site.

Acetone Peroxide
Allyl Hydroperoxide
Ammonium Nitrate
Ammonium Picrate
Astrolite
Benzalaminoguanidine Nitrate
a-Benzenediazobenzyl Hydroperoxide
DADNBU
DADNPE
DDNP
Dinitrobenzene
Dinitrochlorobenzene
Dinitropolystyrene

DNPA
EGDN
FOX-7
Guanidine Carbonate
Guanidine Nitrate
1,1,1,3,5,5,5-Heptanitropentane
Hexamethylenetetramine Dinitrate
Hexanitrocarbanilide
Hexanitrodiphenylamine
HMTD
HMX
HNIW
HNO
IPN
Lead Azide
Lead Nitratophosphite
Lead Picrate
Lead Styphnate
Lead 2,4,6-Trinitro-3-Oxybenzoate
Maltose Octanitrate
Mannitol Hexanitrate
MEDINA
MEDNA
MeEDNA
Mercurous Nitratophosphite
Mercury Fulminate
2-Methyl-2-Nitro-1-Propanolnitrate
Metriol Trinitrate
MMAN
NIBGkDN
NIBGTN
Nitrated Petroleum
m-Nitrobenzenediazonium Perchlorate
2-Nitro-2-(3,5-dinitrophenyl)-propanediol-1,3 Dinitrate
Nitrogen Sulfide
Nitrogen Trichloride
Nitrogen Triiodide
Nitroglycerin
Nitroguanidine
2-Nitro-2-(*m*-Nitrophenyl)-Propanediol-1,3 Dinitrate
Nitrosoguanidine

Nitrostarch
Nitrosyl Perchlorate
NONA
NPN
NTN
Perchlorates
N-Perchlorylpiperidine
PETN
Petrin
Petrin Acrylate
PGDN
1-Phenyl-2-Nitro-1-Propene
Picric Acid
m-Picrylpicryl Chloride
The Polymer
Potassium Picrate
Propylpicrate
PVN
RDX
Silver Fulminate
TACC
TeNN
Tetracene
Tetranitromethane
Tetryl
TNO
TNPEN
TNPht
Trinitroanisol
Trinitrobenzene
Trinitro-*m*-Cresol
Trinitromethane
2,4,6-Trinitro-*m*-Phenylenediamine
1,1,1-Trinitro-2-Propyl Acrylate
Trinitrostilbene
Trinitrotoluene
Tris[1,2-Bis (Difluoramino)-Ethyl] Isocyanurate

The icon indicates an explosive that can be used to make other explosives.

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#I was in the middle of converting this to XHTML 9-18-02

Chemical Weapons

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SEARCH

The chemical weapons section is supposed to have varied methods of laboratory synthesis for some of the deadliest chemicals known to man. Not only do these include your standard war gasses, but also poisons. I say supposed to have because I don't actually have any information ready for posting on the web yet. While I have acquired much valuable data, it still needs to be edited and converted to a web format. The following list of substances represents the information that I have synthesis data for.

Acrolein
Benzyl Bromide
Benzyl Chloride
Benzyl Iodide
Bromoacetone
Bromoacetophenone
Bromobenzyl Cyanide
Bromopicrin
Carbon Monoxide
Carbonyl Bromide
Chloroacetone
Chloroacetophenone
Chloroformoxime
Chloromethyl Chloroformate
Chloropicrin
Chlorosulfonic Acid
checked to here Cyanogen Bromide
Cyanogen Chloride
Cyanogen Fluoride
Cyanogen Iodide
Cyclosarin
Cyclosoman
Dibromoacetylene
Dibromomethyl Ether
Dibromoethyl Sulfide
Dichloroethyl Sulfide
Dichloroformoxime
Dichloromethyl Chloroformate
Dichloromethyl Ether
Diiodoacetylene
Diiodoethyl Sulfide
Dimethyl Sulfate
Diphenyl Chloroarsine
Diphenyl Cyanoarsine
Ethyl Bromoacetate
Ethyl Chloroacetate
Ethyl Dihloroarsine

Ethyl Iodoacetate
Hexachloromethyl Carbonate
Hydrocyanic Acid
Lewisite
* Methyl Chloroformate
Methyl Chlorosulfonate
Methyl Dihloroarsine
Methyl Fluorosulfonate
Methyl Formate
Methyl Sulfuric Acid
Oxalyl Chloride
Perchloromethyl Mercaptan
Phenarsazine Chloride
Phenyl Carbylamine Chloride
Phenyl Dichloroarsine
Phosgene
Sarin
Soman
Sulfuryl Chloride
Tabun
Tetrachlorodinitroethane
Thiophosgene
Thiosarin
Thiosoman
Trichloromethyl Chloroformate
Trichloro Nitroso Methane
VX
Xylyl Bromide

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Pharmaceuticals

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SEARCH

The pharmaceutical section is supposed to have varied methods of laboratory synthesis for recreational drugs, and prescription medication. I may even throw in info for fermenting beer and liquors. I say supposed to have because I don't actually have any information ready for posting on the web yet. While I have acquired some valuable data, I have other projects to get done first. Try a few of the links below to get started.

Check Out These Links!

Rhodium - an informative element
Johan's Guide to Aphrodisiacs
The Hypereal Drug Archive
The Lycaeum
The Vaults of Erowid

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Pesticides

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SEARCH

This is a section for pesticides, herbicides, rodenticides, algaecides, indeed all of your favorite "cides" will be listed here. Many excellent pesticides have been banned over the years for dangers to the environment, or people, but were very effective. Certain modern "cides" are also rather expensive. This will not be a comprehensive of such chemicals, but it will contain a few choice ones.

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Precursors

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SEARCH

A precursor is a chemical substance that is used to synthesize an explosive, poison, drug, etc. This section of the Controversial Chem Lab is here to provide useful information on all of the chemicals used in the various procedures throughout the website. Here you can find information on the important physical properties of many compounds. There is also a material safety data sheet (MSDS) for just about every chemical, as well as storage suggestions. Most important of all, this section contains complete synthesis information for most of the chemicals here.

One of the largest problems facing the hobbyist today is the lack of vendors willing to sell chemicals to those without a business or school purchase order. There are also very few companies willing to sell small quantities of chemicals. When a company does sell in small quantities, the chemical is usually of high quality, and thus adds a considerable sum to the price. Then there are the excessive government regulations on hazardous substances, which of course mean special shipping procedures, and ultimately even more expense.

The fact is there is simply not enough market demand from individuals for chemicals nowadays. Remember that it is perfectly legal to own just about any precursor, it is how the chemicals are used that you can run afoul of the law. Within this section is sufficient information for you to make your own chemicals, or where to get the chemicals that you cannot make. All of this can be done without the prohibitive cost of ordering through a chemical supplier. To the best of my knowledge there is no other project like this one on the Internet. Please understand that this is a very daunting task, there is a reason no one else has ever done what I have here, it is a lot of work. Some chemicals will be difficult to make, perhaps impossible, but ordering one or two such chemicals from a supplier is better than dozens.

This is the motto of the precursor section:

The land beneath our feet, the air in our lungs, the trees on the horizon.
All are sources of chemicals.
No legislation can ban them, no government can control them, no soldier can take them.
If industry can do it, so can I.

Chemicals and their Synonyms

This index includes a link for every chemical used throughout the website. The links will take you to a page that has important information about the chemical as well as a detailed lab synthesis. All names in bold are the primary names used in the site, all other names are synonyms.

A|B|C|D|E|F|G|H|I|J|K|L|M|N|O|P|Q|R|S|T|U|V|W|X|Y|Z

A

absolute alcohol
ac 5230
acardite
acenterine
acesal
acetaldehyde
acetamide
Acetaminophen Aspirin
acetate
acetate salicylic acid
acetic acid
acetic acid amide
acetic acid anhydride
acetic acid chloride
acetic acid ethyl ester
acetic acid glacial
acetic acid, lead(2+) salt
acetic aldehyde
acetic anhydride
acetic chloride
acetic ester
acetic ether
acetic oxide
aceticyl
acetidin
acetilsalicilico
acetilum acidulatum
acetimidic acid
acetisal
acetone
acrylic acid chloride
acrylic acid methyl ester
acryloyl chloride
acrylyl chloride
activated carbon
activated carbon, decolorizing
activated charcoal
acylpyrin
Aerothene MM
aethylis
aethylis chloridum
aglime
Akwa Tears
Albone
AlCl3
alcohol
alcohol dehydrated
alcohol of sulfur
alcojel
alcosolve
alcosolve 2
aldehyde
algrain
Alka-Seltzer
alluminio(cloruro di)
allyl mesylate
allyl methanesulfonate
almond artificial essential oil
4-O-alpha-D-glucopyranosyl-D-glucose
ammonia water
ammonioformaldehyde
ammonium, aqueous
ammonium carbonate
ammoniumchlorid
ammonium chloride
ammonium ferrous sulfate
ammonium hydroxide
ammonium iron sulfate
ammonium muriate
ammonium sesquicarbonate
amylum
ANAC 110
Anacin
anesthetic ether
anhydrol
anhydrous alcohol
anhydrous hydrazine
anilin
anilina
aniline
aniline hydrochloride
aniline oil
aniline reagent
animal charcoal
(6)annulene
Anodynon
antisal 1a
anyvim
aqua ammonia
Aquacare/HP

aceto hmt
acetonyl
acetophen
acetosal
acetosalic acid
acetosalin
2-acetoxybenzoic acid
acetoxyethane
acetylaldehyde
acetyl anhydride
acetyl chloride
acetyl ether
acetylin
acetyl oxide
2-(acetyloxy)-benzoic acid
acetylsal
acetylsalicylic acid
acetyl salycylic acid
Acid Mist
acidogen nitrate
acidum acetylsalicylicum
Aci-Jel
aciletten
acimetten
acisal
acroleic acid
acrylate
acryl chloride
acrylic acid
4-(alpha-D-glucosido)-D-glucose
Altacide
aluminium
aluminiumchlorid
aluminium, (chlorure d')
aluminium trichloride
aluminum
aluminum chloride
aluminum chloride (1:3)
amarthol fast orange r base
Amchlor
ameisensäure
aminic acid
aminobenzene
2-amino-4,6-dinitrophenol
6-amino-2,4-dinitrophenol
Aminoform
aminoguanidine bicarbonate
aminoguanidinium hydrogen carbonate
aminomethane
m-aminonitrobenzene
1-amino-3-nitrobenzene
aminophen
2-aminopropane
Ammoform
ammoneric
ammonia
ammonia, monohydrate
Aquadrate
aqua fortis
aqueous ammonia
aragonite
artificial almond oil
artificial bitter almond oil
artificial essential oil of almond
arwood copper
arylamine
A.S.A
a.s.a. empirin
asagran
asatard
Ascoden-30
Ascriptin
ASH
aspalon
aspergum
aspirdrops
aspirin
Aspro
asteric
atomite
Augus Hot Rod
avantin
azide
azium
azobase mna
azotic acid

B

ba 0108E
baker's p and s
baking soda
barium chloride
barium dichloride
Basodexan
benaspir
bensulfoid
benzal chloride
benzaldehyde
benzaldehyde phenylhydrazone
benzalphenylhydrazine
benzamine
benzene
benzene, amino-
benzenecarbonal
benzene carboxaldehyde
benzene chloride
benzene methylal
benzenol
benzidam
Benzin
benzin
benzine
Benzinoform
benzoic aldehyde
benzol
benzolene
Benzoline
benzoyl hydride
benzyl dichloride
benzylene chloride
benzylidene chloride
benzylidene dichloride
benzylidenephenylhydrazine
BFV
bialpirinia
bicarbonate of soda
bicarburet of hydrogen
bichromate of soda
2,2-bis(hydroxymethyl)-1,3-propanediol
blue oil
blue powder
bluestone
blue vitrol
Bonide Sulfur Plant Fungicide
booze
BOU
brimstone
British gum
Brocide
bromine
bromobenzene
Bufferin
Bulbold

C

Calcichew
Calcidia
calcined brucite
calcined magnesia
calcined soda
Calcit
calcite
calcium carbonate
calcium chloride
calcium dichloride
calcium dihydroxide
calcium hydrate
calcium hydroxide
calcium hypophosphite
calcium sulfate
carbonyl diamide
carbonyldiamine
carboraffin
carborafine
carboxide
o-carboxyphenyl acetate
caustic lye
caustic potash
caustic soda
CDA 102
CDA 122
Celite
chalcanthite
chalk
C.I. oxidation base 1
citretten
citric acid
Citrical
Citro
Clifton Sulfur
cloretilo
coal naphtha
col-evac
colfarit
Colloidal-S
colloidal sulfur
Collokit

calcosan
camphor tar
canary dextrin
Canadol
caprin
carbamaldehyde
carbamide
carbamimidic acid
carbanilide
carbinamine
carbinol
carbolic acid
carbon
carbon, activated
carbon, activated or decolorizing
carbon, amorphous
carbon black
carbon decolorizing
carbon dioxide
carbona
carbon bisulfide
carbon bisulfuret
carbon chloride
carbon disulfide
carbone
carbonic acid, ammonium salt
carbonic acid calcium salt (1:1)
carbonic acid, diammonium salt
carbonic acid disodium salt
carbonic acid monosodium salt
carbonic acid sodium salt (1:1)
carbonic acid, with hydrazinecarboximidamide (1:1)
carbonio
carbon oil
carbon sulfide
carbon tet
carbon tetrachloride
charcoal
charcoal, activated
Chelen
chevron acetone
Chile saltpeter
chlorate of soda
Chlorax
chlorene
chlorethyl
chloric acid, sodium salt
chlorid amonny
chlorid kyseliny akrylove
chloridum
chlorinated water
chlorine
chloroacetic acid
alpha-chloroacetic acid
chlorobenzal
chlorobenzene
chlorobenzene mono
chlorobenzol
chloroethane
chloroethanoic acid
chloroform
chlorohydric acid
2-chloro-1,3,5-trinitrobenzene
Chlorpheninaurine
chlorure d'aluminium
chloryl
Chloryl Anesthetic
chromar
C.I. 37030
C.I. 76000
C.I. 77400
C.I. 77577
C.I. azoic diazo component 7
Cimcool wafers
cologne spirits
colonial spirit
Colsul
columbian spirits
combi-schutz
common salt
contrheuma retard
copper
copper sulfate
cordycepic acid
Coricidin
Coricidin D
corn dextrin
Corosal D and S
Cosan
COSAN 80
cr
cresol
m-cresol
cresylic acid
cresylol
Cristal
crystal ammonia
Crystex
cubic niter
cupric sulfate
curithane 103
CuTEA
cutrine-plus
cyanoguanidine
1-cyanoguanidine
2-cyanoguanidine
cyanol
cyclohexatriene
Cystamin
Cystogen

D

daito orange base r
Darammon
Darvon compound
DCD
DCM
Defol
dehydrated alcohol
denatured alcohol
dendritis
Dervan
devol orange r
dextrin
dextrin hydrate, white
diamide
diamine
diammonium carbonate
diatomaceous earth
2,3-diazido-1,4-butanediol
3,3-diazido-2,4-pentanediol
diazo fast orange r
dibasic lead acetate
dichlorine
1,2-dichloroethane
sym-dichloroethane
dichloromethane
(dichloromethyl)benzene
dichloro methyl-benzene
dichlorophenylmethane
a,a-dichlorotoluene
1,3-dichloro-2,4,6-trinitrobenzene
dicyandiamide
dicyanodiamide
diethylene dioxide
1,4-diethylene dioxide
diethylene ether
diethyl ether
diethyl oxide
N,N'-difenylmocovina
dihydrogen dioxide
dihydrogen monoxide
1,2-dihydroxyethane
1,2-dihydroxypropane
(dimethylamino)benzene
dimethylaniline
N,N-dimethylaniline
N,N-dimethylbenzenamine
dimethylbenzene
dimethylcarbinol
N,N-dimethylformamide
dimethyl formaldehyde
dimethylketal
dimethyl ketone
dimethylphenylamine
N,N-dimethylphenylamine
dimethylphylamine
dinitroaminophenol
2,4-dinitro-6-aminophenol
4,6-dinitro-2-aminophenol
m-dinitrobenzene
dinitrogen monoxide
dinitrogen oxide
dinitrogen tetrafluoride
2,4-dinitrophenetole
ß-(2,4-dinitrophenoxy) ethanol
dinitrophenylglycolether nitrate
diokan
Diosmol
Diox
1,4-dioxacyclohexane
dioxane
1,4-dioxane
p-dioxane
dioxyethylene ether
diphenylcarbamide
N,N'-diphenyl-ethanediamide
diphenylhydrazone
diphenylurea
1,3-diphenylurea
1,3-diphenylurea
3-diphenylurea
N,N'-diphenylurea
s-diphenylurea
sym-diphenylurea
diphosphorus pentoxide
dipping acid
dipropyl
disodium carbonate
disulfur dichloride
dithiocarbonic anhydride
DMA
DMF
DMFA
Dowtherm 4000
Dowtherm SR 1
Dri-Die
dried cupric sulfate
Drop-Leaf
Drysol
dublofix
duramax
Dutch liquid
Dylene

diethylene oxide
1,4-diethyleneoxide

E

ECM
Ecotrin
EDC
EG
Elosal
Elvanol
empirin
endydol
entericin
enterosarine
entrophen
erinitrit
essence of mirbane
essence of myrbane
ethanal
ethanamide
1,2-ethanediol
ethane-1,2-diol
ethanoic acid
ethanoic anhydrate
ethanoic anhydride
ethanol
ethanol 200 proof
ethanoyl chloride
ethenol homopolymer
ether
ether chloratus
ether hydrochloric
ether muriatic
ethoxyethane
ethyl acetate
ethyl acetic ester
ethyl alcohol
ethyl aldehyde
ethylaldehyde
ethyl chloride
ethylene alcohol
ethylenecarboxylic acid
ethylene chloride
ethylene dichloride
ethylene dihydrate
ethylene glycol
ethylene glycol ethylene ether
ethyl ether
ethyl hydrate
ethyl hydroxide
ethylic acid
ethyl oxide
Excedrin
extra fine 200 salt
extra fine 325 salt
extren

F

factitious air
Fall
fannoform
fast orange base r
fast orange m base
fast orange mm base
fast orange r base
fermentation alcohol
ferrous ammonium sulfate
flowers of sulfur
flour sulfur
flukoids
Formagene
formaldehyde
formaldehyde solution
Formalin
Formalin 40
formalith
formamide
formamine
formic acid
formic aldehyde
formimidic acid
Formin
Formol
formylic acid
formyl trichloride
fossil flour
Freon 30
Fridex
fuming nitric acid
FYDE

G

gas
gasahol
gasolene
gasoline
Gelprin
Gelvatol
gettysolve-b
glacial acetic acid
Glauber's salt
Glyceol
glycerin
glycerine
glycerin mist
glyceritol
glycerol
D-glycerol
L-glycerol
glycol
glycol alcohol
glycoldinitrophenylether nitrate
glycol ethylene ether
glycyl alcohol
Golden Dew
GOX
grain alcohol

H

halite
hard paraffin
hartosol
hartshorn
Harvest-Aid
HBIW
HCHO
helicon
Hercules P 6
Hex
HEXA
Hexaform
hexahydropyridine
hexamethylenamine
hexamethyleneamine
hexamethylenetetraamine
hexamethylene tetramine
hexamethylene triamine
hexamine
hexane
n-hexane
Hexasul
hexyl hydride
h.g. blending
high-strength hydrogen peroxide
hiltonil fast orange r base
Hioxy
Hiprex
HMT
HMTA
H2O2
HOCH
hooch
Huile D'aniline
Hyanit
hydrargyrum
hydrated lime
hydrazine
hydrazine base
hydrazine, hydrazine sulfate
hydrazine, tetrafluoro-
hydrazoic acid, sodium salt
hydrocerol a
hydrochloric acid
hydrochloride
hydrocyanite
hydrogen
hydrogencarboxylic acid
hydrogen chloride
hydrogen dioxide
hydrogen nitrate
hydrogen oxide
hydrogen peroxide
hydrogen sulfate
hydroperoxide
hydroxybenzene
2-hydroxy-3,5-dinitroaniline
hydroxymethyl)-2-nitropropanediol
hydroxymethyl)-2-nitropropane-1,3-diol
2-hydroxymethyl-2-nitropropanediol
2-(hydroxymethyl)-2-nitro-1,3-propanediol
2-hydroxypropane
hydroxy-1,2,3-propanetricarboxylic acid
2-hydroxy-1,2,3-propanetricarboxylic acid

hexilmethylenamine
hydrochloric ether
hydroxytricarballylic acid
2-hydroxytricarballylic acid
beta-hydroxytricarballylic acid
hyponitrous acid anhydride

I

intergravin-orales
IFP
iodine
isohol
imsol a
IPA
isopropanol
incorporation factor
i-propanol
isopropyl alcohol
infusorial earth
iron
isopropylamine
Inhibine
iron ammonium sulfate
isourea
Irtran-5

J

jaysol
jaysol s
Jodid
jusonin

K

karbanilid
beta-ketopropane
komeen
karsan
kieselguhr
koolstofdisulfide
Kelene
kohlendisulfid
krystallin
Keratinamin
Kolofog
Kumulus S
ketone propane
Kolospray
kyanol

L

laughing gas
lead acetate
lead diacetate
lead dibasic acetate
lead dinitrate
lead monoxide
lead nitrate
lead (II) nitrate
lead ocher
lead oxide
lead (II) oxide
lead oxide (mono)
lead oxide yellow
lead protoxide
lead(II) salt acetic acid
Lensan A
light gasoline
ligroin
ligroine
lime, hydrated
limestone
lime water
liqueur
liquid silver
Liquifilm
litharge
litharge yellow L-28
LOX
lutosol
lutrol-9
lye
lysoform

M

macrogol 400 bpc
Magcal
Maglite
magnesia
magnesia usta
magnesium monoxide
magnesium oxide
magnesium oxide, heavy
magnesium oxide, light
magnesium styphnate
Magnetic 6
Magnetic 70
Maizena
maltobiose
Maltos
maltose
alpha-maltose
D-(+)-maltose
malt sugar
Mandelamine
Manicol
manna sugar
mercury pernitrate
Methacide
methamin
Methan 21
methanal
methanamide
methanamine
methanecarboxamide
methanecarboxylic acid
methane dichloride
methanesulfonic acid, allyl ester
methanesulfonic acid, 2-propenyl ester
methane tetrachloride
methane trichloride
methanoic acid
methanol
methenamine
metheneamine
methenyl trichloride
methoxycarbonylethylene
3-methoxy-2,2',4,4',6,6'-hexanitrobiphenyl
methyl acrylate
methyl alcohol
methyl propenoate
methyl 2-propenoate
methyl trichloride
metriol
meylon
Microflotox
mighty 150
mighty rd1
mineral naphtha
mirabilite
Mirasept
mirbane oil
Mohr's salt
molasses alcohol
molecular chlorine
Mondamin
monobromobenzene
monochloroacetic acid
monochlorobenzene
monochlorobenzol
monochloroethane
monochloroethanoic acid
monoethylene glycol

Mannidex
mannite
mannitol
D-mannitol
marble
Marcero
Martos-10
massicot
Massicotite
MCA
MCB
Measurin
M.E.G.
mercurialin
mercuric nitrate
mercuric oxide
mercury
mercury nitrate
mercury (II) nitrate
mercury oxide
methyl aldehyde
methylamine
methylbenzene
methyl-benzene
methylbenzol
methylcarbinol
methylene bichloride
methylene chloride
methylene dichloride
methylene glycol
methylene oxide
methyl ester acrylic acid
methyl glycol
methyl hydroxide
methyl ketone
2-methyl-2-nitropropane-1,3-diol
2-methyl-2-nitro-1,3-propanediol
2-methyl-2-nitropropanol
2-methyl-2-nitro-1-propanol
methylol
3-methylphenol
monohydroxy benzene
monohydroxymethane
monoisopropylamine
monomethylamine
monomethyl benzene
mononitrogen monoxide
monopentaerythritol
monophenol
monosodium carbonate
monosodium hydrogen carbonate
moon shine
Morbicid
mothballs
moth flakes
motor benzol
motor fuel
motor spirits
Mowiol
muriatic acid
muriatic ether

N

NaCl
naphthalene
naphthanin
naphtha petroleum
naphtha, VM&P
naphthene
naphtoelan orange r base
Narcotile
narkotil
nitrate of soda
natrium
natron
niter
nitric acid
nitric acid, lead(2+)salt
nitric acid, mercury salt
nitric acid, potassium salt
nitric acid red fuming
nitric acid, sodium salt
nitric oxide
nitroallyl acetate
m-nitroaminobenzene
3-nitroanaline
3-nitroaniline
***m*-nitroaniline**
3-nitrobenzenamine
nitroisobutylglycerine
nitroisobutylglycerol
nitromethane
2-nitro-2-methyl-1,3-propanediol
2-nitro-2-methylpropanol
2-nitro-2-methyl-1-propanol
2-nitro-2-(m-nitrophenyl)-propanediol-1,3
m-nitrophenylamine
1-nitropropane
2-nitropropane
nitrosonium tetrafluorborate
nitrosyl fluoborate

natural gasoline
NCI-C03736
NCI-C04591
NCI-C61074
Necatorina
necatorine
NEUT
neutral lead acetate
nevite
N2F4
N-H
Nital
nitranilin
m-nitraniline
nitration benzene
3-nitrazabutylamine
nitrobenzene
nitrobenzol
nitrocarbol
2-nitro-2-(3',5'-dinitrophenyl)-propanediol-1,3
nitroetan
nitroethane
nitrogen
nitrogen dioxide
nitrogen fluoride
nitrogen monoxide
nitrogen oxide
nitrogen peroxide
nitro-2-(hydroxymethyl)-1,3-propanediol
2-nitro-2-(hydroxymethyl)-1,3-propanediol
nitrosyl fluoride
nitrosyl tetrafluoroborate
nitrotris(hydroxymethyl) methane
nitrous acid sodium salt
nitrous oxide
nitryl hydroxide
NM
NMPD
NO
NO2
Norgesic
norkool
normal hexane
normal lead acetate
NSC 143016
NSC 37088
Nutraplus

O

oil of bitter almond
oil of mirbane
oil of myrbane
oil of vitriol
oleum
Onychomal
Ophthalgan
Optal
orange base irga 1
Osmitrol
Osmosal
oxalic acid
oxaldianilide
oxanilide
oxomethane
oxomethylene
oxybenzene
1,1'-oxybisethane
Oxydol
oxygen
oxymethylene
Oxysept

P

PAC (salt)
paracetaldehyde
paraffin
paraffin wax
Paraform
paraformaldehyde
Paral
paraldehyde
Pastaron
PE 200
pearl ash
Pearlman's catalyst
Pearsall
Pegasyl
pentaertyhrito
pentaerythritol
perchloric acid
perchloromethane
perchloryl fluoride
perfluorohydrazine
Perhydrol
Peroxan
peroxide
Persistin
PETP
petrohol
petrol
petroleum ether
petroleum naphtha
petroleum spirits
phene
phenic
phenic acid
phenol
phenol alcohol
phenylamine
phenyl bromide
phenyl chloride
phenyl hydrate
phenyl hydride
phenyl hydroxide
phenylic acid
phenylic acid, phenyl hydroxide
phenylic alcohol
phenylmethanal
phenylmethane
phenyl methane
N-phenyl-N'-phenylurea
phosphoric anhydride
phosphorus
phosphorous pentoxide
phosphorus chloride
phosphorus oxychloride
phosphorus trichloride
phosphoryl chloride
picramic acid
picraminic acid
picryl chloride
pigment metal 2
pigment yellow 46
piperidine
plumbous oxide
polyhydric alcohols
polyoxymethylene
polystyrene
polyvinal alcohol
Polyviol
potassa
potassium carbonate
potassium dinitroethanol
potassium hydrate
potassium hydroxide
potassium hypophosphite
potassium iodide
potassium nitrate
precipitated
precipitated silica
premium
preparation af
pronarcol
2-propanamine
propan-2-amine
1-propanol
2-propanol
propan-2-ol
n-propan-2-ol
propanone
1,2-propanediol
propanetriol
1,2,3-propanetriol
2-propanone
propene acid
2-propenoic acid
propenoic acid
2-propenoic acid methyl ester
propenoic acid methyl ester
2-propenoyl chloride
propenoyl chloride
propol
n-propyl alcohol
propylene glycol
propylic alcohol
protium
Purex
PVA
pyridine
pyroacetic acid
pyroacetic ether
pyrobenzol
pyrodextrin
pyroxylic spirit

potato alcohol

Q, R

quick silver
R 10 (refrigerant)
R 20 (refrigerant)
R 30
Raney copper
Rathje
Rcra waste number P022
Rcra waste number U012
Red Devil Lye
red fuming nitric acid
red mercury (II) oxide
refined solvent naphtha
refrigerant R10
refrigerant R20
Refrigerant 30
Resectisol
resotropin
Rfna
rhodine
Robaxisal
rock salt
Roman vitrol
rubbing alcohol

S

salacetin
sal ammonia
sal ammoniac
salammonite
salcetogen
saletin
salicylic acid acetate
saline
saline solution
salmiac
Salpetersäure
sal soda
salt
salt cake
salt of Saturn
salt of tartar
saltpeter
Salzburg vitrol
Santar
SBA 0108E
schwefelkohlenstoff
sd alcohol 23-hydrogen
sea salt
sec-propanol
soda ash
soda chlorate
soda lye
soda mint
soda niter
sodium
sodium acetate
sodium acid carbonate
sodium acid sulfate
sodium acid sulfite
sodium azide
sodium benzoate
sodium bicarbonate
sodium bichromate
sodium bisulfate
sodium bisulfite
sodium carbonate
sodium chlorate
sodium chloride
sodium dichromate
sodium hydrate
sodium hydrocarbonate
sodium hydrogen carbonate
sodium hydrogen sulfate
sodium hydrogen sulfate
Spersul thiovit
Spirit of Hartshorn
spirits
spirits of salts
spirits of wine
starch
starch gum
stat trak plus
sterisol hand disinfectant
sterling
styrofoam
sugar of lead
Sul-Cide
Sulfex
Sulfidal
sulfocarbonic anhydride
sulfolane
Sulforon
sulfur
sulfur acid
sulfur atom
sulfur chloride
sulfur dichloride
sulfur, flowers
sulfuric

sec-propyl alcohol
sec-propylamine
Security Nutronex
Sefril
Shed-A-Leaf 'L'
shotgun
silica gel
siliceous earth
silicic acid
silver
silver iodide
silver nitrate
skellysolve B
slaked lime
slaker rejects
smite
Sno Tears
soda
monohydrate
sodium hydroxide
sodium hypochlorite
sodium nitrate
sodium (I) nitrate
sodium nitrite
sodium pyrosulfate
sodium sulfate
sodium sulfite
Sofril
solaesthin
solfuro di carbonio
solmethine
soludal
Solvay soda
solvent naphtha
spectrar
Sperlox-S
Spersul
sulfuric acid
sulfuric acid, ammonium iron (2+) salt
sulfuric acid, monosodium salt
sulfuric ether
sulfur monochloride
sulfurous oxychloride
sulfur subchloride
Sulkol
Sulsol
Supac
super
Super-Cel
Super colloid
Super Six
superlysoform
superoxol
Synasol

T

table salt
takineocol
tar camphor
TCLP extraction fluid 2
tecsol
tescol
Tesuloid
1,3,5,7-tetraazaadamantane
1,3,5,7-tetraazatricyclo [3.3.1.1^{3,7}]decane
tetraazatricyclo[3.3.1.1(3,7)] decane
tetrachlorocarbon
tetrachloromethane
tetrafinol
tetrafluorhydrazine
tetraform
tetrasol
That F
thenardite
thermonatrite
Thiolux
Thion
THION 80
THION 95
thionyl chloride
thiophan sulfone
Thiorit
Thiovit
THME
Thyroblock
Thyrojod
tin
tol
Triaminicin
trichloroaluminum
trichloroform
trichloromethane
tricresol
trifluoroacetic anhydride
triformol
trihydroxypropane
1,2,3-trihydroxypropane
trimethylolnitromethane
2,4,6-trimethyl-1,3,5-trioxane
trinitro-*m*-anisidine
trinitro-*m*-phenetidine
trioxymethylene
tris(hydroxymethyl) nitromethane

tetrahydro-1,4-dioxin
tetrahydro-p-dioxin
tetrahydrothiophene 1,1-dioxide
tetrahydrothiophene 1-dioxide
tetrakis(hydroxymethyl)methane
tetramethylolmethane
toluene
toluol
tolu-sol
m-tolylboronic acid
top flake
torrefaction dextrin
tris-nitro
trivinyl isocyanurate
Trycite
t-stuff
Tumbleaf

U

U-3886
ucar 17
UN 1131
UN 1547
UN 1726
UN 1955
UN 2581
univerm
unleaded
urea
urea, 1,3-diphenyl-
urea nitrate
Ureaphil
Urecare
Urederm
Ureophil
Urepearl
UREX
Uritone
Uroqid
Urotropin
USAF ek-534

V

Vanquish
varnish makers' & painters' naphtha
vaterite
Veracur
vermoestricid
Versneller NL 63/10
Vinarol
vinegar
vinegar acid
vinegar naphtha
Vinol
vinylformic acid
vitriol brown oil
V.M.&P. naphtha

W

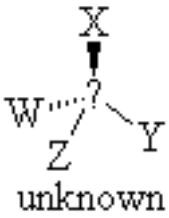
washing soda
water
weeviltox
wegla dwusiarczek
white crystal
white caustic
white dextrin
white tar
whiting
wood
wood alcohol
wood naphtha
wood spirit

X, Y, Z

XAXA
xylene
xylol
yellow dextrin
yellow lead ocher
yellow mercury (II) oxide
yellow oxide of mercury
zinc
Zolvis

A|B|C|D|E|F|G|H|I|J|K|L|M|N|O|P|Q|R|S|T|U|V|W|X|Y|Z

Chemical Table Reference

Chemical Name			Chemical Formula	List Number	Molecular image
mp=melting point	bp=boiling point	d=density	m=molecular mass	c $?.??=cost	
Safety Data: MSDS Material Saftey Data Sheet					

Synonyms: Alternative names of the compound

Synthesis: This portion describes either how to synthesize the compound or where to obtain the compopund

Synthesis Section Nav-Bar

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Lab Skills

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SEARCH

This page, when done, will contain an descriptions, as well as pictures, for every little chemistry technique and definition uson on the site. Consider this page a complete college lab text with all you will ever need to know. Whenever a technique is used, a setup called for, or a particular term mentioned there will be a link to the relative part of this section. It may help to read all of techniques here to gain a valuable insight into how to conduct an actual synthesis. There may also be some parts here that are not linked from elsewhere in the site.

Try these links until I get done...
Laboratory Encyclopedia
Lab Skills

These links are not very good, but hey, it's all I have considering this is a ton of work to do, and not a very high priority compared to other sections. There is not a lot of free information these days either. I will free it for you.

Lab Skills

adding
collect
cooling
dissolving
distillation
drying
evaporation
extraction
filtration
fume removal
pouring
purification
recrystallization
refluxing
salt-ice bath
stirring
storing
temperature
washing

Chemistry Terms

acid
alkaline
base
combustion
concentrated
crystals
decomposition
deflagration
detonation
dust
grams
hygroscopic
ions
milliliters
mixture
moles
pH
powder
precipitate
ratio
reaction
salt
sensitivity
sensitizer
stability
vapor

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Lab Equipment

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SEARCH

This section is here to provide a visual description of every type of laboratory glassware, apparatus, and equipment that is required to perform a particular synthesis. Each piece of labware has a representitive picture as well as a description of what the object does, and where to get it. Since this section is still under construction it is not as informative as it could be. Pictures are provided, but not much in the way of descriptions.

The following tables contain an alphabetical index of either glassware or apparatus. Whenever a piece of labware is mentioned in any lab, there is a direct link to the respective component. It may to helpful to familiarize yourself with all of the labware here before attempting any procedure.

Glassware

Adapters
Beakers
Bottles
Bubblers
Burets
Condensers
Crucibles
Dishes
Distilling Columns
Drying Tubes
Flasks
Funnels
Graduated Cylinder
Mortar and Pestle
Pipets
Stirring Rods
Test Tubes
Tubing
Watch Glass

Apparatus

Apron
Aspirator
Brushes
Burners
Clamps
Desiccators
Filter Paper
Gloves
Goggles
Hotplate
Magnetic Stirrer
pH Paper
Pipet Bulbs
Pipestem Triangle
Ringstand
Rings
Stoppers
Test Tube Clamp
Test Tube Rack
Thermometer
Tongs
Tubing
Wash Bottle

Try out the LabVista Web Search Engine!
Search hundreds of used equipment dealers web pages to find virtually any type of labware.

Web Search

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Safety

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SEARCH

The possession and handling of chemicals, especially explosives, can be extremely hazardous to an untrained or ignorant individual. The preparation of any explosive or chemical substance requires a good deal of planning and forethought to be successful.

To begin with, you should have a dedicated area to set up your lab that has a sizable work area, easy access to chemicals and apparatus, seclusion from prying eyes, a minimum of flammable materials, and good ventilation. A garage or basement is better than a kitchen to keep contamination to a minimum, a shed or other separate building is ideal should a disaster occur.

It is advisable to never work alone in the lab if you can. Also get some basic protective equipment such as gloves, aprons, goggles, and a respirator. It is best to have these things and wear them all the time because they can prevent a potentially harmful incident. Get some kind of fire extinguisher, big or little, its always best to get the kind that made for chemicals. A resourceful person may find that of all things fire extinguishers are found in public buildings just sitting on the walls waiting to be put to good use. Keep a garden hose at the ready as well as a bucket of water for emergency dilatation's or to douse yourself if (when) you catch fire, an extinguisher can be harmful to a person if sprayed onto them.

Now chemical waste. I would suggest dumping chemical waste as far away from your property as possible. Dump it down a sewer, dump it on somebody's lawn, or just dump it near some industry and call the environmentalists to harass that company for spewing toxins, chances are that the environmentalists will already be there dumping toxins so they have something to complain about. Pay for professional disposal if you wish, but I believe environmental destruction is overrated. Dump it down the drain.

Adapted from *Safety In Academic Chemistry Laboratories*, prepared by the American Chemical Society Committee on Chemical Safety, 1990.

General: Never work in the laboratory alone. Perform no unauthorized experiments *(A note if I may, its a good thing its your lab...)* Do not use mouth suction to fill pipettes. Confine long hair and loose clothes while working in the laboratory. Wear shoes. Learn the location of and correct use of the nearest fire extinguisher. Learn the location of the safety shower and first aid kit and be prepared to give help to others *(keep some means*

of running water ready and get some kind of first aid kit because minor accidents do happen, but they are usually more of a nusance than actually life threatning).

Safety Glasses: Safety glasses should be worn **at all times** while in the laboratory, whether you actively engage in experimental work or not. Contact lenses should **never** be worn in the laboratory because they cannot be removed rapidly enough if reagents accidentally splash in the eye *(I have seen it happen, chemical vapors tend to dissolve in the tears behind the lens and will not be flushed away, or a splash will trap chemicals behind and insure that it stays in direct contact with the cornea, ouch)*.

Fire: Avoid unnecessary flames. Check the area near you for volatile solvents before lighting a burner. Check the area near you for flames if you are about to begin working with a volatile solvent. Be particularly careful of the volatile solvents diethyl ether, petroleum ether (ligroine), benzene, methanol, ethanol, and acetone.

Chemicals: Handle every chemical with care. Avoid contact with the skin and clothing. Wipe up spills immediately, especially near the balances and regent shelf. Replace caps on bottles as soon as possible. Do not use an organic solvent to wash a chemical from the skin as this may actually *increase* the rate of absorption of the chemical through the skin. Avoid inhalation of organic vapors, particularly aromatic solvents and chlorinated solvents. Use care in smelling chemicals and do not taste them unless instructed to do so. Drinking, eating, or smoking in the laboratory is forbidden.

Disposal of Chemicals: Dispose of chemicals as directed in each experiment. In general, small quantities of water-soluble substances can be flushed down the drain with a large quantity of water. Water-insoluble solids and liquids should be placed in the waste container provided. Chromium ion in the +6 oxidation state (orange) should be reduced to the +3 state (green) with a mild reducing agent such as bisulfate before disposal.

Caution: It has been determined that several chemicals that are widely used in the organic laboratory (e.g., benzene and chloroform) cause cancer in test animals when administered in large doses *(the good stuff always does this damnit)*. Where possible the use of these chemicals is avoided. In the few cases where suspected carcinogens are used, the precautions noted should be followed carefully. A case in point is chromium in the +6 oxidation state. The *dust* of solid Cr^{+6} salts is carcinogenic. The hazards have been pointed out and safe handling procedures are given.

Beware, this safety section is by no means completed yet. This is only a little of what I want to put here!

Try this link for more safety information.

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- Other Explosives
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- Battlefield Chemistry
- Improvised Weapons
- Detonation and Demolition
- Tools, Techniques, and Plans
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- Chemicals, Apparatus, and Equipment
- Links and Literature
- Special Project 1: Nitric Acid
- Issues and Opinions
- Forum Matters
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- The Water Cooler

War has been declared

Real science, uncensored and free.

Dear Forum members,

As you are no doubt aware our presence on the web has unexpectedly come to an end. I want to dispel any rumors right now that this was the result of some government crackdown or that we are in any kind of legal trouble. It most certainly was not. Our service provider was pressured into closing our site by their service provider who was in turn threatened by a so-called group of crusading do gooders called iDefense.

iDefense has made the absurd claim we are somehow involved with Arab terrorists. In fact their claims are pure lies. The actions of iDefense boarder on libelous, and if I had the money I would sue these misguided fools. They have tried to make an end run around the US Constitution and our guaranteed protections of free speech. Behind them I do suspect a government hand is at work, but since they have no legal basis to shut us down they use threats, intimidation, and outright criminal lies to trick our providers into shutting us down.

While we may be shut out for a time, we are not silenced indefinitely. We will never rest and we will continue to exercise all of our freedoms in any way we see fit. We may be shut down again, but I will do everything in my power to make sure we return as soon as possible.

There must now be a penalty applied to iDefense. There remains in my possession a considerable amount of knowledge concerning the synthesis of explosives and chemical weapons. I have held this knowledge in abeyance because I was unsure if the world is ready for it. I am the kind of person who does things solely for the reasons that others dislike it. Because iDefense thinks we have dangerous information I will no longer horde any of my chemical weapons information. I will distribute everything I have, and encourage others to do the same, for the very reason they don't want me to. I will also make every effort to distribute our information in as many languages as possible, to as many websites as possible.

There must be more of course. It has become necessary to establish additional websites in which to hold our knowledge. These will be created and kept secret until such a time as the main site goes down. I will also make available a complete archive of The Forum database which will be distributed to one and all. This archive will remain encrypted until we are forced to shut down. With the archive anyone will be able to recreate The Forum in its entirety, either starting your own website or running it on a PC. There will also be many more books made available via FTP sites, torrents, and other websites. I have also decided to expand the offerings of the Rogue Science website to include an additional forum. There must be additional outlets of discussion so we can draw an even greater audience from every nation of the world, even if those nations happen to be Arabic.

A freedom you do not exercise will soon be taken away. They have fired the first shot in the war and in doing so they have aroused my ire. I was content in leaving things the way they were, but now I see complacency is the weakness our enemies want to exploit. Now that I know they are our to persecute us I will not rest until their every effort is thwarted.

Jack Diamond (megalomania) webmaster of Rogue Science and admin of The Forum

Search Forum Posts

Search entire post.
Search title only.
Search

FTP Affiliates

(un)Official Roguesci Library - by retrosynthetic

Link Database Menu

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Electronic Journals

Coming Soon!

Forum membership passes 10,000!
July 15, 2004

The Explosives and Weapons Forum has been growing in leaps and bounds, and now we have finally reached our 10,000th member at the end of June. We are an overnight success 5 years in the making. Ahh, yes 5 years. July is the month I started the Forum back in 1999. July is also the anniversary of the Controversial Chem Lab, 2004 marks 7 years of my website. We are truly ancient by Internet standards.

In other news the new unofficial FTP site has climbed to over 25 GB of content since it opened in April. Chemwarrior had a nervous breakdown because his platonic love was having intimate relations with everyone but him. The poor chap must have masturbation dementia and blue balls the size of grapefruit.

In a stunning development the complete 2 CD set of The Encyclopedia of Explosives and Related Items volumes 1 to 10 is now available to one and all! Oh happy day. Retrosynthetic has been kind enough to convert it to a torrent for public download now that Rogue Science has its own torrent tracker. You may find the torrent file at the Filesoup torrent forums. You have to sign up to download the torrent, but it is an easy process.

Forum outage.
December 22, 2003

I knew it would happen sooner or later, and it finally did. The Forum database crapped out and the entire site shut down. Fortunately I was able to repair the database and restore the board right where it left off. Unfortunately it took me two days to do it. The cause? It may have had something to do with all that hacking I have been doing...

Major changes to The Forum.
December 17, 2003

I have begun hacking the code in earnest this December since I have some free time. Now that I have had a chance to familiarize myself with the working of our board software I feel confident enough to make some much needed improvements. I hope our user experiences are improved from these changes. Most importantly newbies are prevented from starting new threads, hence we no longer have to ban them for this offence. Newbie threads are also moderated before going live to the world. There are many more changes to come in the weeks, and months, ahead.

State of the site.
November 30, 2003

I know I have not updated the front page in some time, even though I have been changing it, I have not uploaded the changes. Most of the changes revolve around the new links engine, which as of this writing is almost ready to unveil to the world! I have changed the info on the unofficial FTP site to reflect its new ownership by chemwarrior, it's 30 GB and getting bigger all the time. I am thinking about opening a new section on The Forum just for FTP related stuff to encourage more people to run their own servers. Hopefully I can get someone to write a tutorial.

The new site is under construction.
Sorry for the dust...

The Rogue Science website has only begun to take shape. Most of the content you may see is merely place holding to get the look just right. I cannot really say how long it will be before some of the various sections are open for business, but they will be fleshed out over time. Keep a lookout for an index of explosives and other documents. We hope to offer some downloads and helpful instructions so that you can build your own explosive related website. Keep checking back for the latest updates!

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- Other Explosives
- Pyrotechnics
- Battlefield Chemistry
- Improvised Weapons
- Detonation and Demolition
- Tools, Techniques, and Plans
- Chemistry Related
- Chemicals, Apparatus, and Equipment
- Links and Literature
- Special Project 1: Nitric Acid
- Issues and Opinions
- Forum Matters
- The Water Cooler

UNDER CONSTRUCTION
Please excuse our dust...

Sorry, the section you have tried to access has not yet been implimented. Please keep in mind that the Rogue Science website is still under construction. Please excuse the mess and confusion as the site is brought up to speed.

Search Forum Posts

Match all words.
Match any word.
Search

FTP Affiliates

Coming Soon!

Links Database

Coming Soon!

Electronic Journals

Coming Soon!

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Rogue Science Contact Page

Is there someone else up there we can talk to?

If you have a comment, suggestion, or a problem to report please contact the administrators or staff of Rogue Science using the handy forms below. We welcome your comments and criticisms and are always willing to help those in need. Please try to direct your messages to the right place to get a response in a timely manner.

All staff members of Rogue Science make full use of PGP encryption and prefer all correspondence to be encrypted. Our personal keys are provided on the staff page located here.

Quick links.

I have a problem with my Forum member account!
There is a bug on The Forum!
There is an inaccuracy on Megalomania's Controversial Chem Lab!
I have some information to contribute.
I have a comment, criticism, or suggestion.

Contact megalomania
Contact nbk2000
Contact ALENGOSVIG1
Contact angelo
Contact Anthony
Contact J
Contact kingspaz
Contact Machiavelli
Contact Maddoc
Contact Mr Cool
Contact zaibatsu

I have a problem with my Forum member account!

If I can't post I'll die!

Sometimes a problem does arise with the software that causes trouble with your account. Make sure you read the FAQ before you submit a trouble message to see if your problem has been answered before. For security purposes no passwords will be sent to email addresses other than the one registered in your Forum member account.

Your member name (required)
Your member number (required)
Your email address (required)
Please describe the problem (required)

Search Forum Posts

Search entire post.
Search title only.
Search

FTP Affiliates

(un)Official Roguesci Library - by Ctrl_C

Links Database

Rogue Science Links Engine - Visit our comprehensive link database now! The database is fully searchable, has detailed descriptions, lists what's new and cool, and you can submit your own collection of links!

Electronic Journals

Coming Soon!

There is a bug on The Forum!
Who runs this place, monkeys?

If something is not working right on the board please contact us right away about the trouble.

Your member name (optional)
Your member number (optional)
Your email address (optional)
Please describe the problem (required)

There is an inaccuracy on Megalomania's Controversial Chem Lab!
Can this be true?

I don't like any inaccuracies on my website, but try as I might a few pop up here and there. If you spot an incorrect physical constant, a misspelled word, a bad chemical reaction, some omitted safety info, or see an incorrect chemical formula please do not hesitate to correct me. I do require a documented source before I make changes to chemical information.

Your email address (optional)
Enter the address of the page in question (required)
Please describe the error (required)
Can you provide a source for the correction? (required)

I have some information to contribute.
Share and share alike I always say.

If you have some scientific information to contribute, a book to upload, some useful bit of software, or you just want to offer your services in furtherance of Rogue Science please contact us regarding what you have to offer.

Your email address (required)
What is it you have to offer? (required)

I have a comment, criticism, or suggestion.
Just my two cents.

If you feel the website is lacking in some way, or you just want to tell us what a good job we are doing go ahead and drop us a line. If your mind has somehow deluded itself into a warped sense of reality where we have done wrong, go ahead and submit your criticisms, and then take your meds.

Your email address (required)
Comment, Criticism, Suggestion (check one)
Say your piece (required)

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Rogue Science Tutorials

How-to guides to help you spread the knowledge.

Ever wanted to digitize your books to share them? How about protect your privacy online? Perhaps you have some information to share, but you don't know how to make your own website. The Rogue Science tutorials section is here to help. Below you will find an assortment of how-to guides designed to maximize the spread of information written by Forum members and staff. If you want to submit your own tutorial or how-to guide please use this handy form.

Putting your images online

A picture is worth a thousand words.

Sometimes it helps to see what it is you are describing. Perhaps you have something interesting to show, or a design schematic that must be seen to be understood. Sometimes you don't want to go through the hassle of building your own website just to show a couple of snapshots.

This tutorial takes you step by step through the process of creating your own free webspace just for hosting images. You can be online in a matter of minutes without learning web page creation, or using complex software.

Authored by: megalomania

Scanning books with an improvised planetary camera

The quickest way to digitize books.

You can use a digital camera to scan pages of a book, sometimes two pages at once, in a fraction of the time you could with a flatbed scanner. It is as simple as turn the page and take the picture. Devices that scan books this way are called planetary cameras, but the real things cost $20,000 and up!

This tutorial shows you how you can use your digital camera to scan an entire book, and use software to process the images, so that you can make a quality digital copy of your books in less time than other methods.

Authored by: megalomania

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Search entire post.
Search title only.
Search

FTP Affiliates

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Electronic Journals

Coming Soon!

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Rogue Science is brought to you by:

The Rogue Science website is made possible by these individuals who have generously donated their time and effort to building the site into what it is today. Please take the opportunity to learn about who we are, what we do, and what our interests are. You will also be able to contact us here.

megalomania: The creator and webmaster of the Rogue Science and Controversial Chem Lab websites as well as head administrator of The Explosives and Weapons Forum. megalomania is El Presidentae around here.

about megalomania | contact megalomania | megalomania's PGP key

nbk2000: Vice-Administrator of The Forum, administrator of vices, and HED executioner of all lames and morons that cross his path.

about nbk2000 | contact nbk2000 | nbk2000's PGP key

ALENGOSVIG1:

about ALENGOSVIG1 | contact ALENGOSVIG1 | ALENGOSVIG1's PGP key

angelo:

about angelo | contact angelo | angelo's PGP key

Anthony:

about Anthony | contact Anthony | Anthony's PGP key

Bitter:

about Bitter | contact Bitter | Bitter's PGP key

J:

about J | contact J | J's PGP key

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Machiavelli:

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Maddoc:

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Mr Cool:

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zaibatsu:

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SEARCH

This list of links contains some of the more useful and informative websites that I have found in my web travels. This is not meant to be a comprehensive or even useful list, just a starting point for further research. I don't necessarily use or endorse all of these links, but they are valuable in their own way. If you know of a website that you think fits within one of the categories here, just email me and I will check it out.

Labware Links

Advance Scientific Mid-sized company that provides reasonable selection of lab equipment and some chemicals, a bit pricey in my opinion. This company is rumored to be a front for DEA sting operations, so buy chemicals from here at your own risk. Chemical sales are restricted to companies and universities only. Printed catalog is $5.00, they do not offer online shopping.

BLWA The Association of the Laboratory Supply Industry. A UK based directory of over 160 European laboratory supply companies.

Chemglass A manufacturer and supplier of Standard Taper glassware with reasonable prices. They offer a free printed catalog.

Corning Labware & Equipment Corning is one of the largest manufacturers of lab glass, but you must order through a company as they do not sell direct except to dealers. The website offers a complete catalog and an index of authorized distributors. Print catalogs are available.

Daigger Offers good selection of lab equipment at reasonable prices. They offer a free printed catalog or online shopping.

Fisher Scientific A large supplier of lab equipment, but with high prices in small quantities. Average selection of overpriced chemicals, restricted to companies and universities only. They offer a huge free printed catalog and online shopping.

Indigo Instruments Offers limited selection of lab equipment priced well for small quantities. They mainly sell unusual items for school science labs.

Lab Depot Offers an apparently limited selection of lab equipment and chemicals on the website, but they say they have lots. They also say they sell to individuals. They offer a free printed catalog or online shopping.

LabX An online auction website selling new, used, and refurbished lab equipment from many different companies and individuals. This is a very unique place where good deals can be had on used equipment or in the auction.

Thomas Scientific Offers a large selection of name brand scientific supplies for industry only. Free catalog available to scientists only.

Voigt Global An international supplier of lab equipment and chemicals. They are scared to death of selling any drug precursor, so they do not sell many basic chemicals. No prices are offered online, nor is there a print catalog that I am aware of.

VWR One of the largest suppliers of lab equipment, but very very expensive in small quantities. Average selection of overpriced chemicals, restricted to companies and universities only. They offer a huge free printed catalog or online shopping.

Chemical Suppliers

Other Science Links

Explosive Sites

Aerodynamic Inventions A very informative website about pneumatics and pyrotechnics

Bruce's Bombs, Explosives, and Ordinance Page General explosives information geared towards safety and law enforcement types

DaveBoomIndex A small list of links related to explosives

Explosives & Pyrotechnics Information Database A good page, but its creator is a difficult person to get along with

Vaeyens Senne's explosives thesis An academically written site with general explosives data

Political Links

Chemical Weapons

Introduction to Chemical Warfare A brief overview of the use of chemical weapons, nothing of true value

Biological Weapons

Nuclear Weapons

Drugs

The Hive This is a great discussion board for all matters of drug synthesis and chemical acquisition. Read all you can before posting because they do not tolerate the ignorant. This site was the primary inspiration for me in creating my explosives forum.

Lycaeum This is one of the largest and best sites for information on recreational drugs and for drug synthesis. It is a huge and comprehensive database on all things drug related.

Rhodium One of the top drug synthesis archives. This site has a massive section of synthesis procedures for many precursors. It is kind of the drug equivalent of my site.

Poisons

Megalomania's Controversial Chem Lab ©1997-2004 /links/ revised January 31, 2004

Whats New

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SEARCH

Megalomania's Controversial Chem Lab is a web site devoted to publishing chemical information on any substance that has been deemed "unacceptable" to use, posses, sell, consume, etc. The chemicals here are dangerous, yes, but they are also very interesting. These substances capture the attention of the news media and the general public every day, primarily for there misuse.

I wanted to create a place where those with little scientific skill could learn the trade while being informed about chemistries hidden side. Within this web site are methods of synthesizing a variety of chemical compounds including explosives, drugs, poisons, medicinal compounds, and chemical weapons. There is also extensive supporting information to assist you in understanding these labs. I have made sections on laboratory safety, explanations of laboratory equipment, skills and terms used in all these labs, and a more or less comprehensive section detailing how every precursor chemical used in the sites labs can be synthesized themselves.

What I do not provide are any means of building detonators, bombs, delivery systems, or any other means of actually using these chemicals. This information could facilitate a misuse of these compounds for criminal purposes. These labs are provided for educational purposes only.

I have gone to great lengths to include more than the average amount of information on preparing a chemical. No where else can you find links within the Lab directing you to the chemicals used, or the equipment needed, or even an explanation of this or that Lab skill. I hope that someday the chemical preparations here will become incidental to the safety information, the explanations of laboratory equipment, the definitions of chemistry terms, and the clear explanations on how to perform a Lab technique.

The update history: Progress and direction.

Projected Status for 2002:
I have decided to refocus back on explosives again. All of the precursors and the other areas still need a lot of work, but explosives are what I do best, so I want to offer more. Specifically I will be researching the latest and greatest 21st century explosives fresh from the lab, with some older mid 20th century stuff thrown in. I may also begin to get my own precursor research underway. I have already started experiments on homemade nitric acid, and my theory on making benzene is very solid now. I also plan a few molten electrolysis experiments.

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11. No criminal or civil offence is being committed by accessing or reading these documents.
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Lab Skills|Lab Equipment|Safety|Rogue Science|Links|What's New|Contact Me|Disclaimer

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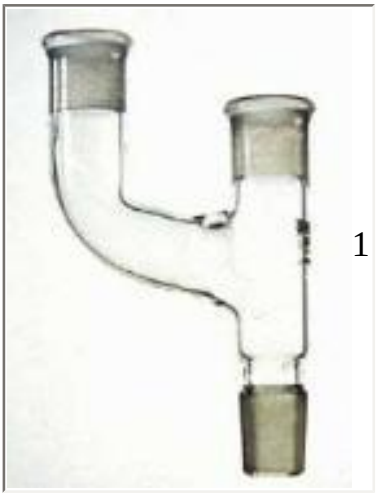
Glassware


1

2

3

4

Adapters

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1

2

3

Beakers

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1

2

3

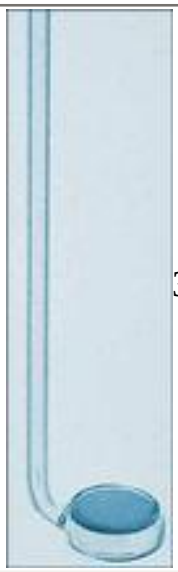
Bottles

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1

2


3

Bubblers

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1

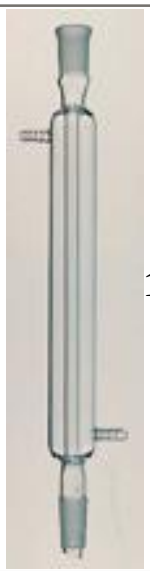
2

3

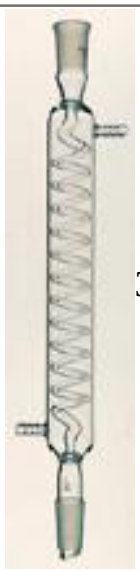
Burets

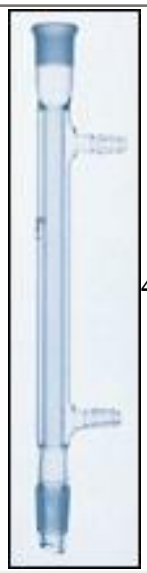
What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah


1

2


3


4

5

Condensers

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1

2

3

Crucibles

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1

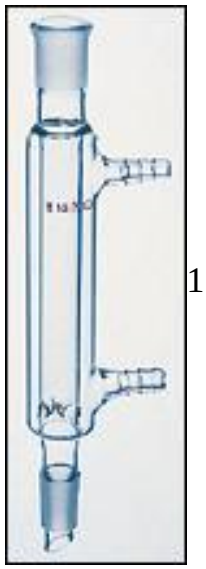
2

3

Dishes

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah


1

2

3

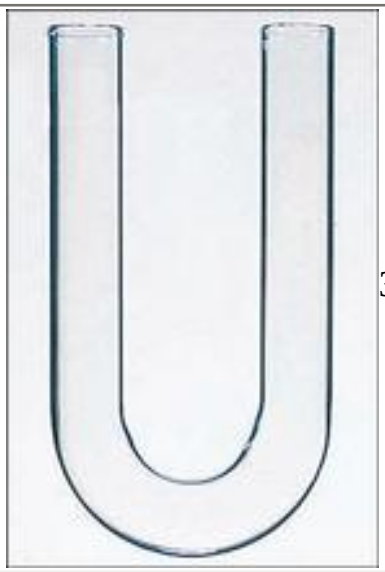
Distilling Columns

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1

2


3

Drying Tubes

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1

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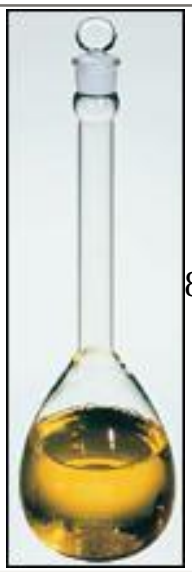
4

5

6

7

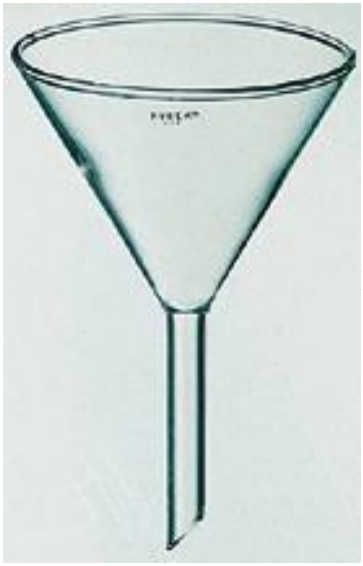


8

Flasks

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah


1

2

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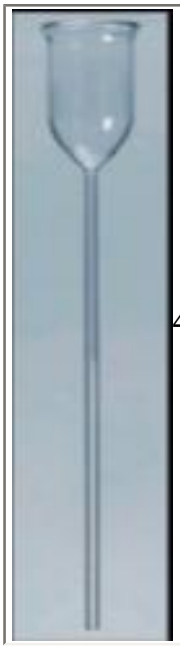

4

Funnels

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Graduated Cylinder

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

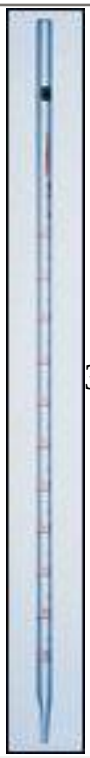
Mortar and Pestle

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1

2


3

4

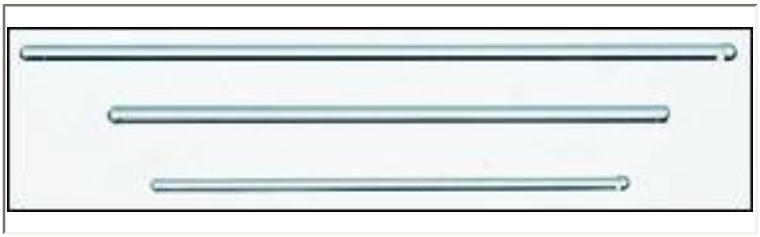
5

6

Pipets

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah



Stirring Rods

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Test Tubes

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Tubing

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Watch Glass

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

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Apparatus

Apron

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Aspirator

What It Is: Blah, Blah, Blah, Blah

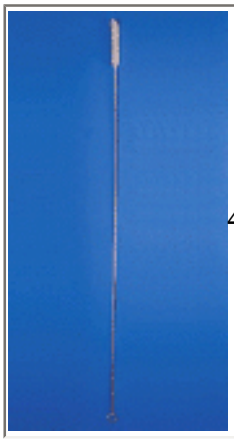
Where To Get It: Blah, Blah, Blah, Blah

1

2

flask brush

3



4

Brushes

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1

2

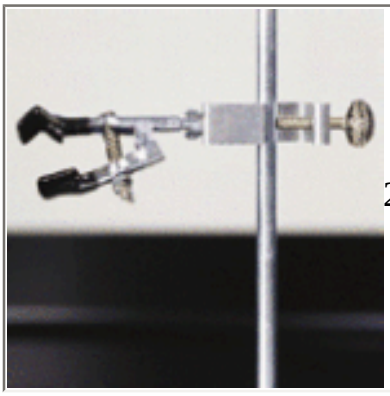
3

Burners

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

talon clamp 1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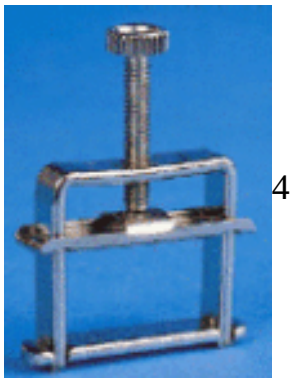
3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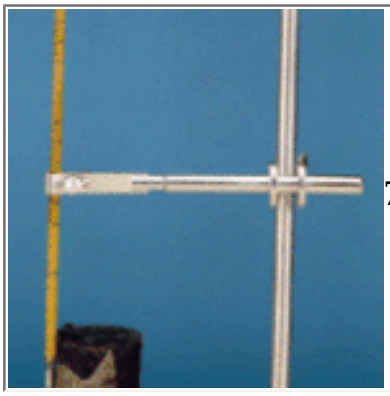
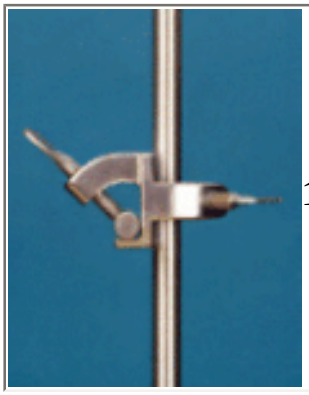
Keck clamps 5

6


7

8

chain clamp 9	double buret clamp 10	swivel clamp holder 11	 12

Clamps

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

an economical desiccator 1	standard desiccator 2	vacuum desiccator 3	4

Desiccators

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1	2	3

Filter Paper

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

nitrile gloves	1	latex gloves	2	heavy chemical resistance gloves	3

Gloves

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

goggles

Goggles

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Hotplate

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Magnetic Stirrer

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1

2

3

pH Paper

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

1

2

3

4

5

6

Pipet Bulbs

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Pipestem Triangle

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Ringstand

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Rings

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Stoppers

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Test Tube Clamp

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Test Tube Rack

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Thermometer

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Tongs

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Tubing

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

Wash Bottle

What It Is: Blah, Blah, Blah, Blah

Where To Get It: Blah, Blah, Blah, Blah

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Distillation

Distillation is a process in which a liquid is vaporized to a gas, recondensed to a liquid, and collected in a receiver. The liquid which has not vaporized is called the residue, and the liquid which is collected in the receiver is called the distillate. Distillation is used to purify liquids and to separate one liquid from another. It is based on a chemicals volatility, or the relative ease of which the molecules leave the surface of a liquid. Every chemical has a unique volatility, usually a more volatile chemical has a lower boiling point. The successful application of distillation techniques depends on several factors. These include the difference in boiling points of chemicals present, the size of the sample being distilled vs. the size and type of distillation apparatus, the occurrence of azeotrope formation, and the care you exercise.

You may think that boiling a liquid will release the lower boiling compound first. In reality a mixture of the chemicals being distilled will vaporize. There will be more of the lower boiling chemical, but, depending on how close each chemicals boiling point are to one another, and the ratio of their volumes, the exact compositions will vary. In general, the earlier portion of a distillation will be higher in the lower boiling component. As the volume of that material becomes less and less, more and more higher boiling component will be distilled over. When the boiling points of the chemicals are very close, it is difficult to separate them. Sometimes two or more chemicals will form an azeotrope, or a constant boiling mixture that can not be separated which has its own unique boiling point different from its components. A common azeotrope is ethyl alcohol and water, distillation can only get around 95% alcohol and 5% water at best.

Since not all chemicals distill the same way, there are several distillation techniques that are used. These include simple distillation, fractional distillation, steam distillation, and vacuum distillation. Some important things to remember for all distillations: Do not fill a distilling flask more two-thirds of the way, and never distill a flask to dryness because explosive peroxides tend to form and are concentrated enough to blow a flask to pieces. Also, you may want to use a boiling stone to prevent bumping, that is a sudden gushing of liquid that rushes upwards and may splash out of the flask in simple distillations and hinder fractional distillations. A boiling stone is a small piece of marble gravel.

Simple Distillation

A simple distillation is for purifying liquids of one component (separating a liquid from solid contaminants), multiple liquids where the differences in boiling points is very large (a low boiling liquid from a high boiling liquid), or where time is at a minimum. Simple distillations are not effective in removing multiple solvents from one another with a high degree of success.

Assemble the glassware as pictured in figure 1. The picture shows standard taper glassware which is superior to ordinary glassware. Ordinary glassware can be substituted for standard taper equipment. There should be a clamp on the distilling flask neck, the right angle adapter neck, the middle of the condenser, and the receiving flask neck. You may need a separate stand for the condenser/receiver clamps.

Before connecting the distilling flask, add 1 or 2 boiling stones and, of course, the materials to be distilled. Adjust the depth of the thermometer so that the bulb is slightly below the sidearm leading into the condenser, this is to measure the temperature of the **vapor**, *not* the liquid in the distilling flask. If you are using ordinary equipment, use a short length of glass tubing bent at a 45° angle with rubber or cork stoppers large enough to fit into the distilling flask and the ordinary. The stopper in the distilling flask should be a 2-hole, a thermometer fits into the other hole. The condenser should be angled downward and the thermometer bulb should be just below the bottom of the stopper. The glassware on the end of the condenser (drip adapter) that leads into the receiver is not really necessary, it is just convenient. The vacuum adapter doubles as a drip adapter for standard taper glassware. A drip adapter can be purchased or a length of angled glass tubing can be stoppered from the condenser to the receiver. Sometimes hot distillate will escape if no drip adapter is used, omit at your own risk. The receiver can be a beaker, graduated cylinder, flask, etc.

Make sure all connections are tight and firm, the clamps tend to pull apart the connections as they are assembled. The water inlet of the condenser is always the lower nipple (closer to the receiver), the outlet is at the top (closer to the distilling flask). The outlet should be pointing up so the water is forced to completely fill the jacket. Double check that everything is clamped securely and that coolant water is circulating through the condenser. Do not have the water pressure so high that the hose pops off.

Begin heating the distilling flask until boiling begins. Adjust the heat level so that amount of distillate is a steady 2 or 3 drops per second. Discard the first several drops as they may have contaminants. Continue distilling until only a small residue remains, not to dryness, if distilling pure liquids. When distilling mixtures, the more volatile component will be collected in greater concentration at first. As the distillation proceeds a greater percentage of the less volatile component will be collected. It may help to change the receiver several times to collect different fractions. These separate fractions may then be redistilled to collect even purer fractions of each component. Fractional distillations handle this task far more efficiently.

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Filtration

All about filtration

Filtration

How to Filter

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Refluxing

All about refluxing

refluxing

How to reflux

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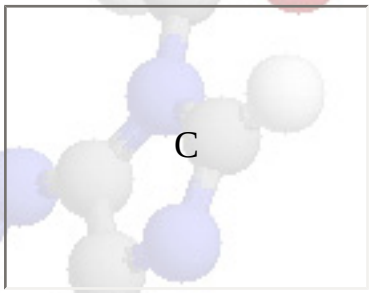
Precursors Part 2

charcoal	C	1	
mp ? bp ? d ?	m 12.01115	c $?.??	
Safety Data: MSDS *Flammable*			

Synonyms: *carbon*; activated carbon; activated carbon, decolorizing; activated charcoal; animal charcoal; carbon, activated; carbon, activated or decolorizing; carbon, amorphous; carbon black; carbon decolorizing; carboraffin; carborafine; charcoal, activated

Synthesis: Coming soon!

chlorine	Cl_2	1	
mp -101.00 bp -34.05 d ?	m 70.906	c $?.??	
Safety Data: MSDS			

Synonyms: chlorinated water; dichlorine; molecular chlorine

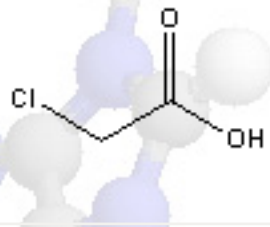
Synthesis: Chlorine gas can be generated in several ways using a wide variety of chemical reagents. The amount of material to use will depend on how much chlorine you need, generating chlorine does not need precise quantities. The reactants are mixed in such a ratio that keeps the gas flowing.

The most convenient OTC method is the reaction of bleach with Sani-Flush brand toilet bowl cleaner. Technically the reaction is between sodium hypochlorite in the bleach and sodium bisulfate in the Sani-Flush. The advantage of this is that both are available as OTC chemicals from the supermarket. Add a quantity of Sani-Flush to a large Erlenmeyer flask. A one-holed stopper with a length of glass tubing connected to a rubber hose is used to direct the gas. Pour a small amount of bleach over the Sani-Flush and quickly stopper the flask. The reaction will quickly generate chlorine in a vigorous reaction. The reaction will soon subside, shake the flask periodically to stimulate the reaction. When shaking is no longer effective, add more bleach to start the process again. When adding more bleach is no longer effective, add additional Sani-Flush. Continuing in this manner will generate a large amount of chlorine. The most efficient way is to fill the flask one third of the way with Sani-Flush and add the bleach dropwise with an addition funnel. When enough bleach has been added to create a solution, a magnetic stirrer is used to provide agitation. This method will provide a constant flow of gas.

A second method of generating chlorine gas is to fill a flask one third of the way with small pieces of manganese dioxide. To this is added concentrated hydrochloric acid in sufficient quantity to cover the solid. On heating, a regular current of chlorine is generated.

Alternately, chlorine can be generated by adding 1 L of hydrochloric acid to 180-200 g of powdered potassium dichromate and heating on a water bath.

Chlorine gas must be dried in some preparations. By passing the gas through a wash bottle filled with water, any excess hydrochloric acid will be removed (if hydrochloric acid is used to prepare the gas). A second wash bottle filled with concentrated sulfuric acid will remove traces of moisture; the presence of water is harmful for most uses of chlorine here.

chloroacetic acid			$ClCH_2COOH$	1
mp 61-63	bp 189	d 1.580	m 94.50	c $?.??
Safety Data: MSDS *Corrosive, Toxic*			LABGUARD* Storage Code WHITE	

Synonyms: alpha-chloroacetic acid; chloroethanoic acid; MCA; monochloroacetic acid; monochloroethanoic acid

Synthesis: Prepare a mixture of 12 g of red phosphorus and 143 mL of glacial acetic acid in a 250-mL Florence flask. Connect a Clasien adapter to the flask; attach a reflux condenser to the angled arm, and a thermometer adapter to the straight arm. Instead of using a thermometer in the adapter, place a piece of glass tubing that extends to the bottom of the liquid. This is an addition tube for chlorine gas, using a bubbler on the end of the tube can improve the reaction.

Locate the apparatus in a location that it can receive as much sunlight as possible, even to the point of positioning mirrors to get more sunlight. The sunlight is very important as the light provides the photochemical energy necessary for this reaction to succeed. Ordinary lamp light will not work, nor will this reaction be very effective during the winter months. The best time is midday during summer. With adequate sunlight the reaction will require as little as 12 hours (essentially all day while there is light) and in winter it will require two or more days (stopping for the night). The longer it takes, the more chlorine that will be wasted.

While heating the flask on a vigorously boiling water bath, pass a current of dry chlorine gas into the acetic acid. The completion of the reaction can be determined by taking a small sample into a test tube and cooling it in an ice-water bath. If the sample solidifies after rubbing the walls of the test tube with a glass stirring rod, it is done. After the reaction is complete, set the flask up for simple distillation. Distill the contents, collecting the portion that distill over from 150 to 200 °C in a beaker. Cool the beaker in a salt-ice bath, rub the walls with a glass stirring rod. The portion that solidifies, consisting of pure chloroacetic acid, is rapidly suction filtered, the loose crystals are to be pressed together with a spatula or spoon to squeeze out excess liquid. The suction must not be continued too long because the chloroacetic acid gradually becomes liquid in warm air. The filtrate is again distilled, but this time the portion distilling over from 170 to 200 °C is collected in a beaker. A second portion of chloroacetic acid is obtained by cooling and filtering as before. The two crystalline portions are combined, and then distilled to obtain perfectly pure chloroacetic acid; yield can vary from 80-125 g.

Although this reaction primarily synthesizes chloroacetic acid, some amounts of dichloroacetic acid, and trichloroacetic acid will also be made. These can be obtained from the filtrate and what does not boil over during the distillations. By continuing the reaction beyond what is necessary to make chloroacetic acid, you will eventually end up with mostly trichloroacetic acid. This will take several extra days though. The rate of the reaction can be facilitated by the addition of a small quantity of iodine to the acetic acid and phosphorus. This will cause some amount of contamination (iodoacetic and chloroiodoacetic acids), but a greater yield will be achieved in less time.

It is possible to substitute sulfur for red phosphorus in this reaction, which is much more readily available, but it is not as efficient as phosphorus . It is also possible to conduct this reaction using bromine instead of chlorine; bromoacetic acid is thus obtained. Getting iodine products is only possible by treating the corresponding bromo or chloro compounds with potassium iodide. Furthermore, other carboxylic acids can be used instead of acetic acid, as long as it has an alpha hydrogen (a hydrogen atom on the carbon that is bonded to the carboxylic functional group).

chlorobenzene	C_6H_5Cl	1	

mp -45	bp 131-132	d 1.107	m 112.56	c $?.??

Safety Data: MSDS *Flammable*

LABGUARD* Storage Code RED

Synonyms: benzene chloride; chlorobenzene mono; chlorobenzol; MCB; monochlorobenzene; monochlorobenzol; phenyl chloride

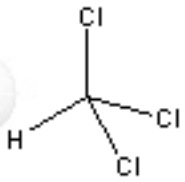
Synthesis: Nothing yet

chloroform	$CHCl_3$	1

mp -63.5	bp 61-62	d 1.484	m 119.38	c $?.??

Safety Data: MSDS

LABGUARD* Storage Code BLUE



Synonyms: *trichloromethane*; formyl trichloride; methane trichloride; methenyl trichloride; methyl trichloride; R 20 (refrigerant); refrigerant R20; trichloroform

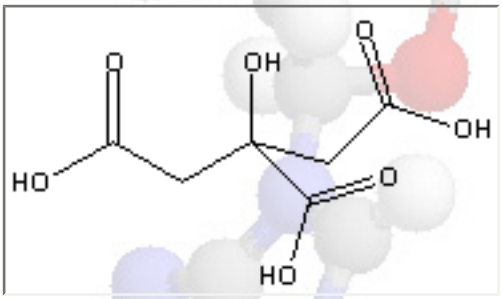
Synthesis: Coming soon!

citric acid	$C_6H_8O_7$	1

mp 153	bp ?	d 1.665	m 192.13	c $?.??

Safety Data: MSDS

LABGUARD* Storage Code GREEN



Synonyms: *2-hydroxy-1,2,3-propanetricarboxylic acid*; aciletten; citretten; Citro; hydrocerol a; hydroxy-1,2,3-propanetricarboxylic acid; hydroxytricarballylic acid; 2-hydroxytricarballylic acid; beta-hydroxytricarballylic acid

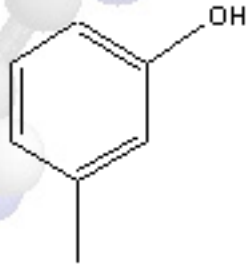
Synthesis: Coming soon!

copper	Cu	1

mp 1083	bp 2595	d 8.94	m 63.546	c $?.??	Cu
Safety Data: MSDS				LABGUARD* Storage Code RED	

Synonyms: ANAC 110; arwood copper; CDA 102; CDA 122; C.I. 77400; CuTEA; cutrine-plus; komeen; pigment metal 2; Raney copper

Synthesis: Coming soon!

m-cresol		C_7H_8O	1	
mp 11-12	bp 202	d 1.034	m 108.14	c $?.??
Safety Data: MSDS *Corrosive, Toxic*			LABGUARD* Storage Code WHITE	

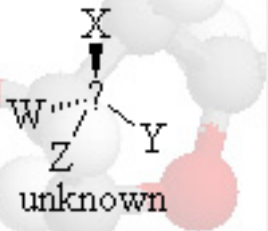
Synonyms: *3-methylphenol*; cresol; cresylic acid; cresylol; tricresol

Synthesis: Prepare a solution of 5.4 g of *m*-tolylboronic acid and 100 mL of ethyl ether in a 250-mL round-bottomed flask. Drop in a magnetic stir bar and attach an addition funnel to the flask. While stirring, add 30 mL of 10% hydrogen peroxide from the funnel over a period of 5 minutes. The reaction will generate heat as the reaction commences. After all of the peroxide has been added, continue stirring until the contents of the flask have cooled to room temperature. This will require about 20 to 30 minutes.

After cooling, transfer the contents to a separatory funnel. Drain off the lower aqueous layer and discard it. Wash the remaining ether layer by shaking with three 30 mL portions of 10% ammonium ferrous sulfate solution. This removes any remaining peroxide. Again discard the lower aqueous layers. Next, extract the product from the ether by shaking with three 30 mL portions of 10% sodium hydroxide solution. This time keep and combine the aqueous extracts, discard the ether layer. Acidify this solution by adding an excess of concentrated hydrochloric acid, and then extract the product by shaking with three 70 mL portions of ether.

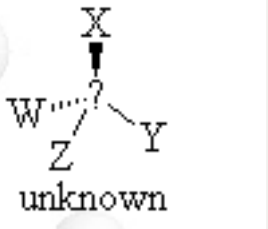
Dry the combined ether extracts by adding several grams of calcium sulfate, shake for a minute, and then filter to remove the sulfate. Remove the ether by allowing it to evaporate. Finally, distill the crude product to collect pure *m*-cresol. The yield is 58% or about 2.5 g.

cupric sulfate	$CuSO_4$	1	

mp 560 (dec)	bp -	d 3.6	m 159.61	c $?.??	
Safety Data: MSDS				LABGUARD* Storage Code BLUE	

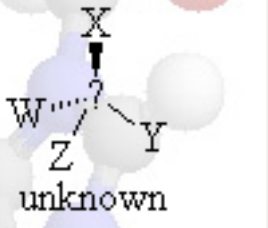
Synonyms: bluestone; blue vitrol; chalcanthite; copper sulfate; dried cupric sulfate; hydrocyanite; Roman vitrol; Salzburg vitrol

Synthesis: Coming soon!

dextrin		$(C_6H_{10}O_5)_n + xH_2O$		1	
mp -	bp -	d ?	m -	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

Synonyms: British gum; canary dextrin; corn dextrin; dextrin hydrate, white; pyrodextrin; starch gum; torrefaction dextrin; white dextrin; yellow dextrin

Synthesis: Coming soon!

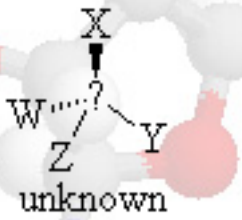
2,3-diazido-1,4-butanediol			$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

Synonyms:

Synthesis: Nothing yet

3,3-diazido-2,4-pentanediol		$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??

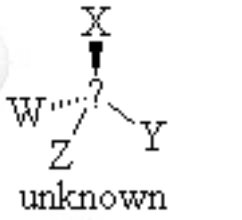
Safety Data: MSDS				ChemAlert* Storage Code GRAY



Synonyms:

Synthesis: Nothing yet

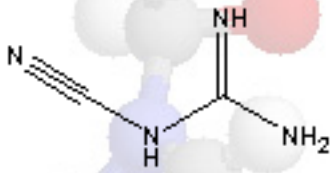
1,3-dichloro-2,4,6-trinitrobenzene		$X_aY_bZ_c$	1
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS				ChemAlert* Storage Code GRAY



Synonyms:

Synthesis: Nothing yet

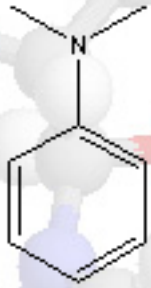
dicyanodiamide		$C_2H_4N_4$	1
mp 209.5	bp ?	d 1.400	m 84.08	c $?.??
Safety Data: MSDS				ChemAlert* Storage Code GRAY



Synonyms: *cyanoguanidine*; 1-cyanoguanidine; 2-cyanoguanidine; DCD; dicyandiamide

Synthesis: Nothing yet

N,*N*-dimethylaniline		$C_8H_{11}N$	1
mp 2	bp 192-194	d 0.956	m 121.18	c $?.??

Safety Data: MSDS	ChemAlert* Storage Code GRAY	

Synonyms: *N,N-dimethylbenzenamine*; (dimethylamino)benzene; dimethylaniline; dimethylphenylamine; N,N-dimethylphenylamine; dimethylphylamine; DMA; Versneller NL 63/10

Synthesis: Nothing yet

N,N-dimethylformamide			$HCON(CH_3)_2$	1
mp -61	bp 153	d 0.9445	m 73.09	c $?.??
Safety Data: MSDS *Flammable, Toxic*			LABGUARD* Storage Code RED	

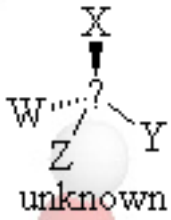
Synonyms: DMF; DMFA

Synthesis: Nothing yet

m-dinitrobenzene			$C_6H_4N_2O_4$	1
mp 89-90	bp 300-303	d ?	m 168.11	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	

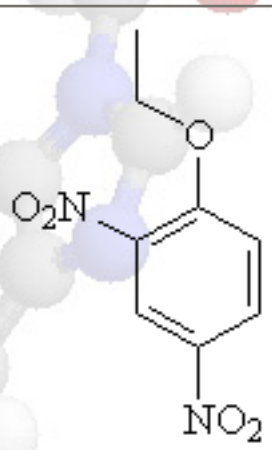
Synonyms:

Synthesis: Prepare a mixture of 14 mL of 99-100% sulfuric acid and 10 mL of fuming (+1% to +10% free NO_2) nitric acid. Slowly add the nitric acid to the sulfuric acid in a 250-mL Erlenmeyer flask cooled in a salt-ice bath. After the acid mix has cooled to room temperature remove from the cooling bath. Slowly add 8.5 mL of nitrobenzene to the acid in a well ventilated area. The mixture is then heated on a water bath for 30 minutes with frequent shaking. After allowing the mix to cool for a few minutes, pour it, with stirring, into a 500-mL beaker of cold water. Dinitrobenzene crystals should have formed. Filter the crystals to collect them, wash with water, press them with another piece of filter paper to squeeze out any excess liquid, and then recrystallize from ethyl alcohol. Yield is about 10-12 g.

2,4-dinitrophenetole			$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??	
Safety Data: MSDS			ChemAlert* Storage Code GRAY		

Synonyms:

Synthesis: Nothing yet

ß-(2,4-dinitrophenoxy) ethanol			$(O_2N)_2C_6H_3OCH_2CH_2(ONO_2)$	1	
mp ?	bp ?	d ?	m ?	c $?.??	
Safety Data: MSDS			LABGUARD* Storage Code RED		

Synonyms: dinitrophenylglycolether nitrate; glycoldinitrophenylether nitrate

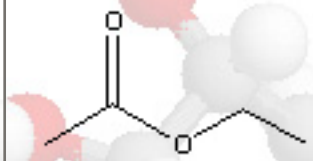
Synthesis: I know very little about this compound, it is an explosive, but the synthesis details are too sketchy for inclusion in its own page.
It can be prepared from dichlorobenzene and ethylene glycol, followed by nitration of the resulting glycol monophenyl ether.

dioxane			$C_4H_8O_2$	1
mp 11.80	bp 101.1	d 1.0329	m 88.11	c $?.??
Safety Data: MSDS			LABGUARD* Storage Code RED	

Synonyms: diethylene dioxide; 1,4-diethylene dioxide; diethylene ether; diethylene oxide; 1,4-diethyleneoxide; diokan; Diox; 1,4-dioxacyclohexane; 1,4-dioxane; p-dioxane; dioxyethylene ether; ethylene glycol ethylene ether; glycol ethylene ether; tetrahydro-1,4-dioxin; tetrahydro-p-dioxin

Synthesis: Nothing yet

ethyl acetate			$CH_3COOC_2H_5$	1
mp -83	bp 77	d 0.898	m 88.11	c $?.??
Safety Data: MSDS *Flammable*			LABGUARD* Storage Code RED	



Synonyms: *acetic acid ethyl ester*; acetic ester; acetic ether; acetidin; acetoxyethane; ethyl acetic ester; vinegar naphtha

Synthesis: Prepare a mixture of 50 mL of ethyl alcohol and 50 mL of 98-100% sulfuric acid in a round-bottomed 500-mL Florence flask. Set the flask up for simple distillation with addition. Heat the mixture with an oil bath, when the temperature of the oil reaches 140 °C slowly add a mixture of 400 mL of ethyl alcohol and 400 mL of glacial acetic acid through the addition funnel. Control the addition of the acid mix to correspond to the rate at which the product distills over.

Once the reaction has been completed, transfer the distillate to a beaker. Treat the distillate with a dilute solution of sodium carbonate to neutralize any acetic acid that has passed over. Test the pH of the upper layer; it should be basic. Transfer the neutralized distillate to a separatory funnel, and drain off the lower layer. Filter the remaining layer to remove any contaminants, and then pour the solution back into the separatory funnel.

Prepare a solution of 100 g of calcium chloride in 100 mL of water. Add this solution to the separatory funnel to remove any excess alcohol, shake the funnel well. The calcium chloride can also be added in portions if desired, drain off the lower each time. After shaking, dry the upper layer by transferring it to a small Erlenmeyer flask with a layer of granular calcium chloride in the bottom. Filter the dried product to remove the calcium chloride, transfer the filtrate to a Florence flask, and then simple distill to collect pure ethyl acetate. Yield can be as high as 90%.

ethyl alcohol			C_2H_5OH	1
mp 114.1	bp 78.5	d 0.789	m 46.07	c $?.??
Safety Data: MSDS			LABGUARD* Storage Code RED	

Synonyms: *ethanol*; absolute alcohol; alcohol; alcohol dehydrated; algrain; anhydrol; anhydrous alcohol; booze; cologne spirits; dehydrated alcohol; denatured alcohol; ethanol 200 proof; ethyl hydrate; ethyl hydroxide; fermentation alcohol; grain alcohol; hooch; jaysol; jaysol s; liqueur; methylcarbinol; molasses alcohol; moon shine; potato alcohol; sd alcohol 23-hydrogen; spirits; spirits of wine; Synasol; tecsol

Synthesis: Nothing yet

ethyl chloride			C_2H_5Cl	1
mp -138.7	bp 12.3	d 0.9214	m 64.51	c $?.??
Safety Data: MSDS			LABGUARD* Storage Code RED	

Synonyms: *chloroethane*; aethylis; aethylis chloridum; Anodynon; Chelen; chlorene; chlorethyl; chloridum; chloryl; Chloryl Anesthetic; cloretilo; dublofix; ether chloratus; ether hydrochloric; ether muriatic; hydrochloric ether; Kelene; monochloroethane; muriatic ether; Narcotile

Synthesis: Nothing yet

ethylene dichloride			$ClCH_2CH_2Cl$	1
mp -40	bp 83-84	d 1.2569	m 98.96	c $?.??
Safety Data: MSDS *Flammable, Toxic*			LABGUARD* Storage Code RED	

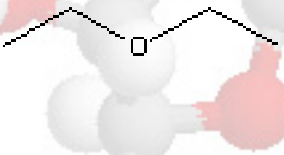
Synonyms: *1,2-dichloroethane*; Brocide; sym-dichloroethane; Dutch liquid; EDC; ethylene chloride

Synthesis: Nothing yet

ethylene glycol			$HOCH_2CH_2OH$	1
mp -13	bp 197.6	d 1.1135	m 62.07	c $?.??
Safety Data: MSDS			LABGUARD* Storage Code GREEN	

Synonyms: *1,2-ethanediol*; 1,2-dihydroxyethane; Dowtherm 4000; Dowtherm SR 1; EG; ethane-1,2-diol; ethylene alcohol; ethylene dihydrate; Fridex; glycol; glycol alcohol; lutrol-9; macrogol 400 bpc; M.E.G.; monoethylene glycol; norkool; tescol; ucar 17

Synthesis: Nothing yet

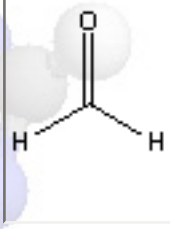
ethyl ether			$C_2H_5OC_2H_5$	1
mp -116.3	bp 34.6	d 0.7134	m 74.12	c $?.??
Safety Data: MSDS *Flammable*			LABGUARD* Storage Code RED	

Synonyms: *1,1'-oxybisethane*; anesthetic ether; diethyl oxide; diethyl ether; ether; ethoxyethane; ethyl oxide; pronarcol; sulfuric ether

Ether is a very useful organic solvent that has fallen into ill repute because of its use by drug dealers. It is a watched chemical by the DEA, purchasing large quantities will put you on The List. Ether is an explosively flammable liquid that will easily fill a room with fumes just waiting to be ignited by the slightest heat, it ignites over 180 °C. Keep containers of ether tightly closed and away from all flame sources. Ether used to be an anesthetic back in the days, inhaling the fumes will cause unconsciousness, but not much damage if you get to fresh air. Ether can also form an explosive peroxide if it is old or exposed to air. In short, keep ether away from all flame, in a well ventilated area, and tightly sealed in its container. You might think that ether and water do not mix, wrong, ether can hold up to 1.2% water. The only OTC source of ether is in starting fluid for cars, among other contaminants, from which it can be distilled. Ether can easily be prepared by reacting ethyl alcohol with sulfuric acid.

Synthesis: Assemble the necessary equipment for fractional distillation, adding in a Clasien adapter. Place the fractionating column on the side arm of the Clasien, and a 2-holed rubber stopper in the straight arm. In the first hole, place a thermometer that extends to near the bottom of the reaction flask. In the second hole, place a length of glass tubing that extends to near the bottom and sticks up

about an inch. Place a short length of rubber tubing on the glass tubing and connect it to an addition funnel. The rubber tubing is to slightly offset the funnel which would get in the way of the thermometer. If using a 500-mL reaction flask, add 146 mL of anhydrous ethyl alcohol. You can use 95% alcohol but the efficiency of the reaction will suffer because of the water. Slowly add 133 mL of anhydrous sulfuric acid, again you can use less than 100%, but the more water there is the worse the reaction will proceed. Place a magnetic spin bar in the flask and connect it to the rest of the apparatus. Using a hotplate or oil bath, no flame, heat the reaction flask, while stirring, to between 130-140 °C and hold it at that temperature. Be sure not to go in excess of 150 °C as ethylene gas will be produced. Once some distillate starts to come over, slowly add an additional 146 mL of ethyl alcohol from the addition funnel at the same rate as is collected from the distillation. That should be about a drop or two a second. The total distillation time should be over 2 hours. After the distillation is over, pour the distillate from the receiver flask to a large beaker and add 10% sodium hydroxide solution until the pH is neutral. Pour this mixture into a seperatory funnel and allow the lighter ether layer to float on top. Remove the heavier water layer and wash the remaining ether by shaking twice with a volume of saturated salt water equal to the volume of ether. Allow the last wash to sit for several minutes to insure complete seperation then remove the water layer. Put the ether in a Florence flask and add 15 g of calcium chloride for every 100 mL of ether, stir this for 2 hours with a magnetic stirrer. Finally, do a simple distillation to remove the now anhydrous ether from the calcium chloride.

formaldehyde			HCHO	1	
mp -92	bp -19.5	d 1.067	m 30.03	c $?.??	
Safety Data: MSDS *Flammable, Toxic*					

Synonyms: BFV; fannoform; formaldehyde solution; Formalin; Formalin 40; formalith; formic aldehyde; Formol; FYDE; HCHO; HOCH; karsan; lysoform; Methan 21; methanal; methyl aldehyde; methylene glycol; methylene oxide; Morbicid; oxomethane; oxomethylene; oxymethylene; superlysoform; Veracur

Synthesis: Formaldehyde can be obtained at Wal-Mart stores in a variety of products called Campa Chem for use in recreational vehicle sewage treatment (in the automotive section). There is one brand that is solid granules, get that, not the solution. The actual chemical is paraformaldehyde, the polymerized form of formaldehyde, but formaldehyde can be obtained from this.

Campa Chem paraformaldehyde is dyed blue for some reason with an unknown chemical. As this may or may not affect some chemical reactions it is best to remove it. One of the simplest ways is to extract the dye with numerous small portions of alcohol. Empty the packets (a box comes with ten 2 oz packets) in a beaker and add 40 mL of ethyl or methyl alcohol per packet to wet the powder. Two packets for example will require about 1 L of ethyl alcohol to extract most of the blue dye. You should add only 20-25 mL at a time, stir, and pour off the alcohol.

You may lose a little of the paraformaldehyde when you decant off the alcohol, so a filter may help. With each successive extraction more of the dye will be removed. The dark blue alcohol extract can be simple distilled to recover pure alcohol. The resulting paraformaldehyde granules may still have a slight blue tint, but significant quantities of the dye will be gone.

To obtain a formaldehyde solution add 100 g of paraformaldehyde granules to a bottle and dilute with enough water to make 250 mL of solution. Add a small amount of sodium hydroxide, approximately 120 mg, to the solution. Cap the bottle and shake to dissolve some of the paraformaldehyde. Place the bottle into a hot water bath heated to 60 degrees C for 25-30 minutes. Every 5 minutes shake the bottle and open it to vent any gasses. Some of the paraformaldehyde may not have dissolved, it can be filtered off, or heat the bottle longer. The resulting formaldehyde solution should be about 40% and will remain fresh for a few days if refrigerated.

Not everyone may be able to get to Wal-Mart, so here is a synthesis of formaldehyde from scratch:

The side tube (length about 10 cm) of a distilling flask (capacity 250-mL) is bent upwards at the junction with the neck of the flask. The end of the side tube, drawn out into a capillary (internal diameter 1.0-1.5 mm), is then inserted through a cork into a piece of combustion tubing about 30 cm long (fig 53). Within the tubing and about 6 cm from the point of the capillary is a copper spiral 4 cm long. The tubing slopes upwards at a small angle and its upper end is connected with a vertical condenser, preferably of the coil type. To the lower end of the condenser there are attached two communicating receivers which, during the experiment, are almost completely immersed in a freezing mixture. The short side tube of the second receiver is connected to an air pump (like a fish tank pump). Into the distilling flask, which is lowered as deeply as possible into a water bath kept **exactly** at 46-47 degrees C, 100 mL of methyl alcohol are poured. The flask is then closed with a rubber stopper, through which is inserted a glass tube reaching nearly to the bottom. Through this tube air is drawn in, and when the air is passing, the copper spiral is warmed in the flame, cautiously at first, until, when red heat is reached, the reaction sets in.

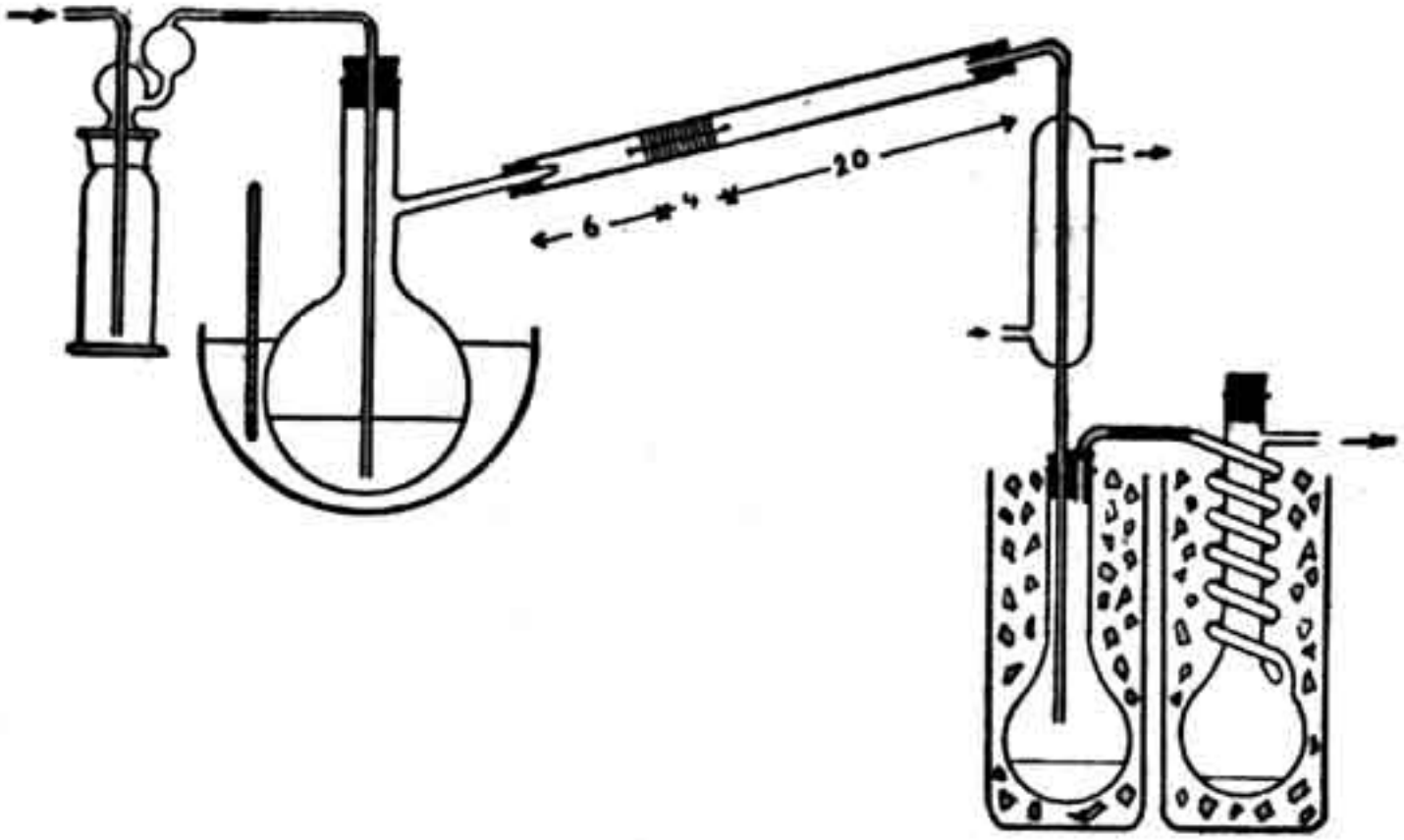
The air current must now be so regulated that the spiral continues to glow quite feebly without further application of heat. If the experiment is carried out in this way there will be complete freedom from explosions. The region within which methyl alcohol-air mixtures explode is indeed reached when the temperature of the bath is too low (42-44 degrees C), but the flame strikes back no further than the capillary tube, since the rapid current in the latter prevents further striking back. This is why it is very important to keep the water bath at 46-47 degrees C.

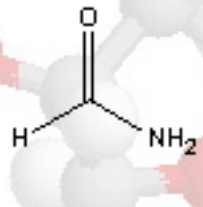
The two receivers contain 110-115 mL of a 30-32% formaldehyde solution after all the methyl

alcohol has been evaporated. A further small quantity of formaldehyde may still be collected in a third receiver containing a little water.

The following paragraph contains some points which should be considered in carrying out gaseous reactions.

In order to dehydrogenate one mole of methyl alcohol 0.5 mole of oxygen is required, and hence for one volume of the alcohol half as much oxygen or two and a half times as much air. The stoicheiometrical must therefore contain methyl alcohol and air in the proportions (by volume) 1 : 2.5, ie. 28.5% of methyl alcohol. Since the volumes vary as the partial pressures the temp of evaporation (of the alcohol) must be so chosen that its vapor pressure shall be 28.5% of the atmospheric pressure, ie. About 210 mm of mercury. With the simple type of apparatus here described complete saturation of the air with methyl alcohol vapor is not reached, and hence a temperature somewhat higher than the theoretical is used.

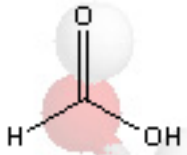


formamide			$HCONH_2$	1	
mp 2.55	bp 210.5	d 1.13340	m 45.04	c $?.??	

Safety Data: MSDS	LABGUARD* Storage Code GREEN

Synonyms: carbamaldehyde; formimidic acid; methanamide

Synthesis: Nothing yet

formic acid			HCOOH	1	
mp 8.4	bp 100.8	d 1.220	m 46.03	c $?.??	
Safety Data: MSDS *Corrosive*				LABGUARD* Storage Code WHITE	

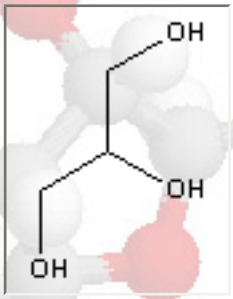
Synonyms: ameisensäure; aminic acid; formylic acid; hydrogencarboxylic acid; methanoic acid

Synthesis: Nothing yet

gasoline			mixture	1	No Graphic
mp ?	bp 32-210	d ?	m -	c $?.??	
Safety Data: MSDS *Flammable*				LABGUARD* Storage Code RED	

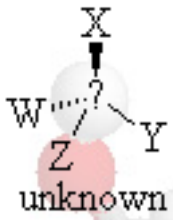
Synonyms: Benzin; gas; gasahol; gasolene; light gasoline; motor fuel; motor spirits; natural gasoline; petrol; premium; super; unleaded

Synthesis: Coming soon!

glycerol			$CH_2OHCHOHCH_2OH$	1	
mp 17.8	bp 290 (dec)	d 1.26362	m 92.09	c $?.??	
Safety Data: MSDS				LABGUARD* Storage Code GREEN	

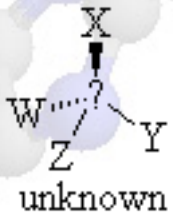
Synonyms: *1,2,3-propanetriol*; Bulbold; Cristal; Glyceol; glycerin; glycerine; glycerin mist; glyceritol; D-glycerol; L-glycerol; glycyl alcohol; IFP; incorporation factor; Ophthalgan; polyhydric alcohols; propanetriol; trihydroxypropane; 1,2,3-trihydroxypropane

Synthesis: Coming soon!

HBIW			$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??	
Safety Data: MSDS			ChemAlert* Storage Code GRAY		

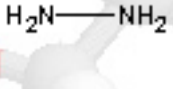
Synonyms:

Synthesis: Nothing yet

n-hexane			$CH_3(CH_2)_4CH_3$	1	
mp -100	bp 69	d 0.660	m 86.18	c $?.??	
Safety Data: MSDS *Flammable*			LABGUARD* Storage Code RED		

Synonyms: dipropyl; gettysolve-b; Hex; hexane; hexyl hydride; normal hexane; skellysolve B

Synthesis: Nothing yet

hydrazine			H_2NNH_2	1	
mp 2	bp 113.5	d 1.0036	m 32.05	c $?.??	
Safety Data: MSDS*Corrosive, Toxic*			LABGUARD* Storage Code RED		

Synonyms: anhydrous hydrazine; diamide; diamine; hydrazine base; hydrazine, hydrazine sulfate

Synthesis: Prepare a solution of 1500 mL of 28-29% ammonium hydroxide, 900 mL of water, 375 mL of 10% gelatin solution, and 1200 mL of normal sodium hypochlorite solution. It is absolutely imperative to use distilled water, the presence of any contaminant ions will screw up this reaction! It is possible to use starch, glue, or glycerol instead of gelatin, but they are inferior. Mix these chemicals in a large glass dish, like a pie plate or bowl, or just use several portions, as this is nearly a gallon of liquid. This mixture is heated as rapidly as possible and boiled down to one-third of its original volume. The solution is then cooled thoroughly with ice and suction filtered twice to remove any impurities. When filtering, first use towels (like a washcloth), then use regular filter paper on top of some cloth (like from a T-shirt).

The resulting liquid is dilute hydrazine hydrate. To make concentrated hydrazine hydrate, mix 144 mL of dilute hydrazine with 230 mL of xylene in a round-bottomed 500-mL Florence flask. Fractionally distill the mixture in an atmosphere of nitrogen, the xylene will first pass over with most of the water, then the hydrazine will pass over. Keep the fractions separate of course. The resulting hydrazine hydrate will be 90-95% hydrazine. This concentration procedure is meant for 60% hydrazine hydrate, since the hydrazine hydrate prepared above may be greater or less than 60%, some experimentation may be needed to find the proper amount of xylene to use (more xylene is needed for dilute hydrazine, less for more concentrated hydrazine).

To obtain anhydrous hydrazine, mix 20 g of potassium hydroxide per 100 g of >90% hydrazine hydrate in a beaker, let this mixture stand overnight so much of the water can be withdrawn. After standing, filter the solution to remove the hydroxide. Add to the filtered liquid an equal amount by weight of sodium hydroxide. Place this mixture in a round-bottomed 500-mL Florence flask, reflux for 2 hours, then distill in a slow stream of nitrogen. You must use nitrogen, distillation in air may lead to an explosion!

hydrochloric acid			HCl	1	
mp -46.2	bp 108.58	d 1.15	m -	c $?.??	
Safety Data: MSDS *Corrosive*				LABGUARD* Storage Code WHITE	

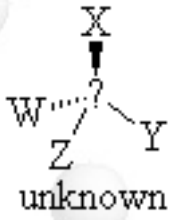
Synonyms: chlorohydric acid; hydrochloride; hydrogen chloride; muriatic acid; spirits of salts

Hydrochloric acid is actually a mixture of hydrogen chloride gas in water, not a single compound. The physical data provided here is for 30% hydrochloric acid, the most common varity. The maximum concentration of acid is about 40%.

Synthesis: Adding concentrated sulfuric acid to large chunks of ammonium chloride can generate hydrochloric acid (actually hydrogen chloride gas). The sulfuric acid is slowly added to the ammonium chloride kept inside a bottle. The bottle is sealed with a 2-holed stopper, in one hole goes an addition funnel where the sulfuric acid is added, and in the other goes a short length of glass tube bent at a right angle. The angled tube is the outlet tube for the hydrochloric acid, it can be connected to whatever experiment is needed, or bubbled into water to collect the acid for later use. Be careful not to allow acid gas to escape through the addition funnel, either use a stopcock, or keep the stem below the surface of the liquid.

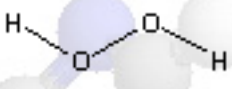
If anhydrous hydrogen chloride gas is required, using a similar glassware setup as above, add hydrochloric acid very slowly through the addition funnel into concentrated sulfuric acid. The hydrochloric acid gas that evolves is dried by bubbling it through a safety wash bottle filled with concentrated sulfuric acid. To set up a safety wash bottle, affix a 2-hole stopper to a top of a bottle, in one hole goes a short length of glass tube bent at a right angle; this is the outlet tube. In the other hole, place a wide diameter glass tube that extends just below the surface of the sulfuric acid. Place a second small diameter glass tube inside the wide tube. This tube should nearly reach the bottom of the bottle, it should also be bent at a right angle at the top to keep it from falling in. This is the inlet tube for the acid to be washed. See the illustration. This setup is necessary to prevent the acid wash from being sucked back into the generator.

Hydrochloric acid can also be generated by heating 10 parts of sodium chloride with a cold mixture of 3 parts of water and 18 parts of sulfuric acid.

hydrogen	H_2	1	
mp -259.2	bp 252.77	d 0.0700	m 2.0158	c $?.??
Safety Data: MSDS		LABGUARD* Storage Code RED	 unknown

Synonyms: protium

Synthesis: Coming soon!

hydrogen peroxide	H_2O_2	1	
mp -0.43	bp 152	d 1.463	m 34.01	c $?.??
			

Safety Data: MSDS *Corrosive*	ChemAlert* Storage Code YELLOW	

Synonyms: Albone; dihydrogen dioxide; high-strength hydrogen peroxide; Hioxy; H2O2; hydrogen dioxide; hydroperoxide; Inhibine; Lensan A; Mirasept; Oxydol; Oxysept; Pegasyl; Perhydrol; Peroxan; peroxide; superoxol; t-stuff

Synthesis: Coming soon!

hydroquinone			$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

Synonyms:

Synthesis: Nothing yet

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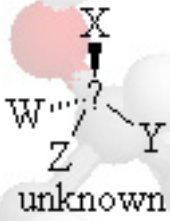
Precursors Part 4

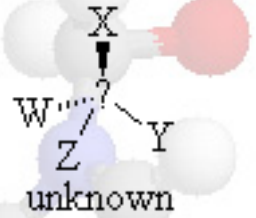
2-nitro-2-(m-nitrophenyl)-propanediol-1,3			$X_aY_bZ_c$	1
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	
Synonyms:				
Synthesis: Nothing yet				

1-nitropropane			$CH_3CH_2CH_2NO_2$	1
mp -108	bp 131.6	d 0.9934	m 89.09	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	
Synonyms:				
Synthesis: Nothing yet				

2-nitropropane			$CH_3CH(NO_2)CH_3$	1
mp -93	bp 120.3	d 0.9821	m 89.09	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	

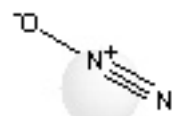
Synonyms:

Synthesis: Nothing yet

nitrosyl tetrafluoroborate			$NOBF_4$	1	
mp ?	bp ?	d 2.185	m 116.81	c $?.??	
Safety Data: MSDS			ChemAlert* Storage Code GRAY		

Synonyms: nitrosonium tetrafluorborate; nitrosyl fluoborate; nitrosyl fluoride

Synthesis: Nothing yet

nitrous oxide			N_2O	1	
mp -90.81	bp -88.46	d -	m 44.01	c $?.??	
Safety Data: MSDS			LABGUARD* Storage Code GREEN		

Synonyms: dinitrogen monoxide; dinitrogen oxide; factitious air; hyponitrous acid anhydride; laughing gas; nitrogen oxide

Synthesis: This is listed as a potential undesired byproduct of explosive manufacture, but its drug properties make it a good candidate for inclusion in The Pharmacy.

oxalic acid			$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??	
Safety Data: MSDS			ChemAlert* Storage Code GRAY		

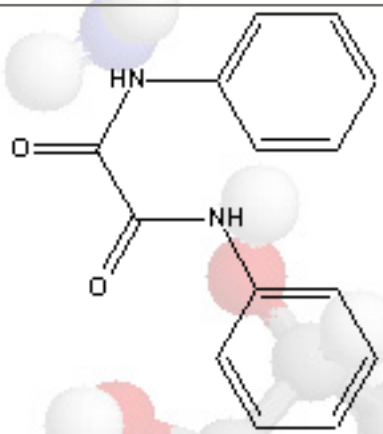
Synonyms:

Synthesis: Oxalic acid is available OTC in hardware stores as a generic cleaning agent. It is sold as a reasonably pure powder in approximately 500 g boxes depending on brand.

It is often desirable to use anhydrous oxalic acid; it can be dried by the following procedure. Place a glass casserole dish or pie plate in an oven and preheat it to 100 °C. When the temperature has been reached, remove the dish and rapidly cover it with a uniform layer of finely pulverized oxalic acid, quickly return the dish to the oven. The layer of acid should not be more 3-4 mm thick, and should be as finely powdered as possible to insure maximum dehydration. Let the acid cook for 2 hours.

When finished, the product is removed, crushed if slightly caked, and quickly bottled to keep it away from moisture. The exact quantity that can be dried is dependant on the size and number of plates you use. A certain portion of oxalic acid will sublime during heating, and this portion may eventually be harmful to the metal of the oven. I suggest you crank up the heat for another hour when done to drive off any remaining vapors, then give the oven a washing to prevent any contamination, even if this oven is not used to cook food with.

oxanilide			$C_{14}H_{12}N_2O_2$	1
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	



Synonyms: N,N'-diphenyl-ethanediamide; oxaldianilide

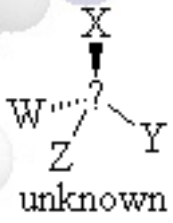
Synthesis: This substance has been used as an antiflash agent in propellants, and as a coolent and burning rate reducer in fuzes. To synthesize, mix two parts of oxalic acid with one part of aniline in a round bottom flask. Stir and heat the mixture until the reaction is complete as evidenced by the cessation of effervescence. The mass should be cooled to room temperature, poured into several volumes of water cooled to 21-24 °C, then filtered on a Buchner funnel. The material on the funnel is washed free of oxalic acid with water, and then washed free of aniline with acetone. The washed material is dried at 100-110 °C.

oxygen			O_2	1
mp -218.4	bp -182.96	d -	m 32	c $?.??

Safety Data: MSDS			LABGUARD* Storage Code RED	

Synonyms: GOX; LOX

Synthesis: Coming soon!

paraffin			mixture of C_nH_{2n+2}	1	
mp 50-57	bp ?	d 0.90	m -	c $?.??	
Safety Data: MSDS				LABGUARD* Storage Code GREEN	

Synonyms: hard paraffin; paraffin wax

Synthesis: Nothing yet

paraformaldehyde			$(CH_2O)_n$	1	
mp -	bp -	d ?	m -	c $?.??	
Safety Data: MSDS *Corrosive, Flammable*				LABGUARD* Storage Code RED	

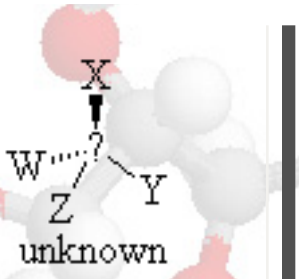
Synonyms: Formagene; Paraform; polyoxymethylene; triformol; trioxymethylene

Synthesis: Nothing yet

paraldehyde			$C_6H_{12}O_3$	1
mp 12	bp 124	d 0.994	m 132.16	c $?.??

Safety Data: MSDS

ChemAlert* Storage Code GRAY



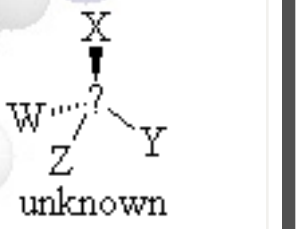
Synonyms: *2,4,6-trimethyl-1,3,5-trioxane*; paracetaldehyde; Paral

Synthesis: See the end of acetylaldehyde for the Synthesis of paraldehyde.

Pearlman's catalyst			$X_aY_bZ_c$	1
mp ?	bp ?	d ?	m ?	c $?.??

Safety Data: MSDS

ChemAlert* Storage Code GRAY



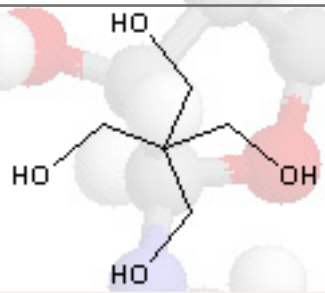
Synonyms:

Synthesis: Nothing yet

pentaerythritol			$C_5H_{12}O_4$	1
mp 260	bp ?	d ?	m 136.15	c $?.??

Safety Data: MSDS

ChemAlert* Storage Code GRAY



Synonyms: *2,2-bis(hydroxymethyl)-1,3-propanediol*; Hercules P 6; monopentaerythritol; PE 200; pentaertyhrito; PETP; tetrakis(hydroxymethyl)methane; tetramethylolmethane; THME

Synthesis: Prepare a solution of 800 g of paraformaldehyde and 165.5 mL of acetaldehyde in 5.5 L of water. Add to this solution 180 g of powdered calcium oxide in small portions with rapid stirring, a mechanical stirrer is advised. The rate of addition of the calcium oxide is adjusted such that the temperature of the solution rises to 50 °C over a 30 minute period with the first portion. The addition of each subsequent portion should not be allowed to raise the temperature above 55 °C. After the addition is complete, stirring is continued for 3 hours. The solution will become yellowish. After stirring, the solution is filtered to remove any contaminant particles, and the yellow filtrate is acidified with just enough hydrochloric acid to make it acid to litmus paper. It is recommended to decolorize the filtrate; add the decolorizer, stir for 5 minutes, and then filter again.

The colorless filtrate is now concentrated under reduced pressure until crystals begin to separate. Since it is rather inconvenient to run the entire lot, divide the solution into portions. The concentration can be done with a vacuum distillation setup. Using a 500-mL flask, add 200-300 mL of solution, when 40% of the water (80-120 mL) has boiled over, stop the distillation and add the next portion. Eventually you should have approximately 3 L of concentrated solution left. Heat this solution on a steam bath, while hot, suction filter it to remove any contamination. Any precipitated crystals that get caught on the filter can be washed through by wetting with steam. The filtrate is now allowed to stand in a refrigerator overnight, whereupon the first crop of crystals will precipitate. These crystals are filtered to collect them. The filtrate is then boiled down to about 2 L, and again refrigerated overnight. A second crop of crystals will form; these can be filtered to collect them like before. The filtrate is now boiled down to about 1.2 L, refrigerated overnight, and the subsequent crystals are collected by filtration. The filtrate is finally boiled down to the consistency of syrup, refrigerated overnight, and the last crop of crystals is collected by filtration.

The combined crystals, which should weigh as much as 410-420 g, are recrystallized from an equal weight of hot water containing 10 mL of concentrated hydrochloric acid. This new solution can be decolorized, and then boiled down to obtain several additional crops of pure crystals. Discard the last 30-40 mL. The yield is about 55-57%.

perchloric acid			$HClO_4$	1	
mp -112	bp dec	d 1.768	m 100.46	c $?.??	
Safety Data: MSDS *Corrosive, Oxidizer*			LABGUARD* Storage Code WHITE		

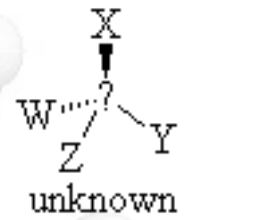
Synonyms:

Synthesis: Coming soon!

perchloryl fluoride	$ClFO_3$	1	
mp -147.7	bp -46.7	d -	m 102.45	c $?.??
Safety Data: MSDS	ChemAlert* Storage Code GRAY	

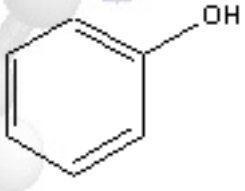
Synonyms:

Synthesis: Nothing yet

petroleum ether	mixture	1	
mp -	bp 90-155	d 0.860	m -	c $?.??
Safety Data: MSDS *Flammable*	LABGUARD* Storage Code RED	

Synonyms: benzin; Benzoline; Canadol; ligroin; ligroine; naphtha petroleum; naphtha, VM&P; petroleum naphtha; petroleum spirits; refined solvent naphtha; solvent naphtha; varnish makers' & painters' naphtha; V.M.&P. naphtha

Synthesis: Petroleum ether, or ligroin, is a very common solvent made up of a mixture of all the crap left over from petroleum industries. As such, it can't really be synthesized without extensive resources and equipment, it is far easier just to buy it. Petroleum ether is not all that expensive or hard to get, it is available OTC in hardware and paint stores as a paint solvent, usually under the name of VM&P naphtha. It retails around $2.70 a liter. VM&P naphta stands for Varnish Makers and Painters naphtha.

phenol	C_6H_5OH	1	
mp 43	bp 182	d 1.071	m 94.11	c $?.??
Safety Data: MSDS *Corrosive, Toxic*	LABGUARD* Storage Code WHITE	

Synonyms: baker's p and s; benzenol; carbolic acid; hydroxybenzene; monohydroxy benzene; monophenol; oxybenzene; phenic; phenic acid; phenol alcohol; phenyl hydrate; phenyl hydroxide; phenylic acid; phenylic acid, phenyl hydroxide; phenylic alcohol

Synthesis: Pour 18.2 mL of 95-100% sulfuric acid as rapidly as possible, with stirring, into 50 mL of water in a 500-mL beaker. Add to the hot solution 10 g of freshly distilled aniline, with stirring, by allowing it to flow down the side of the beaker. Next add 100 mL of water. Place the beaker into a cold water bath so it may cool to room temperature, it is then treated with a solution of 8.5 g of sodium nitrite in 40 mL of water, until it shows a blue spot on starch-potassium-iodide paper. If you do not have the paper, add it all. The beaker will now contain diazobenzene sulfate, this is gently heated to 40-50 °C for 30 minutes to convert it to phenol.

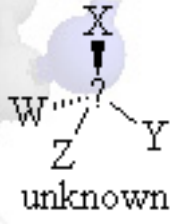
The phenol that should have formed is removed by steam distillation. Add a large enough quantity of salt to the distillate so it becomes saturated, the solution is now extracted several times with ether. Add a small amount of sodium sulfate to the combined ether extracts and let it stand for a few hours. The ether is then evaporated, and the residue of phenol is simple distilled. The yield is about 7-8 g.

The liquid that remains in the flask after the steam distillation contains oxydiphenyl. It can be disposed of, or filtered hot. Upon cooling crystals will form.

phosphorus	$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS		ChemAlert* Storage Code: GRAY	

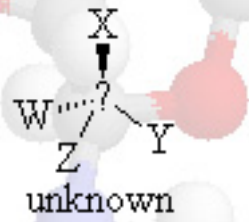
Synonyms:

Synthesis: Nothing yet

phosphorus oxychloride	$POCl_3$	1	
mp 1.25	bp 105.8	d 1.645	m 153.33	c $?.??
Safety Data: MSDS *Corrosive*		LABGUARD* Storage Code: WHITE	

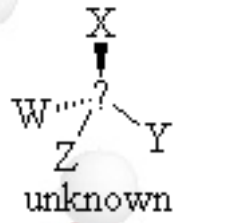
Synonyms: *phosphoryl chloride*; phosphorus chloride

Synthesis: Coming soon!

phosphorous pentoxide	P_2O_5	1	
mp 340	bp 360	d 2.30	m 141.94	c $?.??
Safety Data: MSDS *Corrosive*	LABGUARD* Storage Code WHITE	

Synonyms: diphosphorus pentoxide; phosphoric anhydride

Synthesis: Nothing yet

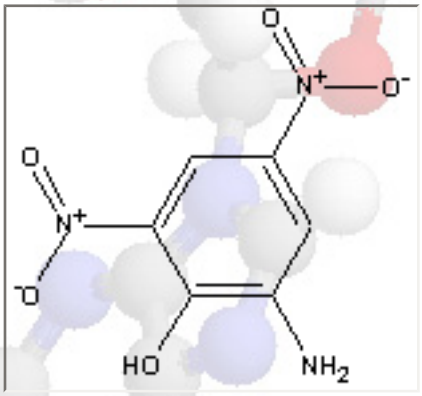
phosphorus trichloride	PCl_3	1	
mp -112	bp 76	d 1.574	m 137.33	c $?.??
Safety Data: MSDS	ChemAlert* Storage Code GRAY	

Synonyms: phosphorous chloride

Synthesis: Under water, in a shallow dish, cut 40 g of white phosphorus into small pieces with a knife. Displace the air in a 250-mL Florence flask with dry carbon dioxide. Add each piece of phosphorus to the flask by removing it from the water with tweezers, drying quickly by pressing between several layers of paper towel, and immediately placing in the flask. Be extremely careful that you do not ignite the phosphorus by friction from the paper towel, or by dropping it against the next of the flask. As soon as all of the phosphorus has been added, set the flask up for simple distillation with addition. Instead of a separatory funnel on the Clasien adapter, seal the straight arm with a 1-hole stopper or a thermometer adapter. Into the hole place a straight length of glass tubing far enough into the flask such that it is just above the level of the phosphorus. Do not run water through the condenser. The receiving flask should be held under a shower of cold water, and in a cold water bath, for example under a running faucet, and in a bowl that can overflow into the sink. There will be substantial quantities of waste chlorine gas, if you are using a vacuum adapter to connect the condenser to the receiver, attach a hose to it so it may direct the gas elsewhere. If not, you will figure something out, or you will suffocate.

A moderately rapid current of dry chlorine gas is passed over the white phosphorus; phosphorus trichloride will form with the evolution of heat and light. Some crystals of phosphorus pentachloride may begin to clog the condenser, these can be dislodged by gently heating the condenser, or by increasing the flow of the chlorine to generate more heat. If some white phosphorus begins to distill over, reduce the flow of the chlorine, or try to cool the reaction flask by briefly immersing it in cold water. The phosphorus trichloride thus collected is purified by distillation.

picramic acid	$C_6H_5N_3O_5$	1
mp 169	bp -	d ?	m 199.12	c $?.??
Safety Data: MSDS	LABGUARD* Storage Code RED	



Synonyms: *2-amino-4,6-dinitrophenol*; 6-amino-2,4-dinitrophenol; dinitroaminophenol; 2,4-dinitro-6-aminophenol; 4,6-dinitro-2-aminophenol; 2-hydroxy-3,5-dinitroaniline; picraminic acid

Synthesis: Nothing yet

picryl chloride	$C_6H_2ClN_3O_6$	1
mp 83	bp ?	d 1.797	m 247.55	c $?.??
Safety Data: MSDS	ChemAlert* Storage Code GRAY	

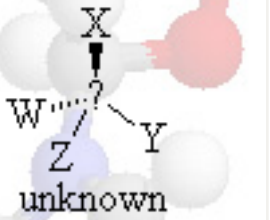
Synonyms: *2-chloro-1,3,5-trinitrobenzene*

Synthesis: Nothing yet

piperidine	$C_5H_{11}N$	1
mp -7	bp 106	d 0.8622	m 85.15	c $?.??
Safety Data: MSDS *Corrosive, Flammable, Toxic*	LABGUARD* Storage Code RED	

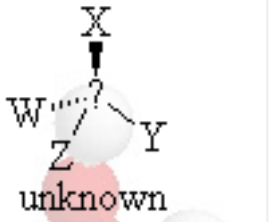
Synonyms: hexahydropyridine

Synthesis: Nothing yet

polystyrene	$(C_8H_8)_n$	1	
mp -	bp -	d 1.04-1.065	m -	c $?.??
Safety Data: MSDS	ChemAlert* Storage Code GRAY	

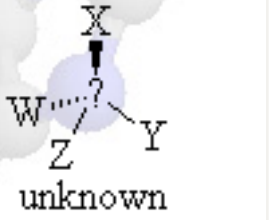
Synonyms: Dylene; styrofoam; Trycite

Synthesis: Nothing yet

polyvinyl alcohol	$(CH_2CHOH)_n$	1	
mp -	bp -	d ?	m -	c $?.??
Safety Data: MSDS	ChemAlert* Storage Code GRAY	

Synonyms: *ethenol homopolymer*; Akwa Tears; Elvanol; Gelvatol; Liquifilm; Mowiol; Polyviol; PVA; Sno Tears; Vinarol; Vinol

Synthesis: Nothing yet

potassium carbonate	K_2CO_3	1	
mp 891	bp ?	d 2.29	m 138.21	c $?.??
Safety Data: MSDS	LABGUARD* Storage Code GREEN	

Synonyms: pearl ash; salt of tartar

Synthesis: Coming soon!

potassium dinitroethanol	$X_aY_bZ_c$	1	

mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	

Synonyms:

Synthesis: Nothing yet

potassium hydroxide			KOH	1
mp 360	bp ?	d ?	m 56.11	c $?.??
Safety Data: MSDS *Corrosive*			LABGUARD* Storage Code WHITE	

Synonyms: caustic potash; potassa; potassium hydrate

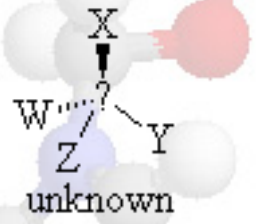
Synthesis: Coming soon!

potassium hypophosphite			KH_2PO_2	1
mp dec	bp -	d ?	m 104.09	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	

Synonyms:

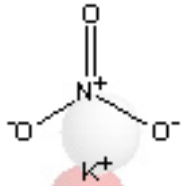
Synthesis: Nothing yet

potassium iodide			KI	1
mp 680	bp -	d 3.12	m 166.00	c $?.??

Safety Data: MSDS			LABGUARD* Storage Code GREEN	

Synonyms: Jodid; Thyroblock; Thyrojod

Synthesis: Coming soon!

potassium nitrate			KNO_3	1
mp 333	bp 400 dec	d 2.11	m 101.10	c $?.??
Safety Data: MSDS *Oxidizer*			ChemAlert* Storage Code YELLOW	

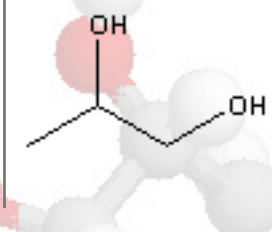
Synonyms: niter; nitric acid, potassium salt; saltpeter

Synthesis: Coming soon!

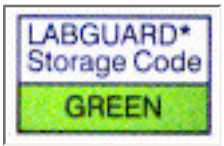
n-propyl alcohol			$CH_3CH_2CH_2OH$	1	
mp -127	bp 97.2	d 0.8016	m 60.10	c $?.??	
Safety Data: MSDS *Flammable*			LABGUARD* Storage Code RED		

Synonyms: *1-propanol*; Optal; propylic alcohol

Synthesis: Nothing yet

propylene glycol			$CH_3CHOHCH_2OH$	1	
mp -59	bp 188.2	d 1.036	m 76.10	c $?.??	

Safety Data: MSDS



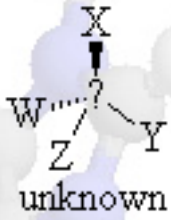
Synonyms: *1,2-propanediol*; 1,2-dihydroxypropane; methyl glycol

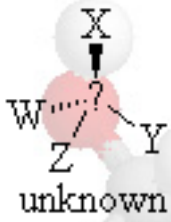
Synthesis: This chemical can be found as a component in certain antifreeze as a non-toxic replacement for ethylene glycol. This Synthesis is for the laevorotatory version only, kind of like only left handed molecules versus a mixture of both left and right handed. This will not affect its usefulness. This Synthesis is kind of like fermenting alcohol.

Prepare a solution of 1 Kg of sucrose in 9 L of water placed in a 20 L (5 gallon) bucket. Make a paste of baker's yeast by breaking up 1 Kg of yeast and gradually stirring in 1 L of water. This is then added to the sugar solution. Unless you have a way of sealing up the bucket, or you have a big bottle like a water cooler, I recommend pouring this solution into several 2-L plastic soda bottles, or gallon milk jugs. Cap each of the bottles with a one-hole rubber stopper and connect a length of rubber or plastic tubing from the stopper into a beaker, or small bucket, of water. This reaction will produce waste carbon dioxide and must be protected from air. The tubes in water allow the gas to escape while preventing any air from entering the bottle.

The mixtures in the bottles are allowed to stand at room temperature until a lively evolution of gas starts, this will require from one to three hours. To the vigorously fermenting solutions add a total of 100 g of freshly prepared acetol; divide this equally between each bottle. The mixtures are allowed to stand at room temperature until the reaction subsides; adding the acetol may temporarily make it look like the reaction has subsided. The bottles are then transferred to a heated room kept at 32 °C, where the fermentation continues. At the end of three days the reaction is generally completed. At this point the yeast is suction filtered using a pad of fiberglass or asbestos instead of filter paper. The filtrate is concentrated to a thick syrup under diminished pressure on a water bath, the temperature being kept below 40 °C. This can be a tricky to maintain the temperature. A handy way to regulate it is to start with only a small amount of filtrate in the flask, then connect an addition funnel to the distillation setup from which you add more cold filtrate over time. Control the rate of addition of the filtrate to maintain the optimal temperature.

The residue (about 200 mL) is added to a mixture of 400 mL of anhydrous ethyl alcohol and 100 mL of dry ether. The precipitate formed is removed by adding about 15 g of fiberglass fibers, stirring or shaking for 5 minutes, then suction filtering. The residue is extracted with a mixture of 200 mL of 98.5% ethyl alcohol and 100 mL of dry ether. The combined alcohol-ether solutions are concentrated under diminished pressure at 35–40 °C to a thick syrup. The residue is again taken up in a mixture of 400 mL of 98.5% alcohol and 100 mL of dry ether, mixed with glass fibers, and suction filtered. The filtered liquid is concentrated under diminished pressure and distilled to obtain about 100 g of crude product. The crude material is redistilled and collected at 88–90 °C under vacuum or 187–189 °C under atmospheric pressure. The final product is a colorless liquid having a density near water. The yield is 49-58% or about 50–60 g.

pyridine	C_5H_5N	1	
mp -41.6	bp 115.2	d 0.98272	m 79.10	c $?.??
Safety Data: MSDS *Flammable*			LABGUARD* Storage Code RED
Synonyms:			
Synthesis: Nothing yet			

silicic acid	H_2SiO_3	1	
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS			LABGUARD* Storage Code GREEN
Synonyms: Dri-Die; precipitated silica; silica gel			
Synthesis: Nothing yet			

silver	Ag	1	
mp 960.5	bp 2000	d 10.49	m 107.868	c $?.??
Safety Data: MSDS			LABGUARD* Storage Code GREEN
Synonyms:			
Synthesis: Nothing yet			

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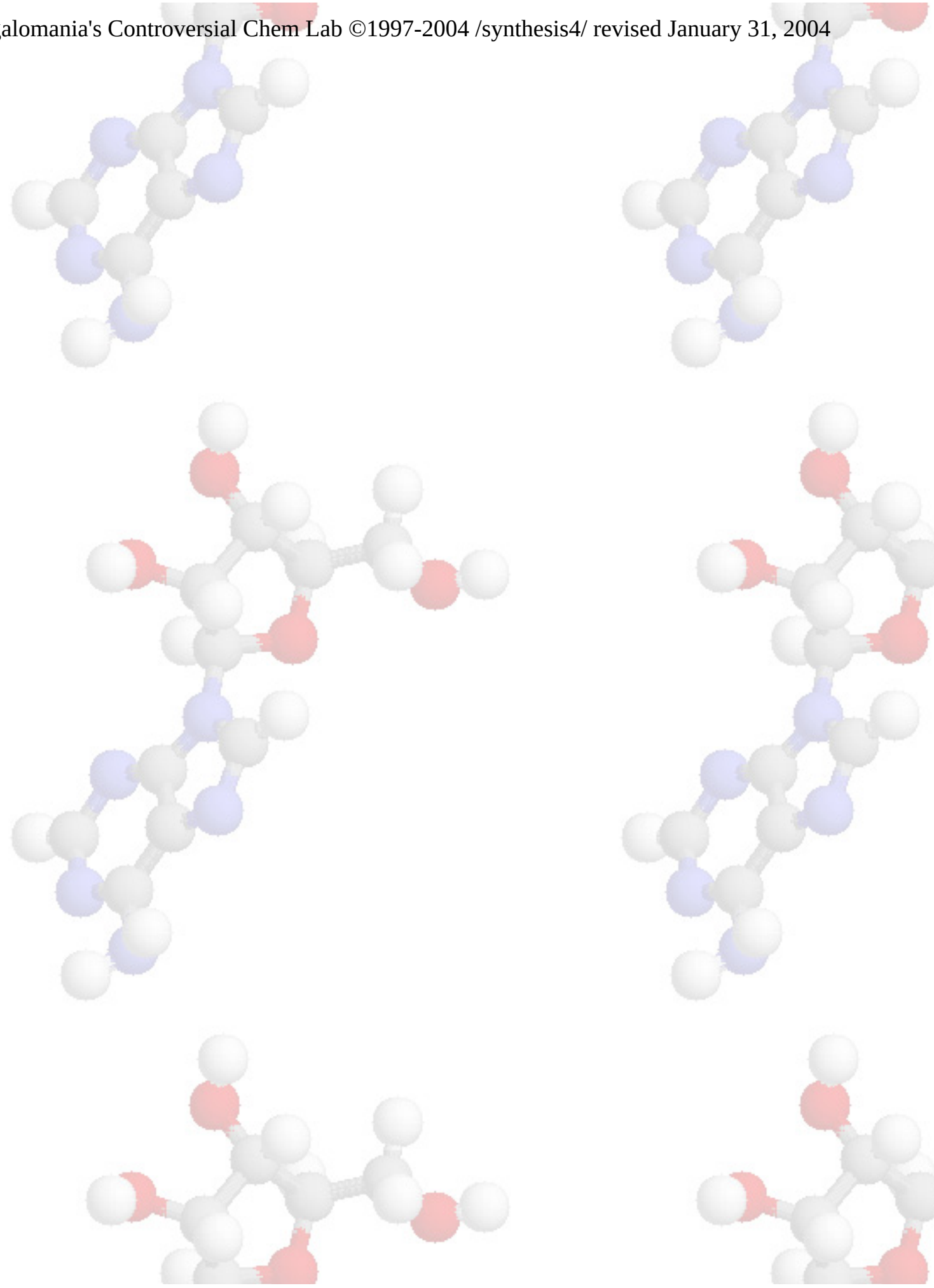
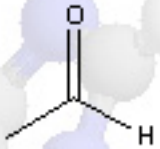


Precursors Part 1

acetaldehyde			CH_3CHO	L1 #1	
mp -123.5	bp 21	d 0.788	m 44.05	c $?.??	
Safety Data: MSDS *Flammable*			table key	LABGUARD* Storage Code RED	

Synonyms: acetic aldehyde; acetylaldehyde; aldehyde; ethanal; ethyl aldehyde; ethylaldehyde

Synthesis: Place 260 mL of 23% sulfuric acid in a 1500-mL Florence flask. Connect an addition funnel to the flask, and set it up for vacuum distillation with a 500-mL receiving flask. The receiving flask should be immersed in a salt-ice bath to cool the distillate when it comes over. Although a setup for vacuum distillation is used, it is not necessary to apply a vacuum; the vacuum adapter merely provides a means of equalizing pressure. Prepare a solution of 100 g of sodium dichromate in 200 mL of water and 127 mL of ethyl alcohol. Factor in the amount of water that is already in the ethyl alcohol when making the solution, i.e. 100 mL of 95% alcohol has 5 mL of water in it already. Place this solution in the addition funnel, position the stem of the funnel such that it is about 3 cm above the surface of the acid. Heat the acid until it just begins to boil, then add the mixture in the funnel in a steady stream to the acid. It will not be necessary to heat the flask during the addition because it will generate its own heat. The heat will be sufficient to distill over the acetaldehyde along with some alcohol and waste acetal. If acetaldehyde vapors begin to escape from the flask, regulate the distillation by decreasing the amount of dichromate solution being added. If the reaction flask does not boil on its own, gently heat it for a short time until boiling begins.

The crude acetaldehyde thus obtained is difficult to distill from the alcohol and acetal mixed with it. It is therefore converted to aldehyde-ammonia, then back to pure aldehyde. Place the crude acetaldehyde in a Florence flask of suitable volume to contain no more than two thirds of the liquid. Attach a reflux condenser to the flask. Fill the condenser jacket with 30 °C water. It is only necessary to have the warm water in the jacket, not flowing. Stop up the lower connecter to prevent water from leaking out. To the top of the condenser, attach a glass tube connected to a wash bottle filled with 50 mL of ethyl ether. This wash bottle is then connected to another wash bottle filled with 50 mL of ether. After all connections have been made, the crude aldehyde is heated to a gentle boil for 5-10 minutes. The ether will absorb the acetaldehyde as it boils off. If the ether begins to rise up into the connecting tube from the condenser to the wash bottle, increase the heating.

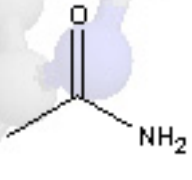
Combine the ether into a 150-mL beaker immersed in a salt-ice bath. Bubble dry ammonia gas into the ether through an inverted funnel or wide tube immersed near the bottom of the beaker. Add ammonia until the ethereal solution smells strongly of ammonia. After about an hour, pure ammonia-aldehyde should have separated out. Scrape the crystals from the beaker and collect them by suction filtration. Wash the crystals with a small amount of ether, and allow them to dry in a desiccator. The yield is about 30 g.

To obtain pure acetaldehyde, dissolve 10 g of aldehyde-ammonia in 10 mL of water in a 50-mL Florence flask. Add 28 mL of cold 29% sulfuric acid to the flask and set it up for simple distillation. Heat the flask on a water bath to distill over the aldehyde. Place the receiving flask in a salt-ice bath to cool the volatile acetaldehyde.

Acetaldehyde is extremely volatile and cannot be stored satisfactorily unless it is refrigerated or sealed in glass ampoules (not just capped), therefore it is necessary to prepare acetaldehyde each time it is needed. There is, however, an easier solution. A quick and easy way to store acetaldehyde is to polymerize it to paraldehyde, which can be handled and stored easily, then depolymerize when you need to use it. Now you can make a larger amount without worry.

To polymerize acetaldehyde for storage, place it in a dry test tube and cautiously add 1 drop of concentrated sulfuric acid per 2 mL of acetaldehyde in the tube. Mix thoroughly, the polymerization will begin to take place. Some gentle warming can hasten the reaction. After some minutes add 3-4 mL of water per 2 mL of acetaldehyde, an insoluble precipitate of paraldehyde will form. As an aside, technically paraldehyde is a controlled substance. It is a sedative and a hypnotic drug useable by prescription only.

To depolymerize paraldehyde back into acetaldehyde, place the paraldehyde into a round-bottom 200-mL Florence flask. Add 4-5 drops of concentrated sulfuric acid for every 20 g (20 mL) of paraldehyde in the flask. Set the flask up for fractional distillation, use glass in the fractionating column. Use a 125-mL Erlenmeyer flask as the receiver; keep it cool by immersing in an ice water (but not salt-ice) bath. Place a loose plug of cotton into the Erlenmeyer flask to help reduce evaporation loss; it must be loose. Care must be taken to prevent the cotton from coming into contact with the distillate. After setting up, heat the flask gently. The temperature of the distillate must not be allowed to rise above 35 °C as it will only repolymerize. The acetaldehyde is now ready for use.

acetamide			CH_3CONH_2	L2 #1
mp 81	bp 222	d 1.159	m 59.07	c $?.??
Safety Data: MSDS			LABGUARD* Storage Code GREEN	

Synonyms: acetic acid amide; acetimidic acid; ethanamide; methanecarboxamide

Synthesis: Place 71.5 mL of glacial acetic acid into a ceramic or porcelain dish, heat the acid to 40-50 °C by a water bath. Neutralize the acid by adding 100 g of finely pulverized ammonium carbonate; the resulting compound should be slightly alkaline. The mass is warmed on the water bath to 80-90 °C until acidic, test for acidity by adding a few drops to a test tube of water then drop on litmus or pH paper.

The reaction is now completed in a bomb tube, or Volhard tube, this is essentially a glass bottle that is sealed by melting the glass together at the opening. Since these may be hard to come by a substitute is needed. A heavy walled glass beer or wine bottle should lend itself well to acting as a reaction container. There is a strong possibility that such a bottle can burst under the great heat required of this reaction, this applies to the Volhard tube as well. The tube or bottle should be wrapped in a fine mesh metal screen, the kind used on windows, if it bursts the screen will prevent glass going everywhere. Heating the tube behind a sheet of wood is also a good idea.

It will be quite necessary to melt the top of the glass closed; using a mere rubber or cork stopper is not sufficient because they will melt or burn. To seal the open end of a tube charged with the substance, it is warmed by holding it at an angle of about 45°, with constant turning, in the small luminous flame of a burner, and then heated strongly in the larger non-luminous flame. Heat the neck if using a bottle. When the glass becomes soft, use pliers to gently pull and squeeze the top of the tube upwards causing the glass of the neck to narrow. Continue to heat this narrowed portion and draw the top up until the glass has closed itself off. After breaking off or cutting of the end of the tip, to allow the air to escape on further heating, it is heated just below the top. When the tube is softened at this point it is drawn out slightly, heat is applied just below the top, it is drawn out again, and so on. The result is that the form of the top of the tube gradually changes from a cylinder to a sharp-pointed cone. The narrowest part of the cone is then heated without drawing it further. The soft glass melts together, and a thick walled cap is obtained.

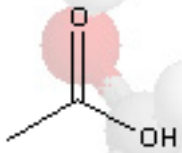
Fill the tube, previously heated by flame, with the compound while hot without using a funnel. If any portion adheres to the top of the tube, melt it down by carefully heating with a flame. Any remaining trace can be wiped away, now seal the tube as described above. Heat the tube for 5 hours at 220-230 °C in a furnace. After heating, break the bottle open to obtain the reaction product. The liquid product is fractionally distilled in a well ventilated area. The first fraction that distills over between 100-130 °C will be acetic acid and water. The temperature will then rise rapidly to 180 °C where upon acetamide will begin to distill over. Collect the portion distilling over between 180-230 °C in a beaker. Cool the beaker with a salt-ice bath towards the end of the distillation. Rub the walls of the beaker after the distillation to crystallize the impure acetamide. The crystals are placed on a Buchner funnel and pressed to squeeze out any liquids. The crystals are now simple distilled to obtain almost pure acetamide. To remove the last traces of impurities, again press the crystals, then recrystallize from a minimum amount of ethyl ether. Filter to collect the crystals, allow a brief period to dry. Yield is about 40 g.

acetic acid	CH_3COOH	3	

mp 16.7	bp 118	d 1.0492	m 60.05	c $?.??

Safety Data: MSDS *Corrosive, Flammable*

LABGUARD* Storage Code: WHITE



Synonyms: acetate; acetic acid glacial; Aci-Jel; ethanoic acid; ethylic acid; glacial acetic acid; methanecarboxylic acid; shotgun; TCLP extraction fluid 2; vinegar; vinegar acid

Synthesis: Acetic acid is available as an OTC chemical in the form of vinegar, a dilute solution of acetic acid. Vinegar should be available from any grocery story in 3%-5% concentrations or so. Acetic acid is a chemical that I consider to plentiful to bother synthesizing yourself since it is a cheap, abundant OTC chemical. It can be done, and it may be cheaper in the long run to make it on your own, but I do not have the information handy. A trip to the library, or a web search will yield much info on the topic. Acetic acid is more useful in concentrated, or glacial, form. Only acetic acid is referred to as glacial rather than concentrated acid. This is because the ancients liked how much frozen acetic acid looked, it reminded them of an ice glacier, so the term glacial stuck. Glacial acetic acid is very corrosive and slightly flammable.

Vinegar can be made into glacial acetic acid by first converting it to sodium acetate. Once you have some sodium acetate ready, set up the necessary equipment for a simple distillation and fill the reaction flask with concentrated (95%+) sulfuric acid. Add the sodium acetate to the acid and begin the distillation. The sulfuric acid will break down the sodium acetate and the resulting acetic acid will distill off. The concentration of the acetic acid obtained will be nearly anhydrous, especially if you start with thoroughly dried sodium acetate and 100% sulfuric acid.

acetic anhydride	$(CH_3CO)_2O$	4

mp -73	bp 139	d 1.080	m 102.09	c $?.??

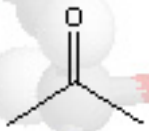
Safety Data: MSDS *Corrosive, Flammable*

LABGUARD* Storage Code: WHITE

Synonyms: acetic acid anhydride; acetic oxide; acetyl anhydride; acetyl ether; acetyl oxide; ethanoic anhydrate; ethanoic anhydride

Synthesis: Acetic anhydride is a very handy organic compound that has fallen into ill repute thanks to the drug dealers. It is technically a watched chemical, but you will only have to answer questions at gunpoint if you buy over 250 gallons. Even so, you will most likely be put on The List if you buy any, and you will have to come up with a bunch of explanations as to what you are going to do with it. Acetic anhydride is very corrosive and must be kept away from moisture, as it will decompose into acetic acid.

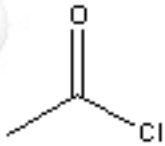
Into a 200-mL Florence flask, add 70 g of finely pulverized, anhydrous sodium acetate. Set the flask up for simple distillation, instead of a thermometer in the top of the flask use an addition funnel. Slowly add, by dropwise addition, 45.5 mL of acetyl chloride from the addition funnel. After half of the acetyl chloride has been added, stop the addition and stir the reaction mix with a glass stirring rod. Afterwards, continue the addition the rest of the way. If at any point during the addition some material should distill over, pour it back into the reaction flask and decrease the rate of addition to prevent this. After the addition is complete, remove the addition funnel, stop up the flask, and distill with flame or hot plate. The crude acetic anhydride thus obtained needs to be purified by distillation. Set up for a simple distillation, add 3 g of finely pulverized, anhydrous sodium acetate to the reaction flask, and then pour in the crude acetic anhydride. The sodium acetate will convert any remaining acetyl chloride into the anhydride. The receiving flask should be under a water shower for cooling. Place a large funnel (a cheap plastic one will work fine) under the flask with a tube leading to the sink, pour cold water over the top of the receiving flask. The receiving flask can also be held directly under the faucet in the sink. Commence the distillation; the yield should be about 50 g of pure acetic anhydride.

acetone			CH_3COCH_3	5	
mp -94	bp 56.5	d 0.788	m 58.08	c $?.??	
Safety Data: MSDS *Flammable*				LABGUARD* Storage Code RED	

Synonyms: *2-propanone*; chevron acetone; dimethyl formaldehyde; dimethylketal; dimethyl ketone; ketone propane; beta-ketopropane; methyl ketone; propanone; pyroacetic acid; pyroacetic ether

Synthesis: Acetone is available as an OTC chemical in just about every hardware store. The stores sell it cheap, pure, and in large quantities. As far as Synthesis goes it is rather complicated, so it is best to purchase it. Its primary use in the household is as a solvent for paint, i.e. thinning paint, removing varnishes, and cleaning brushes. It can be purchased in pint to 5-gallon sizes at hardware stores or paint supply stores without question.

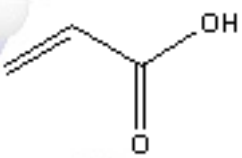
Acetone can be dried out by adding a small amount of calcium chloride, say 1 g per 25 mL, and letting it stand for three to seven days in a sealed container. Occasional agitation, every 12-24 hours, will improve the drying process. After letting the acetone stand, distill it to get the dry acetone. Some of the acetone will combine with the calcium chloride, so it necessary to distill it. Store the dry acetone in a well-sealed container.

acetyl chloride			CH_3COCl	6
mp -112	bp 52	d 1.104	m 78.50	c $?.??
Safety Data: MSDS			LABGUARD* Storage Code RED	

Synonyms: acetic acid chloride; acetic chloride; ethanoyl chloride

Synthesis: Place 95 mL of glacial acetic acid into a round-bottomed 500-mL Florence flask. Set the flask up for vacuum distillation with addition. Instead of connecting the vacuum adapter to a vacuum source, attach a calcium chloride drying tube. There is no need for vacuum, just an airtight connection to protect the product from moisture. While cooling the flask in a salt-ice bath, slowly add 51 mL of phosphorus trichloride through the addition funnel. After the addition, place the flask in a water bath heated to 40-50 °C. Continue heating until the active evolution of hydrochloric acid gas slackens, and the liquid separates into two layers.

To separate the acetyl chloride, which should have formed on the upper layer, heat the flask on a boiling water bath until nothing more distills over. To purify the acetyl chloride, simple distill the product obtained in the same apparatus used before, except this time replace the addition funnel with a thermometer. Collect the portion distilling over from 50 to 56 °C. The yield is about 80-90 g.

acrylic acid			$CH_2=CHCO_2H$	7
mp 14	bp 141.0	d 1.0621	m 72.06	c $?.??
Safety Data: MSDS *Corrosive, Flammable*			LABGUARD* Storage Code WHITE	

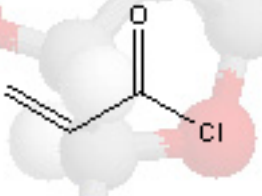
Synonyms: *2-propenoic acid*; acroleic acid; acrylate; ethylenecarboxylic acid; propene acid; propenoic acid; vinylformic acid

Synthesis: Prepare a mixture of 151 mL of 98-100% formic acid, 1060 mL of methyl acrylate, 30 g of hydroquinone, and 2 mL of sulfuric acid in a round-bottomed 2-L flask. Set the flask up for refluxing. Reflux with an oil bath heated to 85-95 °C (the oil not the contents of the flask) for 1-3 hours.

Remove the reflux column and set the flask up for fractional distillation, using copper sponge to pack the column. Slowly distill the mixture at 32-35 °C for about 8-10 hours, you will be removing methyl formate waste from the mixture. You will want to let 1 drop of distillate come over for every 5 that fall back into the flask, then allow more to come over near the end.

When no more methyl formate is produced, the excess methyl acrylate is fractionally distilled under partial vacuum at 32-35 °C with the oil temperature at 60-65 °:C. Reconfigure the setup for vacuum distillation if need be. You will also need to add a clasien adapter so as to extend a length of tubing into the mixture. During the distillation, a slow stream of carbon dioxide is admitted through this tube.

When all the methyl acrylate has been removed, the acrylic acid is fractionally distilled at 53-56 ° C under vacuum. Upon redistillation acrylic acid of 97% purity is obtained in a yield of 74-78% or about 220-230 g.

acrylyl chloride			$H_2C=CHCOCl$	8
mp ?	bp 72-76	d 1.1140	m 90.51	c $?.??
Safety Data: MSDS *Corrosive, Flammable*			LABGUARD* Storage Code RED	

Synonyms: acryl chloride; acrylic acid chloride; acryloyl chloride; chlorid kyseliny akrylove; 2-propenoyl chloride; propenoyl chloride

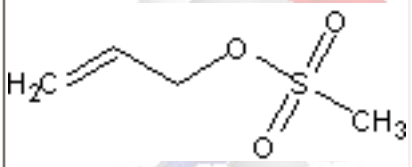
Synthesis: Into a 1-L round-bottomed flask place 135 mL of thionyl chloride. Set this flask up for refluxing with addition. Heat the thionyl chloride to boiling, and then add 115 mL of acrylic acid at such a rate that the mixture refluxes gently. It may require about an hour to add all of the acid. This reaction will generate toxic sulfur dioxide gas, so take the necessary precautions. After all of the acid has been added, continue to reflux for an additional 30 minutes to expel all of the sulfur dioxide gas.

I have no information on how to isolate or purify this chemical. It will be mixed with hydrochloric acid as a waste byproduct. I would suggest neutralizing the acid by adding some sodium hydroxide, and then distilling the product to get pure acrylyl chloride. If using this chemical to make 1,1,1-trinitro-2-propyl acrylate, try using aluminum hydroxide to neutralize the acid. The product of this is aluminum chloride, which is needed in the reaction, so no need to distill this.

allyl methanesulfonate	$C_4H_8O_3S$	9
mp ?	bp ?	d ?	m 136.1	c $?.??

Safety Data: MSDS

ChemAlert* Storage Code: GRAY



Synonyms: allyl mesylate; methanesulfonic acid, allyl ester; methanesulfonic acid, 2-propenyl ester

Synthesis: In a 1000-mL Erlenmeyer flask prepare a solution of 20 g of distilled allyl alcohol (98%) in 300 mL of diethyl ether. Cool the flask in an ice-water bath to below 5 degrees C. With stirring add 56.5 g of solid potassium carbonate in one portion; next add 3.3 g of solid trimethylamine hydrochloride in one portion. Stir the resulting suspension for 5 minutes. With vigorous stirring add 46.9 g of methanesulfonyl chloride to the flask dropwise over a period of 1 hour. After the addition of methanesulfonyl chloride is complete continue stirring the contents of the flask for 5 hours and maintain the temperature at 5 degrees C. Next add 300 mL of water to the flask and continue to stir the contents vigorously for an additional 15 minutes before discontinuing the stirring. Allow the contents of the flask to separate into two layers, the aqueous layer will be on the bottom. Decant off as much of the aqueous layer as possible by a pipette and collect it in a separate beaker. Mix the aqueous portion with two portions of 100 mL of ethyl ether and shake them in a seperatory funnel. It may be necessary to break up the aqueous layer into four batches to fit into the seperatory funnel, in which case shake each 75 mL portion of water with two 25 mL portions of ether. Combine all of the ether extracts with the organic layer in an Erlenmeyer flask and add a portion of anhydrous magnesium sulfate to draw out any moisture. Remove the ether by evaporating under reduced pressure without heating. The remaining allyl methanesulfonate is poured over a filter to remove the magnesium sulfate and kept under high vacuum to remove any final traces of solvent. What remains should be about 38-39 g of clear colorless oil. Yield is 83%. If possible this reaction should be carried out under an atmosphere of nitrogen.

aluminum	Al	10
mp 660	bp 2327	d 2.70	m 26.981539	c $?.??

Safety Data: MSDS *Flammable*

LABGUARD* Storage Code: RED

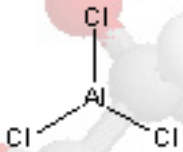
Al

Synonyms: aluminium

Synthesis: Aluminum powder will add explosive strength to just about any high explosive. The powder only that is, not foil or wire. The kind of powder needed is very finely divided, not the kind that can be purchased from automotive stores as a leak plugger for the radiator, that variety is too coarse. The only possible OTC source is from paint stores as an additive for paint. I should mention that I have never seen it sold in paint stores.

If all else fails one can buy finely powered aluminum from chemical suppliers who deal with the public. Companies that sell pyrotechnic materials will in all likelihood have several grades available from coarse down to atomized.

When using aluminum in chemical reactions one can use aluminum foil available at any grocery store, or aluminum tubing or rod available at hardware stores. Aluminum products are quite abundant at many stores. Aluminum foil is quite versatile because it offers a higher surface area compared to other types of OTC aluminum, it is quite cheap, and is pure. Aluminum foil is easy to tear into a desired mass and can be crumpled into balls of any size if coarse bits are needed for a reaction. Aluminum tubing or rod will need to be machined to get turnings, chunks, or shot which sounds like a lot work and special equipment.

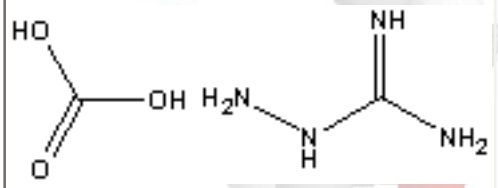
aluminum chloride	$AlCl_3$	11	
mp ? bp ? d ?	m 133.34	c $?.??	
Safety Data: MSDS *Corrosive*	LABGUARD* Storage Code WHITE		

Synonyms: AlCl3; alluminio(cloruro di); aluminiumchlorid; aluminium, (chlorure d'); aluminium trichloride; aluminum chloride (1:3); chlorure d'aluminium; Drysol; NSC 143016; PAC (salt); Pearsall; trichloroaluminum; UN 1726; UN 2581

Synthesis: The Synthesis of aluminum chloride will require a creative glassware setup. Assemble a heating apparatus as shown in the illustration below; each part must be completely dry for the reaction to work. The long furnace tube of hard glass should be 1.5 to 2 cm in diameter. The length is up to you, but a tube of 25-40 cm should suffice. One end of the tube can be drawn out to a narrow aperture if desired, since that requires some glassblowing skill it may be difficult for the improviser. A stopper with a short length of glass tubing in the middle will do nicely. The wide end of the tube is inserted into the center of a large stopper, a second glass tube, of at least 8 mm diameter, bent at a right angle, is placed above the larger. The large stopper is then attached to a wide mouth glass bottle. The part of the tube extending beyond the flames must be as short as possible to prevent the product from condensing prematurely, or it will clog the tube. Each end of the tube is plugged with glass wool to keep the reactants inside. A heat resistant plate is secured between the bottle and the flame to protect the stopper from burning or melting, you can use glass wool, aluminum foil, or any kind of fire resistant material (asbestos was recommended, it is now unavailable). If you have a stopper at the other end instead of a narrowed end, you will need a plate

there too. Fill the glass tube half way (horizontally, not vertically) with aluminum shavings before assembling of course. You can use little aluminum foil balls, or machine shop shavings, the latter must be cleaned of oil by boiling in ethyl alcohol and dried in an oven at 120 °C.

A very rapid current of dry hydrogen chloride gas is passed into the tube from the narrow end; the gas first passes into two drying bottles filled with concentrated sulfuric acid. Do not fill the bottles with too much acid as it can foam up. Test to see if all of the air has been removed from the apparatus by connecting a rubber hose to the angled outlet tube and directing the gas into a beaker of water. When only HCl gas remains, it will be absorbed directly into the water with little or no bubbling, now remove the tubing. If any air remains, there can be an explosion of oxygen and hydrogen. Now that the air is out, begin heating the tube with several burners along its length. Start with small flames and gradually increase. White vapors of aluminum chloride will begin to be evolved when the flames are high enough, and will be condensed into the bottle. Do not heat the aluminum so high it melts, if this happens remove the flames immediately. Continue heating when it solidifies. The reaction is done when all of the aluminum has been consumed, a small amount of dark residue may remain. The current of hydrogen chloride gas must be kept constantly rapid for this reaction to work. The aluminum chloride thus obtained is quite pure; store it in tightly sealed bottles or a desiccator.

aminoguanidine bicarbonate	$C_2H_8N_4O_3$	12	
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS *Irritant*	LABGUARD* Storage Code GREEN		

Synonyms: aminoguanidinium hydrogen carbonate; carbonic acid with hydrazinecarboximidamide (1:1)

Synthesis: Two hundred and sixteen grams (2.07 moles) of nitroguanidine1 and 740 g. (11.3 moles) of purified zinc dust (Note 1) are thoroughly ground together in a mortar, and then enough water (about 400 ml.) is added with stirring with the pestle to form a thick paste. The paste is transferred to a 3-l. enameled can or beaker surrounded by an ice bath. A solution of 128 g. (2.14 moles) of glacial acetic acid in 130 ml. of water is cooled to 5° in another 3-l. beaker, which is fitted with a strong mechanical stirrer and surrounded by an ice bath. The paste of nitroguanidine and zinc dust, cooled to 5°, is added slowly with mechanical stirring, the temperature of the reaction mixture being kept between 5° and 15°. A total of about 1 kg. of cracked ice is added to the mixture from time to time as the mixture becomes too warm or too thick to stir. The addition of the paste takes about 8 hours, and the final volume of the mixture is about 1.5 l. (Note 2). The mixture is then slowly warmed to 40° on a water bath with continued stirring, and this temperature is maintained for 1–5 minutes, until reduction is complete (Note 3).

The solution is immediately separated from the insoluble material by filtration on a 20-cm. Büchner funnel, and the cake is sucked as dry as possible. The residue is transferred to the 3-l. beaker, triturated well with 1 l. of water, and then separated from the liquid by filtration. In the same manner, the residue is washed twice more with two 600-ml. portions of water. The filtrates are combined and placed in a 5-l. round-bottomed flask. Two hundred grams of ammonium chloride is added, and the solution is mechanically stirred until solution is complete (Note 4). The stirring is continued, and 220 g. (2.62 moles) of sodium bicarbonate is added during a period of about 10 minutes. The aminoguanidine bicarbonate begins to precipitate after a few minutes, and the solution is then placed in a refrigerator overnight. The precipitate is collected by filtration on a Büchner funnel. The cake is removed to a 1-l. beaker and mixed with a 400-ml. portion of a 5% solution of ammonium chloride and filtered. It is again washed with two 400-ml. portions of distilled water, the wash solution being removed each time by filtration. Finally the solid is pressed down on the Büchner funnel; the mat is broken up with a spatula and washed while on the funnel with two 400-ml. portions of 95% ethanol and then with one 400-ml. portion of ether. After air drying, the aminoguanidine bicarbonate amounts to 180–182 g. (63–64%) of a white solid, melting at 172° with decomposition (Note 5) and (Note 6).

1. The zinc is purified by stirring 1.2 kg. of commercial zinc dust with 3 l. of 2% hydrochloric acid for 1 minute. The acid is removed by filtration, and the zinc is washed in a 4-l. beaker with one 3-l. portion of 2% hydrochloric acid, three 3-l. portions of distilled water, two 2-l. portions of 95% ethanol, and finally with one 2-l. portion of absolute ether, the wash solutions being removed each time by filtration. Then the material is thoroughly dried and any lumps are broken up in a mortar.

2. The solution becomes basic to litmus after one-half to three-fourths of the paste has been added. Lower yields are obtained if a larger excess of acetic acid is employed.

3. The state of reduction can be determined by placing 3 drops of the reaction mixture in a test tube containing 5 ml. of a 10% solution of sodium hydroxide and then adding 5 ml. of a freshly prepared saturated solution of ferrous ammonium sulfate. A red coloration indicates incomplete reduction; when the reduction is complete, only a greenish precipitate is observed. The mixture should not be heated after this test shows that reduction is complete.

4. The presence of the ammonium chloride prevents the coprecipitation of zinc salts when sodium bicarbonate is added to the solution to precipitate the aminoguanidine as the bicarbonate. If the solution is not clear at this step, it should be filtered.

5. The aminoguanidine bicarbonate is pure enough for most purposes. It should not be recrystallized from hot water, since decomposition will occur.

6. W. W. Hartman and Ross Philips have submitted a procedure suitable for the preparation of aminoguanidine bicarbonate on a larger scale. The sulfates of methylisothiourea and of hydrazine are allowed to react with the evolution of methyl mercaptan. In a 30-gal. crock are placed 10 l. of water and 5760 g. (20 moles) of methylisothiourea sulfate.2 In a 22-l. flask, 5.2 kg. (40 moles) of hydrazine sulfate3 is stirred with 12 l. of water, and 40% sodium hydroxide is added until all the hydrazine sulfate has dissolved and the solution is just neutral to Congo paper. The exact amount of alkali is noted and a duplicate amount added. The hydrazine solution is then added to the 30-gal. crock with stirring, as fast as possible, without allowing the foam to overflow the crock. The mixing is done out-of-doors, or in an efficient hood, since large volumes of methyl mercaptan are evolved.

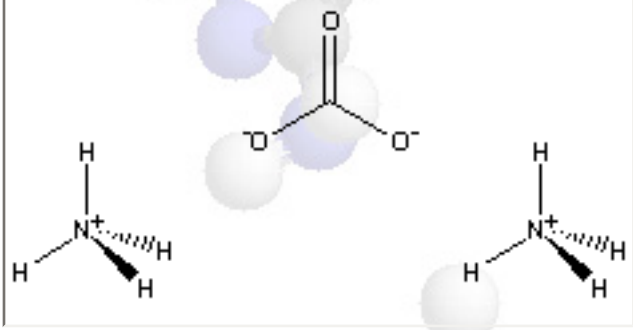
If the reaction is carried out on a smaller scale in 12- or 22-l. flasks, using appropriate amounts of material, the methyl mercaptan evolved may be absorbed in cold sodium hydroxide solution and isolated if desired. The solution is stirred until evolution of mercaptan stops, and then a few liters of water are distilled off under reduced pressure to free the solution entirely from mercaptan. The residual liquor is chilled in a crock, and a crop of hydrated sodium sulfate is filtered off, washed with ice water, and discarded. The filtrate is warmed to 20–25°, 25 ml. of glacial acetic acid is added, then 4 kg. of sodium bicarbonate, and the solution is stirred vigorously for 5 minutes and thereafter occasionally during an hour, or until the precipitate no longer increases. The precipitate is filtered with suction and washed with ice water and then with methanol, and is dried at a temperature not above 60–70°. The yield is 3760 g. (69% of the theoretical amount). Hydrazine sulfate may be recovered from the final filtrate, if the filtrate is strongly acidified with sulfuric acid and allowed to cool.

This procedure borrowed from Organic Synthesis Collective Volume 3 pg 73

ammonia	NH_3	13	
mp -77.7	bp -33.35	d 0.6818	m 17.03	c $?.??
Safety Data: MSDS *Corrosive, Irritant, Toxic*	LABGUARD* Storage Code BLUE	

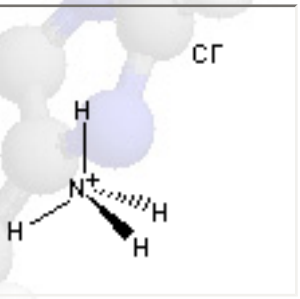
Synonyms: N-H

Synthesis: One method gaseous ammonia can be generated is by heating a small flask full of the most concentrated ammonium hydroxide available with a burner, household hydroxide will not be sufficient. The gas can be dried by passing it through a drying tube filled with a mixture of 4 parts calcium oxide with 1 part sodium hydroxide.

ammonium carbonate	$(NH_4)_2CO_3$	14	
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS	LABGUARD* Storage Code GREEN	

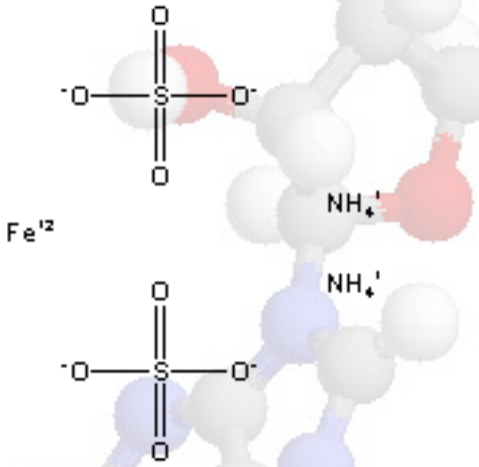
Synonyms: ammonium sesquicarbonate; carbonic acid, ammonium salt; carbonic acid, diammonium salt; crystal ammonia; diammonium carbonate; hartshorn

Synthesis: Coming soon!

ammonium chloride	NH_4Cl	15	
mp ? bp ? d 1.5274	m 53.49	c $?.??	
Safety Data: MSDS	LABGUARD* Storage Code GREEN		

Synonyms: Amchlor; ammoneric; ammoniumchlorid; ammonium muriate; chlorid amonny; Darammon; sal ammonia; sal ammoniac; salammonite; salmiac

Synthesis: Coming soon!

ammonium ferrous sulfate	$(NH_4)_2Fe(SO_4)_2 \cdot 6\,H_2O$	16	
mp 100 (dec) bp - d 1.86	m 284.05	c $?.??	
Safety Data: MSDS	LABGUARD* Storage Code GREEN		

Synonyms: ammonium iron sulfate; ferrous ammonium sulfate; iron ammonium sulfate; Mohr's salt; sulfuric acid, ammonium iron(2+) salt

Synthesis: Prepare a solution of 234 g of ammonium bisulfate in 1 L of water. Add 42.7 g iron metal to the solution and heat to 70 degrees C until all of the iron dissolves (reacts). Add an additional 234 g of ammonium bisulfate to the solution and again add 42.7 g of iron and heat to 70 degrees until all of the iron reacts. Cool the solution down to less than 15 degrees C with stirring; ammonium ferrous sulfate should then precipitate. Pour the liquid over a filter to collect the crystals. You may need to boil the liquid down to half its volume to obtain a complete crop of crystals.

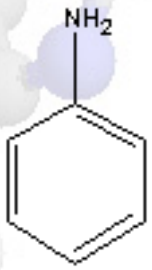
The ammonium bisulfate used in this reaction can be obtained by heating ammonium sulfate to 370 degrees C and cooking for about 15-20 minutes. Ammonium sulfate can be obtained either as fertilizer or by reacting ammonia with sulfuric acid.

ammonium hydroxide			NH_4OH	17
mp -	bp -	d 0.90	m -	c $?.??
Safety Data: MSDS *Corrosive*			LABGUARD* Storage Code WHITE	

Synonyms: ammonia, monohydrate; ammonia water; ammonium, aqueous; aqua ammonia; aqueous ammonia; Spirit of Hartshorn

Synthesis: Coming soon!

aniline			$C_6H_5NH_2$	18
mp -6	bp 184-186	d 1.022	m 93.13	c $?.??
Safety Data: MSDS *Toxic*			LABGUARD* Storage Code BLUE	



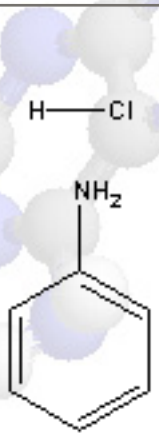
Synonyms: *benzamine*; aminobenzene; aminophen; anilin; anilina; aniline oil; aniline reagent; anyvim; arylamine; benzene, amino-; benzidam; blue oil; C.I. 76000; C.I. oxidation base 1; cyanol; Huile D'aniline; krystallin; kyanol; NCI-C03736; phenylamine; Rcra waste number U012; UN 1547

Synthesis: Prepare a mixture of 90 g of tin granules and 41.5 mL of nitrobenzene in a round bottom 1500-mL flask. Gradually add about 17 ml of concentrated hydrochloric acid, attach a reflux condenser, with or without water flowing, and shake the flask until thoroughly mixed. The flask will become warm after a short time, and a vigorous reaction can be observed. When this happens, immerse the flask in cold water to moderate the reaction. Add another 17 mL of hydrochloric acid and repeat the shaking/cooling process. Add a third and fourth portion of acid until approximately 80-85 mL of acid has been added, shaking and cooling each time. At this point the addition of acid should not give as quite a violent reaction, add an additional 85-90 mL of hydrochloric acid in larger portions. The total amount of acid added is 167 mL.

After all of the acid has been added, the mixture is heated on a steam bath for 1 hour at reflux. After refluxing, add 100 mL of water to the flask. Prepare a solution of 150 g of sodium hydroxide in 200 mL of water, gradually add this solution to the flask in small portions. If the addition of the hydroxide solution causes the contents of the flask to boil, cool the flask in a water bath before adding more.

To distill the aniline, set the flask up for steam distillation and distill, aniline and water will be collected. The initial distillate will be a milky color, when it becomes clear remove the collecting flask and add a new one. Collect an additional 300 mL of distillate.

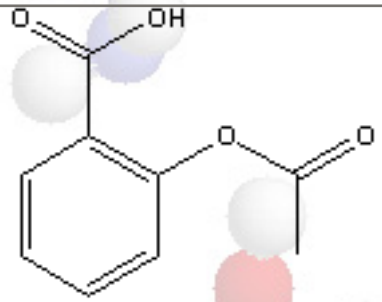
Combine the two distillate portions in an Erlenmeyer flask, and then add 25 g of finely powdered sodium chloride for every 100 mL of distillate collected. Shake the flask until all of the salt dissolves, then extract the solution with several portions of ether. Combine the ether portions, add a small amount of potassium hydroxide, and allow the ether to evaporate. The crude aniline thus obtained can be purified by simple distillation. The yield is 90-100%.

aniline hydrochloride	$C_6H_7N.HCl$	19	
mp 198	bp 245	d 1.2215	m 129.5889	c $?.??
Safety Data: MSDS			

Synonyms: aniline chloride; aniline hydrochloride; aniline salt; anilinium chloride; benzenamine hydrochloride; C.I. 76001; hydrochloride benzenamine; phenylamine hydrochloride; phenylammonium chloride

Synthesis: Aniline hydrochloride is made by gradually adding concentrated hydrochloric acid to aniline. One method to test for completion is by placing a drop of solution on a piece of filter paper stained with methyl violet. If it turns green it is done. Otherwise add an excess of hydrochloric acid. After the acid has been added, cool the solution rapidly, with stirring, by placing it in a salt-ice bath. Small crystals of aniline hydrochloride will precipitate. Vacuum filter the solution to collect these crystals, press them with filter paper to squeeze out any excess water, and allow to dry.

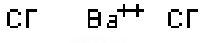
aspirin	$C_9H_8O_4$	18
mp ? bp ? d ?	m ?	c $?.??
Safety Data: MSDS	LABGUARD* Storage Code GREEN	



Synonyms: *2-(acetyloxy)-benzoic acid* ; ac 5230; acenterine; acesal; Acetaminophen Aspirin; acetate salicylic acid; aceticyl; acetilsalicilico; acetilum acidulatum; acetisal; acetonyl; acetophen; acetosal; acetosalic acid; acetosalin; 2-acetoxybenzoic acid; acetylin; acetylsal; acetylsalicylic acid; acetyl salycylic acid; acidum acetylsalicylicum; acimetten; acisal; acylpyrin; Alka-seltzer; Anacin; A.S.A.; a.s.a. empirin; asagran; asatard; Ascoden-30; Ascriptin; aspalon; aspergum; aspirdrops; Aspro; asteric; benaspir; bialpirinia; Bufferin; caprin; o-carboxyphenyl acetate; Chlorpheninaurine; colfarit; contrheuma retard; Coricidin; Coricidin D; cr; Darvon compound; duramax; ECM; Ecotrin; empirin; endydol; entericin; enterosarine; entrophen; Excedrin; extren; Gelprin; helicon; Measurin; Norgesic; Persistin; rhodine; Robaxisal; salacetin; salcetogen; saletin; salicylic acid acetate; Supac; Triaminicin; Vanquish; XAXA

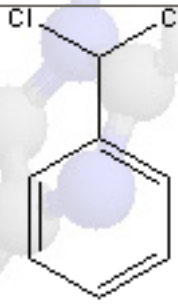
Synthesis: Coming soon!

barium chloride	$BaCl_2$	19
mp 963 bp - d 3.86	m 208.23	c $?.??
Safety Data: MSDS *Toxic*	LABGUARD* Storage Code BLUE	



Synonyms: ba 0108E; barium dichloride; NCI-C61074; SBA 0108E

Synthesis: Coming soon!

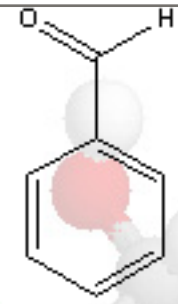
benzal chloride	$C_6H_5CHCl_2$	20	
mp -17	bp 205	d 1.26	m 161.03	c $?.??	
Safety Data: MSDS		LABGUARD* Storage Code BLUE	

Synonyms: *benzylidene chloride; (dichloromethyl)benzene*; benzyl dichloride; benzylene chloride; benzylidene dichloride; chlorobenzal; dichloro methyl-benzene; a,a-dichlorotoluene; dichlorophenylmethane

Synthesis: Place 58 mL (50 g) of toluene in a round bottom 100-mL flask. Attach a Clasien adapter to the flask. On the angled arm of the adapter, attach a condenser set up for refluxing. Since excess chlorine gas will be released from the top of the condenser, affix a one-holed stopper with a short length of glass tubing connected to a long hose, direct the hose to a well ventilated area. On the straight arm of the adapter, attach a length of glass tubing with a bubbler at the end that extends below the surface of the toluene. The top of this tube is connected to a chlorine generator.

Position the setup such that the flask is in direct sunlight, or very strong light. Sunlight is superior. Heat the toluene to boiling while a current of dry chlorine gas is bubbled in, the chlorine can be dried by passing it through two drying bottles filled with concentrated sulfuric acid. The course of the reaction is best judged by weighing the product; the reaction is complete when the toluene has increased by 40 g, the total weight being 90 g. By weighing the flask beforehand, and periodically interrupting the flow of chlorine to cool and weigh the flask, the completeness of the reaction can be determined. Without weighing, it is very difficult to gauge this reaction as the length varies greatly.

In the summer, in direct midday sunlight, the reaction is complete in a few hours. In winter, or low light, the reaction needs 12-24 hours to complete. Adding 4 g of phosphorus pentachloride to the toluene can enhance the reaction. The crude benzal chloride thus obtained can be directly used to make benzaldehyde.

benzaldehyde	C_7H_6O	21	
mp -56.5	bp 179	d 1.043	m 106.12	c $?.??	
Safety Data: MSDS		LABGUARD* Storage Code GREEN	

Synonyms: almond artificial essential oil; artificial almond oil; artificial bitter almond oil; artificial essential oil of almond; benzenecarbonal; benzene carboxaldehyde; benzene methylal; benzoic aldehyde; benzoyl hydride; oil of bitter almond; phenylmethanal

Synthesis: To prepare benzaldehyde, start with the crude benzal chloride obtained from its synthesis. Into a round-bottomed flask with the benzal chloride, add a solution of 500 mL of water and 150 g of calcium carbonate. Set the flask up for reflux and heat for 4 hours on an oil bath. Keep the oil bath at 130 °C by checking the oil itself with a thermometer.

After refluxing, steam distill the product to obtain crude benzaldehyde oil. (The portion that did not distill over contains some benzoic acid. It can be discarded, or purified by filtering while hot through a piece of fluted filter paper, then adding concentrated hydrochloric acid to the filtrate. On cooling the benzoic acid will precipitate, it is filtered and recrystallized from hot water.) The crude benzaldehyde oil is treated with a concentrated solution of sodium bisulfite, after shaking for a long time the oil should have dissolved into solution. If any crystals happen to form during the shaking, add water until they dissolve.

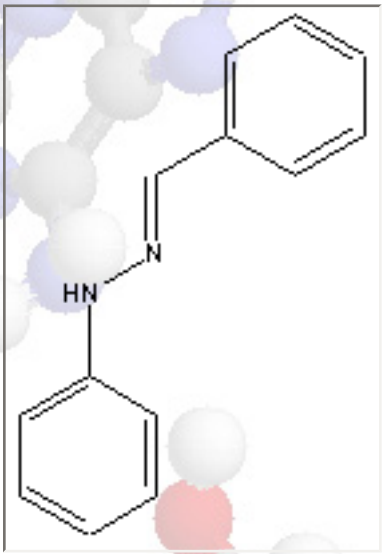
After most of the oil is dissolved, filter the solution over fluted filter paper, and then treat the filtrate with sodium carbonate until it is strongly alkaline. This liquid is now steam distilled to obtain pure benzaldehyde. The product can be further purified by mixing with ether, letting the ether evaporate, and distilling (normal, not steam) the benzaldehyde.

If you have obtained benzaldehyde from other sources, it must be purified if it is anything less than ACS grade. It should be washed with sodium carbonate solution, dried, and distilled with minimum atmospheric exposure. Only the fraction collected at 178-180 °C is kept.

benzaldehyde phenylhydrazone	$C_{13}H_{12}N_2$	22
mp 158	bp 327.5	d ?	m 196.1	c $?.??

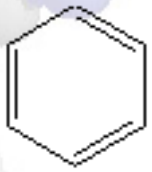
Safety Data: MSDS

ChemAlert* Storage Code GRAY



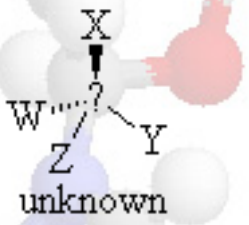
Synonyms: benzalphenylhydrazine; benzylidenephenylhydrazine; diphenylhydrazone; NSC 37088

Synthesis: Prepare a solution of 9.81 g of benzaldehyde and 10 g of phenylhydrazine in 100 mL of ethyl alcohol. The benzaldehyde should be chilled to 0-5 degrees C before adding it to the solution. A cream colored solid should form; allow the solution to stand for 2 hours to complete the reaction. The solid is collected by vacuum filtration, washed with ice-cold ethyl alcohol, and dried under vacuum.

benzene	C_6H_6	23	
mp 5.5	bp 80.1	d 0.8787	m 78.11	c $?.??
Safety Data: MSDS *Flammable, Toxic*	LABGUARD* Storage Code RED	

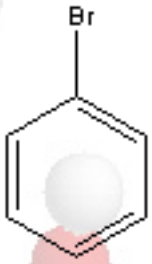
Synonyms: (6)annulene; benzine; benzol; benzolene; bicarburet of hydrogen; carbon oil; coal naphtha; cyclohexatriene; mineral naphtha; motor benzol; nitration benzene; phene; phenyl hydride; pyrobenzol

Synthesis: Nothing yet

bromine	$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS	ChemAlert* Storage Code GRAY	

Synonyms:

Synthesis: Nothing yet

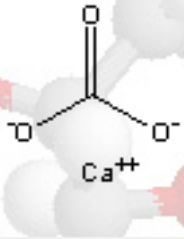
bromobenzene	C_6H_5Br	24	
mp -30.6	bp 156.2	d 1.4952	m 157.01	c $?.??
Safety Data: MSDS *Flammable, Irritant*	LABGUARD* Storage Code RED	

Synonyms: monobromobenzene; phenyl bromide

Synthesis: To a 250-mL Florence flask connect a vertical tube 50 cm long and 1.5 cm wide, the upper end of which is closed by a stopper bearing a narrow glass tube bent at right angles to form a U. The other end is connected with a flask containing 250 mL of water, by a stopper having a small wedge removed. See the illustration. The tube does not touch the water, but remains about 1 cm above the surface. Place 57 mL of benzene and 1 g of iron filings into the first flask. Immerse the flask in a salt-ice bath to cool it down. Through the vertical tube add 40 mL of bromine, then immediately connect the narrow tube. After some time an extremely energetic reaction will begin with the evolution of hydrobromic acid gas, which should be completely absorbed by the water. Should there be no reaction after a short time, remove the ice bath for a brief period, and if necessary momentarily immerse the flask in warm water. As soon as even a weak gas evolution begins, the flask is at once cooled again. If you do not cool it right away there is a risk of the reaction going out of control, if this happens even with cooling, use larger iron filings or small nails.

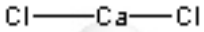
When the reaction has subsided remove the ice bath, dry the flask, and heat until no red bromine vapors are visible above the dark colored liquid. The product is shaken with several portions of water to wash it, and then steam distilled. As soon as crystals of dibromobenzene (some will always form) begin to separate out in the condenser, the receiver is changed and the distillation is continued until all of the dibromobenzene has passed over. The liquid portion is added to a seperatory funnel where the bromobenzene layer is collected, the water layer is discarded. Add the bromobenzene layer to a small Erlenmeyer flask, add a small amount of calcium chloride to dry it, shake the flask gently to mix it up. Filter the liquid to remove the calcium chloride, and then add it to a small round-bottomed Florence flask. Fractionally distill the liquid to collect pure bromobenzene. The portion distilling over between 140-170 °C is collected separately, this portion is fractionally distilled again, this time collecting only that which distills over at 150-160 °C. Yield is about 60-70 g.

The residue boiling above 170 °C remaining the flask after the two distillations contains dibromobenzene and hydrobromic acid. These can be disposed of or, since bromine is quite valuable, purified and kept. Pour the residue, while still warm, onto a watch glass so it may cool. After cooling place the material, along with the other crystals of dibromobenzene, on a porous glass plate and press it to separate the acid. Add the pressed dibromobenzene to ethyl alcohol and recrystallize, it should now be quite pure. The hydrobromic acid that remains can be purified by fractional distillation. The fraction below 126 °C is water, which can be discarded. When the temperature reaches 126 and stays constant, begin collecting the distillate; this should be about 48% hydrobromic acid.

calcium carbonate			$CaCO_3$	25	
mp 825 (dec)	bp -	d 2.83	m 100.09	c $?.??	
Safety Data: MSDS			LABGUARD* Storage Code GREEN		

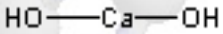
Synonyms: aglime; aragonite; atomite; Calcichew; Calcidia; Calcit; calcite; carbonic acid calcium salt (1:1); chalk; Citrical; limestone; marble; slaker rejects; vaterite; whiting

Synthesis: Coming soon!

calcium chloride	$CaCl_2$	26	
mp 772	bp 1600	d 2.152	m 110.98	c $?.??
Safety Data: MSDS *Irritant*	LABGUARD* Storage Code GREEN		

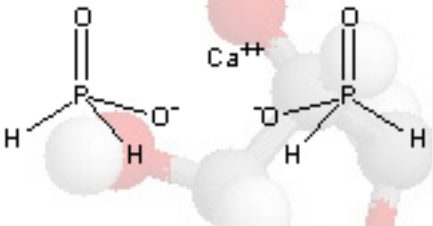
Synonyms: calcium dichloride; calcosan; intergravin-orales

Synthesis: Coming soon!

calcium hydroxide	$Ca(OH_2)$	27	
mp -	bp -	d 2.08-2.34	m 74.09	c $?.??
Safety Data: MSDS *Corrosive*	LABGUARD* Storage Code WHITE		

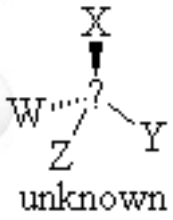
Synonyms: calcium dihydroxide; calcium hydrate; carboxide; hydrated lime; lime, hydrated; lime water; slaked lime

Synthesis: Coming soon!

calcium hypophosphite	$Ca(H_2PO_2)_2$	28	
mp ?	bp ?	d ?	m 170.05	c $?.??
Safety Data: MSDS	LABGUARD* Storage Code GREEN		

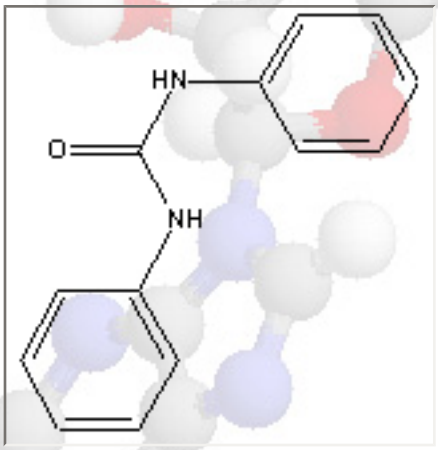
Synonyms:

Synthesis: Nothing yet

calcium sulfate	$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS	ChemAlert* Storage Code GRAY	

Synonyms:

Synthesis: Nothing yet

carbanilide	$C_6H_5NHCONHC_6H_5$	29	
mp 238	bp 260 (dec)	d 1.239	m 212.25	c $?.??
Safety Data: MSDS	LABGUARD* Storage Code GREEN	

Synonyms: *N,N'-diphenylurea*; acardite; N,N'-difenylmocovina; diphenylcarbamide; diphenylurea; 1,3-diphenylurea; 3-diphenylurea; s-diphenylurea; sym-diphenylurea; karbanilid; N-phenyl-N'-phenylurea; urea, 1,3-diphenyl-; USAF ek-534

Synthesis: Prepare a solution of 390 g of aniline hydrochloride and 190 g of urea in 1500 mL of water. Add the solution to a 3-L Florence flask and reflux at its boiling point for 2 hours. After reflux, rapidly suction filter the solution to collect the crystals, and then wash the carbanilide with 100 mL of boiling water. The filtrate is chilled, and the phenylurea that crystallizes out is filtered off and rinsed with a little cold water, the washing being discarded. The filtrate is again boiled under reflux for 2 hours, or until it begins to bump, and the filtration process is repeated. The filtrate is again refluxed and filtered a third time, and each time the phenylurea is collected from the cold filtrate. The filtrate is finally evaporated to half of its original volume, and additional crops of carbanilide and phenylurea are so obtained. The filtrate can now be discarded.

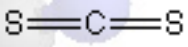
The crude carbanilide can be purified be recrystallizing from ethyl alcohol with the use of some decolorizing carbon, you will need 1 L of alcohol per 25 g of carbanilide. The yield is about 40%. It may be more practical to use only a fraction of the reactants for this lab, say a tenth, and make multiple batches. The final purification can be done all at once.

All of that phenylurea can be discarded, or kept, I know of no use for it. If you are keeping it, it can be purified by dissolving it in the minimum quantity of boiling water, adding a little decolorizing carbon, and filtering to remove any impurities. When the filtrate first begins to cool, a precipitate of carbanilide is deposited; this must be filtered off while the liquid is still hot. On cooling, pure phenylurea will precipitate. The yield here is about 50-55%.

carbon dioxide			$X_aY_bZ_c$	1
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	

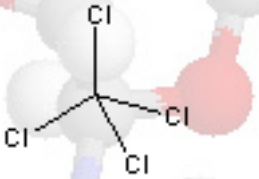
Synonyms:

Synthesis: Nothing yet

carbon disulfide			CS_2	30
mp -111.6	bp 46.5	d 1.2632	m 76.14	c $?.??
Safety Data: MSDS *Flammable, Toxic*			LABGUARD* Storage Code RED	

Synonyms: alcohol of sulfur; carbon bisulfide; carbon bisulfuret; carbone; carbonio; carbon sulfide; dithiocarbonic anhydride; kohlendisulfid; koolstofdisulfide; NCI-C04591; Rcra waste number P022; schwefelkohlenstoff; solfuro di carbonio; sulfocarbonic anhydride; UN 1131; weeviltox; wegla dwusiarczek

Synthesis: Coming soon!

carbon tetrachloride			CCl_4	31
mp -23	bp 76.7	d 1.589	m 153.82	c $?.??
Safety Data: MSDS *Toxic*			LABGUARD* Storage Code BLUE	

Synonyms: *tetrachloromethane*; Benzinoform; carbona; carbon chloride; carbon tet; flukoids; methane tetrachloride; Necatorina; necatorine; perchloromethane; R 10 (refrigerant); refrigerant R10; tetrachlorocarbon; tetrafinol; tetraform; tetrasol; univerm; vermoestricid

Synthesis: Nothing yet

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This website uses a verity of abbreviations and key words to describe the physical and chemical properties of explosives, chemical weapons, and their precursors. Most of these properties are listed in handy informative tables at the top of each substances page. To assist the viewer in better understanding these tables this guide has been created. What follows are actual tables taken from the site followed by an explanation of what each cell means.

Explosives Table

melting point 91 °C	boiling point explodes	chemical name	molecular mass 222.1 g/mol	density 1.18 g/mL
table key	sensitivity very high	chemical formula $C_9H_{18}O_6$	explosive velocity 5300 m/s	estimated cost $?.00 /g

Melting point: the temperature in degrees Celsius at which the explosive melts.
Boiling point: the temperature in degrees Celsius at which the explosive boils.
Chemical name: the common name of the explosive. This is usually a non-IUPAC name or acronym.
Molecular mass: the mass in grams of 1 mole of the explosive.
Density: the mass in grams of 1 milliliter, or 1 cubic centimeter, of the explosive typically at room temperature. Some densities are low average density reflecting that which an improvised chemist is likely to obtain, not maximum densities obtainable only by specialized hydraulic equipment.
Table key: a link to this page.
Sensitivity: a relative comparison based on TNT of the ease by which this explosive can detonate. Primary explosives are very easy to detonate and are therefore considered very sensitive. High explosives are generally difficult to detonate and are therefore considered insensitive. This rating is purely arbitrary in most cases and should not be considered a definable property of any explosive.
Chemical formula: the molecular formula of the explosive. Some formulas may be structural and others may be ionic, but most are in their condensed form starting with hydrogen, followed by carbon, and then all other elements in alphabetical order.
Explosive velocity: the velocity of detonation given in meters per second based on the given density. Some explosive velocities are based on the maximum obtainable density given in the literature, and not the listed density.
Estimated cost: the cost of 1 gram of the explosive using commercially available precursors. These costs have not yet been calculated for all explosives.

Chemical Weapons Table

melting point ? °C	boiling point ? °C	chemical name	molecular mass ? g/mol	density ? g/mL

table key	toxicity ?	chemical formula $C_xH_yO_z$	LD_{50} x mg/Kg	estimated cost $?.00 /g

Melting point: the temperature in degrees Celsius at which the chemical melts.
Boiling point: the temperature in degrees Celsius at which the chemical boils.
Chemical name: the common name of the chemical. This is usually a non-IUPAC name or acronym.
Molecular mass: the mass in grams of 1 mole of the chemical.
Density: the mass in grams of 1 milliliter, or 1 cubic centimeter, of the chemical typically at room temperature.
Table key: a link to this page.
Toxicity: a relative scale used to designate the lethality of the chemical. This rating is purely arbitrary as almost all of the chemicals are deadly, but the extent to which they are is described in the table.
Chemical formula: the molecular formula of the chemical. Some formulas may be structural and others may be ionic, but most are in their condensed form starting with hydrogen, followed by carbon, and then all other elements in alphabetical order.
LD_{50}: this data is the lethal dose required to induce death in 50% of all experimental trials. These results are usually determined on rats. The given number is the amount of poison, given in milligrams, that must be ingested, inhaled, or absorbed for each kilogram of body mass of the victim. The lower this number the more lethal the compound.
Estimated cost: the cost of 1 gram of the chemical using commercially available precursors. These costs have not yet been calculated for all chemicals.

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Precursors Part 5

silver iodide			AgI	1	
mp 552	bp ?	d 5.67	m 234.77	c $?.??	
Safety Data: MSDS				LABGUARD* Storage Code GREEN	
Synonyms:					
Synthesis: Nothing yet					

silver nitrate			$AgNO_3$	1	
mp 212	bp 440 dec	d 4.35	m 169.87	c $?.??	
Safety Data: MSDS *Corrosive*				LABGUARD* Storage Code WHITE	
Synonyms:					
Synthesis: Coming soon!					

sodium			Na	1	
mp 97.82	bp 881.4	d 0.968	m 22.98977	c $?.??	
Safety Data: MSDS *Corrosive, Flammable*				LABGUARD* Storage Code RED	
Synonyms: natrium					

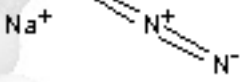
Synthesis: Nothing yet

sodium acetate			CH_3COONa	1	
mp 58	bp >120 dec	d 1.45	m 82.03	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

Synonyms:

Synthesis: Starting with some acetic acid (in this case a bottle of clear white vinegar, not cider vinegar), add enough sodium hydroxide to neutralize the acid. 1 mole of hydroxide will neutralize 1 mole of acid, so adjust your reactants according to how much you wish to make. It will take about 126 g of sodium hydroxide to neutralize 4 L of 5% vinegar. It is a good idea to have the solution be slightly acidic rather than have excess sodium hydroxide, the acid will be removed later on, the base will not. The neutralization will generate a good deal of heat, add the hydroxide slowly with stirring, a cooling bath may help. A more economical choice for a neutralizer is sodium bicarbonate, good old baking soda. This will be the trite baking soda and vinegar reaction kids love; in this case it will take 266.7 g of sodium bicarbonate to neutralize 4 L of 5% vinegar. The level of neutralization can be gauged by how much carbon dioxide gas is being released; once the fizzing subsides it is done.

To obtain the crystals of sodium acetate, boil the neutralized solution down until only crystals remain. To obtain anhydrous crystals, place them in a shallow iron, nickel, or ceramic crucible and heat with a flame. The salt will first melt from its moisture content, eventually steam will be evolved in large amounts and the salt will solidify. To remove the last traces of moisture, heat the mass very strongly, wave the flame back and fourth under the crucible until the crystals melt again, it is done. Be sure not to overheat the crystals, they will decompose into a flammable gas and begin to char. After the crystals have cooled, scrape them from the dish with a knife and seal them, they will eventually absorb moisture from the air. If the crystals are kept for any length of time, or if they are obtained from a chemical supplier, it is a good idea to melt them to drive off any acquired moisture.

sodium azide			NaN_3	1	
mp dec	bp -	d 1.846	m 65.01	c $?.??	
Safety Data: MSDS *Toxic*				LABGUARD* Storage Code BLUE	

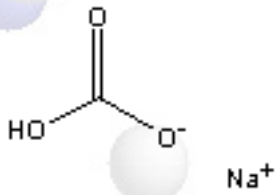
Synonyms: azide; azium; hydrazoic acid, sodium salt; smite; U-3886

Synthesis: Nothing yet

sodium benzoate	C_6H_5COONa	1	
mp ? bp ? d ?	m 144.11	c $?.??	
Safety Data: MSDS		LABGUARD* Storage Code GREEN	

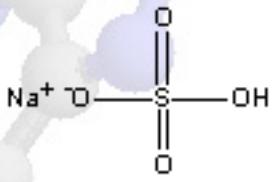
Synonyms:

Synthesis: Nothing yet

sodium bicarbonate	$NaHCO_3$	1	
mp 100 dec bp - d ?	m 84.01	c $?.??	
Safety Data: MSDS		LABGUARD* Storage Code GREEN	

Synonyms: baking soda; bicarbonate of soda; carbonic acid monosodium salt; carbonic acid sodium salt (1:1); col-evac; jusonin; meylon; monosodium carbonate; monosodium hydrogen carbonate; NEUT; soda mint; sodium acid carbonate; sodium hydrocarbonate; sodium hydrogen carbonate; soludal

Synthesis: Coming soon!

sodium bisulfate	$NaHSO_4$	1	
mp 315 bp ? d 2.435	m 120.06	c $?.??	
Safety Data: MSDS *Corrosive*		LABGUARD* Storage Code WHITE	

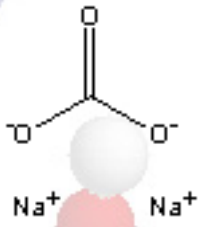
Synonyms: sodium acid sulfate; sodium hydrogen sulfate; sodium hydrogen sulfate monohydrate; sodium pyrosulfate; sulfuric acid, monosodium salt

Synthesis: Nothing yet

sodium bisulfite			$NaHSO_3$	1
mp ?	bp ?	d 1.48	m 104.06	c $?.??
Safety Data: MSDS			LABGUARD* Storage Code BLUE	

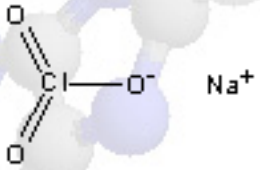
Synonyms: sodium acid sulfite

Synthesis: Nothing yet

sodium carbonate			Na_2CO_3	1
mp 851	bp ?	d 2.53	m 105.99	c $?.??
Safety Data: MSDS			LABGUARD* Storage Code GREEN	

Synonyms: ASH; calcined soda; carbonic acid disodium salt; disodium carbonate; natron; nevite; sal soda; soda; soda ash; Solvay soda; thermonatrite; washing soda

Synthesis: Nothing yet

sodium chlorate			$NaClO_3$	1
mp 248	bp 300 dec	d 2.5	m 106.44	c $?.??
Safety Data: MSDS *Oxidizer*			ChemAlert* Storage Code YELLOW	

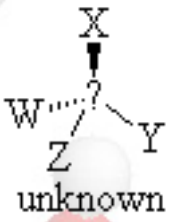
Synonyms: Altacide; chlorate of soda; Chlorax; chloric acid, sodium salt; Defol; Dervan; Drop-Leaf; Fall; Harvest-Aid; Shed-A-Leaf 'L'; soda chlorate; Tumbleaf

Synthesis: Nothing yet

sodium chloride			NaCl	1	
mp 804	bp ?	d 2.17	m 58.44	c $?.??	
Safety Data: MSDS				LABGUARD* Storage Code GREEN	

Synonyms: common salt; dendritis; extra fine 200 salt; extra fine 325 salt; halite; h.g. blending; NaCl; Purex; rock salt; saline; saline solution; salt; sea salt; stat trak plus; sterling; table salt; top flake; white crystal

Synthesis: You don't need me for this one I hope!

sodium dichromate			$Na_2Cr_2O_7$	1	
mp 356.7	bp 400 dec	d 2.348	m 261.97	c $?.??	
Safety Data: MSDS *Oxidizer, Toxic*				ChemAlert* Storage Code YELLOW	

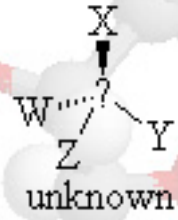
Synonyms: bichromate of soda; sodium bichromate

Synthesis: Nothing yet

sodium hydroxide			NaOH	1	
mp 318	bp ?	d 2.13	m 40.00	c $?.??	
Safety Data: MSDS *Corrosive*				LABGUARD* Storage Code WHITE	

Synonyms: Augus Hot Rod; caustic lye; caustic soda; lye; Red Devil Lye; soda lye; sodium hydrate; white caustic

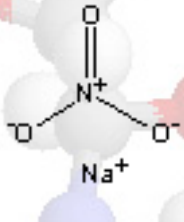
Synthesis: Coming soon!

sodium hypochlorite			NaClO	1	
mp 18	bp ?	d ?	m 74.44	c $?.??	
Safety Data: MSDS					

Synonyms: bleach; Clorox; Dazzle; Eau de Labarraque

Synthesis: Sodium hypochlorite is available as ordinary OTC bleach in about 5% concentration (Clorox brand for example is 5.25%). While it is possible to use store bought bleach to make hydrazine, it may contain undesirable contaminants. The hydrazine lab also specifically requires the use of the "normal" hypochlorite solution outlined below. I do not know how much hypochlorite the normal solution contains, so I cannot tell you how much bleach to substitute. Some experimentation on your part will be in order.

Prepare a solution of 300 g of sodium hydroxide in 1500 mL of water; add 1500 g of ice to this solution. Chlorine gas is then passed into the solution until it has gained 213 g (3 moles) in weight. During the chlorine addition the solution must be kept thoroughly cold with ice to prevent the formation of chlorates. After all the chlorine has passed in, it is necessary to be certain that the mixture is slightly alkaline, since any free chlorine in solution will prevent the formation of hydrazine, if that is what this chemical will be used for.

sodium nitrate			$NaNO_3$	1	
mp 308	bp ?	d 2.26	m 84.99	c $?.??	
Safety Data: MSDS *Oxidizer*					

Synonyms: Chile saltpeter; cubic niter; nitrate of soda; nitric acid, sodium salt; soda niter; sodium (I) nitrate

Synthesis: Nothing yet

sodium nitrite			$NaNO_2$	1	
mp 271	bp 320 dec	d 2.17	m 69.00	c $?.??	

Safety Data: MSDS *Oxidizer, Toxic*				ChemAlert* Storage Code YELLOW
Synonyms: erinitrit; nitrous acid sodium salt				
Synthesis: Nothing yet				

sodium sulfate			Na_2SO_4	1
mp 800	bp ?	d 2.7	m 142.04	c $?.??
Safety Data: MSDS				LABGUARD* Storage Code GREEN
Synonyms: Glauber's salt; mirabilite; salt cake; thenardite				
Synthesis: Nothing yet				

sodium sulfite			$X_aY_bZ_c$	1
mp ?	bp ?	d ?	m 126.04	c $?.??
Safety Data: MSDS				LABGUARD* Storage Code GREEN
Synonyms:				
Synthesis: Nothing yet				

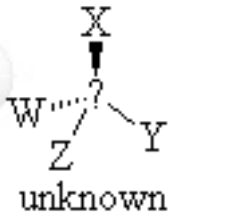
starch			$(C_6H_{10}O_5)_n$	1
mp ?	bp ?	d ?	m -	c $?.??

Safety Data: MSDS				LABGUARD* Storage Code GREEN

Synonyms: amylum; Maizena; Mondamin

Synthesis: Nothing yet

sulfolane			$C_4H_8SO_2$	1
mp 27.4	bp 285	d 1.2606	m 120.17	c $?.??
Safety Data: MSDS				ChemAlert* Storage Code GRAY



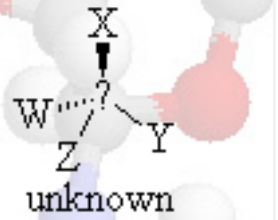
Synonyms: *tetrahydrothiophene 1,1-dioxide*; tetrahydrothiophene 1-dioxide; thiophan sulfone

Synthesis: Nothing yet

sulfur			S_8	1
mp ?	bp ?	d 2.06	m 256.512	c $?.??
Safety Data: MSDS				LABGUARD* Storage Code RED

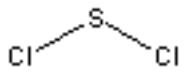
Synonyms: bensulfoid; Bonide Sulfur Plant Fungicide; brimstone; Clifton Sulfur; Colloidal-S; colloidal sulfur; Collokit; Colsul; Corosal D and S; Cosan; COSAN 80; Crystex; Elosal; flowers of sulfur; flour sulfur; Golden Dew; Hexasul; Kolofog; Kolospray; Kumulus S; Magnetic 6; Magnetic 70; Microflotox; precipitated; Security Nutronex; Sefril; Sofril; Sperlox-S; Spersul; Spersul thiovit; Sul-Cide; Sulfex; Sulfidal; Sulforon; sulfur atom; sulfur, flowers; Sulkol; Sulsol; Super colloid; Super Six; Tesuloid; That F; Thiolux; Thion; THION 80; THION 95; Thiorit; Thiovit; Zolvis

Synthesis: Nothing yet

sulfur chloride	S_2Cl_2	1	
mp -77	bp 138	d 1.6885	m 135.04	c $?.??
Safety Data: MSDS	ChemAlert* Storage Code GRAY	

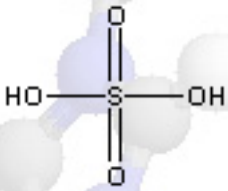
Synonyms: disulfur dichloride; sulfur monochloride; sulfur subchloride

Synthesis: Nothing yet

sulfur dichloride	SCl_2	1	
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS	ChemAlert* Storage Code GRAY	

Synonyms: sulfur chloride

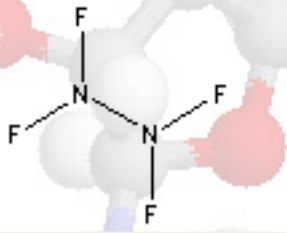
Synthesis: Nothing yet

sulfuric acid	H_2SO_4	1	
mp 3	bp 290	d 1.84	m 98.08	c $?.??
Safety Data: MSDS	LABGUARD* Storage Code WHITE	

Synonyms: Acid Mist; BOU; dipping acid; hydrogen sulfate; oil of vitriol; oleum; sulfur acid; sulfuric; vitriol brown oil

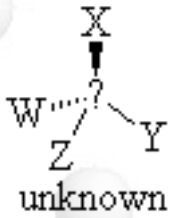
Synthesis: Coming soon!

tetrafluorohydrazine	F_4N_2	1	
mp ?	bp ?	d ?	m ?	c $?.??

Safety Data: MSDS				LABGUARD* Storage Code RED	

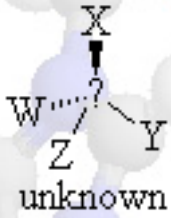
Synonyms: dinitrogen tetrafluoride; hydrazine, tetrafluoro-; N2F4; nitrogen fluoride; perfluorohydrazine; UN 1955

Synthesis: Nothing yet

thionyl chloride			$SOCl_2$	1	
mp -104.5	bp 76	d 1.638	m 118.97	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

Synonyms: sulfurous oxychloride

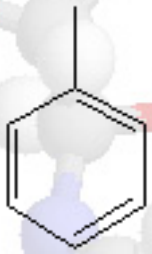
Synthesis: Nothing yet

tin			$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

Synonyms:

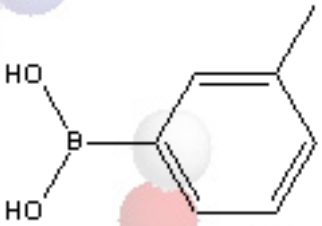
Synthesis: Nothing yet

toluene		C_7H_8	1	
mp -95	bp 110.6	d 0.866	m 92.14	c $?.??

Safety Data: MSDS *Flammable*	LABGUARD* Storage Code RED	

Synonyms: *methylbenzene*; antisal 1a; Methacide; methyl-benzene; methylbenzol; monomethyl benzene; phenylmethane; phenyl methane; tol; toluol; tolu-sol

Synthesis: Coming soon!

m-tolylboronic acid			$C_7H_9BO_2$	1
mp ?	bp ?	d ?	m 135.9569	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	

Synonyms: 3-methylbenzeneboronic acid

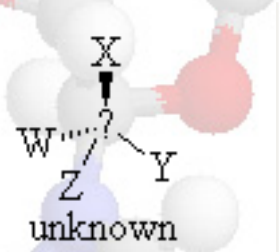
Synthesis: Nothing yet

trifluoroacetic anhydride			$X_aY_bZ_c$	1
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS *Corrosive*			LABGUARD* Storage Code WHITE	

Synonyms:

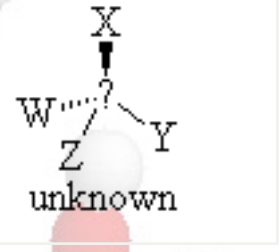
Synthesis: Nothing yet

trinitro-*m*-anisidine			$X_aY_bZ_c$	1
mp ?	bp ?	d ?	m ?	c $?.??

Safety Data: MSDS	ChemAlert* Storage Code GRAY		

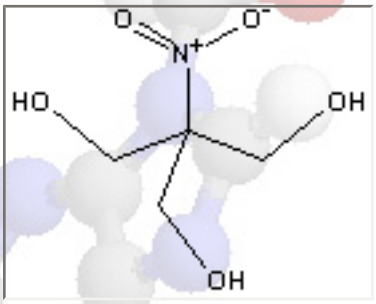
Synonyms:

Synthesis: Nothing yet

trinitro-*m*-phenetidine	$X_aY_bZ_c$	1		
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	

Synonyms:

Synthesis: Nothing yet

tris(hydroxymethyl)nitromethane	$C_4H_9NO_5$	1		
mp 180	bp ?	d ?	m 151.12	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	

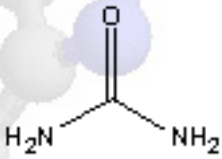
Synonyms: *2-(hydroxymethyl)-2-nitro-1,3-propanediol*; Cimcool wafers; hydroxymethyl)-2-nitropropanediol; hydroxymethyl)-2-nitropropane-1,3-diol; 2-hydroxymethyl-2-nitropropanediol; nitro-2-(hydroxymethyl)-1,3-propanediol; 2-nitro-2-(hydroxymethyl)-1,3-propanediol; nitroisobutylglycerine; nitroisobutylglycerol; nitrotris(hydroxymethyl)methane; trimethylolnitromethane; tris-nitro

Synthesis: Add to a 3-necked 1-liter flask, which has been set in a pan of cold water set atop a cold hotplate, 150 g of nitromethane and 2 g of potassium carbonate hemihydrate. Gradually add 200 g of 37% formaldehyde, maintaining the temperature in the flask below 30 °C. Add gradually, over a period of 30 minutes, an additional 475 g of 37% formaldehyde, allowing the temperature of the mixture to rise to 80 °C. Maintain the solution at 90 °C for 2 hours, connect the flask to a vacuum source to evaporate the solution to half of its volume, this will drive off the bulk of the formaldehyde. Break the vacuum, dilute with water, and concentrate again under reduced pressure. Repeat the dilutations and concentrations until only a faint odor of formaldehyde remains. After allowing the mixture to cool, pour the solution over a filter to collect the red colored precipitate. Dissolve the crude product in hot alcohol and crystallize by cooling. Recrystallize several times from ether.

trivinyl isocyanurate	$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS	ChemAlert* Storage Code GRAY	

Synonyms:

Synthesis: Nothing yet

urea	H_2NCONH_2	1	
mp 132.7	bp -	d 1.32	m 60.06	c $?.??
Safety Data: MSDS	LABGUARD* Storage Code GREEN	

Synonyms: Aquacare/HP; Aquadrate; Basodexan; carbamide; carbamimidic acid; carbonyl diamide; carbonyldiamine; Hyanit; isourea; Keratinamin; Nutraplus; Onychomal; Pastaron; Ureaphil; Urecare; Urederm; Ureophil; Urepearl

Synthesis: Coming soon!

urea nitrate			$CO(NH_2)_2HNO_3$	1	
mp 152 dec	bp -	d ?	m 123.07	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

Synonyms: acidogen nitrate

Synthesis: Coming soon!

water			H_2O	1	
mp 0	bp 100	d 0.997	m 18.02	c $?.??	
Safety Data: MSDS				LABGUARD* Storage Code GREEN	

Synsynonyms: dihydrogen monoxide; hydrogen oxide

Synthesis: This shouldn't be too hard to figure out... Although distilled water is essential.

xylene			$C_6H_4(CH_3)_2$	1	
mp -47.4 to 14	bp 137 to 140	d 0.86	m 106.17	c $?.??	
Safety Data: MSDS				LABGUARD* Storage Code RED	

Synonyms: *dimethylbenzene*; xylol

Synthesis: Nothing yet

zinc	Zn	1	

mp 419.5	bp 908	d 7.14	m 65.38	c $?.??
Safety Data: MSDS *Flammable*			LABGUARD* Storage Code RED	

Synonyms: blue powder

Synthesis: Zinc is an element so it must be purchased, the kind of zinc needed here is powdered. I may yet find a method of preparing powdered zinc, so hang tight.

name	$X_aY_bZ_c$	1
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	

Synonyms:

Synthesis: Nothing yet

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Precursors Part 3

infusorial earth			No Formula	1
mp -	bp -	d -	m -	c $?.??
Safety Data: MSDS			LABGUARD* Storage Code GREEN	

Synonyms: Celite; diatomaceous earth; fossil flour; kieselguhr; siliceous earth; Super-Cel

Synthesis: Coming soon!

iodine			I_2	1
mp 113.60	bp 185.24	d 4.93	m 126.945	c $?.??
Safety Data: MSDS *Corrosive*			LABGUARD* Storage Code WHITE	

Synonyms:

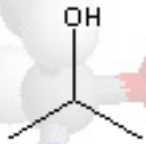
Synthesis: Coming soon!

iron			$X_aY_bZ_c$	1
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	

Synonyms:

Synthesis: Nothing yet

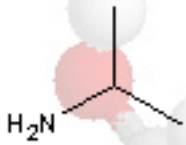
isopropyl alcohol			$CH_3CHOHCH_3$	1
mp -88.5	bp 82.5	d 0.78084	m 60.10	c $?.??
Safety Data: MSDS *Flammable*			LABGUARD* Storage Code RED	



Synonyms: *2-propanol*; alcojel; alcosolve; alcosolve 2; avantin; chromar; combi-schutz; dimethylcarbinol; hartosol; 2-hydroxypropane; imsol a; IPA; i-propanol; isohol; isopropanol; lutosol; petrohol; propan-2-ol; n-propan-2-ol; propol; rubbing alcohol; sec-propanol; sec-propyl alcohol; spectrar; sterisol hand disinfectant; takineocol

Synthesis: Coming soon!

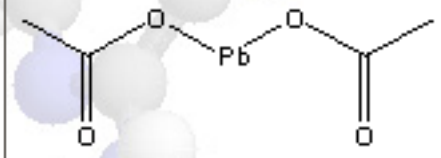
isopropylamine			$(CH_3)_2CHNH_2$	1
mp -101	bp 33-34	d 0.694	m 59.11	c $?.??
Safety Data: MSDS			ChemAlert* Storage Code GRAY	



Synonyms: *2-propanamine*; 2-aminopropane; monoisopropylamine; propan-2-amine; sec-propylamine

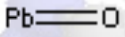
Synthesis: Nothing yet

lead acetate			Pb (CH_3COO_2)	1
mp 75	bp 100 dec	d 2.55	m 325.29	c $?.??
Safety Data: MSDS *Toxic*			LABGUARD* Storage Code GREEN	



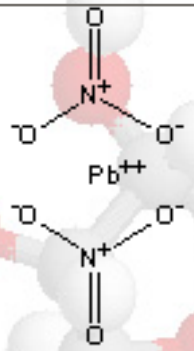
Synonyms: acetic acid, lead(2+) salt; dibasic lead acetate; lead diacetate; lead dibasic acetate; lead (II) salt acetic acid; neutral lead acetate; normal lead acetate; salt of Saturn; sugar of lead

Synthesis: Coming soon!

lead monoxide			PbO	1	
mp 888	bp ?	d 9.53	m 223.20	c $?.??	
Safety Data: MSDS *Toxic*				ChemAlert* Storage Code YELLOW	

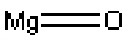
Synonyms: C.I. 77577; lead ocher; lead oxide; lead (II) oxide; lead oxide (mono); lead oxide yellow; lead protoxide; litharge; litharge yellow L-28; massicot; Massicotite; pigment yellow 46; plumbous oxide; yellow lead ocher

Synthesis: Coming soon!

lead nitrate			$Pb(NO_3)_2$	1	
mp ?	bp ?	d 4.53	m 331.21	c $?.??	
Safety Data: MSDS *Oxidizer, Toxic*				ChemAlert* Storage Code YELLOW	

Synonyms: lead dinitrate; lead (II) nitrate; nitric acid, lead(2+)salt

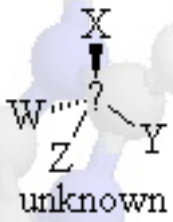
Synthesis: Coming soon!

magnesium oxide			MgO	1	
mp 2800	bp ?	d ?	m 40.30	c $?.??	
Safety Data: MSDS				LABGUARD* Storage Code GREEN	

Synonyms: calcined brucite; calcined magnesia; Irtran-5; Magcal; Maglite; magnesia; magnesia usta; magnesium monoxide; magnesium oxide, heavy; magnesium oxide, light

Synthesis: Coming soon!

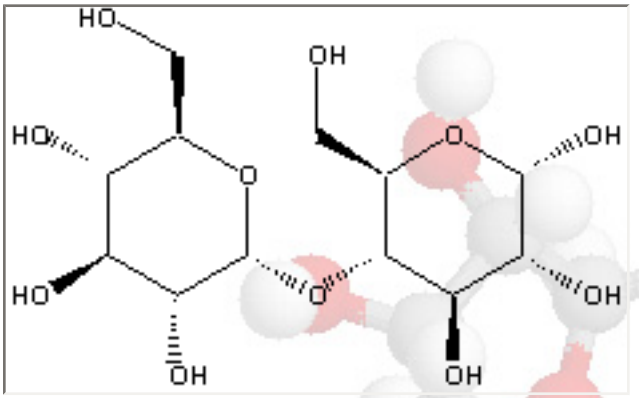
magnesium styphnate	$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS	ChemAlert* Storage Code GRAY		



Synonyms:

Synthesis: Nothing yet

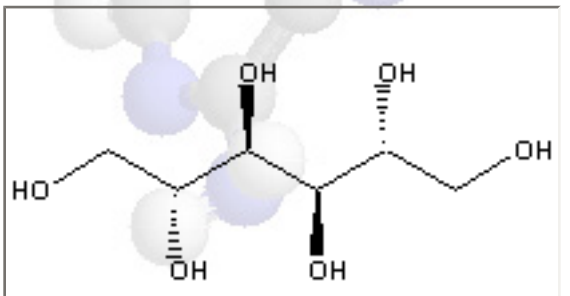
maltose	$C_{12}H_{22}O_{11}$	1	
mp 103	bp ?	d ?	m 342.30	c $?.??
Safety Data: MSDS	LABGUARD* Storage Code GREEN		



Synonyms: *4-O-alpha-D-glucopyranosyl-D-glucose*; 4-(alpha-D-glucosido)-D-glucose; maltobiose; Maltos; alpha-maltose; D-(+)-maltose; malt sugar; Martos-10

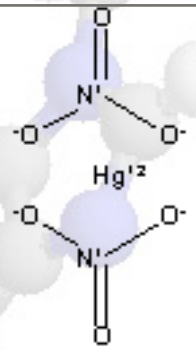
Synthesis: Nothing yet

mannitol	$C_6H_{14}O_6$	1	
mp 166-168	bp 290-295	d 1.52	m 182.17	c $?.??
Safety Data: MSDS	LABGUARD* Storage Code GREEN		



Synonyms: cordycepic acid; Diosmol; Manicol; manna sugar; Mannidex; mannite; D-mannitol; Osmitrol; Osmosal; Resectisol

The listed boiling point is at 3.5 mm of Hg **Synthesis:** Nothing yet

mercuric nitrate			$Hg(NO_3)_2$	1	
mp 79	bp ?	d ?	m 324.60	c $?.??	
Safety Data: MSDS *Toxic*				ChemAlert* Storage Code YELLOW	

Synonyms: mercury nitrate; mercury (II) nitrate; mercury pernitrate; nitric acid, mercury salt

Synthesis: Coming soon!

mercuric oxide			HgO	1	
mp 500 dec	bp -	d 11.14	m 216.59	c $?.??	
Safety Data: MSDS *Toxic*				LABGUARD* Storage Code BLUE	

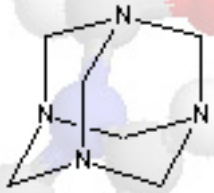
Synonyms: mercury oxide; red mercury (II) oxide; Santar; yellow mercury (II) oxide; yellow oxide of mercury

Synthesis: Coming soon!

mercury			Hg	1	
mp -38.87	bp 356.72	d 13.534	m 200.59	c $?.??	
Safety Data: MSDS *Toxic*				LABGUARD* Storage Code BLUE	

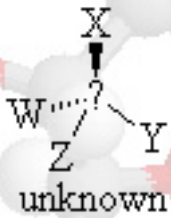
Synonyms: hydrargyrum; liquid silver; Marcero; quick silver; Rathje

Synthesis: Coming soon!

methenamine	$C_6H_{12}N_4$	1	
mp 263 dec	bp -	d ?	m 140.19	c $?.??
Safety Data: MSDS	LABGUARD* Storage Code RED		

Synonyms: *1,3,5,7-tetraazatricyclo[3.3.1.1^{3,7}]decane*; aceto hmt; Aminoform; Ammoform; ammonioformaldehyde; Cystamin; Cystogen; formamine; Formin; HEXA; Hexaform; hexamethylenamine; hexamethyleneamine; hexamethylenetetraamine; hexamethylene tetramine; hexamethylene triamine; hexamine; hexilmethylenamine; Hiprex; HMT; HMTA; Mandelamine; methamin; metheneamine; preparation af; resotropin; 1,3,5,7-tetraazaadamantane; tetraazatricyclo [3.3.1.1(3,7)]decane; UREX; Uritone; Uroqid; Urotropin

Synthesis: Nothing yet

3-methoxy-2,2',4,4',6,6'-hexanitrobiphenyl	$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??
Safety Data: MSDS	ChemAlert* Storage Code GRAY		

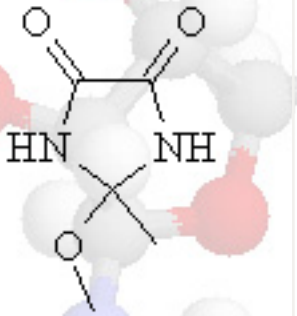
Synonyms:

Synthesis: Nothing yet

2-methoxy-2-methyl-4,5-imidazolidinedione	$C_5H_8N_2O_3$	1	
mp ?	bp ?	d ?	m ?	c $?.??

Safety Data: MSDS

ChemAlert* Storage Code
GRAY



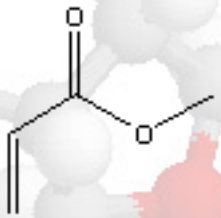
Synonyms:

Synthesis: This substance is used to prepare the explosive FOX-7. I don't know how long this stuff will sit around, so it may be wise to prepare it shortly before its intended use.

Preparation of 2-methoxy-2-methyl-4,5-imidazolidinedione. Prepare a solution of 69.6 g of sodium methoxide in 1100 mL of methyl alcohol in a 2-L round bottomed flask. Add a magnetic stir bar to the flask and set it up for stirring. While stirring, add 36.48 g of acetamidine hydrochloride to the flask and keep stirring until a well mixed suspension forms. Prepare a second solution of 55.88 g of diethyl oxalate in 400 mL of methyl alcohol. Attach an addition funnel to the flask and slowly add the diethyl oxalate solution drop by drop over a period of 3 hours. Maintain stirring throughout the addition. After the addition is complete remove the addition funnel and set up a cold water bath for the flask. Insert a thermometer in the flask and slowly add enough concentrated hydrochloric acid to lower the pH of the mixture to 9 while keeping the temperature below 30 °C. Use the cold water bath as necessary to lower the temperature.

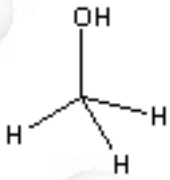
At this point a precipitate of sodium chloride should have formed. Pour the contents of the flask over a filter to remove this solid. The salt collected on the filter paper can be discarded. Pour the liquid filtrate back into the flask and set the flask up for a simple distillation. Very gently heat the flask to distill off the methyl alcohol. This alcohol should be fairly pure and can be recycled. In this situation the flask is distilled to dryness to remove all alcohol and leave a solid white powder. When very little alcohol remains reduce the heat to around 30 degrees until dry. At this point this is a mixture of waste sodium chloride, 2-methyl-4,5-imidazoledione and our final product. Heat a beaker of 320 mL of methyl alcohol to boiling and add it to the flask with the solid. Allow a few minutes for the soluble portions to dissolve and immediately filter the liquid while still hot to remove any insoluble impurities. Again this is just salt, which can be discarded and the liquid kept. Redistill this liquid until a volume of only 320 mL remains, and then place the liquid in a refrigerator to cool overnight. This process will convert the 2-methyl-4,5-imidazoledione to the final product. In the morning a white crystalline material should have precipitated in the bottom of the flask. Filter this liquid to collect the crystals and allow them to dry. The crystals should be 2-methoxy-2-methyl-4,5-imidazolidinedione with a yield around 64% or 35-36 g.

methyl acrylate	CH_2=CHCOOCH_3	1	
mp -76.5	bp ?	d 0.9561	m 86.09	c $?.??

Safety Data: MSDS	ChemAlert* Storage Code GRAY	

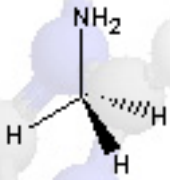
Synonyms: *2-propenoic acid methyl ester*; acrylic acid methyl ester; curithane 103; methoxycarbonylethylene; methyl ester acrylic acid; methyl propenoate; methyl 2-propenoate; propenoic acid methyl ester

Synthesis: Nothing yet

methyl alcohol			CH_3OH	1
mp -97.8	bp 64.7	d 0.7866	m 32.04	c $?.??
Safety Data: MSDS *Flammable, Toxic*			LABGUARD* Storage Code RED	

Synonyms: carbinol; colonial spirit; columbian spirits; methanol; methyl hydroxide; methylol; monohydroxymethane; pyroxylic spirit; wood; wood alcohol; wood naphtha; wood spirit

Synonyms: Nothing yet

methylamine			CH_3NH_2	1
mp -93.5	bp -6.3	d 0.699	m 31.06	c $?.??
Safety Data: MSDS *Flammable, Irritant*			LABGUARD* Storage Code RED	

Synonyms: aminomethane; carbinamine; methanamine; mercurialin; monomethylamine

Synthesis: Prepare a solution of 25 g of dried acetamide and 23 mL of bromine in a 500-mL flask. Place the flask into a cold water bath. Gradually add a solution of 40 g of potassium hydroxide in 350 mL of water to the flask until the brownish red color turns to bright yellow, some hydroxide solution may remain unused. This mixture is then added to a 1-L flask containing a solution of 80 g of potassium hydroxide in 150 mL of water heated to 70-75 °C. The addition should be done by an addition funnel in a continuous stream over the course of 2-3 minutes. The liquid is maintained at 70-75 °C until it becomes colorless, this will take approximately 15-30 minutes. If at any time the temperature rises above 75 °C, the flask must be cooled by immersion for a short time in cold water.

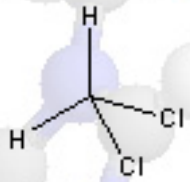
The methylamine that should have formed is then removed by steam distillation; it is collected in a receiver containing a mixture of 52 mL of concentrated hydrochloric acid and 40 mL of water. To insure that the methylamine is completely absorbed by the acid, it must be bubbled into the receiver straight from the condenser. If you are using a vacuum adapter to direct the flow of liquid into the receiver, attach a piece of glass tubing to the tip so it extends to the bottom of the receiver. Otherwise, just connect a one-hole stopper to the condenser with an angled piece of glass tube extending into the bottom of the receiver. Make sure the tube end in the condenser is near the bottom of the stopper, not the middle, so the condensed liquid can drain easier. Periodically test the pH of the condensed liquid, when it is no longer basic discontinue the distillation.

The resulting methylamine hydrochloride is partially evaporated in a porcelain dish heated over a flame, then to dryness by heating on a water bath. It is finally heated on a hotplate to 100 °C until it is dry and dusty. The crude methylamine thus obtained is contaminated with some ammonium chloride salt. Grind the dried substance into a fine powder followed by recrystallization from 100% ethyl alcohol. Filter to collect the crystals, and then dry them in a desiccator.

methylene chloride	CH_2Cl_2	1
mp -95	bp 39.75	d 1.3255	m 84.93	c $?.??

Safety Data: MSDS

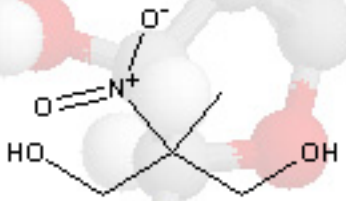
LABGUARD* Storage Code GREEN



Synonyms: *dichloromethane*; Aerothene MM; DCM; Freon 30; methane dichloride; methylene bichloride; methylene dichloride; narkotil; R 30; Refrigerant 30; solaesthin; solmethine

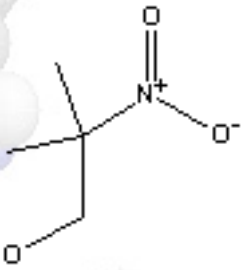
Synthesis: Nothing yet

2-methyl-2-nitro-1,3-propanediol	$C_4H_9NO_4$	1
mp ?	bp ?	d ?	m ?	c $?.??

Safety Data: MSDS				ChemAlert* Storage Code GRAY	

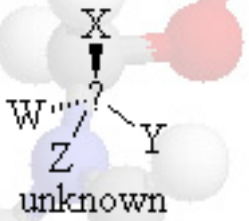
Synonyms: 2-methyl-2-nitropropane-1,3-diol; 2-nitro-2-methyl-1,3-propanediol; NMPD

Synthesis: Nothing yet

2-methyl-2-nitro-1-propanol			$C_4H_9NO_3$	1	
mp ?	bp ?	d ?	m ?	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

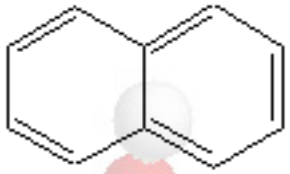
Synonyms: 2-methyl-2-nitropropanol; 2-nitro-2-methylpropanol; 2-nitro-2-methyl-1-propanol

Synthesis: Nothing yet

metriol			$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

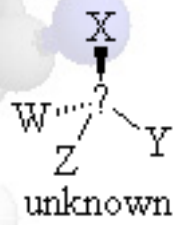
Synonyms:

Synthesis: Nothing yet

naphthalene			$C_{10}H_8$	1	
mp 80.2	bp 217.9	d 1.162	m 128.17	c $?.??	
Safety Data: MSDS				LABGUARD* Storage Code BLUE	

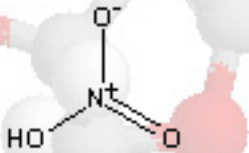
Synonyms: camphor tar; mighty 150; mighty rd1; mothballs; moth flakes; naphthanin; naphthene; tar camphor; white tar

Synthesis: Coming soon!

3-nitrazabutylamine			$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??	
Safety Data: MSDS			ChemAlert* Storage Code GRAY		

Synonyms:

Synthesis: Nothing yet

nitric acid			HNO_3	1	
mp -41.59	bp 83	d 1.4134-1.5129	m 63.01	c $?.??	
Safety Data: MSDS *Corrosive, Oxidizer*			LABGUARD* Storage Code WHITE		

Synonyms: aqua fortis; azotic acid; fuming nitric acid; hydrogen nitrate; Nital; nitric acid red fuming; nitryl hydroxide; red fuming nitric acid; Rfna; Salpetersäure

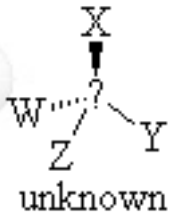
Synthesis: The densities listed are for 70% and 100% acid. A density of up to 1.544 can be reached with 12.7% dissolved nitrogen dioxide in fuming nitric acid. Nitric acid forms an azeotrope with water at 68%, it this has a bp of 120.5 °C (yes, this bp is higher than either water or the acid boils at pure).

nitric oxide			NO	1	
mp -	bp -151.8	d -	m 30.01	c $?.??	

Safety Data: MSDS	ChemAlert* Storage Code GRAY	

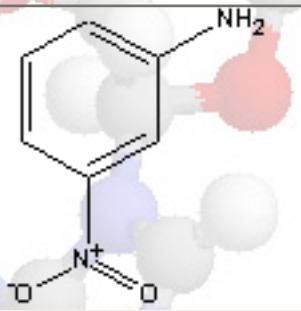
Synonyms: mononitrogen monoxide; nitrogen monoxide; nitrogen oxide; NO

Synthesis: Nothing yet

nitroallyl acetate			$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

Synonyms:

Synthesis: Nothing yet

m-nitroaniline			$C_6H_6N_2O_2$	1	
mp 114	bp 306	d 0.9011	m 138.13	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

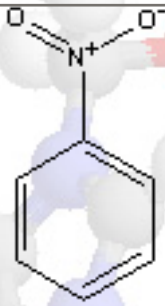
Synonyms: *3-nitrobenzenamine*; amarthol fast orange r base; m-aminonitrobenzene; 1-amino-3-nitrobenzene; azobase mna; C.I. 37030; C.I. azoic diazo component 7; daito orange base r; devol orange r; diazo fast orange r; fast orange base r; fast orange m base; fast orange mm base; fast orange r base; hiltonil fast orange r base; naphtoelan orange r base; nitranilin; m-nitraniline; m-nitroaminobenzene; 3-nitroanaline; 3-nitroaniline; m-nitrophenylamine; orange base irga 1

Synthesis: Dissolve 10 g of m-dinitrobenzene in 40 mL of ethyl alcohol in a round-bottomed 250-mL Florence flask. Place the flask into a salt-ice bath to cool it down; some dinitrobenzene should separate out. The solution is then treated with 9 mL of 27-30% ammonium hydroxide. You must use only concentrated ammonium hydroxide, adding extra dilute hydroxide will not work in this case. Remove the flask from the ice bath and allow it to warm to room temp before proceeding with the next step.

For the synthesis to be most effective it is necessary to weigh the flask (that includes the contents of the flask), the following reaction is complete when the weight of the flask has increased by 6 g. Saturate the mixture in the flask by bubbling in hydrogen sulfide gas; stop when it appears no more is being absorbed. The saturated mixture is now refluxed for 30 minutes. Allow the flask to cool to room temperature, and again saturate the mixture with hydrogen sulfide, followed by refluxing. Continue the process of saturating and refluxing until the weight increase of 6 g is achieved. Without a scale it will be difficult to judge when to stop, some experimentation will be necessary on your Part.

The mixture is now diluted with water, the resulting precipitate is collected on a filter, washed with water, and extracted several times by warming with dilute hydrochloric acid. The acidic extractions now contain the nitroaniline, it can be precipitated by neutralizing the liquid with ammonium hydroxide. The crystals are collected by filtration, and then recrystallized from water. The yield is about 70-80%.

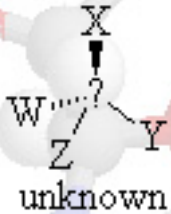
nitrobenzene			$C_6H_5NO_2$	1
mp 6	bp 210-211	d 1.205	m 123.11	c $?.??
Safety Data: MSDS *Toxic*			LABGUARD* Storage Code BLUE	



Synonyms: essence of mirbane; essence of myrbane; mirbane oil; nitrobenzol; oil of mirbane; oil of myrbane

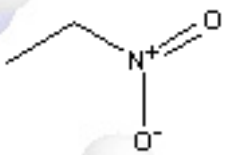
Synthesis: Prepare a mixture of 82 mL of 95-100% sulfuric acid and 71 mL of 70% nitric acid in a 500-mL flask. Stir well and allow the mixture to cool to room temperature in a cold water bath. Gradually add 57 mL of benzene to the acid with frequent shaking. If the temperature rises above 50-60 °C during the benzene addition, stop adding benzene and cool the flask in a cold water bath until the temperature has lowered. After all of the benzene has been added, reflux the flask in a water bath at 60 °C for 1 hour. The temperature of the water bath should be 60 °C, not the contents of the flask. Shake the flask frequently during reflux.

After heating, allow the flask to cool, two layers should form. Transfer the contents to a separatory funnel and drain off the bottom layer of sulfuric and nitric acids; the top layer contains the nitrobenzene. The bottom layer can be disposed of. The nitrobenzene is then vigorously shaken in the separatory funnel several times with water. After each shaking, allow the layers to separate, the nitrobenzene will now be the bottom layer, dispose of the top water layer. After washing, place the nitrobenzene in a dry Erlenmeyer flask with some calcium chloride. Heat this flask on a steam bath, it will first be milky, then it will go clear, stop when it is clear. The nitrobenzene is now purified by simple distillation. Yield is about 60-70 g.

2-nitro-2-(3',5'-dinitrophenyl)-propanediol-1,3			$X_aY_bZ_c$	1	
mp ?	bp ?	d ?	m ?	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

Synonyms:

Synthesis: Nothing yet

nitroethane			$CH_3CH_2NO_2$	1	
mp -50	bp 114-115	d 1.041	m 75.07	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

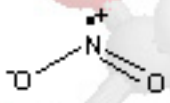
Synonyms: nitroetan

Synthesis: Nothing yet

nitrogen			N_2	1	
mp -210.01	bp -195.79	d -	m 28.0134	c $?.??	
Safety Data: MSDS				ChemAlert* Storage Code GRAY	

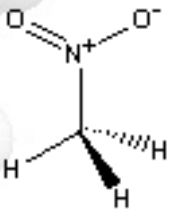
Synonyms:

Synthesis: Coming soon!

nitrogen dioxide			NO_2	1	
mp -9.3	bp 21.15	d 1.448	m 46.01	c $?.??	
Safety Data: MSDS				LABGUARD* Storage Code BLUE	

Synonyms: nitrogen oxide; nitrogen peroxide; NO2

Synthesis: This is made accidently or as a waste product, I only listed it here because its so dangerous. You should know how to avoid making this, as well as how to deal with it if you do.

nitromethane			CH_3NO_2	1	
mp -29	bp 101.2	d 1.1322	m 61.04	c $?.??	
Safety Data: MSDS				LABGUARD* Storage Code RED	

Synonyms: nitrocarbol; NM

Because nitromethane is useful as an explosive ingredient, its availability has dried up on the OTC market. One of its biggest uses is as automotive fuel for drag racers, they burn 100% anhydrous fuel instead of gasoline, but at $25 a gallon or more it's gonna cost ya. This is the same stuff used in the bomb at Oklahoma City, and McVeigh tipped off the feds asking for it at a drag race. It is also available as a component in fuel for model cars and airplanes at hobby shops, from which it can be distilled. Those fuels can be very expensive, however. Hobby shops usually sell it as high as 70% with other contaminants in it; they are also wise to someone asking for "the highest concentration of nitromethane" you should know exactly what kind of car you need the fuel for if you ask. To avoid the hassles of buying this forbidden fuel, I suggest making it yourself.

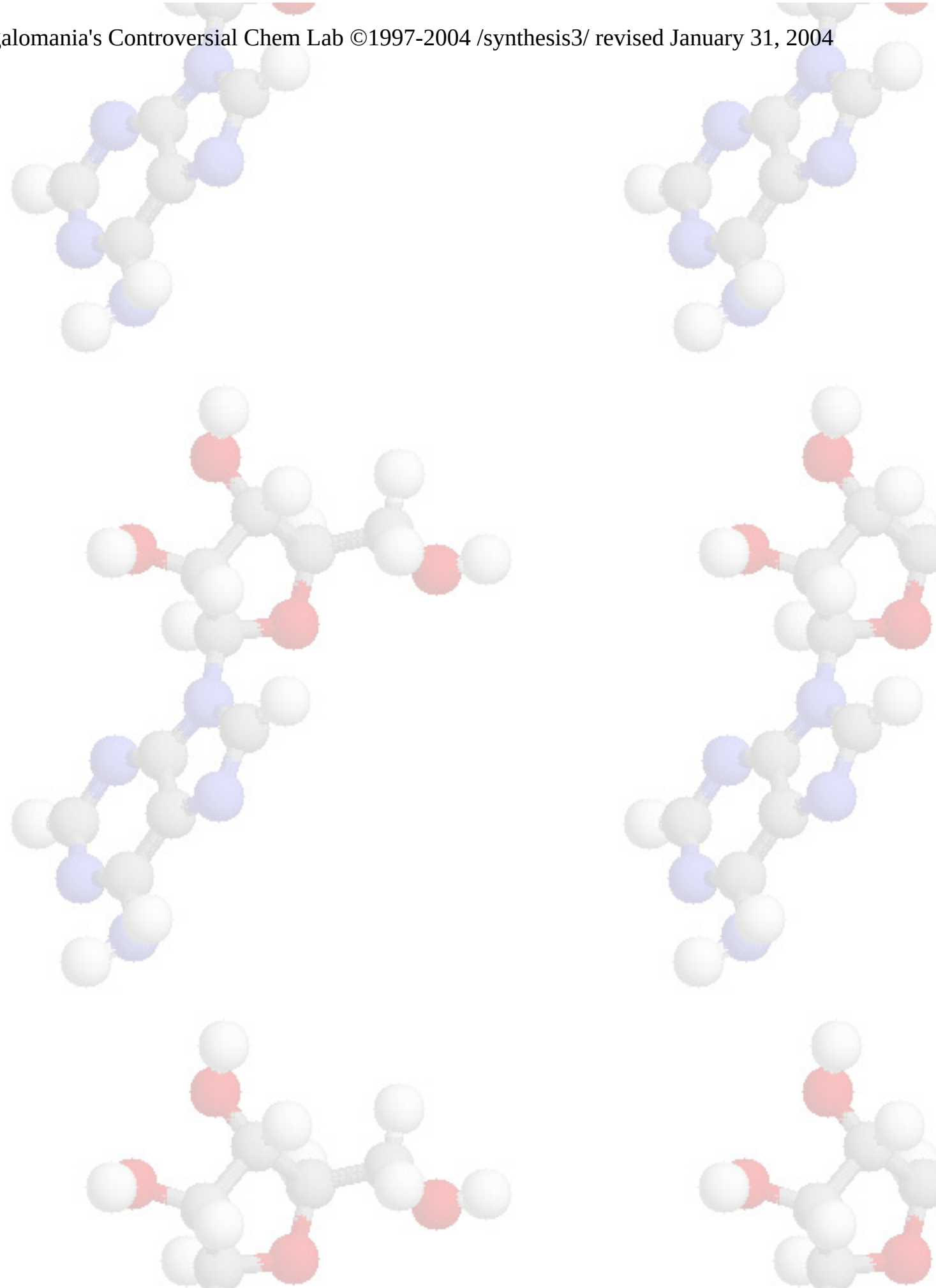
Synthesis: Prepare a mixture of 500 g of chloroacetic acid and 500 g of crushed ice in a large beaker. Add to this enough cold 40% sodium hydroxide solution to neutralize the acid and make the pH of the solution slightly alkaline, about 360 mL should suffice. Do not allow the temperature to rise above 20 °C while adding the hydroxide, failing to do so will cause unwanted sodium glycolate to form. Prepare a solution of 365 g of sodium nitrite in 500 mL of water. Add this solution to the previous solution in a round bottom 3-L Florence flask.

Set the flask up for simple distillation with the thermometer dipping into the liquid (yes, in the liquid, not at the condenser opening like it usually is). Keep the receiving flask cold with an ice water bath. Gently heat the solution until bubbles of carbon dioxide are evolved, this should happen at around 80 °C. Remove the heat as the reaction should proceed spontaneously, it should rise to around 100 °C while the nitromethane/water azeotrope distills over at 90 °C. If the temperature does not rise on its own, gently heat the flask to 85°C until it does. At this temperature the exothermic decomposition of the reactants becomes so rapid that continued application of heat might cause violent frothing, with significant loss of nitromethane. After the reaction subsides to 95-100°C, cautiously heat the flask to 110 °C, stop when no more nitromethane distills over.

This should make about 130 mL of nitromethane with 370 mL of water, they should form separate layers. Place the layers into a separatory funnel and allow them to stand for 30 minutes, afterwards drain off the lower layer of nitromethane. The water layer is mixed with one fourth its weight of salt and distilled to give another 10-12 mL of nitromethane. Add this to the nitromethane already distilled. The crude nitromethane is dried over anhydrous calcium chloride in a desiccator and redistilled to give 115-125 mL of pure nitromethane.

Yield is about 38%. The yield can be improved slightly by using 625 g of chloroacetic acid and 450 mL of 40% sodium hydroxide solution. Another increase in yield can be achieved by adding 374 g of boric acid after adding the sodium nitrite solution, but before doing any heating. You can use a smaller flask and do several distillations if you do not have a 3-L flask, just remember to never fill it more than two-thirds of the way.

Megalomania's Controversial Chem Lab ©1997-2004 /synthesis3/ revised January 31, 2004



Material Safety Data Sheet
Acetamide

ACC# 00110

Section 1 - Chemical Product and Company Identification

MSDS Name: Acetamide
Catalog Numbers: S70042, S70045, A4 250, A4 500, A4-250, A4-500, A4250, A4500, S75020, S75021
Synonyms: Acetic Acid Amide, Ethanamide, Methanecarboxamide.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
60-35-5	Acetamide	100	200-473-5

Hazard Symbols: XN
Risk Phrases: 40

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white. **Caution!** May cause eye and skin irritation. May cause cancer based on animal studies. Potential cancer hazard. May cause liver damage. Hygroscopic. May cause respiratory tract irritation.
Target Organs: Liver.

Potential Health Effects

Eye: May cause eye irritation.
Skin: Causes mild skin irritation.
Ingestion: Ingestion of large amounts may cause gastrointestinal irritation. May cause

liver damage.
Inhalation: May cause respiratory tract irritation. May cause liver damage.
Chronic: Possible cancer hazard based on tests with laboratory animals. May cause cancer according to animal studies. Chronic exposure may cause liver damage.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.
Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear. Do NOT use mouth-to-mouth resuscitation.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Dusts may be combustible when exposed to heat, flame, or oxidizing agents. Dust can be an explosion hazard when exposed to heat or flame.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Water or foam may cause frothing. Use water spray to cool fire-exposed containers.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid runoff into storm sewers and ditches which lead to waterways. Avoid generating dusty conditions. Provide ventilation. Clean up residual material by washing area with a 2-5% solution of soda ash.

Section 7 - Handling and Storage

Handling: Minimize dust generation and accumulation. Avoid contact with skin and eyes. Avoid ingestion and inhalation. Use with adequate ventilation.
Storage: Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Acetamide	none listed	none listed	none listed

OSHA Vacated PELs: Acetamide: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to minimize contact with skin.
Respirators: Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: white
Odor: mousy like odor
pH: Not available.
Vapor Pressure: Negligible.
Vapor Density: ~2
Evaporation Rate: Negligible.
Viscosity: Not available.
Boiling Point: 221 deg C
Freezing/Melting Point:80 deg C

Autoignition Temperature: Not applicable.
Flash Point: Not applicable.
Decomposition Temperature: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 1; Reactivity: 0
Explosion Limits, Lower: Not available.
Upper: Not available.
Solubility: 200% in water.
Specific Gravity/Density:1.16
Molecular Formula:C2H5NO
Molecular Weight:59.07

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions.
Conditions to Avoid: Dust generation, moisture, excess heat.
Incompatibilities with Other Materials: Strong oxidizers, metals, halogenated materials.
Hazardous Decomposition Products: Carbon monoxide, oxides of nitrogen, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 60-35-5: AB4025000
LD50/LC50:
CAS# 60-35-5:
Oral, mouse: LD50 = 12900 mg/kg;
Oral, rat: LD50 = 7 gm/kg;
Carcinogenicity:
CAS# 60-35-5:
California: carcinogen; initial date 1/1/90
OSHA: Possible Select carcinogen
IARC: Group 2B carcinogen
Epidemiology: IARC Group 2B: Proven animal carcinogenic substance of pote ntial relevance to humans.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Neurotoxicity: No information available.
Mutagenicity: No information available.
Other Studies: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: Terrestrial: Very high leachability due to its solubility. Aquatic: Readily biodegrades. Atmospheric: Exists as an aerosol and is removed by wet deposition. Not expected to bioconcentrate.
Physical: No information available.
Other: For more information, see "HANDBOOK OF ENVIRONMENTAL FATE AND EXPOSURE DATA."

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	No information available.				No information available.
Hazard Class:					
UN Number:					
Packing Group:					

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 60-35-5 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 60-35-5: final RQ = 100 pounds (45.4 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 60-35-5: chronic.

Section 313

This material contains Acetamide (CAS# 60-35-5, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 60-35-5 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 60-35-5 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act: WARNING: This product contains Acetamide, a chemical known to the state of California to cause cancer. California No Significant Risk Level: CAS# 60-35-5: no significant risk level = 10 ug/day **European / International Regulations**

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

R 40 Possible risks of irreversible effects.

Safety Phrases:

S 36/37 Wear suitable protective clothing and
gloves.

WGK (Water Danger / Protection)

CAS# 60-35-5: 1

Canada

CAS# 60-35-5 is listed on Canada's DSL List. CAS# 60-35-5 is listed on Canada's DSL

List.
This product has a WHMIS classification of D2A.
CAS# 60-35-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 60-35-5: OEL-FINLAND;Carcinogen OEL-GERMANY;Carcinogen

Section 16 - Additional Information

MSDS Creation Date: 12/16/1998
Revision #6 Date: 3/16/2001

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

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DOH!

You have arrived at the very limits of the known universe. Beyond where you now stand is the negaverse, infinite nothingness, no reality, no time, no gods, no creation. Even now the fabric of reality is being spun by the great creator Megalomania. Soon enough the expansion of existence will sweep past this point and you will have the knowledge you seek.

In short, the page isn't done yet...

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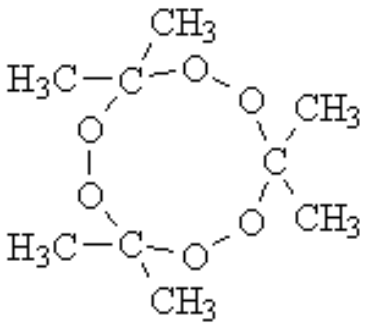
Acetone Peroxide

melting point 91 °C	boiling point explodes	acetone peroxide	molecular mass 222.1 g/mol	density 1.18 g/mL
table key	sensitivity very high	chemical formula $C_9H_{18}O_6$	explosive velocity 5300 m/s	estimated cost $?.00 /g



Narrowing down a name for this compound is rather tricky. In the literature is is commonly referred to as acetone peroxide because it is typically a mixture of isomers. Other literature refers to it as tricycloacetoneperoxide, triacetonetriperoxide, TATP, AP, TCAP, and 3,3,6,6,9,9-hexamethyl-1,2,4,5,7,8-hexoxonane. Many types of chemicals react with air and light to form explosive peroxides, usually this is a bad thing because their formation occurs without intent. A compound being distilled in the lab may explode if peroxides have formed, this is why a small amount of liquid is always left undistilled.

This particular formula is intriguing because of its simplicity to make and the availability of the chemicals used. This simplicity has made it very popular among fools. Instruction derived from the Big Book of Mischief, and their loathsome breed, are lacking in detailed information that may determine a continued success or failure at this procedure. An abundance of misinformation has led to much confusion about acetone peroxide. The information presented here is directly from the original scientific references by the scientists who developed this explosive, not some "crap book" as listed above. There are actually two isomers of acetone peroxide, the first is tricycloacetone peroxide, which is what will be made here, and the second is dicycloacetone peroxide. Both of these compounds are very similar, but the reaction seems to favor the tricyclo over the dicyclo at lower temperatures. The tricyclo isomer is more stable and more powerful than the dicyclo, that is why every effort is made to prepare the former. Both isomers will be made in the reaction with the tricyclo being the principal product. There are also a varity of other peroxides made in this synthesis; see the reaction scheme below.

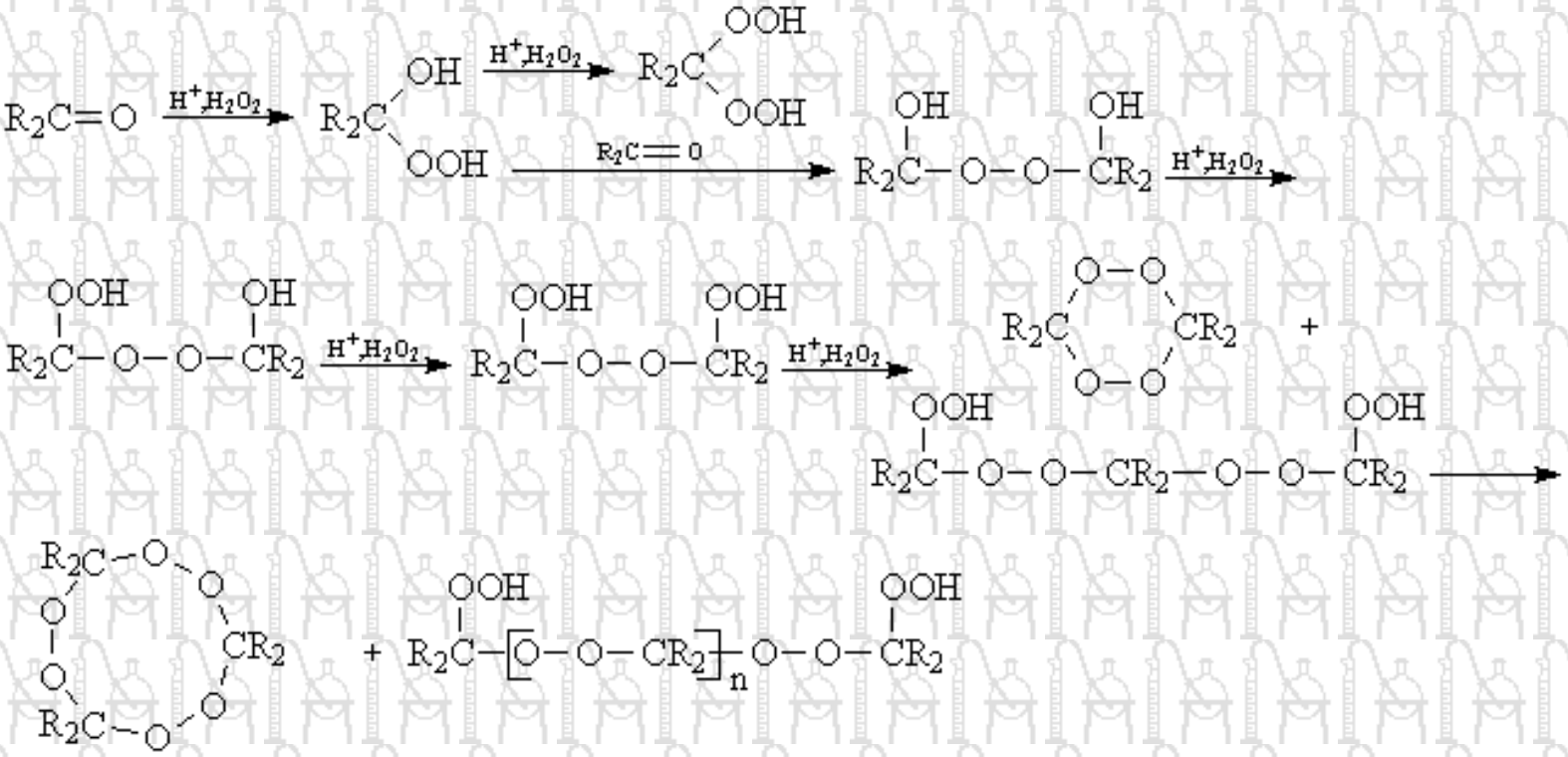
Acetone peroxide would have made a decent military explosive if not for its instability. It can not be stressed enough how unstable and dangerous acetone peroxide is. As instability goes this is among **the most** unstable of other explosives here.

Acetone peroxide is formed by acid-catalyzed nucleophilic addition. That means an acid helps the peroxide, a nucleophile, react with the acetone, a ketone. A nucleophile is a "nucleus lover," or a chemical species that donates electrons. A ketone is a substance that has the molecular formula $R_2C=O$ where R is any carbon chain. There is

some confusion as to which acid to use, the useless internet books frequently cite hydrochloric acid as the acid to use. The fact is, the acid is only a catalyst, it does not matter what acid is used, as long as it is a strong acid. Only inorganic acids fit this criteria. Since the original literature uses sulfuric acid, this lab uses sulfuric. You may use whichever acid is the most economical, or available.

Acetone, hydrogen peroxide, and sulfuric acid, the chemicals used in this lab, are all available over the counter. That is the real reason this explosive is so popular, it is unfortunate that this explosive is so dangerous. Since 30% hydrogen peroxide is hard to obtain, substituting 10 times the volume of commercially available 3% peroxide is acceptable, although this will lower the yield a bit. It is also advisable to multiply the volume of acid by a corresponding value.

Ketone peroxide reaction scheme:



CHEMICALS	APPARATUS
acetone	500-mL beaker
ethyl ether	eye dropper
hydrogen peroxide	graduated cylinder
sulfuric acid	separatory funnel
distilled water	stirring rod/stirrer
	thermometer

To a 500-mL beaker add 50 mL of acetone, then stir in 30 mL of 30% hydrogen peroxide. Place the beaker in a salt-ice bath and cool it to 5° C. After cooling, slowly add 3 mL of 75% sulfuric acid drop by drop with an eye dropper. Stir the mixture continuously while adding the acid, keep the temperature between 5° C to 10° C, stop

adding acid if the temperature gets to high. It is very important that you moderate the reaction, high temperatures will lower your yield and cause the formation of the less useful dicyclo isomer. After adding all the acid, continue stirring for 5 minutes. Keep the mixture in the bath for 1 to 3 hours, or even up to 24 hours. After sitting, a white precipitate should have formed. Filter the mixture to collect the crystals, then wash them with 300-500 mL of water. Allow the crystals to dry before using, keep them damp if storing. For increased purity, add the precipitate to ethyl ether and let it dissolve. Place the ethyl ether solution in a separatory funnel and wash by shaking with three portions of cold water. Add the ethyl ether solution to a beaker and heat it on a steam bath to evaporate the ethyl ether. It should take about 3 hours to dry. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

I would suggest making this explosive shortly before it is desired to use it as it is never wise to keep unstable primary explosives around too long. It can be stored rather safely under water for some time. If allowed to stand in the open it will vaporize after some weeks. If stored in a sealed container it may crystallize into the crevaces of the cap which could detonate from the friction of opening. Mixing with RDX, PETN, or picric acid will improve the stability of this explosive.

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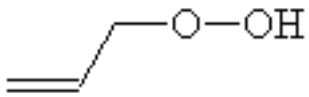
Comprehensive Organic Chemistry Vol. 1

Allyl Hydroperoxide

melting point explodes	boiling point ---	allyl hydroperoxide	molecular mass 74.10 g/mol	density ? g/mL
table key	sensitivity very high	chemical formula $CH_2=CHCH_2OOH$	explosive velocity ? m/s	estimated cost $?.00/g



Allyl hydroperoxide can also be called 2-propenyl hydroperoxide. This extremely unstable compound must be kept away from all forms of heat and friction. A small amount of rather excessive precautions, namely a red light are quite necessary. This compound is stable under UV light but normal light can be hazardous. Like all explosive peroxides, this one does not want to exist for long. I would suggest keeping it refrigerated and in the dark to avoid an untimely detonation.

CHEMICALS	APPARATUS
allyl methanesulfonate	beaker
ethyl ether	Erlenmeyer flask
hydrogen peroxide	graduated cylinder
methyl alcohol	pipet/buret
potassium hydroxide	thermometer
water	

Prepare a solution of 10.8 g of allyl methanesulfonate and 40 mL of 30% hydrogen peroxide dissolved in 30 mL of methyl alcohol in a small beaker. Prepare a second solution of 10.1 g of potassium hydroxide dissolved in 10.1 mL of water, cool this solution to 0 °C and keep it in a salt-ice bath. With extreme caution, add the allyl methanesulfonate solution by dropwise addition to an Erlenmeyer flask

containing the potassium hydroxide solution in the salt-ice bath using a dropper pipet or a buret. The addition must be completed in a room illuminated with one of those darkroom red lights as other light will cause the allyl hydroperoxide to explode, a safer bet would be to cover all glassware with aluminum foil to keep out all light. The product is purified by vacuum distillation followed by extraction with ethyl ether. It can be further purified by liquid chromatography. The yield is quite low, 58 mg after chromatographic distillation. You will need a graduated cylinder to measure liquids and a thermometer to check the temperature.

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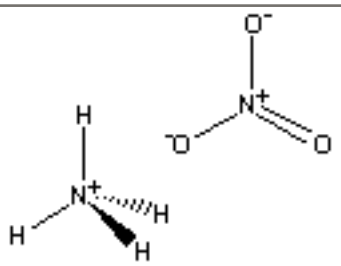
Journal of the American Chemical Society

Ammonium Nitrate

melting point 169.6 °C	boiling point 210 °C	ammonium nitrate	molecular mass 80.043 g/mol	density 1.725 g/mL
table key	sensitivity very low	chemical formula NH_4NO_3	explosive velocity ? m/s	estimated cost $?.00/g



Ammonium nitrate is used as a fertilizer and is supposed to be available from agricultural supply stores or perhaps well stocked garden shops. It may be increasingly hard to find due to its ease of use as an explosive, and especially from the Oklahoma City bombing. The government wants to make it less dangerous by coating the fertilizer pellets with a special chemical. It took me five minutes of research to devise a way of thwarting that method. The proposed anti-explosive would use a similar compound, I think it is ammonium sulfate, mixed in with the ammonium nitrate. Ammonium nitrate is very hygroscopic, or water absorbing, so it completely dissolves in water, but the new stuff is only partially soluble in water. It should not be too difficult to crush up all the nitrate/sulfate nitrate mix, dissolve it in water, and skim off what does not dissolve after a few minutes. Of course it's not all that difficult to make your own. Ammonium hydroxide, the main ingredient, can be obtained in dilute solution as a laundry substance or as a window cleaner, it is ammonia. It is important to get a brand that does not have any fragrance, color, or soap additives in it as it may affect the reaction. More information about ammonium hydroxide is in the chemical synthesis section. The other chemical is nitric acid, that will be far more difficult to obtain and far to precious for most people to make simple ammonium nitrate with.

CHEMICALS	APPARATUS
ammonium hydroxide	beaker
nitric acid	500-mL Erlenmeyer flask
water	litmus paper

The ammonium nitrate is formed by a simple double displacement reaction when the ammonium ion, NH_4+, replaces the H+ ion from the nitric acid and bonds to the remaining nitrate ion, NO_3, then the H+ ion forms water from the hydroxide ion, OH-, left by the ammonium ion. The equation is $NH_4OH + HNO_3 = NH_4NO_3 + H_2O$

Into a 500-mL Erlenmeyer flask , add 100 mL of water then add 100 mL of concentrated nitric acid. Always add acid to water, not the reverse, because the acid will splash when water is added. Slowly add ammonium hydroxide from a beaker to the Erlenmeyer flask while stirring by swirling the flask occasionally until the mixture is alkaline to litmus paper. Keep the flask in a salt-ice bath to keep it cool, and add the ammonium hydroxide in small portions so it may cool a bit. If the reaction gets too hot it will instantly come to a boil and splatter acid all over the place (the first time that happened to me I dropped the whole damned beaker of ammonium hydroxide when I jumped back quite startled, the second time I lost most of my product when it splattered out of the flask). Remember that red litmus turns blue in the presence of base and blue turns red in the presence of acid. Gently boil the mixture until only a crust remains. Let the remaining water evaporate or heat gently to drive out the remaining moisture, you can use an oven for this. Ammonium nitrate will draw moisture from the air so keep it tightly sealed right after you are done heating it. If strongly heated the ammonium nitrate will decompose to form nitrous oxide, which is laughing gas, and then will begin to emit white fumes. If you see white fumes stop heating because that's one step from detonation, don't get too worried though the detonation temperature is several hundred degrees above the fumes stage.

It seems wasteful to use all that nitric acid just to make this particular substance, but knowledge is power! I have never actually seen ammonium nitrate for sale in an agricultural supply store, I have also never been in an agricultural supply store, so that may be why. This chemical is so insensitive to detonation that you could store it under your bed and have more worries about your pillow blowing up than the ammonium nitrate. When mixed with a sensitizer like diesel oil, kerosene, gasoline, nitromethane, hydrazine and the like it becomes quite sensitive.

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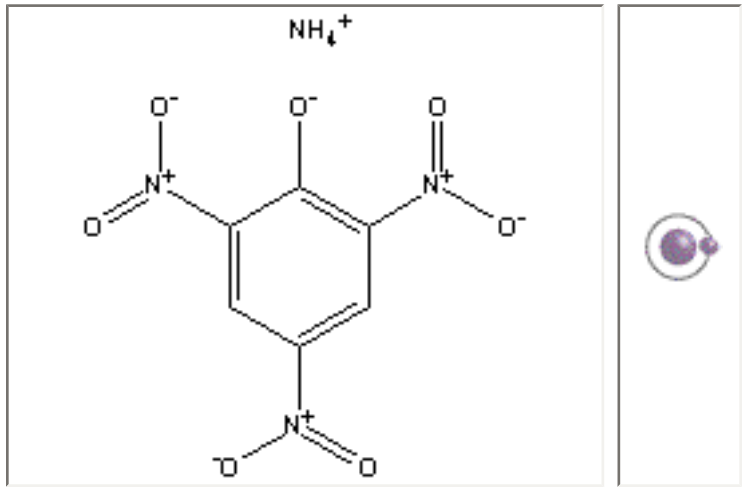
Ammonium Picrate

melting point 265-271 °C	boiling point decomposes >265 °C	ammonium picrate	molecular mass 246.14 g/mol	density 1.60 g/mL
table key	sensitivity very low	chemical formula $C_6H_2(NO_2)_3ONH_4$	explosive velocity 7040 m/s	estimated cost $?.00/g



Ammonium picrate, also called 2,4,6-trinitrophenol ammonium salt, ammonium trinitrophenolate, Dunnite, or Explosive D, is prepared in much the same way as nitrogen triiodide. Ammonium picrate was first prepared in 1841 by a scientist named Marchand. It was not used until 1869 when it was mixed with potassium nitrate as a propellent for rifles. Alfred Nobel patented it in 1888 for Dynamites. The US Army picked it up in 1901, and the Navy floated it in 1907. It saw peak production during WWII but has since fallen victim to progress in chemistry. This explosive is relatively stable, therefore safer to prepare and handle. The only real problem is getting ahold of picric acid which is a regulated explosive chemical. Very few laboratories still use life threatening carcinogens like benzene or explosives like picric acid. That means even if you have the authorization to purchase chemicals you will have a hard time getting any. Not to worry, I have included the preparation of picric acid. Benzene is another matter unfortunately.

CHEMICALS	APPARATUS
ammonium hydroxide	250-mL beaker
picric acid	graduated cylinder

hotplate

2,4,6-Trinitrophenol ammonium salt is formed when the ammonium ion, NH_4^+, attaches itself to the phenol group, OH, of picric acid. I suppose the H from OH is stripped away making O^- that balances the positive ammonium ion. To make, dissolve picric acid in excess ammonium hydroxide. Add 1 g of picric acid to a 250-mL beaker then add 100 mL of hot concentrated ammonium hydroxide. Once the picric acid has dissolved, some will precipitate out of solution upon cooling. The liquid must be evaporated to fully precipitate the crystals. Evaporation can be accelerated by heating the solution on a hotplate or in a heated pan of water. More ammonium picrate can be prepared at once by using the same 1:100 ratio of grams picric acid to milliliters ammonium hydroxide. You will need a graduated cylinder to measure the liquid.

The pure substance occurs in two forms, a stable form which is bright yellow and a less stable form which is bright red. The crystals which separate here are the red form. The yellow form can be procured by recrystallizing the red several times from water. The red form will eventually change into the yellow form if stored as a concentrated solution. Keep this material as dry as possible.

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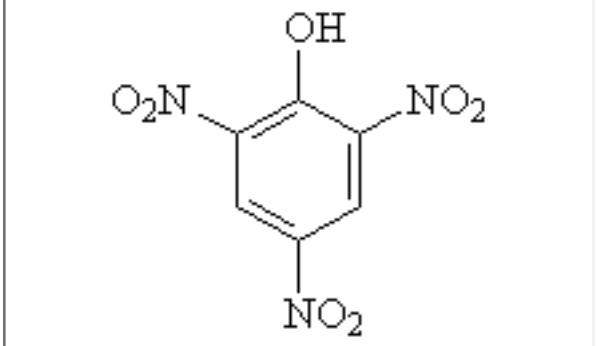
Picric Acid

melting point 122 °C	boiling point explodes over 300 °C	Picric Acid	molecular mass 229.11 g/mol	density 1.763 g/mL
table key	sensitivity medium	chemical formula $C_6H_3N_3O_7$	explosive velocity 7480 m/s	estimated cost $?.00/g



Picric acid, or 2,4,6-trinitrophenol, has also been called picronitric acid; carbazotic acid; nitroxanthic acid; melinite; lyddite; pertite; shimose; melinit; granatfullung; sprengkorper 88; pertit; picrinit; ekrasit; TNF; and shimoza. Picric acid is both a useful explosive compound and a precursor to other explosives. It does not see much use now a days as a laboratory reagent or explosive. It is too dangerous for the lab and too costly for the battlefield. I found a very old bottle in the lab once, the bottle had not been used for 5 years and should not have been there. It is stable unless old, it will form a very unstable crystalline structure after many years. I have three different methods of synthesizing picric acid. The first is a laboratory procedure using fairly common chemical reagents, it will provide a better and cheaper product. The second is a lesser used, but economical, catalytic process for possible large scale manufacture, its chemicals are more difficult to get. The third is one of those improvisational procedures using aspirin tablets, it sounds feasible. Picric acid was first mentioned in the alchemical writings of Glauber in 1742. The old timers made it from nitrating animal horn, silk, indigo, natural resin, and the like. Its synthesis from phenol, and the correct determination of its formula, was in 1841. It was not until 1830 did anybody think to use picric acid as an explosive. Before then it was assumed that only the salts of picric acid were explosive, not the acid itself. In 1873 H. Sprengel proved it could be detonated and by 1894 the Russians had worked out a method of manufacture for artillery shells. Soon after, every military power used picric acid as their primary high explosive material. The 20th century saw the decline of picric acid, the replacement being TNT. The downfall was partially due to the acidic nature and the sensitivity of picric acid. Today picric acid is more suited to detonators or booster charges.

CHEMICALS	APPARATUS
aspirin	1000-mL beaker
benzene	500-mL Erlenmeyer flask
ethyl alcohol	100-mL Florence flask
mercuric nitrate	2-L Florence flask
nitric acid	glass filter paper
phenol	graduated cylinder
potassium nitrate	pipet/buret
sodium nitrate	stirrer/stirring rod
sulfuric acid	thermometer
water	

Add 24 mL of phenol and 14 mL of 98-100% sulfuric acid to a round-bottomed 100-mL Florence flask and reflux for 6 hours at 120°C on an oil bath. After the material has cooled, it is diluted with 46 mL of 72% sulfuric acid. Pour the solution from the round bottomed flask into a 500-mL Erlenmeyer flask. 175 mL of 70% nitric acid is added dropwise, with a pipet or buret, add the acid very slowly, a drop at a time. The addition of nitric acid will cause a vigorous reaction and release toxic gas, use a fume hood or go outside. When all of the acid has been added and the reaction has subsided, the mixture is heated for 2 hours on a steam bath to complete the nitration. After 8 to 12 hours the picric acid crystals should have separated. These crystals will need to be filtered with glass filter paper because of the solutions high acidity. Otherwise, pour off most of the acid, dilute with water, and filter with regular filter paper. Wash the crystals with several small portions of water and allow to dry in the open air. To purify, dissolve the picric acid in 1 L of boiling water per 15 g of crystals, filter while hot and allow to cool slowly. Any heavy droplets of brown oil which dissolve slowly during this boiling should be discarded. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

This catalytic process skips the roundabout way above and converts benzene directly into picric acid in one step. The reagents of this reaction may be a bit hard to come by, however. Prepare a solution of 10 g of mercuric nitrate in 600 mL of 70% nitric acid. Add this solution to a round-bottomed 2-L Florence flask with 228 mL of benzene. Reflux the mixture for 7 hours on a sand bath. Transfer the contents of the flask to another flask and distill it with a steam bath (not steam distillation, simple or fractional will suffice). Benzene will distill over first, then nitrobenzene, and finally a mixture of

dinitrobenzene and dinitrophenol will come over slowly. The distillation is continued until these volatile organics are removed. The remaining residue is filtered while hot to remove any impurities and allowed to crystallize. the picric acid that should have crystallized can be purified by recrystallizing from hot water.

This procedure uses aspirin tablets instead of phenol. Crush 100 aspirin tablets to a fine powder. Put 500 mL of 95% ethyl alcohol in a 1000-mL beaker then add the aspirin powder. Gently heat the alcohol while stirring to dissolve the acetylsalicylic acid within the tablets for 15 minutes. Acetylsalicylic acid is the active ingredient in aspirin and a phenol derivative. Filter the still hot alcohol to remove any excess tablet filler. Now heat the solution to evaporate off all of the alcohol, leaving behind crystals of acetylsalicylic acid. When the crystals have dried, add them to a 1000-mL beaker with 700 mL of 95-100% sulfuric acid. Heat the acid and stir to dissolve the acetylsalicylic crystals. When all of the crystals have been dissolved, add 90 g of sodium nitrate or potassium nitrate. Add a few grams at a time then wait for the reaction to subside before adding more. The nitrate addition must be done in a well ventilated area as it produces deadly nitrogen dioxide gas. When all of the nitrate has been added, allow the mix to cool to room temperature, stirring it every few minutes. Pour it into 1500 mL of ice water to precipitate the picric acid. Decant about 1000 mL of the acid water mix then add another 1000 mL of water. Filter the solution to collect the picric acid crystals. You may purify the crystals as per method one. You will need a stirring rod or magnetic stirrer for mixing.

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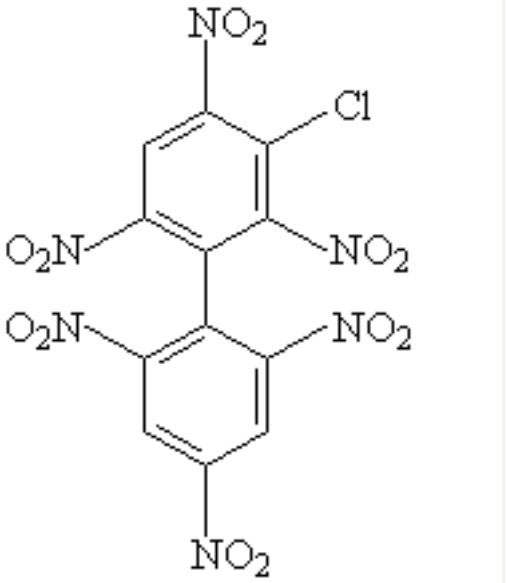
m-Picrylpicryl Chloride

melting point 186 °C	boiling point ? °C	*m*-picrylpicryl chloride	molecular mass 458.72 g/mol	density ? g/mL
table key	sensitivity ?	chemical formula $(O_2N)_3(Cl)C_6HC_6H_2(NO_2)_3$	explosive velocity ? m/s	estimated cost $?.00/g



m-Picrylpicryl chloride has also been called 3-chloro-2,2',4,4',6,6'-hexanitrobiphenyl, and PIPICl. It has the appearance of pale yellow crystals and was first developed by J.C. Dacons & M.J. Kamlet round abouts 1966. As for useful information, other than the fact it is explosive, I have no more.

CHEMICALS	APPARATUS
benzene	2-L Florence flask
n-hexane	graduated cylinder
3-methoxy-2,2',4,4',6,6'-hexanitrobiphenyl	thermometer
phosphorus oxychloride	
pyridine	

water

m-Picrylpicryl chloride can be prepared by refluxing 75 mL of pyridine with 0.33 mole of 3-methoxy-2,2',4,4',6,6'-hexanitrobiphenyl suspended in 1.2 L of benzene for 1 hour at 100 °C in a round bottomed 2-L Florence flask. Dissolve the product of the refluxing into 400 mL of phosphorus oxychloride and warm for 1 hour at 100 °C. Dump the whole works into ice water to precipitate the crystals of *m*-picrylpicryl chloride, filter to collect the crystals, and wash them with water. Allow the crystals to dry, and purify them by recrystallizing from n-hexane. A yield of 89% is obtained. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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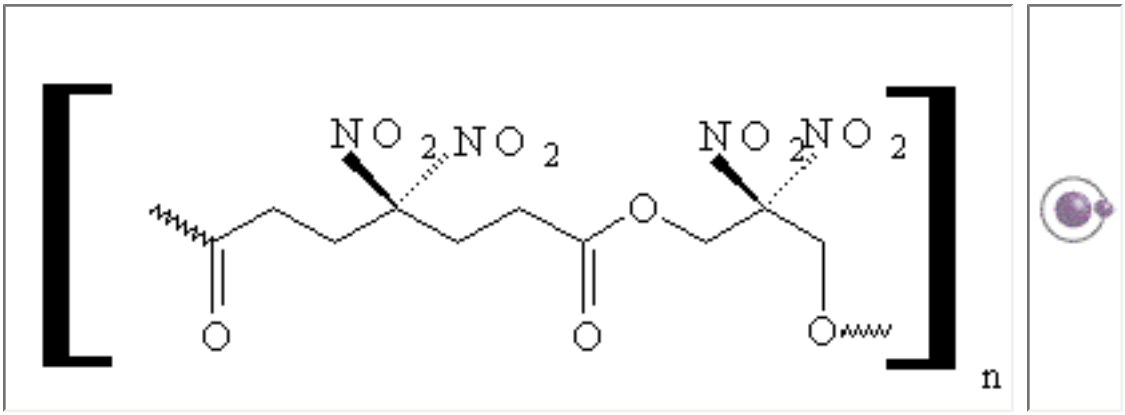
The Polyester Polymer 4,4-Dinitropimelyl Chloride and 2,2-Dinitro-1,3-Propanediol

melting point 180 °C	boiling point ? °C	DNPA polymer	molecular mass $(380.32)_n$	density ? g/mL
table key	sensitivity low	chemical formula $(C_{10}H_{12}N_4O_{12})_n$	explosive velocity ? m/s	estimated cost $?.00/g



This explosive is the polymerization product of the explosive DNPA, the synthesis of which is described in its own lab. It has the appearance of a cream colored powder or an amber pellet when melted together. It is fairly stable, resisting heat and shock to a degree. I do not have much other data of use on this compound. I know the name of this one is pretty strange, there isn't even any chlorine in the final product.

CHEMICALS	APPARATUS
4,4-dinitropimelic acid	250-mL Erlenmeyer flask
dioxane	graduated cylinder
nitrogen	thermometer

phosphorous pentoxide	vacuum desiccator
thionyl chloride	
water	

This preparation is a two-step process which first involves the synthesis of the chloride, and then the polyester. The chloride is prepared by very carefully refluxing a mixture of 33 mL of 4,4-dinitropimelic acid with 90 mL of thionyl chloride in a round bottomed 250-mL Erlenmeyer flask for 2 hours. Filter the mixture while still hot to collect the crystals then rapidly cool them to -15 °C. Recrystallization from thionyl chloride gives a 95% yield of the chloride. To polymerize the chloride, add it to 50 mL of dioxane for every 0.1 moles (about 28 g) of the chloride, in a flask of suitable size. During mixing, the dioxane should be heated to 100 °C and the works should be under dry nitrogen. The polymerization will take about 173 hours. The polymer is washed with water, then vacuum steam distilled at 25 °C. The polymer can be dried over phosphorous pentoxide in a vacuum desiccator at a pressure of 2 mm of mercury. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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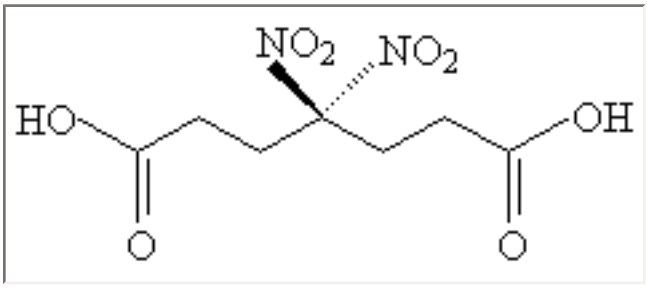
DNPA

melting point 137 °C	boiling point ? °C	DNPA	molecular mass 250.23 g/mol	density 1.52 g/mL
table key	sensitivity low	chemical formula $C_7H_{10}N_2O_8$	explosive velocity ? m/s	estimated cost $?.00/g



DNPA is the acronym for 4,4-dinitropimelic acid, another name is 4,4-dinitro-1,7-heptanedioic acid. This explosive is fairly stable to heat and shock as well as being storable at room temperature. While it is an explosive itself, it is usually used to manufacture polynitroaliphatic explosives and propellents. It may be more useful to polymerize this compound into the polyester polymer 4,4-dinitropimelyl chloride and 2,2-dinitro-1,3-propanediol.

CHEMICALS	APPARATUS
charcoal	beaker
ethyl ether	graduated cylinder
hydrochloric acid	pipet/buret
methyl alcohol	stirrer/stirring rod
methyl acrylate	
potassium dinitroethanol	
water	

Preparation is by two steps, the first forms the dimethyl ester of DNPA, and the second hydrolyzes it. In the first step, 1200 mL of methyl acrylate is added dropwise, with a pipet or buret, while stirring with a magnetic stirrer or stirring rod, to an aqueous solution of 2.5 moles of potassium dinitroethanol at room temperature inside a large beaker. The addition is completed in 3 hours with 8 more hours of stirring required to complete the reaction. After completion of the stirring , the ester that should have formed is extracted several times with ethyl ether, decolorized with charcoal, and the ethyl ether is removed under vacuum. The impure ester is then recrystallized from methyl alcohol. The second step hydrolyzes 39 g of the ester by refluxing it with 350 mL of 18% hydrochloric acid for several hours. After cooling, the 4,4-dinitropimelic acid is crystallized by adding water. The total yield based on potassium dinitroethanol is 55-56%. You will need a graduated cylinder for measuring liquids.

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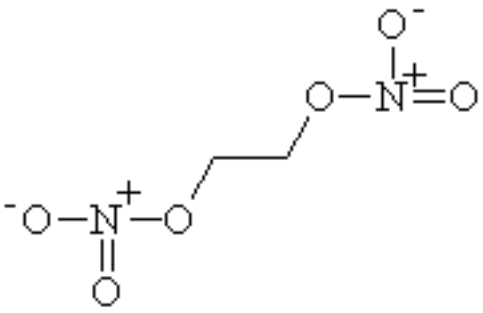
EGDN

melting point -22.8 °C	boiling point explodes at 114 °C	EGDN	molecular mass 152.06 g/mol	density 1.490 g/mL
table key	sensitivity high	chemical formula $O_2NOCH_2ONO_2$	explosive velocity ? m/s	estimated cost $?.00/g



EGDN stands for ethylene glycol dinitrate, other names include 1,2-ethanediol dinitrate, glycol dinitrate, or nitroglycol. EGDN is almost exactly like nitroglycerin, from its chemical properties to its preparation. EGDN will cause severe headaches, as does nitroglycerin, but EGDN headaches are worse, it is also more poisonous, so wear appropriate safety gear. EGDN has better stability in comparison to nitroglycerin, it is also safer to manufacture and handle. The disadvantages of EGDN vs. nitroglycerin is its greater volatility and slower explosive velocity. EGDN was first used in France as a component in non-freezing dynamites. The critical precursor in this synthesis is ethylene glycol, which is the primary ingredient in automobile anti-freeze.

CHEMICALS	APPARATUS
chloroform	250-mL/1000-mL beaker
ethylene glycol	desiccator
nitric acid	graduated cylinder
sodium carbonate	litmus paper
sodium chloride	pipet/buret

sulfuric acid	separatory funnel
water	stirring rod
	thermometer

Prepare a nitrating mixture by mixing 22 mL of concentrated sulfuric acid (>75%) and 15 mL of concentrated nitric acid (>75%) in a 250-mL beaker. Place the beaker into a salt-ice bath and cool it to under 20 °C. While monitoring the temperature with a thermometer, very slowly add 9 mL of ethylene glycol drop by drop with a pipet or buret, keep the temperature below 25 °C at all times. After the glycol addition is complete, allow the mixture to sit for 15 minutes. Next, pour the mixture into a 1000-mL beaker filled with 600 mL of water and stir for several minutes with a stirring rod. Pour the solution into a separatory funnel, allow the EGDN to settle out, it will form a layer on the bottom of the separatory funnel. Drain off the EGDN and keep the acid waste for further extraction. Place the EGDN back into a clean separatory funnel and add plenty of 38° C to 45° C water, mix, then separate. Wash the EGDN again, then wash with a warm 4% solution of sodium carbonate. Wash with warm water three more times. Give it a final wash of concentrated sodium chloride solution, let it sit one day before separating. Separate and check the EGDN for acidity with blue litmus paper. If it is still acidic, keep washing. It **must** be neutral or it will explode. Dry the neutral EGDN in a desiccator, this may take several days. You will need a graduated cylinder for measuring liquids.

To extract any EGDN that may still be in the waste acid, first neutralize the acid with sodium carbonate solution. Next add an equal volume of chloroform to the **neutral** waste acid. Mix well then place it into the separatory funnel. Separate out the EGDN and let it stand in the open for one day so the chloroform may evaporate. Add the EGDN to the washing process above.

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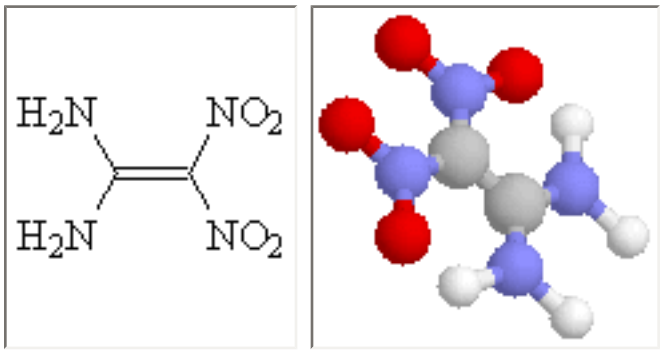
FOX-7

melting point 238 °C (dec)	boiling point -	FOX-7	molecular mass 148.1 g/mol	density 1.885 g/mL
table key	sensitivity very low	chemical formula $C_2H_4N_4O_4$	explosive velocity 8870 m/s	estimated cost $0.50 /g



FOX-7 is a code name for 1,1-diamino-2,2-dinitroethylene, also called 1,1-diamino-2,2-dinitroethene, and its acronyms can be either DADE or DADNE. FOX-7 is a recent development in the search for insensitive high explosive munitions and is the brainchild of the Swedish Defense Research Agency. While FOX-7 is not more powerful than existing explosives like HMX it is being considered as an effective replacement in certain applications because it is a much safer explosive being quite stable to shock, friction, and heat. It is also an inert chemical with demonstrated compatibility to the usual substances used in explosives. FOX-7 is currently being tested in plastic bonded explosive formulations with energetic binders, in propellant formulations for artillery, and is being considered as a replacement in composition B formulations.

The molecular structure of FOX-7 is actually quite simple considering its performance capabilities. While the chemical precursors to synthesize it have been around for over 150 years, it was only in the mid 90's that the pieces were put together just right. The precursors required to synthesize FOX-7 are therefore somewhat easy to come by. Getting the two amino groups on an ethene backbone is quite impossible with straightforward synthetic techniques. A more complex nitrogen containing ring is first nitrated, and then the ring is broken forming both of the amines and the double bond of ethane.

CHEMICALS	APPARATUS
ammonium hydroxide	addition funnel

2-methoxy-2-methyl-4,5-imidazolidinedione	500-mL flask
nitric acid	graduated cylinder
sulfuric acid	stirring rod/stirrer
distilled water	thermometer

The synthesis of FOX-7 proceeds in 2 stages. The first stage nitrates an imidazole type ring, and the second stage breaks the ring forming the final product, 1,1-diamino-2,2-dinitroethylene.

Preparation of 2,2-dinitromethylene-4,5-imidazolidinedione. Place 198 mL of concentrated sulfuric acid (95% and up) in a 500-mL round bottomed flask and immerse the flask in a salt-ice bath to cool the acid. When the acid has cooled slowly add 35.4 g of 2-methoxy-2-methyl-4,5-imidazolidinedione, which should form a clear yellow solution. Set the flask up for magnetic stirring and attach an addition funnel. Slowly add 43 mL of 70% nitric acid to the flask over a period of 60 minutes while stirring. Keep the temperature of the mixture under 30 °C during the addition. After adding the acid, continue stirring for an additional 30 minutes without any cooling. The solution will change color from yellow, to deep red, and finally to a pale orange precipitate. Pour the contents of the flask over a filter to collect the precipitate and allow it to dry in the open air, or vacuum, at room temperature. Optionally the crystals can be washed with a few small portions of trifluoroacetic acid. This precipitate should be 2-(dinitromethylene)-4,5-imidazoledione in approximately 63% yield.

Preparation of 1,1-diamino-2,2-dinitroethylene. Dissolve the above produced 2-(dinitromethylene)-4,5-imidazoledione in 120 mL of distilled water, with stirring, in a 500-mL flask or beaker. Place the flask in a cold water bath and cool it to below 30 °C. Add 30% ammonium hydroxide to the flask at such a rate as to keep the temperature between 20-30 °C. Add enough ammonium hydroxide to reach a pH of approximately 9. One could also use the weaker 3-4% ammonium hydroxide as found in the grocery store, but much larger quantities will be needed, so use an appropriately sized container. Stir the contents of the flask for 2 hours after adding all of the ammonia. Pour the material over a filter to collect the product. Thoroughly wash these crystals several times with water and allow them to dry under vacuum. What remains are bright yellow crystals of 1,1-diamino-2,2-dinitroethylene, aka FOX-7. Yield of the final product is around 54%.

You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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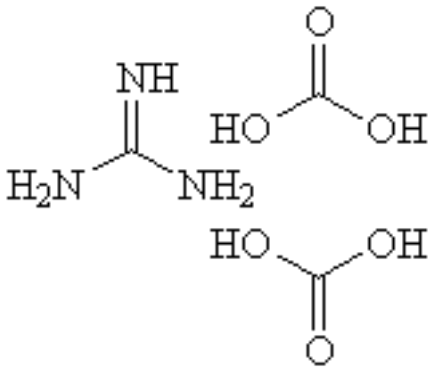
Guanidine Carbonate

melting point 267-270 °C	boiling point ? °C	guanidine carbonate	molecular mass 180.170 g/mol	density ? g/mL
table key	sensitivity very low	chemical formula $[(NH_2)_2C=NH]_2H_2CO_3$	explosive velocity ? m/s	estimated cost $?.00/g



I do not have any information on this compound other than how to synthesize it. Guanidine carbonate is a derivative of nitroguanidine, I suspect that it has similar properties. It can be toxic and its explosive properties are probably like ammonium nitrate, difficult to detonate and low powered. Other names include guanidinium carbonate; carbonic acid, compound with guanidine (1:2); bisguanidinium carbonate; and diguanidinium carbonate.

CHEMICALS	APPARATUS
ammonium carbonate	evaporating dish
ethyl alcohol	2-L Florence flask
nitroguanidine	thermometer
water	

208 g of nitroguanidine, 300g of ammonium carbonate, and 1 L of water are heated together in a 2-L Florence flask in a water bath. The flask is set up for refluxing and with a thermometer dipping into the

mixture. When the temperature reaches 65-70 °C, nitrous oxide escapes rapidly, and it is necessary to shake the flask occasionally to prevent the undissolved nitroguanidine from being carried up into the neck. Heat the flask as rapidly as may be done without the reaction becoming too violent. After all the material has gone into solution, the flask is removed from the water bath and the contents boiled under reflux for 2 hours. The liquid is then transferred to an evaporating dish and evaporated to dryness on a steam or water bath. During this process all the remaining ammonium carbonate should be driven off. The residue is added to the smallest possible amount of cold water, filtered for the removal of any melamine that may have formed, and the filtrate is stirred up with twice its volume of 95% ethyl alcohol which causes the precipitation of guanidine carbonate. Traces of urea which will have formed remain in solution along with any ammonium carbonate which may have survived the earlier treatment. The guanidine carbonate is filtered off, rinsed with alcohol, and dried. The filtrate is evaporated to dryness, taken up in water, and precipitated with alcohol for a second crop. The yield is about 162 g or 90% of the theoretical yield.

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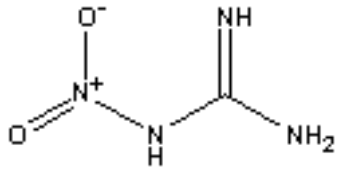
Nitroguanidine

melting point 225-250 °C	boiling point decomposes at 250 °C	nitroguanidine	molecular mass 104.07 g/mol	density 1.5 g/mL
table key	sensitivity low	chemical formula $H_2NC(NH)NHNO_2$	explosive velocity 7650 m/s	estimated cost $?.00/g



Nitroguanidine, sometimes written as nitroguanadine, is a stable primary explosive compound. The explosive power and insensitivity of this chemical make it comparable to high explosives like TNT and a good choice for preparation if your safety skills are not fully established. Unfortunately, the preparation of guanidine nitrate, the main precursor for nitroguanidine, can be hampered as its precursors are difficult to obtain. This of course leads to the synthesis of nitroguanidine being hampered as well. With that aside, nitroguanidine is very simple to synthesize, requiring only sulfuric acid to react with. There are two crystalline forms of nitroguanidine, an alpha and a beta. Although there is little difference between the two forms, the alpha is the simpler to synthesize, the beta will quickly convert to the alpha anyway.

CHEMICALS	APPARATUS
guanidine nitrate	1000-mL beaker
sulfuric acid	graduated cylinder
water	stirrer/stirring rod
	thermometer

In a 1000-mL beaker add 500 mL of 98% or greater sulfuric acid, then cool the flask in a salt-ice bath to 10°C or below. Slowly add 400 g of dry guanidine nitrate to the acid while stirring, keeping the temperature of the mixture below 10 °C. The mixture should have a milky appearance, allow it to stand

at room temperature, while occasionally stirring, until it is homogeneous and free from crystals. This may require anywhere from 15 to 20 hours. After the wait, pour the mixture into a large beaker of ice and water, this will cause nitroguanidine to precipitate out of solution. After one hour of standing, with cooling in the salt-ice bath, all the crystals should have precipitated. Filter the mixture to collect the crystals, rinse them with water to remove any acid that may be behind, then dissolve them in 4 liters of boiling water. Allow the water to cool for 12 to 24 hours and the crystals should precipitate. Pour the water over a filter to collect the crystals, and then allow them to dry. The nitroguanidine formed can be stored safely and will not decompose. The yield is about 90%. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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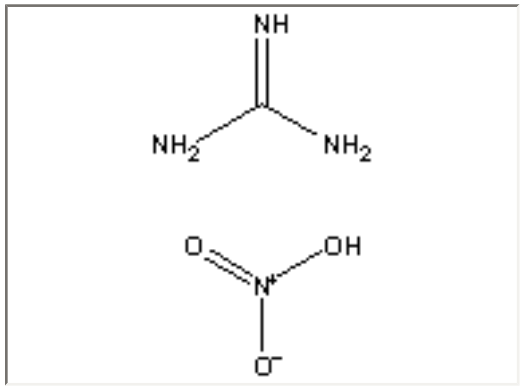
Guanidine Nitrate

melting point 215-216 °C	boiling point explodes at 230 °C	guanidine nitrate	molecular mass 122.08 g/mol	density 0.75 g/mL
table key	sensitivity low	chemical formula $CH_6N_4O_3$	explosive velocity ? m/s	estimated cost $?.00/g



Guanidine nitrate is both an explosive compound and a precursor to other explosives similar to this one. The one difficulty in making this compound is obtaining the main ingredient, dicyanodiamide. The preparation of dicyanodiamide is a long and involved process using cyanamide, which is made from potassium cyanide reacted with chlorine then the product is reacted with ammonia, the cyanamide thus produced is reacted with sulfuric acid or ammonium sulfide. I'm not exactly sure about the specifics as of yet. This process was developed at around 1920 or 1921. I do not have many specifics relating to explosive or chemical properties of this compound. Some legitimate uses of this compound include the manufacturing of trimethoprim, folic acid, sulpha guanidine, organic synthetics, photographic chemicals, and disinfectants. Other names for this explosive are guanidine mononitrate, and guanidinium nitrate.

CHEMICALS	APPARATUS
ammonium nitrate	1-L Florence flask
dicyanodiamide	thermometer
water	

Place a mixture of 210 g of dicyanodiamide and 440 g of ammonium nitrate in a 1-L Florence flask, the flask is immersed in an oil bath for heating which has a thermometer in the oil. The oil bath should be preheated to 110-120 °C before placing the flask in, then it is warmed to 160 °C over 30 minutes, and held at this temp for 2 hours. At the end of that time the flask is removed and allowed to cool, and the contents are extracted on a steam bath by warming with successive portions of water. About 2 L of water will be needed, the hard cake of crystals will dissolve slowly, so sufficient time must be given for each portion of water to become saturated before it is decanted. The combined solution is filtered while hot for the removal of white insoluble material (that being ammeline and ammelide), concentrated to a volume of about 1 liter, and allowed to crystallize. There may be some crystals of guanidine nitrate mixed with the ammeline and ammelide, these can be re-dissolved in hot water and cooled to precipitate the ammeline and ammelide again, the guanidine nitrate will remain in solution. The mother liquors are concentrated to a volume of about 250 mL for a second crop, after the removal of which the residual liquors are discarded. The crude guanidine nitrate may be recrystallized by dissolving it in the least possible amount of boiling water and allowed to cool, or it may be dried thoroughly and used directly for the preparation of nitroguanidine.

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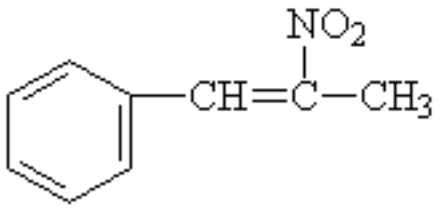
1-Phenyl-2-Nitro-1-Propene

melting point 64.5 °C	boiling point 139 °C	1-phenyl-2-nitro-1-propene	molecular mass 163.19 g/mol	density 1.277 g/mL
table key	sensitivity medium	chemical formula $C_9H_9NO_2$	explosive velocity ? m/s	estimated cost $?.00/g



I do not have many specifics on this explosive such as sensitivity or detonation velocity. This procedure requires that the reactants be heated in a sealed tube, it is advisable to evacuate this tube of air as the expansion of heated air may cause it to burst. Also note that the boiling temperature of this compound is for a low vacuum pressure. This material will decompose at 177 °C.

CHEMICALS	APPARATUS
benzaldehyde	500-mL Erlenmeyer flask
isopropylamine	graduated cylinder
methyl alcohol	
nitroethane	
water	

1-phenyl-2-nitro-1-propene can be prepared by reacting 153 mL of benzaldehyde with 108 mL of nitroethane plus 13.6 g of isopropylamine in a sealed round bottomed 500-mL Erlenmeyer flask heated by submerging in a water bath for 2 hours. After heating the flask, allow it to cool to room temperature and shake, a yellow crystalline product should be obtained. The crystals are filtered to collect them and

washed with water. They are then recrystallized from warm methyl alcohol. Yield is about 57%. You will need a graduated cylinder for measuring liquids.

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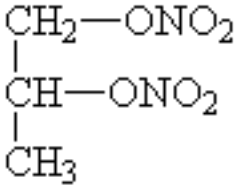
melting point -20 °C	boiling point decomposes at 30 °C	PGDN	molecular mass 166.0 g/mol	density 1.368 g/mL
table key	sensitivity medium	chemical formula $CH_3CH(ONO_2)CH_2(ONO_2)$	explosive velocity ? m/s	estimated cost $?.00/g



PGDN is an acronym for propylene glycol dinitrate, other names include methylglycol dinitrate, and methylnitroglycol. This explosive is very similar to nitroglycerine in both its chemical, physical, and explosive properties, as well as its method of synthesis. Propylene glycol, a derivative of glycerol, is found in some anti-freezes, it is the active ingredient in certain ecological brands because it is non-poisonous. PGDN is actually safer to handle than nitroglycerin by a factor of ten, it sacrifices some explosive power, but the gain in stability more than offsets the loss of power. PGDN can be stored over long periods of time, unlike nitro, and it is difficult to freeze, where frozen nitro is especially dangerous. PGDN can even gel guncotton for use in smokeless powders, like nitro, and all this without the headaches too.

CHEMICALS	APPARATUS
chloroform	100-mL beaker
nitric acid	evaporation dish
propylene glycol	graduated cylinder
sodium carbonate	pipet/buret
sulfuric acid	separatory funnel
water	stirrer/stirring rod

thermometer

Prepare an acid mixture of 16 mL of 96% sulfuric acid and 14 mL of 90% nitric acid in a 100-mL beaker. Place the beaker into a salt-ice bath and cool it to 10 °C. Once cool, slowly add 9.6 mL of propylene glycol dropwise, with a pipet or buret, while stirring. Regulate the rate of addition to keep the temperature between 10-15 °C. The addition should take about 30 minutes. Do not let any liquid splash onto the walls of the beaker, it can oxidize and cause dangerous decomposition, if any red fumes are observed, dump the contents of the beaker down the drain with plenty of cold water. If at any time the temperature rises suddenly, or the temperature climbs over 20 °C, immediately dump the reaction. Having a bucket of ice water to dump the beaker into is advisable. After the addition, continue stirring for an additional 10 minutes, and maintain the temperature. Pour the contents of the beaker into a separatory funnel and allow it to stand for 15 minutes. The lower layer should be acid waste, draw it off and keep for further extraction. Leave the upper layer in the funnel, add an equal volume of cold water and gently shake for 1 minute. Allow the mixture to separate, the lower layer will be PGDN. Draw off the lower layer into a beaker, and pour the wash layer into a separate beaker. Add the PGDN back into the separatory funnel and wash twice more, add each wash layer to the beaker containing the first wash. Next, wash the PGDN with 5% sodium carbonate solution in the separatory funnel, add each of the carbonate washes to the beaker of the previous water washes. Test each of the carbonate washes for its pH, keep washing with carbonate solution until the wash is alkaline. Once the carbonate wash is alkaline, wash the PGDN with more water until the washes are neutral. The PGDN after the final wash may be cloudy from water still in it. Pour the PGDN onto an evaporation dish and let it set for 3-6 hours, the water should evaporate.

To get more PGDN from the waste acid, add the acid to a separatory funnel and extract with several portions of chloroform. Combine all of the chloroform extractions and use it to extract the PGDN from the water and carbonate washes. Wash the chloroform until its pH is neutral. Allow the chloroform to evaporate, leaving behind PGDN which can be combined with the rest. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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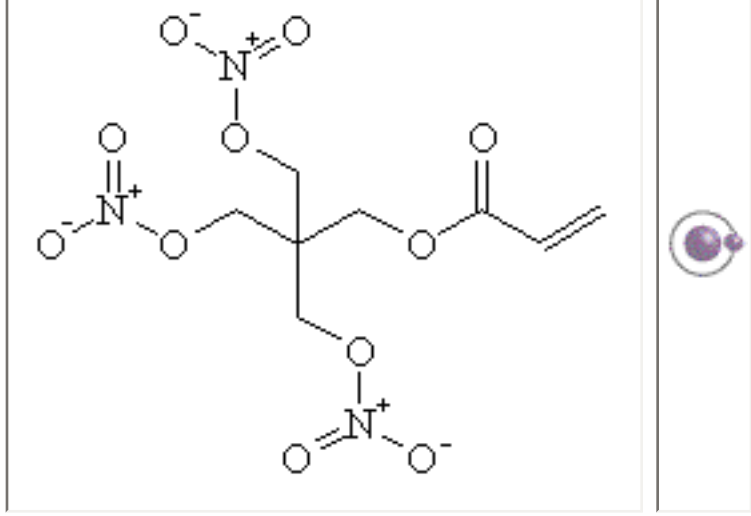
Petrin Acrylate

melting point 78 °C	boiling point ? °C	petrin acrylate	molecular mass 325 g/mol	density ? g/mL
table key	sensitivity low	chemical formula $C_8H_{11}N_3O_{11}$	explosive velocity ? m/s	estimated cost $?.00/g



Petrin acrylate is the smaller version of pentaerythritol trinitroacrylate, or trinitroxypentaerythritol acrylate. Another name is pentaerythritol trinitrate monoacrylate. This substance is primarily used as a rocket propellent, so I guess it is not really an explosive at all. This will burn very well and will probably explode under the proper conditions, still, it seems to me that PETRIN, the main precursor, would make a more valuable explosive instead of acrylating it. Of course, one may need a suitable rocket propellent. This substance also acts as a very effective binder, a double plus for solid rocket fuels.

CHEMICALS	APPARATUS
acrylic acid	Erlenmeyer flask
acrylyl chloride	graduated cylinder
N,*N*-dimethylaniline	pipet/buret
methyl alcohol	thermometer

pentaerythritol trinitrate

trifluoroacetic anhydride

water

Prepare a mixture of a small quantity of trifluoroacetic anhydride and glacial acrylic acid into an Erlenmeyer flask of suitable volume. Cool the mixture to 10-15 °C, then slowly add a small amount of pentaerythritol trinitrate (Petrin), with a pipet or buret, while maintaining the temperature. Although I have no data for exact volumes, I suggest using equal volumes of all chemicals. After 1 hour, drown the mixture with water to precipitate the product. Filter the product to collect the crystals of petrin acrylate. Dissolve the crystals in methyl alcohol, the product is then allowed to crystallized over a period of 16 hours at 0 °C, then washed with water to remove any trace of acidity. The final pure product is dried under vacuum to remove traces of solvent. The yield should be about 74%, an alternative process using *N*,*N*-dimethylaniline and acrylyl chloride instead of trifluoroacetic anhydride and acrylic acid with yields of 46% is possible. The high cost and difficulty using trifluoroacetic anhydride justifies the lower yield. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

Although petrin acrylate can be used as a propellent alone, the addition of an oxidizer can make it more powerful. A typical propellent composition consists of: 34.3% petrin acrylate as a binder, 11.8% triethylene glycol trinitrate as a plasticizer, 2.9% glycol diacrylate as a crosslinker, 51.0% ammonium perchlorate as an oxidizer, and 0.014% hydroquinone as a polymerization inhibitor. This composition is reported to have a specific impulse of 238 lb-sec/lb at a density of 1.3 g/mL. Plain petrin acrylate has a specific impulse of 214 lb-sec/lb and a burning rate of 0.2 inch/sec.

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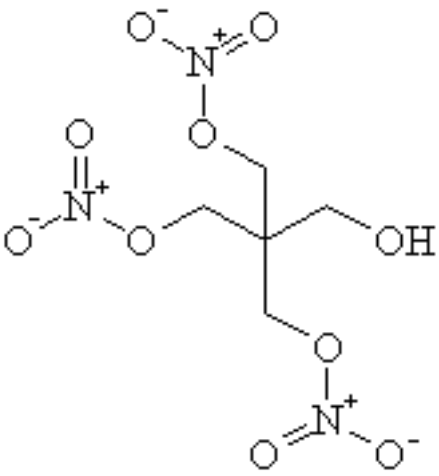
Petrin

melting point 26-28 °C	boiling point decomposes at 130 °C	Petrin	molecular mass 271.1 g/mol	density 1.54 g/mL
table key	sensitivity low	chemical formula $HOCH_2C(CH_2ONO_2)_3$	explosive velocity ? m/s	estimated cost $?.00/g



Petrin is an acronym for pentaerythritol trinitrate. One of the biggest uses for Petrin is to make petrin acrylate, a good propellant and binder in one, out of it. Petrin is also used as an intermediate in a number of other explosive nitrate esters. It has been used as a component of propellent binders, a plasticizer for slow burning propellents, a binder for cloud-seeding pyrotechnics, a gelling agent for nitrocellulose, and even in medicine as a vasodilator. There is not a lot of explosive data on Petrin because most scientists seem more concerned with what they can make from it instead of using it as is. What data there is comes from the original German patent for its synthesis back in 1937, back when the Germans were happy, simple country folk with religious issues and a Christian superiority complex.

CHEMICALS	APPARATUS
ammonium carbonate	beaker
methylene chloride	crystallization dish
nitric acid	graduated cylinder

pentaerythritol	pipet
sulfuric acid	stirrer/stirring rod
water	thermometer

There are many different methods concerning the synthesis of Petrin, but perhaps the best is an anonymous publication from 1971. This reaction creates both Petrin and PETN. Prepare a mixture of pentaerythritol and 100% nitric acid in a beaker chilled to 0 °C in a salt-ice bath. Add to this mixture some methylene chloride solvent and mix well. Now add 2 mL of 100% sulfuric acid for every 8 mL of nitric acid added. The temperature must stay at 0 °C throughout the reaction. I do not have data concerning exact volumes, I suggest using several times the volume of mixed acid to the volume of pentaerythritol. After the sulfuric acid has been added, remove the methylene chloride by decanting it off the top with a pipet. Add more fresh methylene chloride and remove it after a few minutes of mixing. Continue the solvent addition and removal several times during the reaction. Combine all of the solvent extracts and neutralize them with ammonium carbonate until neutral to litmus paper. The neutralized methylene chloride can be distilled to concentrate the volume of Petrin solution while recollecting the methylene chloride. The remaining Petrin residue can then placed in a crystallization dish to evaporate the rest of the way. You could also use vacuum drying to speed the process along. Adding water to the remaining acid mix should precipitate the PETN that formed, further purification instructions can be found on that page. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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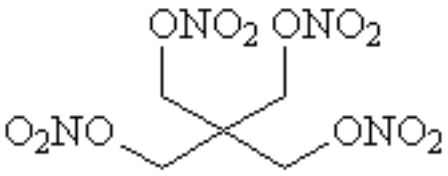
PETN

melting point 141 °C	boiling point ignites at 210 °C	PETN	molecular mass 316.14 g/mol	density 1.773 g/mL
table key	sensitivity medium	chemical formula $C_5H_8N_4O_{12}$	explosive velocity 8300 m/s	estimated cost $?.00/g



PETN is an acronym for pentaerythritol tetranitrate, other names include 1,3-propanediol; 2,2-[bis-(nitroxy)methyl]-dinitrate; 2,2-bis[(nitrooxy)methyl]-1,3-propanediol (ester); 2,2-bishydroxymethyl-1,3-propanediol tetranitrate; nitropentaerythritol; niperyt; Lentrat; Hasethrol; Peritrate; Mycardol; Nitropenton; Pentral 80; Dilcoran-80; Terpate; Perityl; Pentritol; Pentanitrine; Prevangor; Subicard; Pentryate; Vasodiatol; Neo-Corovas; Pentafin; Quintrate; Pergitral; Metranil; Cardiacap; Angitet; dinitrate penta; niperyth; penthrit; penthrite; pentrit; nitropenta; NP; and TEN. While PETN can not be detonated by flame or fuse, it only burns in the open air, it is very easily detonated by shock. A blow from a hammer, dropping it on the floor, and using even a weak detonator will cause detonation. PETN was first prepared in 1894 by the German company Rneinisch Westfalalische Sprengstoff AG. PETN is used as the active ingredient in detonating cord, detonating cord is like a fuse that burns as fast as electricity flows (as fast as sound anyway, but that is only an analogy). The cord can slice a small tree in half from the heat, it was wrapped around prisoners of war when no shackles were handy. Anybody gets out of line... Ouch. PETN has also found uses in blasting caps, grenade filler, as a sometime replacement for RDX, mixed with plastics as a booster charge for insensitive explosives, and in medicine as a vasodilator. Another nifty use for it is in sheet explosive, like bed sheets, it can be used to harden and shape metals, wrap around objects and all sorts of wonderful things. PETN is a rather common and stable high explosive that is not very difficult to prepare. This lab will require white nitric acid which you can make and pentaerythritol, also called tetramethylol methane and 2,2-bis(hydroxymethyl)-1,3-propanediol. Pentaerythritol may have its uses in the paint industry but no use in the hands of the public. I have a method of synthesizing it, but it is vague. I will look for a better procedure.

CHEMICALS | APPARATUS

acetone	600-mL beaker
nitric acid	graduated cylinder
pentaerythritol	stirrer/stirring rod
sodium carbonate	thermometer
water	

In a 600-mL beaker, add 400 mL of white nitric acid and cool to below 5°C in a salt-ice bath. White nitric acid is made by adding a small amount of urea to fuming nitric acid then blowing dry air into the acid until it is colorless. 100 g of finely ground pentaerythritol is slowly added to the acid while stirring, keeping the temperature below 5°C. After all of the pentaerythritol has been added, the stirring and cooling are continued for 15 minutes. The mixture is then dumped in about 3 L of ice water. The crude product that should have formed is filtered to collect it, washed with water, and submerged in 1 L of hot 0.5% sodium carbonate solution for 1 hour. The crystals are again collected on a filter, washed with water, and allowed to dry. These washings are important to remove all traces of acid. To obtain a pure product, dissolve the crystals in hot acetone, allow to cool, then add an equal volume of water as you have of acetone. Filter to collect the crystals, wash with water, and allow 24 hours to dry. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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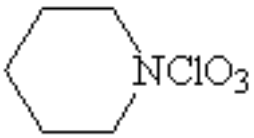
N-Perchlorylpiperidine

melting point explodes	boiling point ---	N-perchlorylpiperidine	molecular mass 167.6 g/mol	density ? g/mL
table key	sensitivity very high	chemical formula $C_5H_{10}NClO_3$	explosive velocity ? m/s	estimated cost $?.00/g



This is an extremely dangerous compound, it is very sensitive to heat, sunlight, you name it. It can be desensitized by adsorption on powdered alumina and it can be stored indefinitely at a balmy -80 °C. If your going to make this one get your super freezer ready with liquid nitrogen, otherwise be very careful. You do have an industrial super freezer don't ya? Umm hmm, me too.

CHEMICALS	APPARATUS
ethyl ether	bubbler
hydrochloric acid	400-mL Erlenmeyer flask
perchloryl fluoride	graduated cylinder
piperidine	

Preparation is by reacting an aqueous solution consisting of 8.0 g of piperidine and 250 mL of water with perchloryl fluoride gas at room temperature in a 400-mL Erlenmeyer flask. The gas is bubbled through the solution for 20 minutes at a rate of 170 mL/minute, a bubbler would help increase the efficiency. The solution is then nitrogen purged for 10 minutes, extracted with ethyl ether, washed with a dilute solution of hydrochloric acid, and dried at room temperature under vacuum. Yield is about 66%. You will need a graduated cylinder for measuring liquids.

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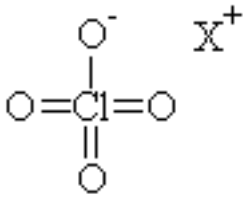
Perchlorates

melting point varies	boiling point explodes	perchlorates	molecular mass varies	density varies
table key	sensitivity high	chemical formula $XClO_4$	explosive velocity varies	estimated cost varies



A perchlorate is a chemical functional group, explosive more often then not, with the formula $-ClO_4$. Since so many pyrotechnic compounds seem to use a perchlorate somewhere in the mix, it seemed logical to have them here. Since there are so many I decided to have one page for all of them. It is easy to confuse perchlorates with chlorates, chlorites, and hypochlorites, their formulas are ClO_4, ClO_3, ClO_2, and ClO respectively. Perchlorate salts are simply the product of a base with perchloric acid, although organic perchlorates exist as well. One thing perchlorates share in common is that they are strong oxidizers, they should be kept away from any reducible materials and excessive heat. Metal perchlorates tend to be more stable than organic perchlorates. One of the first perchlorate salts to be identified was potassium perchlorate, other salts of interest include aluminum perchlorate, ammonium perchlorate, barium perchlorate, cadmium perchlorate, calcium perchlorate, cobalt perchlorate, copper perchlorate, hydrazine diperchlorate, iron perchlorate, lead perchlorate, lithium perchlorate, magnesium perchlorate, manganese perchlorate, mercury perchlorate, nickel perchlorate, nitrosyl perchlorate, nitryl perchlorate, silver perchlorate, sodium perchlorate, strontium perchlorate, titanium tetraperchlorate, uranyl perchlorate, and zinc perchlorate. Some of these are mere curiosities, their chemical precursors will not be in the synthesis section. The usual data on safety and use of these compounds has been omitted as well in the interest of keeping this lab brief.

aluminum perchlorate	chemical formula $Al(ClO_4)_3$	melting point decomposes at 300 °C	molecular mass 325.37 g/mol	density 2.209 g/mL

Set up a round-bottomed 500-mL Florence flask for refluxing and liquid addition. The top of the

reflux condenser needs to be capped with a drying tube to protect the reaction from moisture. Heat to reflux some silver perchlorate in anhydrous methyl alcohol, then slowly add a solution of aluminum chloride in methyl alcohol drop by drop from the addition funnel. A precipitate of silver chloride will appear, filter the product to remove the silver chloride and heat the remaining solution at 150 °C to remove the methyl alcohol and crystallize the aluminum perchlorate.

ammonium perchlorate	chemical formula NH_3ClO_4	melting point decomposes at 269 °C	molecular mass 117.49 g/mol	density 1.9518 g/mL

Ammonium perchlorate can be prepared in the lab by carefully neutralizing perchloric acid with either gaseous ammonia or aqueous ammonium hydroxide. Filter the solution to collect the crystals of ammonium perchlorate, recrystallize them from water, and dry at 110 °C until a constant weight is obtained.

barium perchlorate	chemical formula $Ba(ClO_4)_2$	melting point 505 °C	molecular mass 336.27 g/mol	density 3.681 g/mL

Anhydrous barium perchlorate is prepared by heating a mixture of solid barium chloride and nitrosyl perchlorate, or by heating a mixture of barium carbonate and ammonium perchlorate.

cadmium perchlorate	chemical formula $Cd(ClO_4)_2$	melting point 290 °C	molecular mass 311.30 g/mol

Anhydrous cadmium perchlorate can be prepared by mixing together cadmium nitrate with anhydrous perchloric acid and 100% nitric acid.

calcium perchlorate	chemical formula $Ca(ClO_4)_2$	melting point 220 °C	molecular mass 238.98 g/mol

Anhydrous calcium perchlorate can be prepared by heating a mixture of 100 g of calcium carbonate with 235 g of ammonium perchlorate. Ammonium carbonate will be evolved as a gas, leaving behind pure calcium perchlorate.

cobalt perchlorate	chemical formula $Co(ClO_4)_2$	molecular mass 257.83 g/mol	density 3.327 g/mL

The hexahydrate of cobalt perchlorate can be prepared by dissolving calcium carbonate, or calcium oxide, in aqueous perchloric acid. Evaporation of the solution yields crystals of cobalt perchlorate.

copper perchlorate	chemical formula $Cu(ClO_4)_2$	melting point 82.3 °C	molecular mass 262.43 g/mol	density 2.225 g/mL

Anhydrous copper perchlorate is prepared by heating in vacuum at 200 °C a mixture of nitrosyl perchlorate and your choice of either copper monoxide, copper dichloride, or copper nitrate. It can also be prepared by reacting copper powder with nitrosyl perchlorate in an organic solvent.

hydrazine diperchlorate	chemical formula $N_2H_4.2HClO_4$	melting point 191 °C	molecular mass 232.97 g/mol	density 2.21 g/mL

Hydrazine diperchlorate, or HDP, can be prepared by reacting equimolar amounts of aqueous barium perchlorate with hydrazine sulfate. Filter to remove the precipitate of barium sulfate, and evaporate the filtrate on a water bath to yield crystals of HDP.

iron perchlorate	chemical formula $Fe(ClO_4)_2$	melting point explodes	molecular mass 254.75 g/mol

Iron perchlorate is prepared by reacting 70% perchloric acid with iron sulfide, or iron sulfate, followed by evaporation of the solution. Heat the solution very gently to evaporate, strong heating can cause an explosion.

lead perchlorate	chemical formula $Pb(ClO_4)_2$	melting point 83 °C	molecular mass 406.09 g/mol	density 2.6 g/mL

The trihydrate of lead perchlorate can be prepared by dissolving lead carbonate in aqueous perchloric acid and evaporation the solution until crystals appear.

lithium perchlorate	chemical formula $Li(ClO_4)_2$	molecular mass 205.84 g/mol

The trihydrate of lithium perchlorate can be prepared by reacting lithium sulfate with barium perchlorate in solution, then evaporating the solution to yield the crystals. It can also be prepared by reacting lithium carbonate with aqueous perchloric acid.

magnesium perchlorate	chemical formula $Mg(ClO_4)_2$	melting point 224-520 °C	molecular mass 223.21 g/mol	density 2.21 g/mL

The hexahydrate of magnesium perchlorate can be prepared by dissolving pure magnesium oxide in dilute perchloric acid. Evaporate the solution until fumes appear, then cool. Filter to collect the crystals

of magnesium perchlorate that should have formed, and recrystallize them from water.

manganese perchlorate	chemical formula $Mn(ClO_4)_2$	melting point explodes	molecular mass 253.84 g/mol

The hexahydrate of manganese perchlorate can be prepared by dissolving manganese hydroxide, or manganese carbonate, in dilute perchloric acid. Evaporate the solution until crystals appear.

mercury perchlorate	chemical formula $Hg(ClO_4)_2$	molecular mass 399.49 g/mol

Anhydrous mercury perchlorate can be prepared by adding a solution of perchloric acid in trifluoroacetic acid to and mercury salt in trifluoroacetic acid. Carefully evaporate the solution until crystals form.

nickel perchlorate	chemical formula $Ni(ClO_4)_2$	melting point explodes	molecular mass 257.61 g/mol	density 3.4 g/mL

The hexaammoniate of nickel perchlorate can be prepared by adding a solution of 14 g of sodium perchlorate in 50 mL of water to a solution of 23.8 g of nickel dichloride and 5.4 g of ammonium chloride in 120 mL of water. Slowly add with stirring 60 mL of concentrated ammonium hydroxide. Cool this mixture for 4 hours with a salt-ice bath, then filter to collect the crystals of the perchlorate.

nitrosyl perchlorate has its own section

nitryl perchlorate	chemical formula NO_2ClO_4	melting point 135 °C	molecular mass 161.45 g/mol

Nitryl perchlorate can be prepared by distilling anhydrous perchloric acid, allowing the distillate to drip onto a large excess of dry dinitrogen pentoxide chilled to -80 °C (yes that's negative) and some nitromethane. The mixture is allowed to warm to room temperature, then kept under vacuum for 48 hours to remove any volatile contaminants.

potassium perchlorate	chemical formula $KClO_4$	melting point 588 °C	molecular mass 138.55 g/mol	density 2.53574 g/mL

Potassium perchlorate is prepared by slowly adding 50 mL of concentrated sulfuric acid to 2-5 g of potassium chlorate. The addition is slow to avoid explosion. Alternately, nitric acid, phosphoric acid, or

chromium trioxide can be used instead of sulfuric acid. It can also be prepared by mixing potassium chloride and nitrosyl perchlorate in solid form and heating. A residue of potassium perchlorate will be left behind.

silver perchlorate	chemical formula $AgClO_4$	melting point 486 °C	molecular mass 207.32 g/mol	density 2.806 g/mL

Anhydrous silver perchlorate can be prepared by adding anhydrous perchloric acid to a solution of a silver salt dissolved in trifluoroacetic acid. It can also be prepared by dissolving silver oxide in aqueous perchloric acid and evaporating the solution until crystals appear.

sodium perchlorate	chemical formula $NaClO_4$	melting point 473 °C	molecular mass 122.44 g/mol	density 2.5298 g/mL

The monohydrate of sodium perchlorate can be prepared by dissolving sodium carbonate in a slight excess of dilute perchloric acid. Evaporate some of the solution, then cool to 50 °C. The solid can be centrifuged, collected, and dried at 250 °C. The anhydrous can be obtained by recrystallizing from water above 53 °C.

strontium perchlorate	chemical formula $Sr(ClO_4)_2$	melting point decomposes	molecular mass 286.52 g/mol	density 2.973 g/mL

The monohydrate of strontium perchlorate can be prepared by dissolving pure strontium nitrate in an excess of perchloric acid, and neutralizing the acid with strontium carbonate. Centrifuge to collect waste solids, and chill the liquid until crystals of the perchlorate appear.

titanium tetraperchlorate	chemical formula $Ti(ClO_4)_4$	molecular mass 445.70 g/mol

Anhydrous titanium tetraperchlorate can be prepared by mixing 8 moles of anhydrous perchloric acid with 1 mole of titanium tetrachloride at -10 °C.

uranyl perchlorate	chemical formula $UO_2(ClO_4)_2$	melting point 90 °C	molecular mass 469.0 g/mol

The hexahydrate of uranyl perchlorate can be prepared by dissolving ordinary hardware store brand uranium trioxide in 40% perchloric acid. Concentrate the solution on a water bath then chill to yield yellow crystals of the perchlorate.

zinc perchlorate	chemical formula $Zn(ClO_4)_2$	melting point 106 °C	molecular mass 264.27 g/mol	density 2.252 g/mL

The hexahydrate of zinc perchlorate can be prepared by mixing solutions of zinc sulfate and barium perchlorate, filtering off the precipitate of barium sulfate, and evaporating the solution until crystals appear. It can also be prepared by zinc oxide, or zinc carbonate, in aqueous perchloric acid and evaporating the solution until crystals appear.

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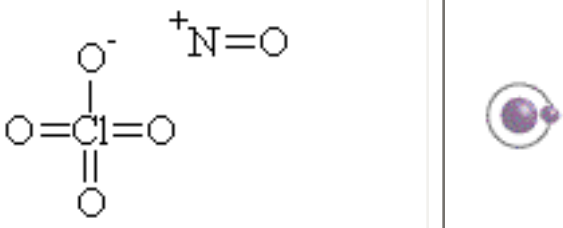
Nitrosyl Perchlorate

melting point decomposes	boiling point ---	nitrosyl perchlorate	molecular mass 129.47 g/mol	density 2.169 g/mL
table key	sensitivity high	chemical formula $NOClO_4$	explosive velocity ? m/s	estimated cost $?.00/g



This rather unstable compound should be kept away from moisture, heat, and other organic liquids with with it will ignite or decompose. This substance has the appearance of white crystals that pull moisture from the air. It will decompose on heating and will react with water forming harmful nitrogen oxide, NO_x, compounds. This substance was first prepared in 1909 by the scientists K.A. Hoffman and A. vonZedtwitz.

CHEMICALS	APPARATUS
nitric oxide	bubbler
nitrogen dioxide	Erlenmeyer flask
perchloric acid	vacuum desiccator
phosphorus pentoxide	

Nitrosyl perchlorate can be prepared by passing a mixture of nitric oxide gas and nitrogen dioxide gas into 72% perchloric acid in an Erlenmeyer flask. The use of a bubbler can increase the amount of gas that reacts with the acid. Evaporate the resulting mixture until the temperature rises to 140 °C and dense white fumes are evolved, then cool. Over times crystals will precipitate, filter to collect them. The product can be dehydrated in a vacuum desiccator over phosphorus pentoxide in the desiccator.

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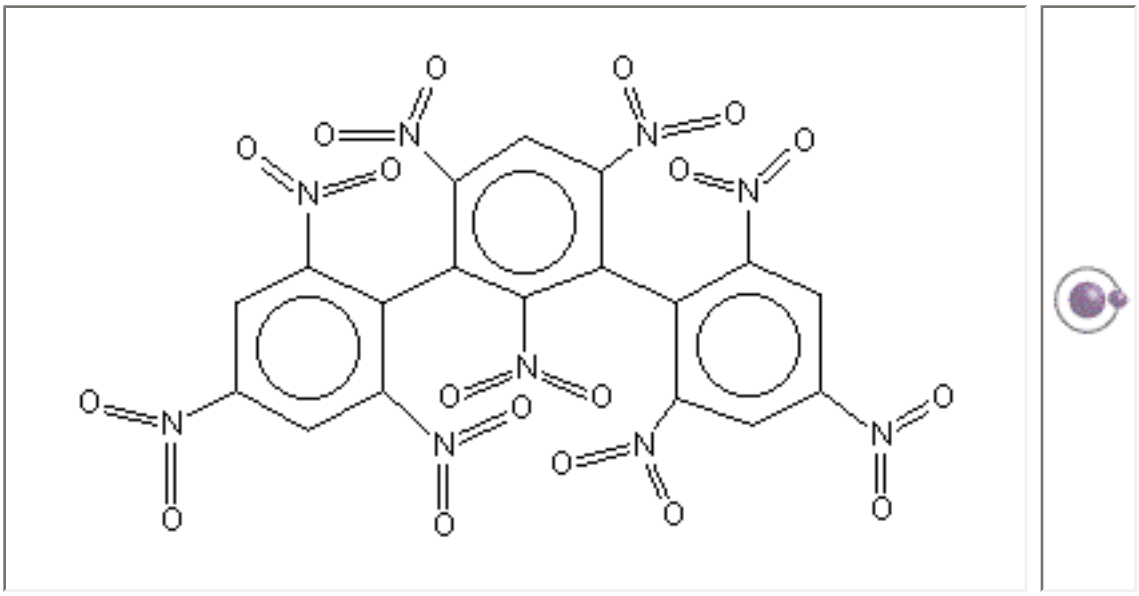
NONA

melting point decomposes at 440 °C	boiling point ---	NONA	molecular mass 635.31 g/mol	density 1.78 g/mL
table key	sensitivity high	chemical formula $C_{18}H_5N_9O_{18}$	explosive velocity ? m/s	estimated cost $?.00/g



NONA is an acronym for nonanitroterphenyl. The more scientific names of 2,2',2",4,4',4",6,6',6"-nonanitroterphenyl and 1,1':3',1"-terphenyl, 2,2',2",4,4',4",6,6',6"-nonanitro- have also been used. This substance has the appearance of light yellow crystals. Although its stability to shock and friction is not very high, it has good thermal stability and low volatility. This substance has found a use as a booster explosive in space applications. This information was classified, but now it is free.

CHEMICALS	APPARATUS
copper	500-mL Florence flask
1,3-dichloro-2,4,6-trinitrobenzene	funnel
infusorial earth	graduated cylinder
nitrobenzene	magnetic stirrer

picryl chloride

silicic acid

toluene

Prepare a glassware setup for addition and refluxing with a round bottomed 500-mL Florence flask. Dissolve 30 g of thoroughly dried picryl chloride in 50 mL of anhydrous nitrobenzene in the flask. Gently heat the solution to reflux. Prepare a mixture of 5.6 g of 1,3-dichloro-2,4,6-trinitrobenzene and 13 g of electrolytic copper dust. This mixture will need to be constantly stirred to keep the copper in solution homogenous, add it from the addition funnel over a 15 minute period. Continue refluxing for an additional 10 minutes, then filter the solution while it is still hot. Wash the inorganic residue on the filter with several small portions of hot nitrobenzene. The filtrate and washings should then be concentrated on an oil bath under reduced pressure to a thick syrup. Add 350 mL of toluene and reflux the mixture for 15 minutes. Filter the hot liquid, the dark brown residue, about 8 g, should be suspended in 350 mL of toluene, and the mixture refluxed again for 15 minutes, and filtered while hot. The residue on the filter should be a brown powdery solid weighing about 5.5 g after drying in air. The combined filtrates and washings are filtered through a 3 inch pad of silicic acid on a 90-mm sintered glass funnel, and the absorbent pad is washed with toluene until a bright yellow band has moved near the bottom of the filter. The filtrate is evaporated to dryness, the residue is added to 300 mL of toluene and refluxed for 15 minutes and filtered. The product recovered on the funnel should be a tan crystalline material. This material is purified in two portions by chromatography on silicic acid-infusorial earth, yielding about 2.0 g of a light yellow crystalline solid that if there is any decency in the world will be NONA. You will need a graduated cylinder for measuring liquids, and a magnetic stirrer for mixing.

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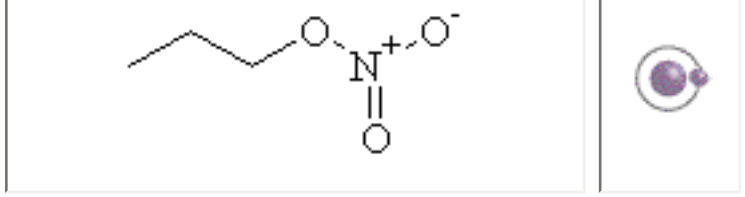
NPN

melting point -100 °C	boiling point 110.5 °C	NPN	molecular mass 105.09 g/mol	density 1.0538 g/mL
table key	sensitivity very low	chemical formula $CH_3CH_2CH_2ONO_2$	explosive velocity 5100 m/s	estimated cost $?.00/g



NPN is an acronym for n-propyl nitrate, it also has the names propyl nitrate; monopropyl nitrate; 1-propyl nitrate; and propyl ester of nitric acid. This substance is a watery white liquid that is extremely toxic if inhaled. It is very stable, it can be knocked around for a good bit before detonating, but increasing the temperature will increase the sensitivity. This substance can be detonated while vaporized making it a good fuel-air explosive, The maximum detonation velocity that can be achieved is 1,900 m/s at 21% concentration in air. Anything more or less will have a lower velocity and is thus less powerful. NPN has found many uses in industry, the list includes: rocket propellent, jet motor starting fuel, turbine motor fuel, a degreasing solvent for iron and aluminum, and a diesel fuel additive just to name a few.

CHEMICALS	APPARATUS
ethyl acetate	stirrer/stirring rod
isopropyl alcohol	thermometer
nitric acid	
n-propyl alcohol	
sodium carbonate	
sulfuric acid	

NPN can be prepared by reacting n-propyl alcohol with 70% nitric acid dissolved in ethyl acetate. During the reaction the temperature must be kept at 20 °C, the product can then be extracted by distillation.

NPN can also be prepared by reacting a continuous stream of propyl alcohol below the surface of a stirred mixed acid composed of 20% nitric acid, 68% sulfuric acid, and 12% by weight of water in an open stainless steel vessel cooled to 0-5 °C. Additional mixed acid is also simultaneously introduced at about a third of the depth of the liquid. An overflow pipe maintains a constant reactant level and the effluent product is separated, washed with aqueous 10% sodium carbonate solution, and dried by passage through a Filtrol packed tower with 50% isopropyl alcohol as the solvent at 0 °C. Yield is about 66.5%. Sorry, I have no volumes to give you. You will need a stirring rod or magnetic stirrer for mixing and a thermometer to monitor the temperature.

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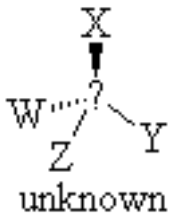
NTN

melting point -58 °C	boiling point 100 °C	NTN	molecular mass ---	density 1.269 g/ml
table key	sensitivity high	chemical formula ---	explosive velocity ? m/s	estimated cost $?.00/g



NTN is not an explosive compound but rather an explosive mixture. Although I don't particularly care about mixtures, this one intrigues me because it is a liquid explosive. This substance is a clear to light yellow homogeneous liquid that is somewhat sensitive to shock and friction but stable in the open air.

CHEMICALS	APPARATUS
nitromethane	
1-nitropropane	
tetranitromethane	

NTN is composed of a mixture of 51.7% nitromethane, 33.2% tetranitromethane, and 15.1% 1-nitropropane. Percentages are by weight.

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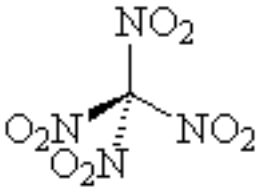
Tetranitromethane

melting point 13.8 °C	boiling point 125.7 °C	tetranitromethane	molecular mass 196.04 g/mol	density 1.62294 g/cc
table key	sensitivity low	chemical formula $C(NO_2)_4$	explosive velocity ? m/s	estimated cost $?.00/g



Tetranitromethane, also called TeNMe, is a colorless to pale yellow liquid that was first prepared by the action of nitric acid on trinitromethane back in 1861. The Germans used it back in WWII for an intermediate in making other explosives and as a substitute for nitric acid in the V-2 rocket. A pilot plant in New Jersey used to make tetranitromethane blew up in 1953. This compound is rather toxic, irritating the skin, mucous membranes and the respiratory tract. Prolonged exposure to vapors causes damage to the liver, kidneys, and other organs. A concentration of 0.1 ppm in the air is fatal. Mixtures of tetranitromethane with organic liquids tend to form more powerful explosives, but the sensitivity is worse. A list of mixtures has been provided. Tetranitromethane has been proposed as a chemical warfare agent.

CHEMICALS	APPARATUS
acetic anhydride	addition funnel
nitric acid	beaker
sodium hydroxide	Clasien adapter
sodium sulfate	desiccator
water	250-ml Florence flask
	graduated cylinder

thermometer

This reaction will produce toxic fumes, so take the necessary precautions. Measure out 21 mL of 100% nitric acid into a round-bottomed 250-ml Florence flask. It is important to only use anhydrous acid and no more than the amount proscribed, any deviation will drastically lower the yield of this reaction. Place a Clasien adapter on the flask and attach a thermometer on the straight arm, almost touching the bottom of the flask, and an addition funnel on the side arm. In this instance do not use a thermometer adapter to connect the thermometer, there must be a gap to allow reaction gasses to escape.

Cool the contents of the flask to 10 °C in an ice water bath. Slowly add 47.2 mL of acetic anhydride in portions of 0.5 mL at a time from the buret. Do not let the temperature of the mixture rise above 10 °C during the addition, failure to maintain the temp may result in a dangerous runaway reaction. After the first 5 mL of acid has been added the reaction should have calmed down enough where you can begin to add larger portions of 1 to 5 mL at a time with constant shaking.

After all the acetic anhydride has been added, everything is removed from the flask. The neck of the flask is wiped clean with a towel, the flask is then covered with an inverted beaker, and it is now allowed to come up to room temperature in the ice bath. It is important to keep the flask in the ice bath because the reaction can still become dangerous if it is allowed to warm up too rapidly. The flask should be left alone for 1 week (yes, 7 days) at room temperature.

After sitting for a week the contents are mixed with 300 mL of water in a 500-mL Florence flask. The tetranitromethane is removed by steam distillation, the tetranitromethane passes over with the first 20 mL of the distillate. The lower layer of the distillate is separated, washed with dilute sodium hydroxide, and then water, and finally dried over anhydrous sodium sulfate in a desiccator. Yield is 14–16 g, or about 57-65%. Do not distill tetranitromethane by ordinary distillation means, it may explode. The residues of distillation are especially dangerous. Use only steam distillation, and even then be careful. You will need a graduated cylinder for measuring liquids.

Explosive mixtures with organic compounds

Tetranitromethane can be mixed with several compounds including benzene, ethylene glycol, gasoline, naphthalene, and toluene, but the resulting explosive may be rather sensitive to detonation. Here are some mixing ratios:

- 87:13 mixture of benzene and TeNMe
- 1:1 mixture of ethylene glycol and TeNMe
- varying amounts of gasoline or diesel mixed with TeNMe are powerful but very sensitive, I suspect that the more TeNMe there is the more sensitive it will be
- 1 mole naphthalene to 2 moles TeNMe
- 4 moles of nitromethane to 1 mole TeNMe
- mixing 10-40% paraffins and 60-90% TeNMe will make powerful explosives that are resistant to mechanical shock but detonate by explosive shock
- mixing with toluene creates a very powerful explosive (>8000 m/s) that is more unstable than

nitroglycerine

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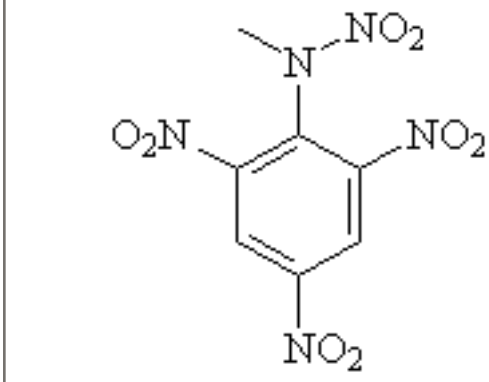
Tetryl

melting point 130 °C	boiling point explodes at 180°C	tetryl	molecular mass 287.15 g/mol	density 1.57 g/mL
table key	sensitivity medium	chemical formula $C_7H_5N_5O_8$	explosive velocity 7260 m/s	estimated cost $?.00/g



Tetryl has a variety of names including nitramine; N-methyl-N,2,4,6-tetranitrobenzenamine; N-methyl-N,2,4,6-tetranitroaniline; picrylmethylnitramine; picrylnitromethylamine; 2,4,6-trinitrophenylmethylnitramine; tetralite; and pyronite. Tetryl is a stable explosivecapablee of being handledreasonablyy safe, yet it is still sensitive enough to be used in blasting caps or booster charges. It was first developed in 1889 by the scientists Michler and Meyer and studied in some detail thereafter. It can be heated either in the open or in solvents causing mere decomposition, usually to picric acid. Tetryl is more powerful then even TNT, although the lesser stability compared to TNT makes it less attractive to the military. You must keep tetryl in the dark and away from the skin, it will stain skin and hair yellow as well as cause itching or worse.

CHEMICALS	APPARATUS
benzene	500-mL beaker
N,*N*-dimethylaniline	500-mL Erlenmeyer flask
ethyl alcohol	graduated cylinder

nitric acid	magnetic stirrer
sulfuric acid	separatory funnel
water	thermometer

Prepare a solution of 20 mL of *N,N*-dimethylaniline and 130 mL of 99-100% sulfuric acid in a 500-mL beaker placed in a salt-ice bath. Keep the temperature below 25 °C while mixing this solution. Pour the solution into a separatory funnel and slowly add it, drop by drop, to a 500-mL Erlenmeyer flask containing 160 mL of 80% nitric acid that has been previously heated to 55-60 °C. During the addition, stir continually with a magnetic stirrer, and maintain the temperature between 65-70 °C. The addition should require about 1 hour. After the addition, continue stirring and maintain the temperature at 65-70 °C for an additional hour. Allow the mixture to cool to room temperature and the crystals of tetryl to precipitate. Decant as much of the acid as possible and drown the remaining crystals with water. Filter to collect the crystals and wash thoroughly with water to remove traces of acid. Add the washed crystals to a beaker of 240 mL of water and boil for 1 hour, continually add water to replace any that boils away, maintaining a constant volume. Again filter to collect the tetryl, add the crystals to a beaker and add enough water to cover the surface, grind these crystals to as fine a paste as possible. Add water equal to twelve times the weight of the crystals and boil for 12 hours. Repeat this with a fresh batch of water and boil for another 4 hours. Filter to collect the crystals and allow them to dry. After drying, add just enough benzene to dissolve the crystals then filter to remove any undissolved impurities. Allow the benzene to evaporate then recrystallize the tetryl residue from ethyl alcohol. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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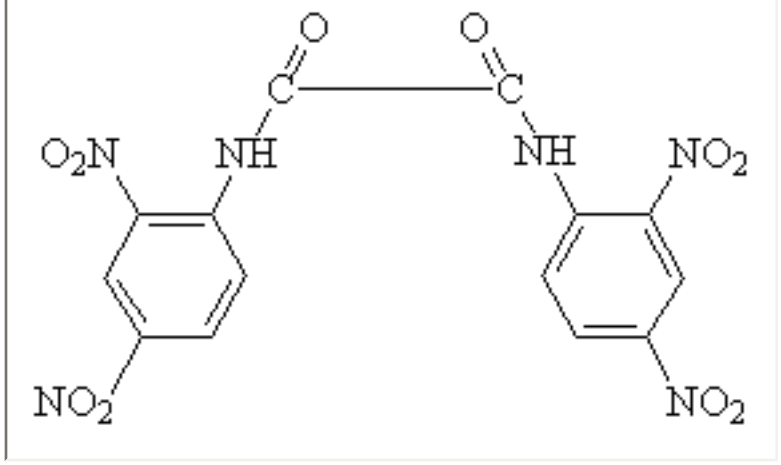
TNO

melting point decomposes at 313 °C	boiling point ---	TNO	molecular mass 420 g/mol	density ? g/mL
table key	sensitivity low	chemical formula $C_{14}H_8N_6O_{10}$	explosive velocity ? m/s	estimated cost $?.00/g



TNO stands for 2,4,2,4-tetranitro-oxanilide. This substance is fairly stable, being able to resist shock, friction, and heat. It is primarily used as a component in pyrotechnical devices or in gunpowder formulations. It was first prepared in 1892 when A.G. Perkins heated oxanilide powder in nitric acid. I believe this lab procedure hails from an anonymous work in 1971.

CHEMICALS	APPARATUS
acetone	500-mL Florence flask
ethyl alcohol	graduated cylinder
nitric acid	stirrer/stirring rod
oxanilide	thermometer
water	

Measure out 100 mL of 98% nitric acid into a round bottomed 500-mL Florence flask. Place the flask into a salt-ice bath to provide cooling. While stirring rapidly, slowly add 50 g of oxanilide while the temperature is maintained below 40 °C. After the addition of the oxanilide is completed (addition should take 2.5-3 hours), the agitation is continued for 10-15 minutes. The flask is now transferred to a water bath where the temperature is then raised to 80 °C over a period of 1 hour and maintained at 80-85 °C for 3 hours. The acid slurry is then cooled to room temperature and drowned by pouring over cracked ice. The product is filtered on a Buchner funnel and washed with water until it is almost acid free. The filter cake is placed in a beaker and sufficient water added to form a slurry. Steam is run into the slurry under agitation for 10 minutes. The slurry is filtered and the residue washed. The latter treatment of the slurry is repeated until the wash water is found to be neutral to litmus paper. The TNO is washed with ethyl alcohol, then acetone, dried in the air, and finally dried at 100-110 °C. Yield is 90-97% of the theoretical. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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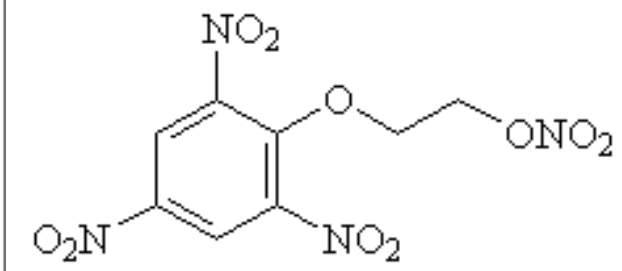
TNPEN

melting point 104.5 °C	boiling point ignites over 104 °C	TNPEN	molecular mass 318.16 g/mol	density 1.25 g/mL
table key	sensitivity medium	chemical formula $(O_2N)_3C_6H_2OCH_2CH_2(ONO_2)$	explosive velocity appx 6000 m/s	estimated cost $?.00/g



TNPEN is an acronym for ß-(2,4,6-trinitrophenoxy) ethanol nitrate, also called 2,4,6-trinitrophenoxyethyl nitrate; or glycoltrinitrophenylether nitrate. TNPEN was first prepared by H.A. Lewis back in 1925, others have since revised the method, with this particular preparation developed by R.C. Elderfield in 1943. TNPEN will ignite when heated in the open and will detonate if struck as if by a hammer, so its stability is not that low, compared to TNT it is as stable and has 122% the explosive power. There is some conflicting data that indicates the stability may be lower. The recommended uses of this explosive are in detonators or boosters, and as an ingredient in propellents. The detonation velocity ranges from 5500 m/s to 6600 m/s depending on the density which can range from 1.15 g/mL to 1.6 g/mL

CHEMICALS	APPARATUS
acetone	beaker
ß-(2,4-dinitrophenoxy) ethanol	250-mL Florence flask
ethyl alcohol	graduated cylinder
nitric acid	glass filter paper
sulfuric acid	stirrer/stirring rod
water	thermometer

Prepare a solution of 10 g of ß-(2,4-dinitrophenoxy) ethanol in 55 mL of 94% sulfuric acid in a small beaker. Prepare a second solution of 21.5 mL of sulfuric acid, 13.2 mL of nitric acid, and 15.7 mL of water in a round bottomed 250-mL Florence flask, chill this solution to between 0-10 °C with a salt-ice bath. It does not matter what concentration of acids are mixed so long as the total water content comes out to 15.7 mL. While stirring, slowly add the ß-(2,4-dinitrophenoxy) ethanol solution to the cold acid mix. When the addition is complete, the temperature is raised in 30 minute intervals to 20 °C, 30 °C, 40 °C, 60 °C, and in a 15 minute interval to 70 °C. After chilling, the cream-colored crystals are filtered using glass filter paper, washed free of acid, and recrystallized by dissolving in acetone and adding ethyl alcohol. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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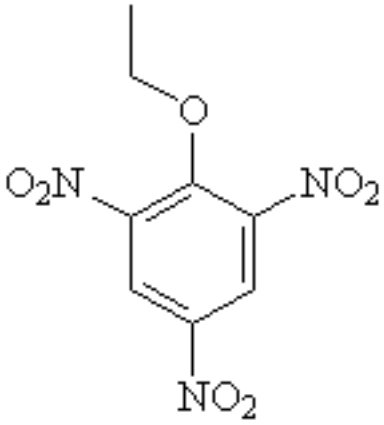
TNPht

melting point 78 °C	boiling point ? °C	TNPht	molecular mass 257.16 g/mol	density 1.5 g/mL
table key	sensitivity medium	chemical formula $C_8H_7N_3O_7$	explosive velocity 6880 m/s	estimated cost $?.00/g



TNPht is also known as ethyl picrate; aethyl-[2,4,6-trinitrophenyl]-ather; pikrinsaureaethylather, or aethylpikrat in German; keineyaku, or keyneyaku in Japanese. The proper scientific name for this substance is 2,4,6-trinitrophenetole. This explosive is almost as powerful as TNT but its sensitivity is not all that great. This explosive would be classified as a booster, it needs a detonator to set it off and then it would set off a high explosive. This material was tested in France during WWI in shells as a bursting charge. The Japanese used it during WWII as a substitute for TNT because they had a shortage of toluene. This lab was developed by L. Desvergnes around 1922.

CHEMICALS	APPARATUS
2,4-dinitrophenetole	500-mL beaker
nitric acid	graduated cylinder
sulfuric acid	stirrer/stirring rod
water	thermometer

Dissolve 53 g of 2,4-dinitrophenetole in 95 mL of 95-98% sulfuric acid in a 500-mL beaker while stirring. Add 62% nitric acid so that the temperature rises rapidly to 30 °C. Continue the addition, while maintaining the temperature between 30-40 °C by cooling with a salt-ice bath, until a total of 30 mL of nitric acid has been added. Pour the resulting yellow slurry into about 1500 mL of cold water, filter to collect the crystals, wash the crystals with cold water, and dry. There should be about 61.8 g of product, or 96% of the theoretical yield. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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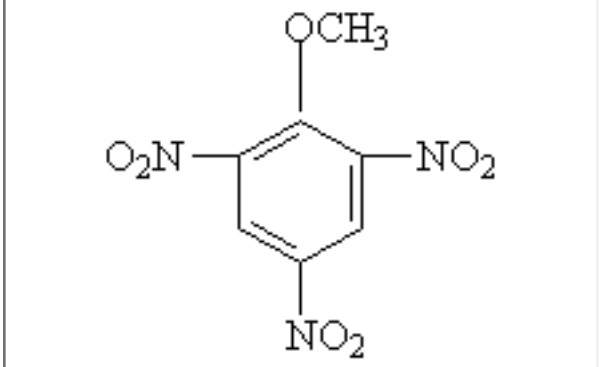
Trinitroanisol

melting point 67 °C	boiling point decomposes at 165 °C	trinitroanisol	molecular mass 243.13 g/mol	density 1.60 g/mL
table key	sensitivity high	chemical formula $C_7H_5N_3O_7$	explosive velocity 7640 m/s	estimated cost $?.00/g



Trinitroanisol, also known as 2,4,6-trinitroanisol; 2,4,6-trinitrophenyl methyl ether; and methyl picrate, is a somewhat sensitive explosive compound similar to picric acid, with the exception that it does not form dangerous salts with metals. It is stable at elevated temperatures, being meltable, but it is detonated by shock and friction. The melting point of this compound is rather low which helps when filling shells and blasting caps, but I would not recommend melting explosives at all unless you know what you are doing. Trinitroanisol was first prepared back in 1849 by one Dr. Cahours via the direct nitration of anisol, the du Pont and Maxim companies were the first to suggest using it as an explosive around 1904. Trinitroanisol say heavy use during WWI, but due to its tenancy to change to picric acid acid from moisture in air, it was used only sparingly by WWII. Other methods of preparation include the interaction of methyl iodide and silver picrate, the nitration of anisic acid, and of course the method developed by Dr. Jackson in 1898 listed below. Trinitroanisol is highly toxic! Symptoms of poisoning include headache, weakness, loss of appetite, gastric disturbance, and irritation of the mucous membrane of the upper respiratory tract. Contact with skin can cause redness, peeling, and blistering. Wear protective clothing and respirators at all times if possible.

CHEMICALS	APPARATUS
hydrochloric acid	50-mL beaker

methyl alcohol	500-mL Florence flask
picryl chloride	graduated cylinder
sodium hydroxide	stirrer/stirring rod
water	thermometer

Add 35 g of picryl chloride to 400 mL of methyl alcohol in a round-bottomed 500-mL Florence flask. Set this flask up for refluxing and reflux until all of the picryl chloride has dissolved, then allow the solution to cool to 30-35 °C. Prepare a solution of 23 g of sodium hydroxide and 35 mL of water in a 50-mL beaker. Slowly pour the sodium hydroxide solution into the flask through the reflux condenser, allow the mixture to cool if it begins to boil before adding more. Allow the flask to sit for 1-2 hours, red crystals should have precipitated. Filter the mixture to collect the crystals, wash them with methyl alcohol, and stir into a small beaker of water. Slowly add concentrated hydrochloric acid to the beaker until the red color disappears. A precipitate of yellow or white crystals should form. Filter these crystals to collect them, wash with water to remove sodium chloride, allow to dry, then recrystallize the crystals from methyl alcohol. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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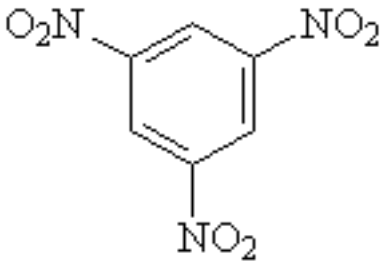
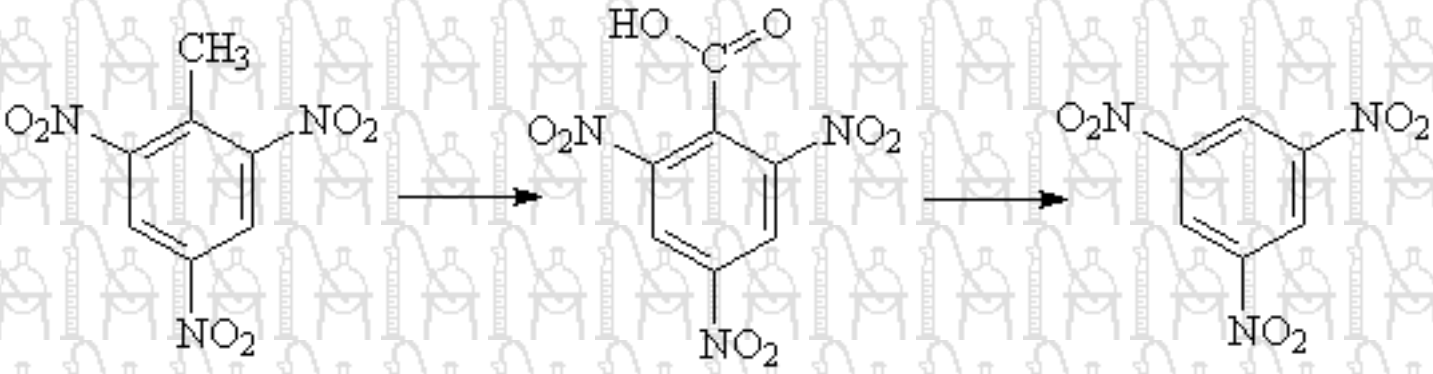
Trinitrobenzene

melting point 122.5 °C	boiling point ---	trinitrobenzene	molecular mass 213.11	density 1.76 g/cc
table key	sensitivity very low	chemical formula $C_6H_3N_3O_6$	explosive velocity 7000 m/s	estimated cost $?.00/g



1,3,5-trinitrobenzene, also known as sym-trinitrobenzene; s-trinitrobenzene; trinitrobenzeen; trinitrobenzene; trinitrobenzol; benzite; Rcra waste number U234; or just TNB, is a stable high explosive compound with slightly greater explosive force than TNT. There are two other isomers of trinitrobenzene, namely 1,2,4- and 1,2,3- , but they are less stable and harder to form. Trinitrobenzene is very poisonous, causing severe skin irritation, so it is best to use every precaution when handling it. The good qualities of trinitrobenzene are its high stability, great explosive power, and low sensitivity to friction and impact. On the down side, this procedure is not exactly an economical choice since it uses perfectly good TNT as the main ingredient. This procedure is a variant of the original that dates back to 1893 when the German scientists Tiemann, Claus, and Becker observed that trinitrotoluene can be oxidized with nitric acid to trinitrobenzoic acid, and the latter being readily decarboxylated to form sym-trinitrobenzene:



trinitrotoluene trinitrobenzoic acid 1,3,5-trinitrobenzene

This lab substitutes sulfuric acid and a chromium compound for nitric acid, the reaction is the same either way. There are other methods of forming TNB but this procedure is the easiest and has the highest yield.

CHEMICALS	APPARATUS
sodium dichromate	500-mL beaker
sulfuric acid	small beaker
trinitrotoluene	graduated cylinder
water	stirrer/stirring rod
	thermometer

Prepare a mixture of 30 g of purified trinitrotoluene and 300 mL of 95-100% sulfuric acid in a tall 500-mL beaker. Slowly add, with stirring, powdered sodium dichromate in small portions, do not allow any lumps to form or powder to rise to the surface. When the temperature of the mixture reaches 40 °C, place the baker into a cold water bath. Continue adding dichromate, while stirring, until a total of 45 g has been added, maintain the temperature between 40-50 °C at all times. After the addition, continue stirring and maintaining the temperature between 40-50 °C for 2 hours. After this time, allow the mixture to cool undisturbed to room temperature over a 12 hour period. Crystals of trinitrobenzoic acid should have formed. Decant off as much of the acidic liquid as possible, then drown the crystals in water. Filter the crystals to collect them, wash with cold water, then transfer them to a small beaker. Add just enough 50 °C water to dissolve the crystals. Filter this solution hot to remove any undissolved impurities, then boil it until no more crystals precipitate. Allow the solution to cool, filter to collect the crystals, then wash them with water. These should be colorless to greenish yellow crystals of trinitrobenzene. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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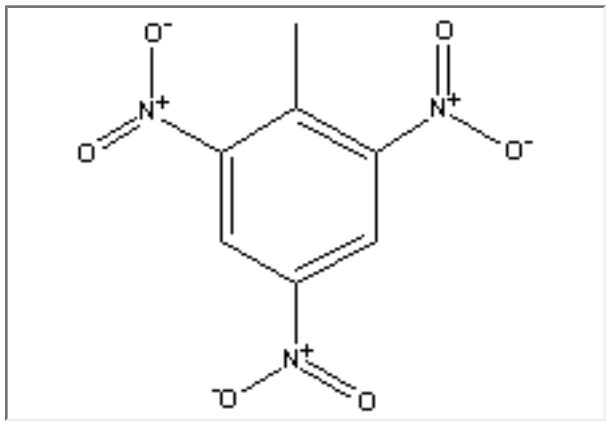
Trinitrotoluene

melting point 80.1 °C	boiling point ignites at 295 °C	trinitrotoluene	molecular mass 227.13 g/mol	density 1.654 g/mL
table key	sensitivity very low	chemical formula $C_7H_5N_3O_6$	explosive velocity 7028 m/s	estimated cost $?.00/g



2,4,6-trinitrotoluene, or just TNT, is the oft used military and industrial explosive that may be the among the best recognized explosive around. Other names for TNT include: trinitrotoluol; sym-trinitrotoluene; a-trinitrotoluol; 2-methyl-1,3,5-trinitrobenzene; entsufon; 1-methyl-2,4,6-trinitrobenzene; methyltrinitrobenzene; tolite; trilit; s-trinitrotoluene; s-trinitrotoluol; trotyl; sym-trinitrotoluol; alpha-trinitrotoluol; tolite; triton; tritol; trilite; tri; tutol; trinol; füllpulver 1902; Fp02; tritolo; trillit; tolita; tol; and trotil. TNT was first synthesized in 1863 by a scientist named Wilbrand who treated toluene with sulfuric and nitric acid at near boiling temperatures. Although there are several isomers of trinitrotoluene, only the 2,4,6- isomer is of importance. Pure TNT is in the form of small columns or needles and is insoluble in water. It is quite stable, being meltable ,or able to act like a plastic at around 50 °C. TNT can even be boiled although the experiments did this under reduced pressure (50mm Hg) to lower the boiling point to around 245 °C. The normal detonation temperature is 333 °C, the calculated boiling point at normal atmospheric pressure is 345 °C, so don't do it. Some experiments have determined that the presence of foreign material like 1.9% of Fe_2O_3 will lower the amount of time it takes for TNT to explode once it reaches its critical temperature, or 295 °C, the temperature at which decomposition begins. Also, mixing pure sulfur with TNT will lower the initiation temperature and increase the explosive power. For example, pure TNT explodes at 333 °C, 5% sulfur explodes at 304 °C, 10% sulfur at 294 °C, 20% sulfur at 284 °C, and 30% sulfur at 275 °C. The increase in explosive power is gained through the addition of 5-10% sulfur. Because the stability of TNT is so great, it is harder to

detonate it, the sensitivity increases somewhat above 80º C, but is still rather low even when molten. A powerful blasting cap, or booster charge, will be needed to detonate TNT. This lab is carried out in three separate operations, forming mononitrotoluene, then dinitrotoluene, and finally trinitrotoluene.

CHEMICALS	APPARATUS
ethyl alcohol	100/500/600-mL beaker
nitric acid	Buchner funnel
sodium bisulfite	graduated cylinder
sulfuric acid	pipet/buret
toluene	separatory funnel
water	stirrer/stirring rod
	thermometer

Prepare a nitrating solution of 160 mL of 95% sulfuric acid and 105 mL of 75% nitric acid in a 500-mL beaker set in a salt-ice bath. Mix the acids very slowly to avoid the generation of too much heat. Allow the mixture to cool to room temperature. The acid mixture is slowly added dropwise, with a pipet or buret, to 115 mL of toluene in a 600-mL beaker while stirring rapidly. Maintain the temperature of the beaker during the addition at 30-40 °C by using either a cold water or salt-ice bath. The addition should require 60-90 minutes. After the addition, continue stirring for 30 minutes without any cooling, then let the mixture stand for 8-12 hours in a separatory funnel. The lower layer will be spent acid and the upper layer should be mononitrotoluene, drain the lower layer and keep the upper layer.

Dissolve one-half of the previously prepared mononitrotoluene and 60 mL of 95% sulfuric acid in a 500-mL beaker set in a cold water bath. Prepare a nitrating solution of 30 mL of 95% sulfuric acid and 36.5 mL of 95% nitric acid in a 100-mL beaker. Preheat the beaker of mononitrotoluene to 50 &Deg;C. Very slowly add the nitrating acid to the beaker of mononitrotoluene, with a pipet or buret, drop by drop while stirring rapidly. Regulate the rate of addition to keep the temperature of the reaction between 90-100 °C. The addition will require about 1 hour. After the addition, continue stirring and maintaining the temperature at 90-100 °C for 2 hours. If the beaker is allowed to stand, a layer of dinitrotoluene will separate, it is not necessary to separate the dinitrotoluene from the acid in this step.

While stirring the beaker of dinitrotoluene, heated to 90 °C, slowly add 80 mL of 100% fuming sulfuric acid, containing about 15% SO_3, by pouring from a beaker. Prepare a nitrating solution of 40 mL of 100% sulfuric acid, with 15% SO_3, and 50 mL of 99% nitric acid. Very slowly add the nitrating acid to the beaker of dinitrotoluene, with a pipet or buret, drop by drop while stirring rapidly. Regulate the rate of addition to keep the temperature of the reaction between 100-115 °C. It may become

necessary to heat the beaker after three-quarters of the acid has been added in order to sustain the 100-115 °C temperature. The addition will require about 90-120 minutes. Maintain the stirring and temperature at 100-115 °C for 2 hours after the addition is complete. Allow the beaker to sit undisturbed for 8-12 hours, it should form a solid mass of trinitrotoluene crystals. Pour the contents of the beaker over a Buchner funnel without any filter paper to collect the bulk of the crystals, save the acidic filtrate as well. Break up the collected crystals and wash them with water to remove any excess acid. Add the collected acid and wash filtrates to a large volume of water, this will cause any remaining trinitrotoluene to precipitate. Decant off as much of the water as possible and combine these crystals with the previous ones on the funnel. Drown the crystals in a large volume of water, filter to collect them, and wash several times with water. Wash the crystals by adding them to a beaker of water, heat the water enough to melt the crystals while stirring rapidly. Repeat the melting and stirring with a fresh batch of water three or four times to wash thoroughly. After the last washing, the trinitrotoluene is granulated by allowing it to cool slowly under hot water while the stirring is continued. Filter to collect the crystals and allow to dry. The TNT can be further purified by recrystallizing from ethyl alcohol, dissolve the crystals in 60 °C and allow the solution to cool slowly. A second method of purification is to digest the TNT in 5 times its weight of 5% sodium bisulfite solution heated to 90 °C while stirring rapidly for 30 minutes. Wash the crystals with hot water until the washings are colorless, then allow the crystals to granulate as before. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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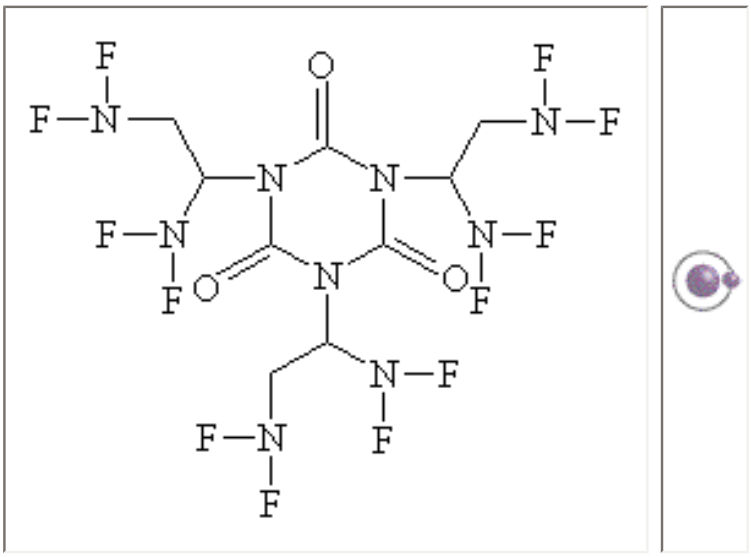
Tris[1,2-Bis (Difluoramino)-Ethyl] Isocyanurate

melting point 48 °C	boiling point ? °C	tris[1,2-bis (difluoramino)-ethyl] isocyanurate	molecular mass 519.261 g/mol	density ? g/mL
table key	sensitivity low	chemical formula $C_9H_9N_9O_3F_{12}$	explosive velocity ? m/s	estimated cost $?.00/g



This explosive seems somewhat complected to synthesize because of the necessity for a pressurized reaction vessel, it can be done however. This material is insensitive to friction and heat as well as being rather hard to detonate from shock. This substance has found uses as both an explosive and as a rocket propellent. One of the nifty things about this material when it is being used as a propellent is the ability for the motor to be stopped and restarted when needed, this is usually the domain of liquid propellents.

CHEMICALS	APPARATUS
chloroform	graduated cylinder
tetrafluorohydrazine	thermometer
trivinyl isocyanurate	

Preparation is by reacting tetrafluorohydrazine under an initial pressure of 13.6 atm with 3 g of trivinyl isocyanurate in 75 mL of chloroform. The mixture is then heated to 125 °C and the reaction is continued at this temp for 32 minutes at a pressure of 20.75 atm. At the end of the 32 minutes the reaction vessel is cooled, vented, and the chloroform is distilled off. You will need a graduated cylinder for measuring liquids, a thermometer to monitor the temperature, and a steel reaction vessle capable of holding well over 21 atm of pressure. This is not your standard lab item.

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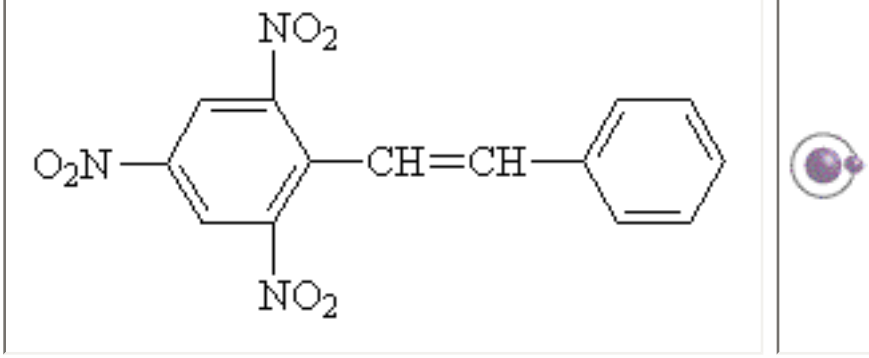
Trinitrostilbene

melting point 158 °C	boiling point ---	trinitrostilbene	molecular mass 159 g/mol	density ? g/mL
table key	sensitivity unknown	chemical formula $C_{14}H_9N_3O_6$	explosive velocity ? m/s	estimated cost $?.00/g



I do not have much information about this explosive other than how it can be prepared. This has been include as an informational curiosity only. Since I do not have any safety information, assume it is very sensitive. I suspect it has similar properties to TNT.

CHEMICALS	APPARATUS
benzaldehyde	100-mL beaker
benzene	100-mL Florence flask
ethyl alcohol	graduated cylinder
piperidine	
trinitrotoluene	

Prepare a solution of 10 g of trinitrotoluene and 25 mL of benzene in a round-bottom 100-mL Florence flask. Add 6 mL of benzaldehyde and 0.5 mL of piperidine to this solution and reflux for 30 minutes on a steam bath. After refluxing, pour the still hot liquid into a 100-mL beaker and allow to

cool. Crystals of trinitrostilbene should begin to precipitate, once they are done filter to collect them and wash with twice with ethyl alcohol. Recrystallize the trinitrostilbene from a mixture of two parts ethyl alcohol and one part benzene. Filter the bright yellow crystals to collect them, and allow to dry. You will need a graduated cylinder for measuring liquids.

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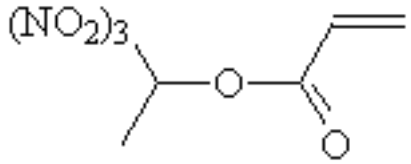
1,1,1-Trinitro-2-Propyl Acrylate

melting point ? °C	boiling point 50-60 °C	1,1,1-trinitro-2-propyl acrylate	molecular mass 249.16 g/mol	density ? g/mL
table key	sensitivity medium	chemical formula $C_6H_7N_3O_8$	explosive velocity ? m/s	estimated cost $?.00/g



I have not listed any volumes for the reactants involved in this substance because I do not have any. I suggest using a few milliliters or grams of each in equal proportions and an excess of water for the hydrolyzing step. 1,1,1-trinitro-2-propyl acrylate will detonate from shock and deflagrates (explodes but with less power) when heated. This material has the appearance of a pale yellow liquid. Note that the boiling temperature is in a near vacuum, not in standard atmospheric pressure. This lab was published anonymously in 1952.

CHEMICALS	APPARATUS
acrylyl chloride	500-mL Erlenmeyer flask
aluminum chloride	graduated cylinder
carbon tetrachloride	separatory funnel
paraldehyde	
sodium bicarbonate	
sodium chloride	
trinitromethane	
water	

Preparation is by refluxing for 30 minutes a mixture of trinitromethane, paraldehyde, and acrylyl chloride all dissolved in 50 mL of carbon tetrachloride with a little aluminum chloride added in. The reacted mixture is then hydrolyzed by adding water. The mixture will separate into two layers, the top is water and the bottom is carbon tetrachloride. Transfer the mixture to a separatory funnel and collect the bottom layer in a 500-mL Erlenmeyer flask. This carbon tetrachloride layer is neutralized with sodium bicarbonate solution, check with litmus to be sure. The neutral solution needs to be dried by pouring it into a clean separatory funnel then shaking with a saturated sodium chloride solution. Collect the bottom layer and vacuum distill the solution, the fraction that boils over is the explosive. The yield is about 25%. You will need a graduated cylinder for measuring liquids.

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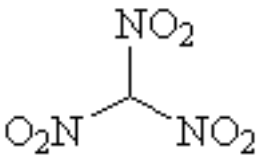
Trinitromethane

melting point 15 °C	boiling point decomposes at 25 °C	trinitromethane	molecular mass 151.04 g/mol	density 1.469 g/mL
table key	sensitivity low	chemical formula $CH(NO_2)_3$	explosive velocity ? m/s	estimated cost $?.00/g



Trinitromethane, also called nitroform or TNMe, is typically used as an intermediate in the manufacture of other explosive compounds. It was first prepared by the action of concentrated nitric acid on acetylene back in 1900 or so. The Germans experimented with this process on a large scale in WWII for TNMe as intermediates for other explosives. The Hercules Powder Co. has a trademark they call Nitroform®, it is an agricultural product designed to release nitrogen into soil, it is not trinitromethane. Since TNMe is very acidic, it tends to form various neutral explosive salts. Most of the salts are used as propellants or are too unstable to use. TNMe has 137% of power vs. TNT. Keep this compound stored in a sealed glass container at 0 °C.

CHEMICALS	APPARATUS
ethyl ether	1000-mL Florence flask
hydrogen chloride gas	glass filter paper
hydrogen peroxide	graduated cylinder
methyl alcohol	stirrer/stirring rod
potassium hydroxide	thermometer
tetranitromethane	

Prepare a solution of 168 g of potassium hydroxide in 350 mL of water in a round-bottomed 1000-mL Florence flask, and cool to 5 °C with a salt-ice bath. While stirring, add 108 mL of 30% hydrogen peroxide to the solution. Next, add 117 mL of tetranitromethane at a rate which keeps the temperature at 20-25 °C, add while stirring. The temperature is then allowed to rise to 30 °C over 15 minutes. The bright yellow solid, that should have formed, is filtered to collect it using glass filter paper because of its high acidity, washed with anhydrous methyl alcohol, then anhydrous ethyl ether, and finally air dried to give 100% of the potassium salt of trinitromethane. The salt is suspended in anhydrous ethyl ether and anhydrous hydrogen chloride gas is passed in until the yellow color disappears. The white precipitate of potassium chloride is filtered off and washed with anhydrous ethyl ether. The ethyl ether is evaporated from the filtrate and additional washings at reduced pressure give 85-90% of crude trinitromethane which can be purified by sublimation. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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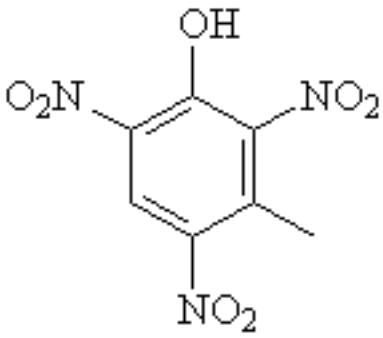
Trinitro-*m*-Cresol

melting point 107 °C	boiling point decomposes at 200 °C	trinitro-*m*-cresol	molecular mass 243.14 g/mol	density ? g/mL
table key	sensitivity medium	chemical formula $C_7H_5N_3O_7$	explosive velocity 6850 m/s	estimated cost $?.00/g



2,4,6-trinitro-*m*-cresol, or just trinitrocresol, is a rarely used explosive compound similar to picric acid in its chemical and physical properties. The only difference from picric acid is the addition of a methyl group to the benzene ring. This explosive has been developed most heavily by the French, they call it Cresilite. Trinitrocresol is best used as a booster explosive or a primary explosive mixed with other more sensitive compounds.

CHEMICALS	APPARATUS
m-cresol	100-mL Florence flask
nitric acid	graduated cylinder
sulfuric acid	thermometer
water	

Prepare a mixture of 20 mL of *m*-cresol and 33 mL of 99% sulfuric acid in a round-bottomed 100-mL Florence flask. Reflux the contents of the flask for 6 hours at 120 °C. After refluxing, slowly add 40 mL

of 52% nitric acid. During the addition, and for 3 hours afterward, keep the temperature at 100 °C by cooling and heating as necessary. After the 3 hours, cool the flask to 90 °C over a period of 20 minutes, then cool it to 70 °C over a period of 1 hour. Use either compressed air blowing into the liquid, or a salt-ice bath to regulate the temperature. Next, allow the flask to sit undisturbed for 12-15 hours where it can assume room temperature and begin to crystallize the trinitrocresol. After sitting, decant of as much of the acid as possible and drown the remaining crystals with water. Quickly filter to collect the crystals, wash them with a small amount of cold water. You should have yellow-brown crystals of trinitro-*m*-cresol. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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2,4,6-Trinitro-*m*-Phenylenediamine

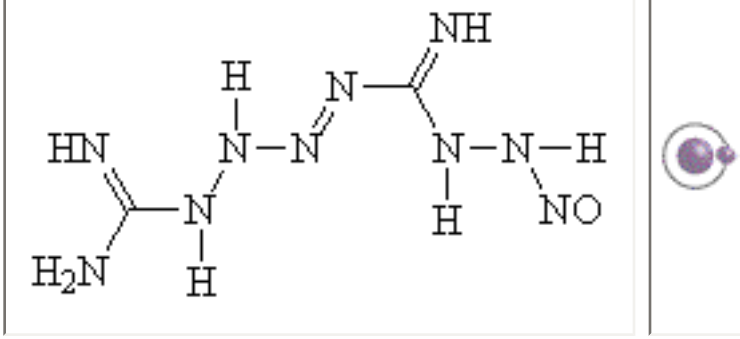
melting point 280 °C	boiling point decomposes at 301 °C	2,4,6-trinitro-*m*-phenylenediamine	molecular mass 243.14 g/mol	density ? g/mL
table key	sensitivity low	chemical formula $C_6H(NO_2)_3(NH_2)_2$	explosive velocity ? m/s	estimated cost $?.00/g

2,4,6-Trinitro-*m*-Phenylenediamine is very similar to TNT in both its explosive properties and chemical structure. This substance has gone by the name of 2,4,6-trinitro-1,3-diaminobenzene; 2,4,6-trinitrophenylenediamin-(1,3) in German; and 2,4,6-trinitrometaphenylenediamin in French. It was first prepared in 1884 by E. Nölting and A. Collin from esters of styphnic acid and ammonia. Many other procedures were tried over the years with different starting compounds until C.F. van Duin and B.C.R. van Lennep compiled all the others data around 1920 and developed the lab that I have reproduced here.

CHEMICALS	APPARATUS
ammonium hydroxide	200-mL beak in French. It wa5be.34ce

Tetracene

melting point explodes at 160 °C	boiling point ---	tetracene	molecular mass 188.76 g/mol	density 0.45 g/mL
table key	sensitivity high	chemical formula $C_2H_8N_{10}O$	explosive velocity ? m/s	estimated cost $?.00/g



1-guanyl-4-nitrosoaminoguanyltetrazene, more conveniently called tetracene, was first prepared back in 1910 by two scientists named Hoffmann and Roth. It is a colorless pale yellow, fluffy material with slight hygroscopic properties. It is stable at normal temperatures when wet or dry, but decomposes in boiling water. Tetracene is sensitive to friction, shock, and flame. Its brisiance is greatest when it has not been compacted, so this compound can easily become dead-pressed. Tetracene is not suited for blasting caps or alone as an explosive since it does not detonate itself very efficiently. It is best suited for booster charges or in blasting caps mixed with other explosives. It can only achieve is full explosive potential if detonated by another explosive charge. The only problem I have noted with this lab is the aminoguanidine bicarbonate used as the main ingredient. I have found no literature whatsoever to suggest that this substance exists although it is probably a rare analog of aminoguanidine reacted with a bicarbonate substance, and given a non IUPAC name.

CHEMICALS	APPARATUS
acetic acid	3-liter Florence flask
aminoguanidine bicarbonate	graduated cylinder
sodium nitrite	thermometer

water

Prepare a solution of 34 g of aminoguanidine bicarbonate and 12.5 mL of glacial acetic acid with 2500 mL of water in a 3-liter Florence flask. Gently warm the flask on a steam bath and shake periodically until everything is completely dissolved into solution. The solution should be filtered to remove any impurities that may have not dissolved, then cooled to 30º C by running cold water from the faucet over the flask. It is necessary to filter the solution if there are impurities present. Add 27.6 g of sodium nitrite to the solution while swirling to dissolve it. Set the flask aside at room temperature for 3 or 4 hours then shake it vigorously to start precipitation of the product. Let the flask stand for another 20 hours. After standing, decant as much of the solution off as possible and drown the remaining crystals with water. Decant and drown with water several more times to wash the crystals. Filter the washed crystals to collect them and thoroughly wash again with water. Dry the product at room temperature and store in a sealed glass container to keep out the moisture. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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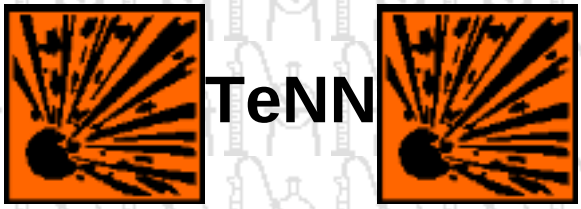
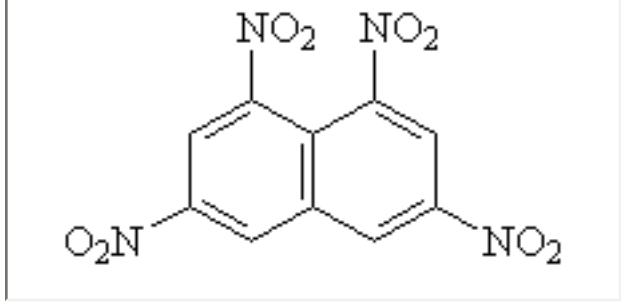


melting point 204 °C	boiling point decomposes	TeNN	molecular mass 308.16 g/mol	density 1.6 g/mL
table key	sensitivity low	chemical formula $C_{10}H_4N_4O_8$	explosive velocity 7013 m/s	estimated cost $?.00/g



TeNN is an acronym for tetranitronaphthalene. There are actually several isomers of TeNN, we are primarily concerned with 1,3,6,8-tetranitronaphthalene as it forms in abundance over the 1,2,4,6-; 1,2,5,8-; 1,2,6,8-; 1,3,5,7-; 1,3,5,8-; and 1,4,5,8-tetranitronaphthalenes. A mixture of isomers is bound to occur, though. TeNN is a very powerful and quite stable high explosive compound. It is actually slightly more powerful that TNT and just as stable. This explosive is superb because of its primary ingredient naphthalene. Naphthalene is the chemical name for moth balls, it is cheap, easy to get, not to hazardous, and sold in a store near you. I keep waiting for the government to ban it, or some environMeNtaList whacko to launch a save the moths campaign to ban it. The only drawback to TeNN is the possibility of side reactions reducing the yield during synthesis. Rapid heating of TeNN will cause it to explode, but slow heating will only cause decomposition. This lab uses concentrated sulfuric and nitric acids which are not so common, but still obtainable. Making TeNN is a multi step synthesis, first making mononitro then 1,8-dinitronaphthalene.

CHEMICALS	APPARATUS
acetone	1000-mL beaker
ethyl alcohol	2000-mL beaker
naphthalene	graduated cylinder

nitric acid	stirrer/stirring rod
potassium nitrate	thermometer
sulfuric acid	
water	

Prepare a mixture of 64 g of powdered naphthalene with 105 mL of water in a 1000-mL beaker. Slowly add 160 mL of 95% sulfuric acid to the beaker then add 81 mL of 70% nitric acid. Stir this mixture occasionally and allow it to cool to room temperature. During a 3 hour period, slowly add with stirring 150 g of powdered naphthalene to the acid mixture. The temperature will rise, regulate the addition of the naphthalene to get the temperature at 50 °C by the end of the addition time. After all of the naphthalene has been added, continue stirring and heat the beaker to 55 °C for several minutes then stop stirring and allow the mix to cool. Some mononitronaphthalene should crystallize on the surface of the beaker.

Prepare a second nitrating mixture by putting 300 mL of 53% sulfuric acid in a 1000-mL beaker. Cool the acid to 25 °C by placing in a salt-ice bath. Add 152 g of potassium nitrate to the acid while stirring rapidly. Remove the mononitronaphthalene from the previous reaction and crush it up, add it in small bits while stirring to the mixture, maintain the temperature between 38 °C and 45 °C. The addition should require about 1 hour, do not allow the temperature to go over 45 °C at any time during the addition. After the addition, continue stirring and heat the beaker to 55 °C until the formation of dinitronaphthalene crystals begin. Filter the contents of the beaker on an acid filter to collect the crystals of dinitronaphthalene that should have formed. Wash the crystals with six portions of cold water and allow them to dry. Dissolve the dry crystals in boiling acetone. Filter this solution while hot to remove any undissolved impurities, collect the filtrate and allow it to cool by placing in a salt-ice bath. Filter to collect the pure crystals of dinitronaphthalene. Collect the acetone filtrate from this filtering, boil it to reduce the volume by half, and cool in a salt-ice bath. Again filter to collect a second crop of dinitronaphthalene, add these crystals to the previous and allow them to dry.

Prepare the final nitrating acid mixture by slowly adding 750 mL of 100% sulfuric acid to 750 mL of 100% fuming nitric acid in a 2000-mL beaker. Cool the acid mix to below 20 °C with a salt-ice bath. Once below this temperature, slowly add with stirring the dry dinitronaphthalene from the previous reaction while maintaining the temperature at 20 °C during the addition. After the addition, slowly heat the mixture to 80 °C over a 1 hour period (1 degree higher every minute) then hold the temperature at 80-90 °C for 3 hours more. Allow the mixture to cool then filter on an acid filter to collect the crystals of TeNN that should have formed. Collect the filtrate and drown it in ice water to precipitate additional crystals of TeNN. Filter to collect these crystals and combine them with the other crystals. Wash the crystals with several portions of water then add them to 95% ethyl alcohol. Allow the crystals to dissolve, then cool in a salt-ice bath to recrystallize the now pure TeNN. The pure crystals can be filtered to collect them and dried by heating on a steam bath.

You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature for these procedures.

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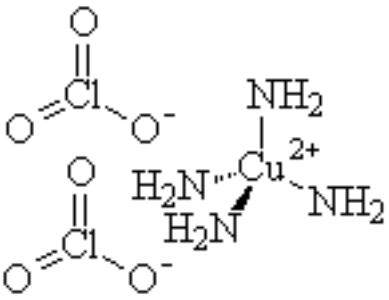
melting point ---	boiling point ---	TACC	molecular mass 215.12 g/mol	density ? g/mL
table key	sensitivity high	chemical formula $[Cu(NH_3)_4]ClO_3$	explosive velocity ? m/s	estimated cost $?.00/g



TACC is an acronym for tetraamminecopper (II) chlorate. It is a somewhat sensitive primary explosive compound, useful for detonators, but too dangerous for larger quantities. TACC is rendered useless by moisture and by being dead-pressed. TACC is safe to handle in the open, it can only be detonated while confined, otherwise it just burns with a green flame. In order for TACC to detonate in a blasting cap it must be filled as a loose powder then protected from moisture. The chemicals used in this preparation are not very common but can be obtained or synthesized.

CHEMICALS	APPARATUS
ammonia	bubbler
cupric sulfate	desiccator
ethyl alcohol	500-mL Erlenmeyer flask
methyl alcohol	evaporation dish
sodium chlorate	500-mL Florence flask
	graduated cylinder

magnetic stirrer

Prepare a mixture of 15 g of sodium chlorate and 24 g of cupric sulfate in 360 mL of anhydrous ethyl alcohol in a round-bottomed 500-mL Florence flask. Anhydrous methyl alcohol can be substituted for ethyl alcohol. Reflux the contents of the flask for 30 minutes at the boiling point of the alcohol, or as close as can be reached depending on how efficient your reflux column is. You will need to stir the mixture with a magnetic stirrer during the reaction. After refluxing you should have a green solution. Filter this solution to remove any impurities that may remain. Add the filtrate to a 500-mL Erlenmeyer flask and bubble dry ammonia gas through the liquid for 20 minutes, the use of a bubbler can help. After this time the solution should be dark blue. After the ammonia addition, pour the liquid into an evaporation dish and allow it to evaporate to half its original volume. You can use a fan or low heat to speed up the process. Crystals of TACC should precipitate after several hours. Filter the liquid to collect the crystals and wash them with 50 mL of very cold methyl alcohol. Put the crystals in a desiccator for 24 hours to dry them, then store in an airtight container to protect against moisture. You will need a graduated cylinder for measuring liquids.

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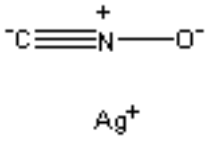
Silver Fulminate

melting point explodes at 170 °C	boiling point ---	silver fulminate	molecular mass 149.89 g/mol	density ? g/mL
table key	sensitivity very high	chemical formula AgCNO	explosive velocity ? m/s	estimated cost $?.00/g



Silver fulminate is a very sensitive primary explosive compound. It is most often found in "bang snaps" and other novelty pyrotechnic objects. Only very tiny amounts of silver fulminate should be prepared at once, the weight of the crystals can cause them to self detonate. Silver fulminate was first prepared in 1800 by Edward Howard in his research project to prepare a large variety of fulminates. For 200 years it has been only useful as a curiosity explosive in toys and tricks.

CHEMICALS	APPARATUS
ethyl alcohol	100/500-mL beaker
nitric acid	graduated cylinder
silver	thermometer
water	

Heat 8 mL of 70% nitric acid in a 100-mL beaker to 35-38 °C. Add 1 g of silver metal to the acid. While the silver is dissolving it will produce toxic nitrogen dioxide fumes, use a fume hood or get to a well ventilated area. Some heating may be required to get all of the silver to dissolve. Put 15 mL of 95% ethyl alcohol in a 500-mL beaker set into a salt-ice bath. After the silver has dissolved, slowly add the solution to the alcohol while keeping the temperature below 18 °C. More toxic nitrogen dioxide will be released. The reaction should require about 25-30 minutes to complete, after which 200 mL of cold water is added to precipitate the silver fulminate. Decant off as much of the liquid as possible then drown the crystals with water. Filter to collect the crystals and wash them with 30 mL of ethyl alcohol.

Flour or starch can be added to the crystals before filtering to add some degree of stability. Store the silver fulminate away from sunlight as it can decompose. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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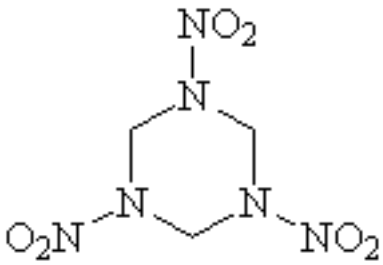
melting point 205 °C	boiling point ---	RDX	molecular mass 222.12 g/mol	density 1.82 g/mL
table key	sensitivity low	chemical formula $C_3H_6N_6O_6$	explosive velocity 8500 m/s	estimated cost $?.00/g



RDX, or cyclonite, is a very insensitive high explosive compound. The actual chemical name is cyclotrimethylenetrinitramine, although the chemical names hexahydro-1,3,5-trinitro-1,3,5-triazine; Hexogen; trimethylenetrinitramine; *sym*-trimethylenetrinitramine ;Hexolite; 1,3,5-trinitrohexahydro-p-triazine; 1,3,5-trinitrohexahydro-s-triazine; cyclotrimrthylene-trinitramine; 1,3,5-triaza-1,3,5-trinitrocyclohexane; trinitrohexahydrotriazine; and T_4 are also used. RDX itself stands for Royal Demolition eXplosive and comes from Great Britain, cyclonite is the American usage, Hexogen is for Germans, and T_4 is Italian. RDX is a very powerful military explosive that can be stored for long periods of time and handled safely. RDX is usually mixed with other explosives and plasticizers to make a variety of useful compositions for military and civilian use, C-4 and Semtex are two such compounds. It seems so much RDX is made that most scientific books give industrial schematics for thousands of pounds instead of lab preparations. The laboratory methods here are not as efficient as in industry, but are fine. The first method uses methenamine, or hexamethylenetetramine, which can be purchased as heating tablets or synthesized in the lab. The second makes use of acetic anhydride, forbidden by the DEA, but it can be synthesized as well.

CHEMICALS	APPARATUS
acetic anhydride	500-mL beaker
acetone	1000-mL beaker

ammonium nitrate	graduated cylinder
methenamine	stirrer/stirring rod
nitric acid	thermometer
paraformaldehyde	
sodium bicarbonate	
water	

Put 335 mL of 100% nitric acid in a 500-mL beaker, cool the acid to below 30 °C by setting the beaker in a salt-ice bath. The nitric acid must be as concentrated as possible, it must also be free of nitrogen oxides. Slowly add 75 g of methenamine in small portions to the acid while stirring. The temperature must be kept between 20 °C to 30 °C during the addition. Once all of the methenamine has dissolved, slowly heat it to 55 °C while stirring, hold it to between 50-55 °C for 5 minutes, keep stirring. Now cool the mix to 20 °C then let it sit for 15 minutes. After standing, it is gradually diluted with three or four times its volume of cool water, this should precipitate the RDX from solution. Depending on how the gods of chemistry feel about your reaction it may take from minutes to hours to fully precipitate all of the RDX. Decant most of the liquid then add 1 L of 5% sodium bicarbonate solution to neutralize the remaining acid. Filter the mixture to collect the crystals of RDX that should have formed. Wash them with cold water, then with hot 5% sodium bicarbonate solution, and again with water. The RDX can be dried at room temperature or in an oven. Further purification can be accomplished by recrystallizing from acetone. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

The second procedure is as follows: Place 260 mL acetic anhydride in a 1000-mL beaker and add 105 g powdered ammonium nitrate while stirring. Heat the beaker to 90 °C and remove the source of heat. Very slowly add 38 g of paraformaldehyde to the beaker, this addition will release toxic and flammable fumes, use a fume hood or go to an open area. After the addition, add the contents of the beaker to twice its volume of cold water to precipitate crystals of RDX. Filter the solution to collect the crystals and wash them with cold water then boiling water. The RDX can be purified by dissolving in the minimum amount of acetone then diluting with cold water. Filter the crystals to collect them and allow to dry in the open air.

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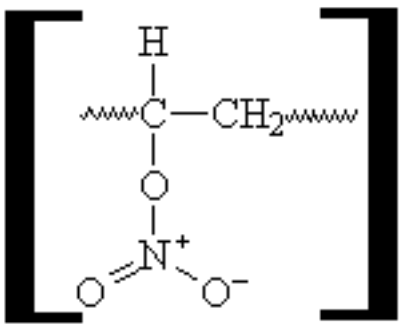
PVN

melting point ignites at 175 °C	boiling point 175 °C ignites	PVN	molecular mass $(89.05)_n$ g/mol	density 1.0 g/mL
table key	sensitivity medium	chemical formula $(C_2H_3NO_3)_n$	explosive velocity 5000 m/s	estimated cost $?.00/g



PVN stands for polyvinyl nitrate, which means that this explosive is a continually linked chain of vinyl nitrate over and over again. The material appears to be a white powder if the polymer has fewer links in the molecule and as tough white strands if there are many links in the molecule. PVN was first prepared in Germany in 1929 by G. Frank and H. Kruger by nitrating polyvinyl alcohol. This laboratory procedure comes from, I believe, two French scientists named Chédin and Tribot who experimented on method of PVN preparation after WWII. The densities of PVN can vary depending on the density of the starting polyvinyl alcohol and range from a low 0.3 g/mL to 1.5 g/mL and corresponding detonation velocities of 2030 m/s to 6560 m/s. Obviously it is better to have a higher density product. This product has found a niche in military applications mainly in propellents, but not so much in industrial applications.

CHEMICALS	APPARATUS
acetic anhydride	250-mL beaker
ethyl alcohol	graduated cylinder
nitric acid	stirrer/stirring rod

polyvinyl alcohol	thermometer
sodium bicarbonate	vacuum desiccator
water	

Over a period of 1 hour, very slowly add 5 g of finely pulverized polyvinyl alcohol (containing 10% moisture) to 100 mL of 99-100 nitric acid in a 250-mL beaker. The beaker should be in a salt-ice bath to provide cooling during the addition. Maintain constant stirring and a temperature of -8 °C throughout the addition, and for an additional 2 hours after the addition. The resulting slurry is slowly drowned in an equal volume of ice water while vigorously stirring. Filter this to collect the white powder that should have formed, wash the powder with water until neutral to litmus, then put it in clean water for 12 hours. Repeat the washing and standing process using 95% ethyl alcohol, and again repeat the process with 12% sodium bicarbonate solution. Finally, the powder is washed with water until neutral to litmus, dried in the open air, then in a vacuum desiccator. The yield is about 96%. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

It may be possible to increase the nitration yield by adding the polyvinyl alcohol to acetic anhydride first and using more nitric acid, the procedure is followed as above.

Here are the formulas for WC846 and M9 propellants:

82% PVN	57.75% PVN
10.2% nitroglycerin	40.0% nitroglycerin
0.7% dinitrotoluene	1.50% potassium nitrate
6.1% dibutylphthalate	0.75% ethyl centralite
1.0% diphenylamine	0.50% ethyl alcohol

And, yes, M9 does add up to 100.5%, the alcohol is supposed to be just trace amounts, but is listed as 0.5% for some reason.

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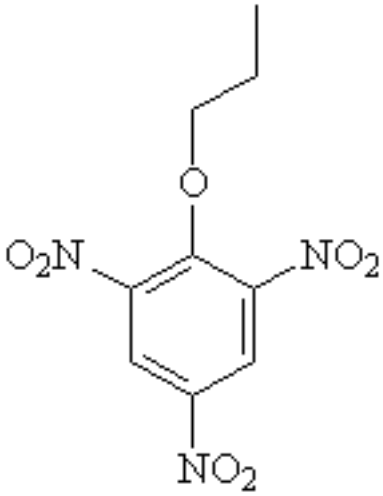
Propylpicrate

melting point 43 °C	boiling point ? °C	propylpicrate	molecular mass 271.21 g/mol	density ? g/mL
table key	sensitivity low	chemical formula $(O_2N)_3C_6H_2OCH_2CH_2CH_3$	explosive velocity ? m/s	estimated cost $?.00/g



Propylpicrate is also given the names of propyl-[2,4,6-trinitro-phenyl]-ether and picricacidpropyl ether. This substance is a colorless crystalline material that is soluble in a large number of organic solvents. The preparation is nothing special and the explosive is about 68% as powerful as TNT.

CHEMICALS	APPARATUS
benzene	beaker
hydrochloric acid	
petroleum ether	
picryl chloride	
potassium hydroxide	

n-propyl alcohol

Prepare a warm solution of picryl chloride dissolved in n-propyl alcohol in a small beaker. Add this solution to an ice-cold solution of potassium hydroxide in n-propyl alcohol in another beaker. The orange precipitate that should have formed is hydrolyzed with dilute hydrochloric acid to form a yellow solid. The crude propylpicrate is then dissolved in benzene and treated with decolorizing carbon. Final precipitation is then performed using petroleum ether.

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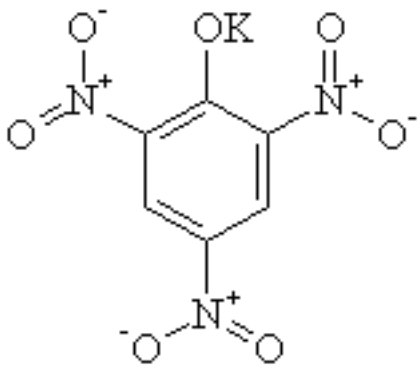
Potassium Picrate

melting point explodes at 310 °C	boiling point ---	potassium picrate	molecular mass 267.20 g/mol	density 1.852 g/mL
table key	sensitivity low	chemical formula $C_6H_2(NO_2)_3OK$	explosive velocity ? m/s	estimated cost $?.00/g



Potassium picrate was first prepared back in the mid 17th century by J.R. Glauber. The first use for potassium picrate came in 1869, it found its way into explosives, propellents, primers, and pyrotechnics. This explosive is stable and resists shock, friction, etc. It will deflagrate if subjected to flame, and in mixtures with oxidizing agents, it will only burn if ignited, but it has lower sensitivity. This is not a very powerful explosive, it is more suited to pyrotechnics and bullet primers.

CHEMICALS	APPARATUS
nitric acid	beaker
picric acid	
potassium carbonate	

Potassium picrate can be prepared by Glaubers original method of dissolving wood in nitric acid then neutralizing the resulting mixture with potassium carbonate. For the modern method, neutralize a hot aqueous solution of potassium carbonate with a hot picric acid solution in a beaker of suitable size, test

the solution with litmus paper until neutral. Filter the crystals that separate when the solution cools to collect them and allow to dry.

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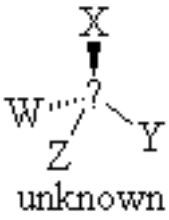
Nitrostarch

melting point ---	boiling point ---	nitrostarch	molecular mass varies	density 0.88 g/cc
table key	sensitivity low	chemical formula $[C_6H_7(OH)_x(ONO_2)_y]_n$	explosive velocity 4000-6000 m/s	estimated cost $?.00/g



Nitrostarch, also called NS; nitrate d'amidon; nitrostaerke; and staerkenitrat, is actually a mixture of several nitrate esters of starch. Yes, starch is the plant product that can be purchased in the grocery store. Since this is really a variety of nitrated products the formula is $[C_6H_7(OH)_x(ONO_2)_y]_n$ where x+y=3 and n is any whole number from one on up. The exact composition depends on the reaction conditions during the nitration. Nitrostarch found a use as a filler in hand grenades back in WWII, and also in mining explosives. Nitrostarch was first made when H. Barconnot nitrated cellulose and starch back in 1833. At that time nitrocellulose and nitrostarch were thought to be one and the same. Then A. Béchamp applied various methods of separating them in 1862. The US first began to produce nitrostarch in 1888 under the name Volney Powder. Various companies produced nitrostarch throughout both world wars, but the US emerged as its sole manufacturer.

CHEMICALS	APPARATUS
nitric acid	500-mL beaker
sodium bicarbonate	graduated cylinder
starch	stirrer/stirring rod
sulfuric acid	thermometer
water	

Prepare a mixture of 100 mL of 98-100% nitric acid and 138 mL of 95-100% sulfuric acid in a 500-mL beaker by pouring one acid into the other. Add the acids slowly as a lot of heat will be generated, keep the beaker in a salt-ice bath to cool it. Slowly add 100 g of starch to the acid mix while stirring and maintain a temperature of 10-12 °C for 1 hour and 50 minutes, continue stirring during the nitration. You can increase the rate of the reaction by holding the temperature to as much as 40 °C, but keep in mind higher temperatures increase the chance of accidents. Information on purifing and stabilizing the product is sketchy because of trade secrets, I suggest adding the nitrostarch to water and bring it to a boil. Then add the nitrostarch to another batch of water in which a small amount of base has been added, like sodium bicarbonate, and bring to a boil. This should stabilize and purify the nitrostarch. The nitrostarch is then filtered to collect it and dried. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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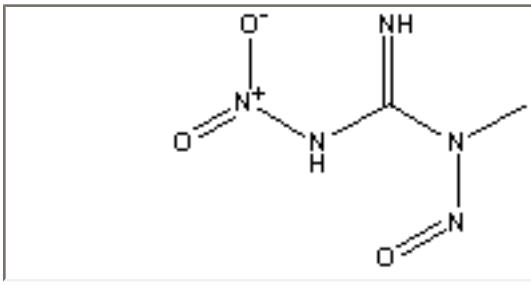
Nitrosoguanidine

melting point explodes at 165 °C	boiling point ---	nitrosoguanidine	molecular mass 147.09 g/mol	density ? g/mL
table key	sensitivity high	chemical formula $C_2H_5N_5O_3$	explosive velocity ? m/s	estimated cost $?.00/g



Nitrosoguanidine is technically called N-methyl-N'-nitro-N-nitrosoguanidine, other names include MNNG; N-methyl-N-nitroso-N'-nitroguanidine; N'-nitro-N-nitroso-N-methylguanidine; 1-methyl-3-nitro-1-nitrosoguanidine; methylnitronitrosoguanidine; N-nitroso-N-methylnitroguanidine; 1-methyl-1-nitroso-N-methylguanidine; 1-nitro-N-nitroso-N-methylguanidine; MNG; and methyl-N'-nitro-N-nitrosoguanidine. Nitrosoguanidine is a yellow, crystalline powder, it is a primary explosive that detonates producing little heat and no flash. Although this is a sensitive explosive, exploding from shock, friction, and elevated temperatures, it does not have powerful explosive properties and can be stored indefinitely if dry in a sealed bottle. This compound will slowly decompose in the presence of water and will explode on contact with sulfuric acid. I have instructions concerning a demonstration of its flashlessness in a darkened room involving placing 0.5 g on the back of the left hand. A match is lit and blown out, the heated match stick is touched to the powder and it explodes. Suffice to say **DO NOT** try this. The only after affects are a rash and peeling of the skin if you want to know...

CHEMICALS	APPARATUS
ammonium chloride	800-mL beaker
nitroguanidine	graduated cylinder
water	magnetic stirrer
zinc	thermometer

Prepare a mixture of 21 g of nitroguanidine, 11 g of ammonium chloride, 18 g of zinc dust, and 250 mL of water in an 800-mL beaker. Cool this mixture in a salt-ice bath and keep the temperature between 20-25 °C while stirring with a magnetic stirrer. After 2 hours of stirring the gray color of the zinc should have disappeared and the mixture should now be yellowish, there should be no crystals floating around as well. Keep stirring a while longer if not. Next, cool the mixture to 0 °C or lower with the salt-ice bath. Filter the mixture to collect the nitrosoguanidine, discard the filtrate. The yellow residue of nitrosoguanidine will contain some zinc oxide or hydroxide and basic zinc chloride. The residue must be extracted with 4 successive portions of 250 mL of water heated to 65 °C. Combine the extracts and allow them to stand at 0 °C for 12-24 hours, nitrosoguanidine will precipitate out of the solution. Filter to collect the crystals, rinse them with water, and dry at 40 °C. Yield is about 8.0-9.2 g or 45-52% of the theoretical yield. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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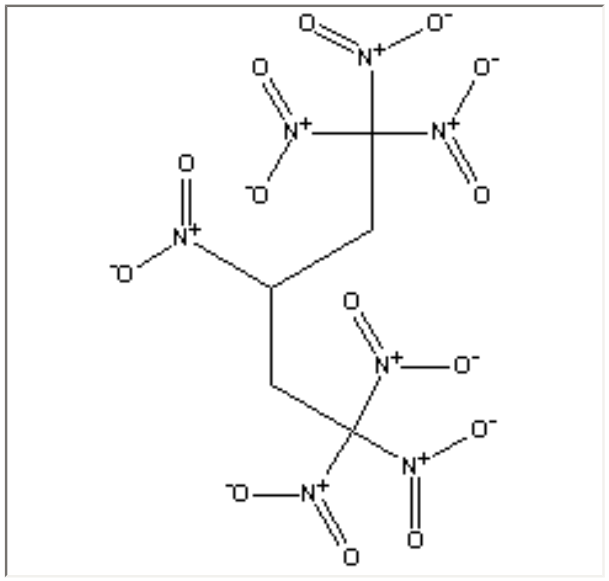
1,1,1,3,5,5,5-Heptanitropentane

melting point decomposes at 104 °C	boiling point ---	1,1,1,3,5,5,5-heptanitropentane	molecular mass 387.24 g/mol	density 1.74 g/cc
table key	sensitivity medium	chemical formula $(NO_2)_3CCH_2CH(NO_2)CH_2C(NO_2)_3$	explosive velocity ? m/s	estimated cost $?.00/g



This explosive looks like white crystals, it is stable, able to resist heat and friction up to a point, and stores well for several weeks. What little data there is has been provided by L.T. Carleton from Aerojet Engineering Co. in 1951.

CHEMICALS	APPARATUS
methyl alcohol	beaker/flask
nitric acid	desiccator
nitroallyl acetate	graduated cylinder
sodium hydroxide	pipet/buret
trinitromethane	stirrer/stirring rod
water	thermometer

Prepare a solution of 7.5 g of nitroallyl acetate and 20 mL of methyl alcohol in a beaker or Erlenmeyer flask, and cool. Slowly add the cold solution drop by drop, with a dropper pipet or buret, to a constantly stirred mixture of 15.1 g of trinitromethane in 150 mL of water maintained at 0 °C over a period of 1 hour. Add 1 mL of a 20% solution of sodium hydroxide to the mixture of trinitromethane and water before the acetate and alcohol addition. The hydroxide will act as a catalyst for the reaction. The product is washed with water and recrystallized from 70% nitric acid at 75 °C. The product is then dried in a desiccator. Yield is about 66%. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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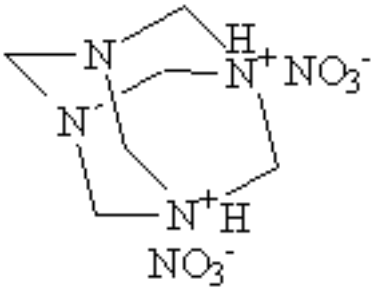
Hexamethylenetetramine Dinitrate

melting point 165 °C (dec)	boiling point ---	hexamethylenetetramine dinitrate	molecular mass 266.21 g/mol	density ? g/mL
table key	sensitivity low	chemical formula $C_6H_{14}N_6O_6$	explosive velocity 6000 m/s	estimated cost $?.00/g



Hexamethylenetetramine dinitrate, also called HDN, is a rather weak high explosive made from a quite simple reaction between methenamine and a nitrating mixture forming a quaternary ammonium salt. It is fairly stable to heat, shock, and friction but it is somewhat hygroscopic. This explosive is a close cousin to the far superior RDX, but HDN does not really stand out as anything exceptional from a military perspective. The reaction is quite simple and straightforward for the improvisational chemist. Two different methods of preparation are presented here and the molar ratios may be scaled up or down as required.

CHEMICALS	APPARATUS
acetone	250-mL beaker
ammonium nitrate	desiccator
hydrochloric acid	graduated cylinder
methenamine	stirrer/stirring rod
nitric acid	thermometer
water	

Dissolve 14 g (0.1 mol) of methenamine in 50 mL of warm water in a 250-mL beaker. Place the beaker of solution into a salt-ice bath and cool it to 5 °C or less. Measure out 20 mL (0.314 mol) of 70% nitric acid into a small test-tube or beaker and cool the acid in the ice bath as well. It is not necessary to use 70% acid as long as the proper molar amount is added, just limit the amount of water the methenamine is dissolved in accordingly if dilute acid is used. Slowly add the nitric acid, with stirring, to the methenamine solution at such a rate as to keep the temperature below 5 °C. The addition of the acid should cause the immediate precipitation of product. Continue stirring a minute after all of the acid has been added to insure complete precipitation, and then pour the mixture over a vacuum filter to collect the crystals. Hexamethylenetetramine dinitrate can be decomposed by water into formaldehyde in short order, so no extra time should be taken. Wash the crystals with several portions of dry acetone or anhydrous ethyl alcohol to remove any last trace of acid and to accelerate drying. Place the crystals in a desiccator to dry. Store in a tightly closed vial to protect from moisture. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

An alternative to using nitric acid in this synthesis is to use a nitrate salt and hydrochloric acid. The yields may be a bit less, but the result is the same. Instead of preparing a hexamine solution, prepare a nitrating solution by dissolving 28 g (0.35 mol) of ammonium nitrate in 80 mL (0.8 mol) of 31.45% hydrochloric acid in a 250-mL beaker. Cool this solution in a salt-ice bath to 0 degrees. Again, it is not necessary to use the specified concentration of hydrochloric acid as long as the proper molar amount is added. Dissolve 14 g (0.1 mol) of methenamine in a minimum amount of water (about 21 mL). Quickly add this solution to the nitrating mix with rapid stirring; a precipitate should soon form. Filter and wash the crystals as above. One could substitute sodium nitrate or potassium nitrate of the same molar mass in place of ammonium nitrate.

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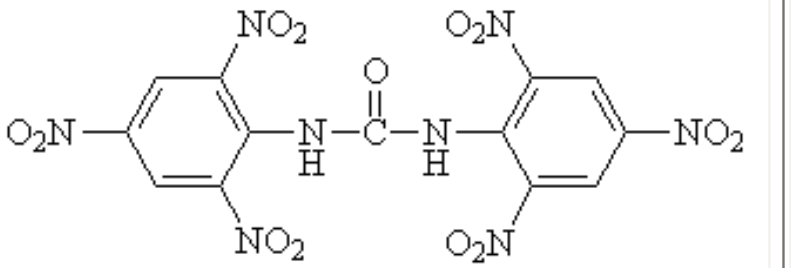
Hexanitrocarbanilide

melting point decomposes at 208 °C	boiling point explodes at 345 °C	hexanitrocarbanilide	molecular mass ? g/mol	density ? g/mL
table key	sensitivity medium	chemical formula $C_6H_2(NO_2)_3NHCONHC_6H_2(NO_2)_3$	explosive velocity ? m/s	estimated cost $?.00/g



This particular explosive is of curious interest, it is not really used that much but it still explodes. It is a pale yellow crystalline substance that melts with some decomposition at 208 °C. It is very brisant, usually used in detonators or booster charges. The explosive force is slightly greater than TNT. The primary ingredient is carbanilide, also known as sym-diphenylurea, which can be made from heating aniline and urea together at 160-165 °C, or by the interaction of phosgene and aniline. A more technical name for this explosive is 2,2',4,4',6,6'-hexanitro-N,N'-diphenylurea or sym-dipicrylurea.

CHEMICALS	APPARATUS
carbanilide	beaker
nitric acid	buret/separatory funnel
sulfuric acid	Erlenmeyer flask
water	Florence flask
	graduated cylinder
	stirrer
	thermometer

40 g of carbanilide is dissolved in 60 mL of 100% sulfuric acid in a small beaker, pour the solution into a buret or separatory funnel and add it drop by drop during a 4 hour period in to 96 mL of 100% nitric acid, in an Erlenmeyer flask, while the mixture is stirred vigorously with a mechanical stirrer and its temperature is maintained at 35º to 40º C.

After all of the solution has been added, the stirring is continued and the temperature is raised to 60 °C over 30 minutes and held at that temperature for another 60 minutes. The mixture is allowed to stand over night where it can cool to room temperature. After sitting, crushed ice and water are added to the solution, then it is poured over a filter to collect the crystals that should have formed. The crude tetranitrocarbanilide is washed thoroughly with water and allowed to dry in the air. In the second stage, 10 g of crude tetranitrocarbanilide is added to a mixture of 9 mL of concentrated sulfuric acid and 16 mL of nitric acid in a small Florence flask, and the material is heated on a steam bath or hotplate, to no more than 100 °C, for 1 hour with constant stirring. After cooling, crushed ice and water are added to the mixture, then it is poured over a filter to collect the crystals. The product is washed with 500 mL of cold water, then treated with 500 mL of hot water, and dried in the air. The resulting hexanitrocarbanilide is of good quality for use as an explosive. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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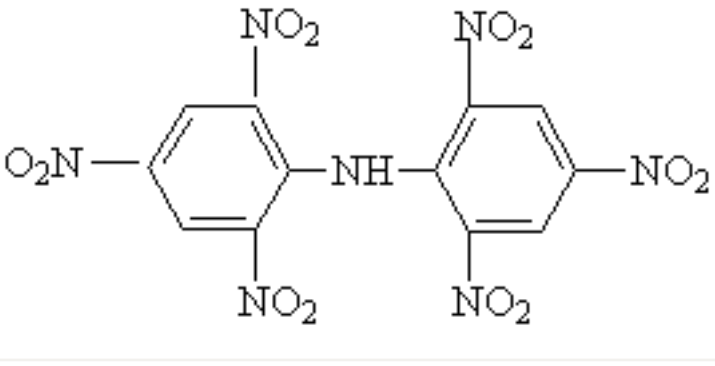
Hexanitrodiphenylamine

melting point decomposes at 243 °C	boiling point ---	hexanitrodiphenylamine	molecular mass 439.22 g/mol	density 1.58 g/mL
table key	sensitivity low	chemical formula $(C_6H_2(NO_2)_3)_2NH$	explosive velocity 6900 m/s	estimated cost $?.00/g



2,2',4,4',6,6'-hexanitrodiphenylamine, also known as dipicrylamine, hexamine, hexamin, heksyl, hexil, hexamite, hexite, or usually hexyl, was first prepared back in 1874 and was used as early as 1910 in both world wars, mostly by the Germans. Other scientific names include 2,4,6-trinitro-N-(2,4,6-trinitrophenyl)- benzenamine; 2,4,6-Trinitro-N-(2,4,6-trinitrophenyl)benzenamine; and Bis(2,4,6-trinitrophenyl)amine. Foreign names include esanitrodifenilammina o exiI in Italian; hexanitrodifenilamina o hexamina in Spanish; and gheksonitrodifenilamin in Russian.

Hexyl forms yellow needles in its crystalline state and decomposes slightly at its melting point of 243-245 °C. Hexyl is slightly hygroscopic at room temperature so keep it stored tightly away from air. Hexyl is very toxic, attacking the skin and causing severe burns. It causes respiratory irritation of the nose and throat if inhaled. Hexyl is not really a sensitive compound, it can be heated up to 250 °C before detonating if heated at a rate of 5 °C a minute. It can be detonated by severe shock, but you would have to treat it pretty badly. Drop tests caused detonations when a 2 kg weight fell from 60 cm. The explosive power is around 6900 m/s and increases with greater density to around 7150 m/s at 1.67 g/cc which is comparable to TNT.

The Germans and the Japanese used this explosive in admixture with TNT in torpedoes, sea mines, depth charges, and bombs. Commercially this explosive was used in compositions called Neurodits. The Swedish used it in compositions called Novit. The Germans mixed it with aluminum powder in compositions called Schieewolle 18, and it was also used in German skip bombs. The Japanese used it in compositions called Seigata (aka Type 97), and Otsu-B.

CHEMICALS	APPARATUS
acetone	500-mL beaker
aniline	graduated cylinder
calcium carbonate	pipet/buret
dinitrochlorobenzene	stirrer/stirring rod
hydrochloric acid	thermometer
nitric acid	
petroleum ether	
sulfuric acid	
water	

Synthesis 1:

This preparation will be carried out in two stages forming dinitrophenylamine, tetranitrophenylamine, and finally hexanitrodiphenylamine. 70 mL of aniline and 32 g of pure calcium carbonate are stirred up together with 300 mL of water in a 500-mL beaker to form a homogeneous suspension, and the mixture is heated to about 60 °C. 150 g of previously melted dinitrochlorobenzene is slowly added by pouring in a fine stream from a beaker while the stirring is continued and the mixture is gradually heated to about 90 °C, the rate of heating being regulated by the progress of the reaction which can be determined by the formation of dinitrophenylamine. The product is poured over a filter to collect the crystals, washed with hydrochloric acid to free it from aniline and calcium carbonate, then with water until free from chlorides, and dried in an oven at 100 °C.

In the first stage, 50 g of finely powdered dinitrodiphenylamine (formed from the above process) is added in small portions to 315 mL of 50-55% nitric acid in a 500-mL beaker, which is stirred vigorously while the temperature is maintained at 50-60 °C. The progress of the nitration is followed by observing the color change from the red of the dinitro compound to the yellow of the tetranitrodiphenylamine. After the dinitrodiphenylamine has been added, the temperature is raised to 80-90 °C and kept there for two hours longer while the stirring is continued. After the mixture has cooled, the product is filtered off directly, washed with water until free from acid, and dried in the air or in an oven at 100 °C.

In the second stage, 50 g of tetranitrodiphenylamine (formed in the first stage) is added slowly from a pipet or buret, with stirring, over one hour, to a mixture of 170 mL of 100% nitric acid and 140 mL of 100% sulfuric acid in a 500-mL beaker. After all of the tetranitrodiphenylamine has been added, the mixture is allowed to stand for 3 hours at room temperature, and is then drowned in ice water. The

hexanitrodiphenylamine that should have formed is filtered off, washed thoroughly with water, dried in the air, and recrystallized from acetone with the addition of petroleum ether. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

Synthesis 2:

Into a 1000-mL Florence flask containing 500 mL of concentrated sulfuric acid (100%) slowly add, while swirling the flask, 50 g of roughly ground diphenylamine. Into a 5-L round-bottomed flask immersed in an ice bath place 333 mL (500 g) of fuming nitric acid (100% with 5-10% dissolved nitrogen dioxide). Set the flask up for addition and slowly add the sulfuric acid solution drop by drop to the nitric acid while maintaining a temperature of 30 C. After adding all of the solution heat the flask on a steam bath until no more nitrogen dioxide gas escapes (CAUTION: this gas is toxic, use adequate ventilation!). The blue colored solution should fade and yellow crystals will precipitate. Allow the mixture to cool to room temperature and then slowly pour it into a large container of 5 L of ice water. Pour this solution over a filter to collect the product and wash it thoroughly first with cold and then with hot water until no trace of acid remains. Dry the product in an oven at 100 C. Yield is about 88 g. The product may be purified by recrystallization from 75% nitric acid.

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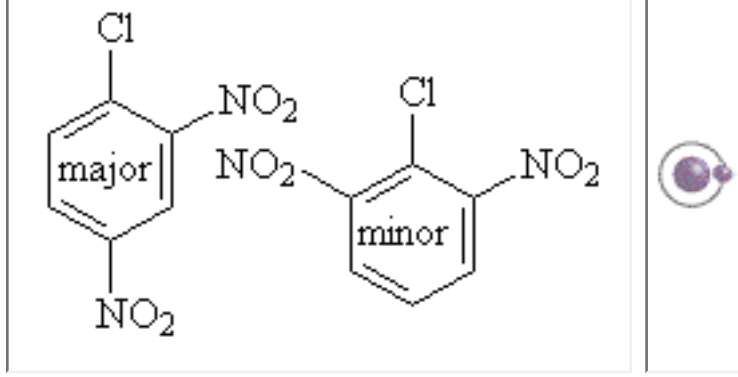
Dinitrochlorobenzene

melting point 52-54 °C	boiling point 315 °C	dinitrochlorobenzene	molecular mass 202.55 g/mol	density 1.7 g/mL
table key	sensitivity low	chemical formula $C_6H_3Cl(NO_2)_2$	explosive velocity ? m/s	estimated cost $?.00/g



During the early chemical industry days of World War I there was a lot of spare chlorine floating about and there was a big demand for benzene which made it cheap and available. Put em together and you get chlorobenzene and dichlorobenzene,of which p-dichlorobenzene is a type of mothball still used today. The nitration of chlorobenzene was started around 1862 by A. Riche. Dinitrodichlorobenzene was first manufactured as an explosive called parazol. It was mixed with with TNT in shells but did not detonate completely. Instead, the unexploded portion was atomized in the air and was a vigorous itch-producer and lachrymator (causes tears like mace), it also yielded some phosgene gas which was a dreadful chemical weapon used back then. Dinitrochlorobenzene finds more use as an ingredient in the manufacture of other explosives than as an actual explosive itself, although it has been mixed with picric acid for use in shells. Avoid contact with the solid and vapors of this chemical, it causes severe itching, as well as weakness, low blood count, digestive organ damage, and heart failure. The proper name of this compound is 1-chloro-2,4-dinitrobenzene for the most abundant isomer, and 2-chloro-1,3-dinitrobenzene for the other isomer. Other names include 2,4-dinitro-1-chlorobenzene; 2,4-dinitrochlorobenzene; 1,3-dinitro-4-chlorobenzene; chlorodinitrobenzene; DNCB; and 4-chloro-1,3-dinitrobenzene.

CHEMICALS | APPARATUS

chlorobenzene	1000-mL beaker
nitric acid	graduated cylinder
sulfuric acid	pipet/buret
water	stirrer/stirring rod
	thermometer

90 mL of chlorobenzene is added dropwise with a dropper pipet or buret to a previously prepared, and cooled to room temperature, mixture of 110 mL of 99% nitric acid and 185 mL of 99% sulfuric acid, in a 1000-mL beaker, while the mixture is stirred mechanically with a magnetic stirrer. A stirrer is essential for the length of time required, you may try this by hand with a stirring rod at your own risk. The temperature will rise because of the heat of the reaction, but should not be allowed to go above 50-55 °C. After all the chlorobenzene has been added, the temperature is slowly raised to 95 °C and is kept there for 2 hours longer while the stirring is continued. An upper layer of light yellow liquid solidifies when cold. The layer is removed, broken up under water, and rinsed. The spent acid, on dilution with water, will precipitate an additional quantity of dinitrochlorobenzene. All the product is brought together, washed with cold water, then several times with hot water while it is melted, and once more with cold water under which it is crushed. Finally, it is drained and allowed to dry at room temperature. The product, melting at about 50 °C, consists largely of 2,4-dinitrochlorobenzene, along with a small quantity of the 2,6-dinitro compound, m.p. 87-88 °C. The two substances are equally suitable for manufacture of other explosives or alone as an explosive. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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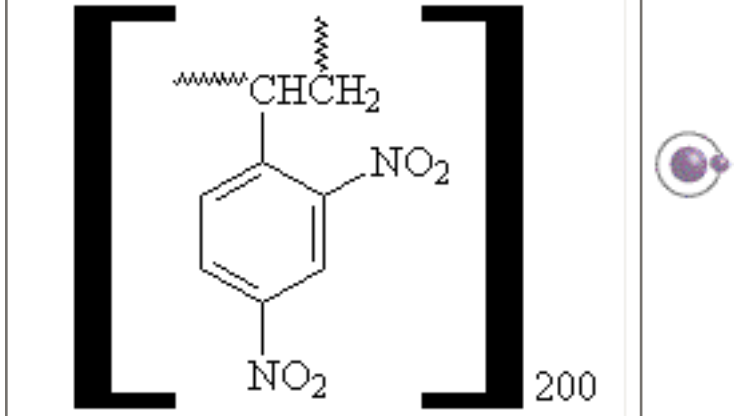
Dinitropolystyrene

melting point 260 °C	boiling point ? °C	dinitropolystyrene	molecular mass >38000 g/mol	density 0.25 g/mL
table key	sensitivity low	chemical formula $[C_6H_3(NO_2)_2(CHCH_2)]_{200}$	explosive velocity 1510 m/s	estimated cost $?.00/g



Dinitropolystyrene, or nitropolystyrene, is a very interesting explosive procedure involving the nitration of everyday polystyrene. That's the same stuff as Styrofoam, all those containers from fast food restaurants and packing from boxes. This lab calls for isotactic polystyrene, which is the crystalline version. I suppose you can use ordinary Styrofoam. This material has found a home as a mining explosive since it is stable and somewhat low powered. It will burn in the open and requires a suitably powerful explosive plus confinement to detonate.

CHEMICALS	APPARATUS
nitric acid	small beaker
polystyrene	stirring rod
fuming sulfuric acid	
water	

Dinitropolystyrene is prepared by nitrating isotactic, or crystalline, polystyrene. Prepare an anhydrous nitration mixture by bubbling sulfur trioxide into concentrated sulfuric acid, making fuming sulfuric acid with about 50% free sulfur trioxide. Mix this acid with 100% nitric acid in the ratio of 4.51 parts nitric to 2 parts sulfuric in a small beaker. An example would be 45.1 mL of nitric acid mixed with 20 mL of sulfuric acid. Add the acids slowly and cool the mixture to 15-20 °C. While maintaining the cool temperature, add in the crystalline polystyrene. If you are using foamed polystyrene, break it up as much as possible. Add only as much as can still be covered by the acid. Stir the polystyrene for 3-5 minutes with a stirring rod, then heat the mixture to 50-55 °C for 2 hours, stirring occasionally. Next, cool the mixture down to 25 °C and decant off as much of the acid as possible. Drown the dinitropolystyrene with water to dilute the remaining acids. Pour the contents over a filter to collect the dinitropolystyrene, wash it several times with water, and allow to dry. The yield should be about 33%. One explosive mixture uses 7.2% dinitropolystyrene along with 10.8% dinitrotoluene and 82.0% PETN. The detonation velocity of this mixture is 7520 m/s.

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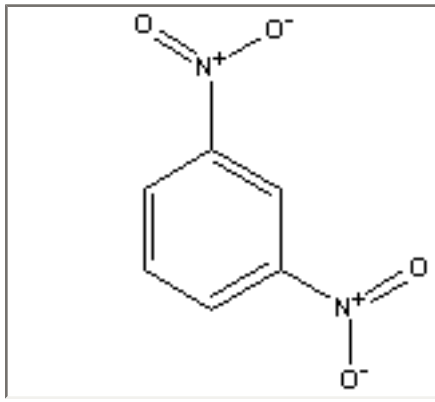
Dinitrobenzene

melting point 90 °C	boiling point 291 °C	dinitrobenzene	molecular mass 168.11 g/mol	density 1.5751 g/mL
table key	sensitivity low	chemical formula $C_6H_4(NO_2)_2$	explosive velocity 6100 m/s	estimated cost $?.00/g



Dinitrobenzene comes in three isomers, they are ortho, meta, and para-dinitrobenzene. The most important explosive isomer is meta-dinitrobenzene, or just *m*-dinitrobenzene, other names include dinitrobenzol; 1,3-dinitrobenzene; 2,4-dinitrobenzene; binitrobenzene; and 1,3-dinitrobenzol. This material was used as a replacement for TNT back in World War I since it was somewhat more economical. The Russians used dinitrobenzene from 1914 to 1918 as a filling for naval mines, in Germany it was called Di-Füllpulver, DiFp for short, for use in shells. An earlier explosive called Hellhoffites mixed nitric acid and dinitrobenzene, this was used in 1897-1880. This compound was first prepared by St. C. Deville in 1841 by treating benzene with concentrated nitric acid and boiling. I should warn you that this particular substance is very toxic, poisoning may be caused by inhaling the vapors or by absorption through the skin. The volatility is rather low but a concentration as low as 1 mg per cubic meter of air can cause acute poisoning. Poisoning is more likely in warm weather when the vapor pressure is higher due to the increased temperature. So keep it cool, don’t touch it and wear some sort of respirator. Frequent exposure and past poisoning will increase the probability of future poisoning. Women, especially, should stay away as it affects them more than men. The sensitivity of m-dinitrobenzene is quite low, it requires an initiator charge to detonate it. This procedure requires nitrobenzene as the main ingredient, the preparation of which is in the synthesis section. This procedure makes about 92% meta, and an 8% mix of ortho and para isomers.

CHEMICALS	APPARATUS
ethyl alcohol	Erlenmeyer flask
nitric acid	graduated cylinder
nitrobenzene	pH paper
sodium hydrogen sulphite	stirring rod
sodium hydroxide	thermometer
sulfuric acid	
water	

To prepare dinitrobenzene, heat a mixture of 14 mL of concentrated sulfuric acid and 10 mL of concentrated nitric acid in an open Erlenmeyer flask in a boiling water bath in an area with good ventilation. 10 g of nitrobenzene is added gradually over a period of 30 minutes. The mixture is allowed to cool somewhat, then drowned in cold water. The dinitrobenzene should separate as a solid. Crush it under water with a stirring rod, wash with water, and recrystallize from ethyl alcohol or nitric acid. Dinitrobenzene crystallizes from nitric acid in beautiful needles which are practically colorless. Further purification by removing the ortho and para isomers can be achieved by reacting the product with sodium sulphite, it is not necessary to do this, but it will give a highly refined product. The dinitrobenzene is added to a 33% sodium hydroxide solution and heated to 50 °C while vigerously stirring. The temperature must be monitored with a thermometer to insure it does not rise above 80-85 ° C. The total washing time is 30 minutes. During the washing, the pH must be alkaline, test often with pH paper. If at any point the pH is not alkaline, add more sodium hydroxide solution. Next, sulphitation of dinitrobenzene is done by adding cold water to the above alkaline solution until the temperature falls to 66 °C. Then, a solution of sodium sulfite, prepared by mixing a 40% solution of sodium hydrogen sulphite with half its volume of 33% sodium hydroxide solution, is added. Maintain the temperature at 66-73 °C while stirring for 2 hours. Afterwards, cool the mix to 50 °C and the purified dinitrobenzene will precipitate into large crystals. The majority of the liquor can be decanted off and the crystals poured over a filter to collect them. Wash the crystals throughly by repeated rinsings with water. The final product can be dried at 135 °C under reduced pressure. You will need a graduated cylinder for measuring liquids.

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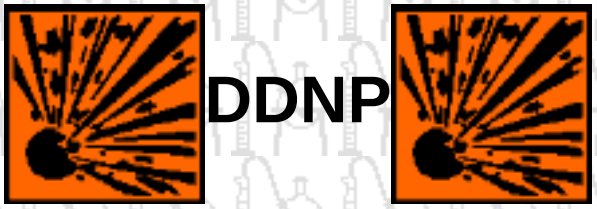
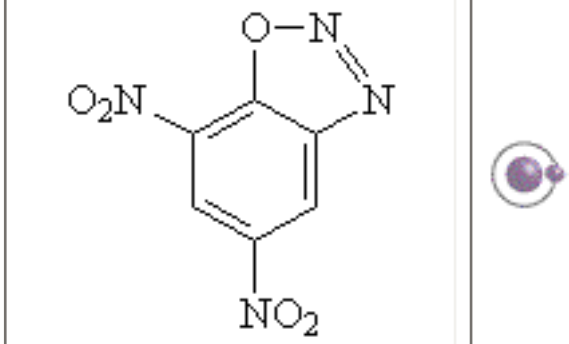


melting point ? °C	boiling point ? °C	DDNP	molecular mass ? g/mol	density 1.63 g/mL
table key	sensitivity high	chemical formula $C_6H_2N_4O_5$	explosive velocity 6900 m/s	estimated cost $?.00/g



DDNP is an acronym for diazodinitrophenol, it is also known as 4,6-dinitrobenzene-2-diazo-1-oxide, and Dinol. DDNP is a picric acid derivative with somewhat good stability and explosive velocity. It is still susceptible to heat, friction, and shock making it a primary explosive. Its preparation is very simple, needing only picramic acid, sodium or potassium nitrite, and some dilute hydrochloric or sulfuric acid. Obtaining the picramic acid will be impossible for most, so I included how it can be prepared in the synthesis section. This compound was first prepared by Dr. Griess in 1858, this led him to conduct ground breaking research on the diazotization reaction.

CHEMICALS	APPARATUS
acetone	250-mL beaker
hydrochloric acid	graduated cylinder
picramic acid	magnetic stirrer/stirring rod
sodium nitrite	thermometer
water	

Diazodinitrophenol is prepared by a diazotization reaction, this happens when an amine substituient,
NH_2, on an aromatic ring, , loses its hydrogen atoms and forms a triple bond with another nitrogen atom. Place 120 mL of 5% hydrochloric acid in a 250-mL beaker, then immerse the beaker in a salt-ice bath. Place the ice bath on top of a magnetic stirrer and drop a spin bar in the beaker. Slowly add 10 g of picramic acid to the acid solution while stirring rapidly, monitor the temperature with a thermometer. Be sure there is no sudden rise in temperature. If you do not have a magnetic stirrer, use a stirring rod and stir like the wind. Dissolve 3.6 g of sodium nitrite in 10 mL of water. After the picramic acid has dissolved, add the sodium nitrite solution all at once and continue stirring for 20 minutes. Filter the solution to collect the dark brown crystals that should have formed and wash them with cold water. The diazodinitrophenol thus formed can be used as is, or it can be purified by dissolving in hot acetone then precipitated by adding a large volume of ice water while rapidly mixing the liquid. This treatment will convert the diazodinitrophenol into bright yellow crystals. You will need a graduated cylinder for measuring liquids.

The diazodinitrophenol must be dried before it will explode. Drying will take 24 hours if done at room temperature, or in 2 hours if the crystals are placed in a beaker suspended in hot water. The diazodinitrophenol must be stored in a sealed glass container. Storing the explosive moist, about 25% water, will increase safety. Dry immediately before use. DDNP will detonate if it is struck by a sharp blow, but it will only burn rapidly if ignited in the open, even several grams.

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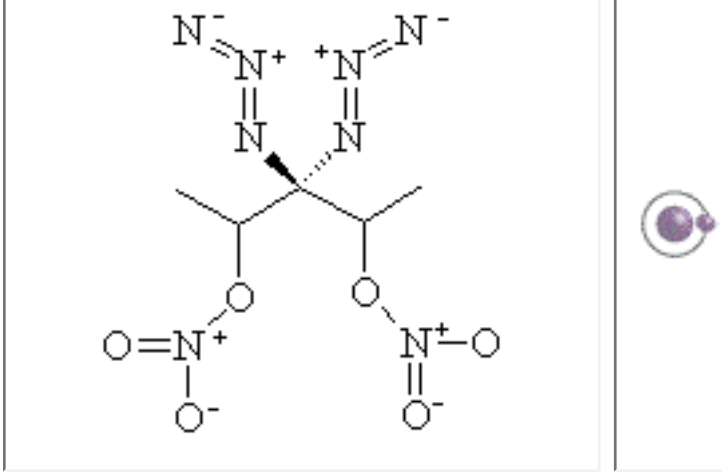
DADNPE

melting point 64 °C	boiling point 135 °C decomposes	DADNPE	molecular mass 276.24 g/mol	density ? g/mL
table key	sensitivity very high	chemical formula $C_5H_8N_8O_6$	explosive velocity ? m/s	estimated cost $?.00/g



The name of this explosive is 3,3-diazido-2,4-dinitratopentane, and that is about all I know for this compound except it is very sensitive to friction and shock. It has been proposed as a propellant and as a percussion primer for caseless ammunition.

CHEMICALS	APPARATUS
acetic anhydride	dropper pipet
3,3-diazido-2,4-pentanediol	Erlenmeyer flask
ethyl ether	graduated cylinder
hexane	magnetic stirrer
nitric acid	thermometer
water	

Prepare a nitrating solution by slowly adding 4.56 mL of 100% nitric acid with a dropper pipet to 10.68 mL of acetic anhydride in a small Erlenmeyer flask, and cool the solution to 0-5 °C. While maintaining the temperature at 5-15 °C, add 4.2 g of solid 3,3-diazido-2,4-pentanediol over a period of 20 minutes. Stir the mixture for 30 minutes, with a magnetic stirrer or by occasionally swirling the flask, after which time some crystallization should have occurred. Complete precipitation is achieved by drowning the mixture in an excess of ice water. The product is extracted with ethyl ether and recrystallized from hexane. The yield is about 85%. You will need a graduated cylinder for measuring liquids and a thermometer to monitor the temperature.

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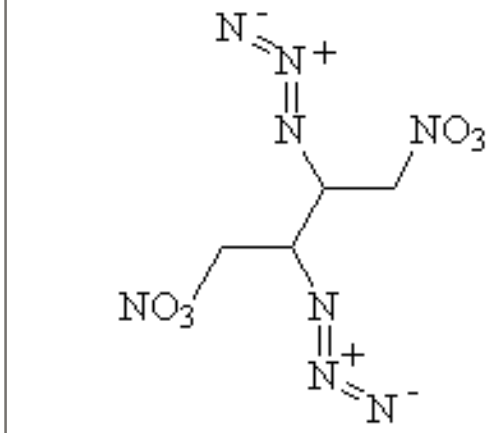
The Preparation of Some New Polyfunctional Organic Azides

DADNBU

melting point 70 °C	boiling point 150 °C decomposes	DADNBU	molecular mass 262.21 g/mol	density ? g/mL
table key	sensitivity very high	chemical formula $(NO_3)CH_2CHN_3CHN_3CH_2(NO_3)$	explosive velocity ? m/s	estimated cost $?.00/g



The name of this explosive is 2,3-diazido-1,4-dinitratobutane. All I know about this compound, other than how to synthesize it, is that it is very sensitive to friction and shock. It has been proposed as a military propellant.

CHEMICALS	APPARATUS
acetic anhydride	Erlenmeyer flask
2,3-diazido-1,4-butanediol	graduated cylinder
ethyl alcohol	dropper pipet
nitric acid	magnetic stirrer
	thermometer

Prepare a 1 to 1 molar solution of nitrating acid by slowly mixing 12.3 mL of acetic anhydride and 5.5 mL of 100% nitric acid in a small Erlenmeyer flask. Cool the solution to 0-5 °C in a salt-ice bath. Slowly add

2.58 g of 2,3-diazido-1,4-butanediol drop by drop with a pipet to the cool acid. Add the diol at such a rate that the reaction temperature stays between 5-15 °C. Stir the mixture during the addition and for 30 minutes afterwards with a magnetic stirrer or by swirling the flask. Several recrystallizations from ethyl alcohol give a fairly pure product with an approximate yield of 40%. You will need a graduated cylinder for measuring liquids and a thermometer to monitor the temperature.

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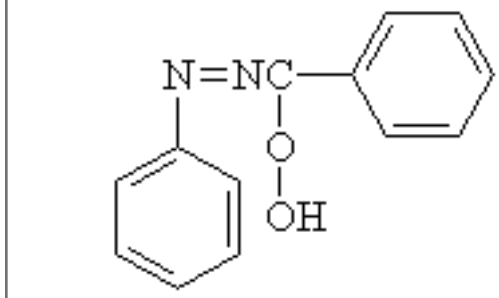
The Preparation of Some New Polyfunctional Organic Azides

α-Benzenediazobenzyl Hydroperoxide

melting point 65 °C decomposes	boiling point ---	α-benzenediazobenzyl hydroperoxide	molecular mass 228.28 g/mol	density ? g/mL
table key	sensitivity very high	chemical formula $C_6H_5N{=}NCH(OOH)C_6H_5$	explosive velocity ? m/s	estimated cost $?.00/g



This compound has the appearance of canary yellow needles. I have very little information about this compound other than it is sensitive to light, it may explode on standing, it is insensitive to friction or impact, but will explode on contact with flame, concentrated sulfuric acid, and nitric acid. This explosive was first prepared around 1914.

CHEMICALS	APPARATUS
benzaldehyde phenylhydrazone	bubbler
benzene	Erlenmeyer flask
oxygen	graduated cylinder
petroleum ether	

Prepare a mixture of 1 g of benzaldehyde phenylhydrazone suspended in 6 mL of benzene in a small Erlenmeyer flask. You can make any volume desired, but keep the same 1 g per 6 mL ratio, keep in mind the danger increases in making more. While constantly shaking the mixture, bubble oxygen gas through it for 6 hours. It may seem bothersome to shake this stuff all the time and I doubt you have an automatic shaker, so you might be able to get away with shaking it for a minute every 10 to 15 minutes. Inserting the end of some rubber tubing from your oxygen generator may not yield good results, it is far better to use a bubbler similar to a fish tank aerator. A bubbler may be somewhat costly, but better in the long run, you can use a fish tank aerator but it may dissolve in the benzene (this has happened to me, the aerators are just sand pressed together). Another potential problem is that there will not be enough room for a fish tank aerator , with such a low volume of solution since they are cylindrical, whereas bubblers can be flat. After the oxygen addition, add cold petroleum ether to crystallize the product out of solution. Pour the crystals over a vacuum filter to collect and dry them faster. The yield is about 73%. Keep the product away from light and dispose immediately as it may detonate on standing. You will need a graduated cylinder to measure liquids.

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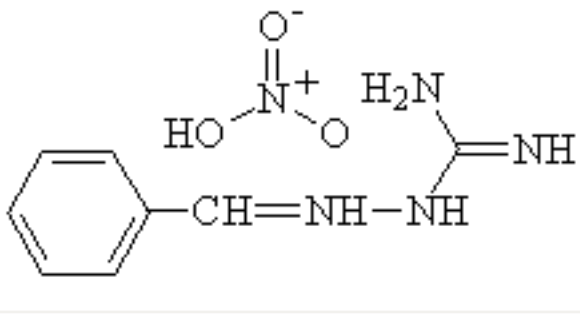
Organic Peroxides

Benzalaminoguanidine Nitrate

melting point 160.5 °C	boiling point ? °C	benzalaminoguanidine nitrate	molecular mass ? g/mol	density ? g/mL
table key	sensitivity unknown	chemical formula $C_6H_5CH{=}NHNHC(NH)NH_2\ NO_3H$	explosive velocity ? m/s	estimated cost $?.00/g



I don't have much information on this explosive other than it is a derivative of the explosive nitroguanidine as it uses that material as its precursor. I would assume it has properties similar to nitroguanidine. This explosive may also be called benzaldehyde guanylhydrazone nitrate.

CHEMICALS	APPARATUS
acetic acid	Erlenmeyer flask
benzaldehyde	small beaker
ethyl alcohol	graduated cylinder
nitric acid	stirring rod
nitroguanidine	thermometer
water	
zinc dust	

Into a 300-mL Erlenmeyer flask, add 26 g of zinc dust, 10.4 g of nitroguanidine, and 150 mL of

water. Slowly add 42 mL of glacial acetic acid from a small beaker at such a rate that the temperature of the mixture does not rise above 40 °C. The liquid at first turns yellow because of the formation of nitrosoguanidine but becomes colorless again when the reduction is complete. After all the zinc has disappeared, add 45 mL of concentrated nitric acid , then 102 mL of benzaldehyde. Shake the mixture well to mix the contents then scratch the inside of the flask with a glass stirring rod to facilitate the precipitation of benzalaminoguanidine nitrate crystals. The product can be purified by recrystallizing from water or from ethyl alcohol. You will need a graduated cylinder for measuring liquids and a thermometer to monitor the temperature.

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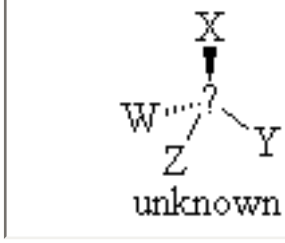
The Chemistry of Powder and Explosives

Astrolite

melting point ? °C	boiling point ? °C	Astrolite	molecular mass ---	density ? g/mL
table key	sensitivity very low	chemical formula ---	explosive velocity 8600 m/s	estimated cost $?.00/g



Astrolite is not a chemical compound but rather a two component high explosive mixture. Its claim to fame is it has the highest explosive velocity of all chemical explosives, a distant second only to a nuclear blast, a claim that is entirely false. Only that anarchist crap still thinks that Astrolite is super powerful. The truth is, its low density makes it unlikely to achieve a detonation comparable to more common explosives Astrolite G is a mixture of ammonium nitrate and hydrazine, Astrolite A adds aluminum powder to the mix for extra power. Hydrazine is a very toxic, corrosive, and dangerous chemical that you will never be able to get. The fumes can kill you in seconds if breathed in a confined area. I have devoted a section to hydrazine and its safety in the chemical synthesis section.

CHEMICALS	APPARATUS
aluminum powder	beaker
ammonium nitrate	graduated cylinder
hydrazine	stirring rod

To make Astrolite G, add 200 g of ammonium nitrate to a large beaker and stir in 100 mL of hydrazine, mix well. For Astrolite A add 40 g of aluminum powder to the Astrolite G mixture. It is best to make the mixture immediately before use because the ammonium nitrate becomes sensitive to detonation once hydrazine is added. Professional blasters make their mixtures in the field at the blast site

for greater safety. Each component is measured out in separate containers, transported to the site, mixed, allowed to sit for 20 minutes, and detonated. As separate components they are very safe (well as safe as hydrazine can get) and the mixing is easy. Astrolite can be detonated even when it has been poured out on the ground and left for 4 days. More Astrolite can be prepared by observing a 2:1 ratio of ammonium nitrate to hydrazine by weight and 1:5 of aluminum powder to ammonium nitrate by weight. You will need a graduated cylinder for measuring liquids and a stirring rod for mixing.

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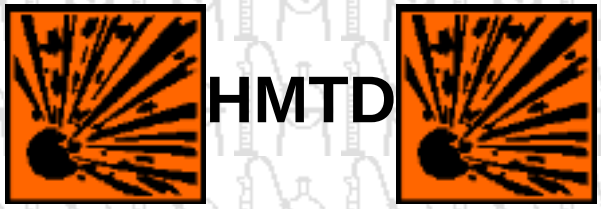
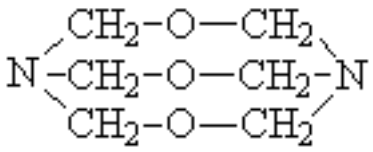


melting point decomposes at 75 °C	boiling point ---	HMTD	molecular mass ? g/mol	density 0.88 g/mL
table key	sensitivity very high	chemical formula $N(CH_2\text{-}O\text{-}O\text{-}CH_2)_3N$	explosive velocity 4511 m/s	estimated cost $?.00/g



HMTD, or hexamethylenetriperoxidediamine, is a somewhat unstable primary explosive compound. Its extreme sensitivity to heat, shock, and friction make HMTD a poor choice for the lesser skilled home chemist. This lab uses hydrogen peroxide at 30% concentration, it is possible to use the more common 3% concentration by adding ten times as much. The hexamethylenetetramine used here, also called hexamine, methenamine, or urintropine, can be purchased as "heating tablets." As to what heating tablets are... They are used in camping and in the military for heating meals, or hand warmers. It is very unlikely that you will find this anymore, so synthesize your own as described in the chemical synthesis section. HMTD has been used as a detonator, it is safer and more powerful than mercury fulminate or acetone peroxide. It is stable when compared to other primary explosives, and it is one of the safest explosive peroxides. HMTD should be kept cool and dry as it may evaporate or decompose, it should also be kept away from metals as it will corrode them. HMTD will detonate if struck, but will only burn if heated.

CHEMICALS	APPARATUS
citric acid	200-mL beaker
methenamine	graduated cylinder
hydrogen peroxide	stirrer/stirring rod
methyl/ethyl alcohol	thermometer
water	

Dissolve 14 g of methenamine in 50 mL of 30% hydrogen peroxide in a 200-mL beaker while stirring vigorously with a magnetic stirrer or with a stirring rod. You must also cool this solution by placing the beaker in a salt-ice bath. While stirring, slowly add 21 g of powdered citric acid in small portions to the beaker making sure the temperature stays at or below 0 °C at all times. After adding the citric acid, keep stirring for 3 hours and continue to hold the temperature at 0 °C. Next, remove the beaker from the cooling bath and let it stand at room temperature for 2 hours, discontinue stirring as well. Finally, pour the solution over a filter to collect the crystals of HMTD, wash them thoroughly with water, and rinse with methyl or ethyl alcohol so they can dry faster at room temperature. Dry by setting in a cool place. HMTD does not store well, so deal with it immediately. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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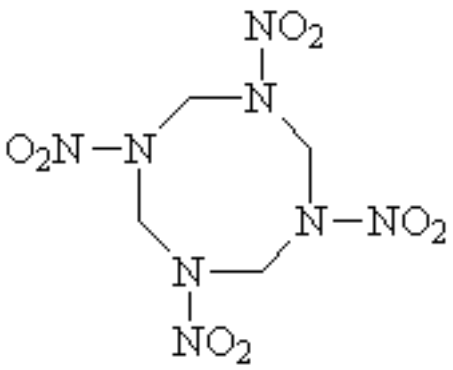
HMX

melting point 281 °C	boiling point ? °C	HMX	molecular mass 296.16 g/mol	density 1.903 g/mL
table key	sensitivity very low	chemical formula $C_4H_8N_8O_8$	explosive velocity 9110 m/s	estimated cost $?.00/g



HMX is a very powerful military explosive with similar properties to RDX, the other great military explosive with which it is often mixed. HMX is technically called octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine, other names include 1,3,5,7-tetranitro-1,3,5,7-tetrazacyclooctane; cyclotetramethylene tetranitramine; and octogen. HMX is itself an acronym for either High velocity Military eXplosive, or Her Majesties eXplosive depending on what country you are in. HMX is very stable, it requires a powerful detonator or booster charge to detonate. It was first developed during WWII in the never ending search for more powerful bombs.

CHEMICALS	APPARATUS
acetic acid	500/1000-mL beaker
acetic anhydride	500-mL Florence flask
ammonium nitrate	graduated cylinder
methenamine	stirrer/stirring rod
nitric acid	thermometer

paraformaldehyde

water

Prepare a solution of 748 mL of glacial acetic acid, 12 mL of acetic anhydride, and 17 g of paraformaldehyde, keep this solution at 44 °C while mixing. Prepare a second solution of 217.6 g of ammonium nitrate and 154.6 mL of 99% nitric acid in a 500-mL beaker. Prepare a third solution of 101 g of methenamine, 157 mL of glacial acetic acid, and 296 mL of acetic anhydride in a 1000-mL beaker. Combine the third solution with 112.5 mL of the second solution. Add this combined solution to the first solution over a 15 minute period while stirring rapidly. After the addition, continue stirring for an additional 15 minutes. Next, carefully add 296 mL of acetic anhydride, then carefully add the remainder of the second solution, then add another 148 mL of acetic anhydride, all while stirring. Continue the stirring for 1 hour more. After stirring, add 350 mL of hot water and reflux the whole works for 30 minutes. After this time, cool the liquid down to 20 °C by adding ice. Decant off as much of the liquid from the precipitate as possible and drown the remaining crystals with cold water. Filter to collect the crystals of HMX and wash them with three portions of cold water, allow to dry. The yield is about 95%. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

Owing to the large volume of reactants in this lab, in excess of 2.5 L, it is necessary to use a 5-L flask, unfortunately this is beyond most laboratories, and especially the home chemist. This reaction can be carried out in a glass gallon jug or similar large capacity glass container. The refluxing step can be done in portions using a round-bottomed 500-mL Florence flask.

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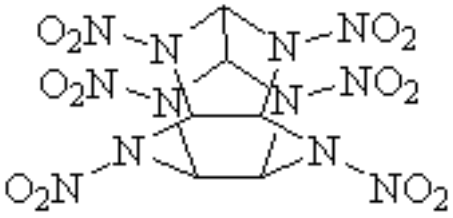
melting point decomposes at 260 °C	boiling point ---	HNIW	molecular mass 438.19 g/mol	density 1.98 g/mL
table key	sensitivity very low	chemical formula $C_6H_6N_{12}O_{12}$	explosive velocity 10300 m/s	estimated cost $?.00/g



HNIW is an acronym for hexanitrohexaazaisowurtzitane, other names include CL-20; octahydro-1,3,4,7,8,10-hexanitro-5,2,6-(iminomethenimino)-1H-imidazo[4,5-b]pyrazine; 2,4,6,8,10,12-hexanitro-2,4,6,8,10,12-hexaazatetracyclo[5.5.0.$0^{5,9}$.$0^{3,11}$]dodecane; and 2,4,6,8,10,12-hexanitro-2,4,6,8,10,12-hexaazaisowurtzitane. HNIW is a new kid on the block, it was first prepared by A.T. Nielsen in 1987, and has since been proposed as a propellent for bullets and as a blasting explosive. There are actually 6 crystalline isomers of HNIW, this lab will prepare the beta form, although some of the alpha form will probably be made. The other isomers are made by heating the crystals to its decomposition point, the alpha and beta forms are the most stable. This explosive will most likely be the standard workhorse of the 21st century, it is currently still in testing for useful applications. HNIW is a symmetric polyazacyclic nitramine, itself a type of caged polynitramine, a promising new series of compounds. HNIW is similar to RDX and HMX in structure and explosive properties. This is a two part lab, the first synthesizing a derivative called tetraacetyldibenzylhexaazaisowurtzitane (TADB), then from that, HNIW.

CHEMICALS	APPARATUS
acetic anhydride	500-mL Florence flask
bromobenzene	graduated cylinder
chloroform	stirrer/stirring rod

N,N-dimethylformamide	thermometer
ethyl acetate	
ethyl alcohol	
HBIW	
hydrogen	
nitrogen	
nitrosyl tetrafluoroborate	
Pearlman's catalyst	
sulfolane	
water	

Prepare a solution of 129 mL of N,N-dimethylformamide and 65 mL of acetic anhydride in a round-bottomed 500-mL Florence flask. Add to the flask, with stirring, 43.2 g of HBIW, 0.8 mL of bromobenzene, and 4.7 g of Pearlman's catalyst. Purge the flask by bubbling hydrogen gas in the liquid , this will displace the air. Continue to bubble hydrogen gas into the flask and stir. If possible, maintain a pressure of 50 psi. Over a short period of time, the temperature may rise to about 50 °C, at this temperature begin cooling the flask with a cold water or salt-ice bath to keep it under 50 °C. The total reaction time needed is 24 hours. Since it is undesirable to bubble hydrogen gas through the flask for this length of time, as much would be wasted, a pressure is maintained. During the reaction, stop cooling if the temperature drops below 35 °C, always keep it between 35-50 °C. Stir the contents of the flask for the entire 24 hours. Purge the flask by bubbling nitrogen gas into it to displace any remaining hydrogen. Filter the contents of the flask to collect the solid material and the catalyst. Wash with 130 mL of denatured ethyl alcohol, this should leave behind a gray solid of Pearlman's catalyst and TADB. The TADB can be separated from the catalyst by dissolving the solid in boiling chloroform, and filtering to remove the remaining solid catalyst. Boil the chloroform down to recrystallize the TADB. The yield is about 85%.

Prepare a solution of 15.5 g of the above prepared TADB, 1.1 mL of water, and 300 mL of sulfolane in a round bottomed 500-mL Florence flask on a salt-ice bath. Add 10.5 g of nitrosyl tetrafluoroborate to the flask over a period of 30 minutes, keeping the temperature below 25 °C. After the addition, stir the mixture for 1 hour at 25 °C, then for 1 hour at 55-60 °C. Allow the solution, which should be a yellow-orange color, to cool to 25 °C. After cooling, rapidly add 47.8 g of nitrosyl tetrafluoroborate, keeping the temperature below 25 °C. Stir the mixture at 25 °C for 2 hours, then at 55-60 °C for 2 hours. Cool the mixture to below 10 °C with a salt-ice bath, then dump the contents, solid precipitate and all, into a large bucket. Slowly add 4.5 L of water to the mixture in the bucket, keeping the temperature below 25 °C, the

color of the solution should change from green to yellow, some brown fumes may be evolved. Maintain the temperature at 25 °C with continuous stirring for 18 hours, a white precipitate should form. Filter to collect this crude HNIW, and wash several times with water to yield about 12 g of hydrated product. To purify the HNIW, dissolve it in 40 mL of ethyl acetate, chromatographically filter the solution through a short column of silica get, and wash with ethyl acetate. Pour the filtered solution into 500 mL of chloroform to precipitate the HNIW in its anhydrous beta form. The chromatographic filtration can be skipped. If pale yellow crystals are obtained as the crude product, it is the wrong stuff. Heat these crystals in 15 mL of water per 1 g of product at 95 °C with stirring for 10 minutes, then cool to 0 °C. After standing for 6 hours, filter and wash the crude product as above, it should be HNIW now. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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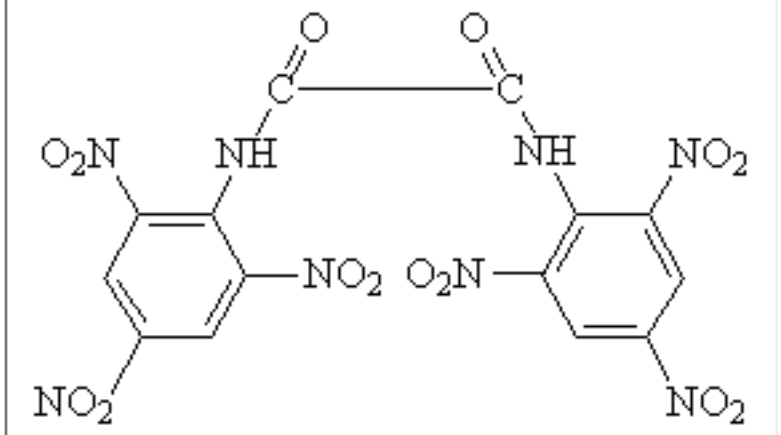
melting point ? °C	boiling point ? °C	HNO	molecular mass ? g/mol	density ? g/mL
table key	sensitivity low	chemical formula $(C_6H_2(NO_2)_3NHCO)_2$	explosive velocity ? m/s	estimated cost $?.00/g



HNO stands for 2,4,6,2',4',6'-hexanitro-oxanilide. This material uses the explosive TNO as its precursor. HNO was first prepared by A.G. Perkins in 1892 when he did nitrations of TNO and from oxanilide. HNO is a stable compound that resists mechanical shock, friction, and heat. Compared to TNO this compound is fairly similar, it has, perhaps, slightly greater stability and explosive power. HNO is used as a component in ignitors and pyrotechnics.

CHEMICALS	APPARATUS
acetone	beaker
ethyl alcohol	Buchner funnel
nitric acid	1000-mL Florence flask
sulfuric acid	graduated cylinder
tetranitro-oxanilide	litmus paper

water	stirrer/stirring rod
	thermometer

Prepare an acid mixture by pouring 125 mL of 90% nitric acid into a round bottomed 1000-mL Florence flask. Slowly add 55 mL of concentrated sulfuric acid. Set the flask into a salt-ice bath and cool it to 10 °C. You will need a magnetic stirrer if using a flask, otherwise stir by hand with a stirring rod in a beaker with extreme caution. Slowly add 29.2 of tetranitro-oxanilide (TNO) to the mixed acid with rapid agitation while keeping the temperature between 8-10 °C, this should require about 25 minutes. After adding the TNO, transfer the flask to a water bath and heat it to 85 °C over a 2 hour period, then hold the temperature between 85-90 ° for 1 hour more. The HNO slurry is filtered on a Buchner funnel and washed with water until it is almost acid free. The filter cake is placed in a beaker and sufficient water added to form a slurry. Steam is run into the slurry under agitation for 10 minutes. The slurry is filtered and the residue washed. The latter treatment of the slurry is repeated until the wash water is found to be neutral to litmus paper. The HNO is washed with ethyl alcohol, then acetone, dried in the air, and finally dried at 100-110 °C. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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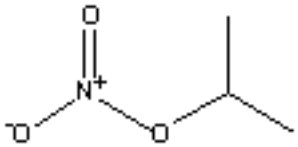
IPN

melting point -82 °C	boiling point 101.5 °C	IPN	molecular mass 105.09 g/mol	density 1.036 g/mL
table key	sensitivity low	chemical formula $CH_3CH(ONO_2)CH_3$	explosive velocity 5070 m/s	estimated cost $?.00/g



IPN is an acronym for isopropyl nitrate, its proper scientific name is 2-propyl nitrate. IPN is a white liquid with an ether like smell. IPN is a volatile liquid with anesthetic properties at lower concentrations as well as causing headaches if inhaled or spilled on the skin. Ingesting or constant inhalation of quantities exceeding 4% for two or more hours is lethal. Quantities as low as 0.2% show no ill effects. This substance has found uses as rocket propellents and jet starter fuel when it is not being used as a propellent or explosive. The liquid is stable for the most part although it is flammable.

CHEMICALS	APPARATUS
isopropyl alcohol	Florence flask
nitric acid	
urea	

To prepare IPN, isopropyl alcohol is nitrated continuously by adding a mixture of 61% nitric acid with 95% isopropyl alcohol, saturated with urea, into a Florence flask set up for distillation containing boiling 50% nitric acid. The IPN and water formed are continuously distilled off at about 98 °C from the reaction mixture. The volume of the reaction mixture is held constant by drainage of nitric acid and unstable by-products from it as the reactants are added. Unless you have a special flask with a stopcock on the bottom, you will have to periodically disconnect the flask from the condenser and dump out some of the used nitric acid. You will also have to momentarily disconnect the flask to add more acid/alcohol mix if you do not have an addition funnel. Be very careful doing this as you will subject yourself to a

blast of acid fumes. A curtain of air, nitrogen, or carbon dioxide is blown through the reaction mixture to improve mixing and to facilitate the elimination of the volatile products. However, a flow of inert gas in excess of 50 L/hr decreases the IPN yield. The optimum ratio of nitric acid to isopropyl alcohol is about 2:1. The IPN yield is 78%.

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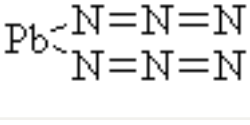
Lead Azide

melting point explodes at 350 °C	boiling point ---	Lead Azide	molecular mass 291.24 g/mol	density 3.8 g/mL
table key	sensitivity high	chemical formula $Pb(N_3)_2$	explosive velocity 4500 m/s	estimated cost $?.00/g



Lead azide is a common primary explosive used as a standard to compare sensitivity among other primary explosives. Making lead azide is not a simple task, this laboratory uses advanced techniques and equipment. Getting the chemicals will be another task. Sodium azide is an unstable, therefore regulated, material nearly impossible to get, it will need to be synthesized. Lead azide is sensitive to heat, shock and friction. The addition of dextrin to this lab prevents the formation of large crystals which can be very dangerous.

CHEMICALS	APPARATUS
dextrin	250-mL beaker
lead nitrate	Buchner funnel
sodium azide	graduated cylinder
sodium hydroxide	pipet/buret
water	separatory funnel
	stirring rod
	thermometer

Dissolve 2.33 g of sodium azide and 0.058 g of sodium hydroxide in 70 mL of water by shaking in a separatory funnel. This is solution A. Dissolve 6.9 g of lead nitrate and 0.35 g of dextrin in 90 mL water

in a 250-mL beaker, add 1 or 2 drops of 10% sodium hydroxide to bring the pH to about 5. This is solution B. Heat solution B to 60-65° on a water bath and agitate it with a plastic or hardwood stirring rod. The stirring should be as efficient as possible to prevent the formation of large crystals. Stirring, while vigorous, should not produce any spattering of the mixture and the stirring should not rub against the walls of the beaker. The friction might cause some crystals to explode. Add solution A dropwise to solution B while stirring. The addition should take about 10 minutes. Remove the beaker from the water bath and continue stirring the mixture in the beaker while cooling to room temperature, this will take about 1 hour. Allow the precipitate of lead azide to settle and pour the solution over a filter to collect the crystals. Use suction filtration with a Buchner funnel if possible. Add 150 mL of water to the crystals to wash them, add the water in 50 mL increments. Dry the sample for 8-15 hours or longer, but no more than 24, at 65 °C. The lead azide should form small spherical crystals that are opaque in color. The yield should be around 5 g. Store the lead azide moist in a rubber stoppered plastic bottle if you must. If you do not have a separatory funnel for solution A, use a beaker to prepare the solution and a pipet or buret to to add it to solution B. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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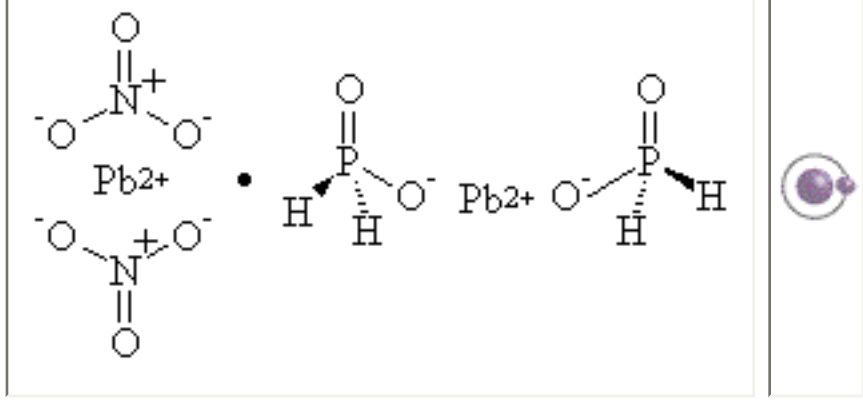
Lead Nitratophosphite

melting point decomposes at 100 °C	boiling point ---	lead nitratophosphite	molecular mass 668.43 g/mol	density ? g/mL
table key	sensitivity low	chemical formula $Pb(NO_3)_2Pb(H_2PO_2)_2$	explosive velocity 4500 m/s	estimated cost $?.00/g



Lead nitratophosphite, or LNP, is a stable heavy, white crystalline compound first prepared back in 1916 by E.R. Von Hertz. This compound is not all that well suited as a stand alone explosive because of its high stability and small volume of gas produced. On the plus side, it makes an excellent component in mixtures and is practically smokeless, leaving little residue or slag. This compound is best suited for percussion fuses as it burns very hot in the open.

CHEMICALS	APPARATUS
calcium hypophosphite	beaker
lead nitrate	stirrer/stirring rod
water	

Prepare a saturated lead nitrate solution by adding 331 g of it to 260 mL of hot water in a beaker. Prepare a saturated calcium hypophosphite solution by adding 170 g of it to 1360 mL of water, bring this solution to a boil. Add the hot lead nitrate solution slowly to the boiling calcium hypophosphite solution.

The mixture is then cooled rapidly, with efficient stirring, by placing it in a salt-ice bath upon which lead hypophosphite separates. Pour the solution over a filter to collect the lead hypophosphite. Add 250 g of the lead hypophosphite to a boiling solution of 500 g of lead nitrate in 1500 mL of water in a beaker while stirring, and cool rapidly. The LNP precipitate that should have formed is filtered and dried at 40-50 °C. You will need a stirring rod or magnetic stirrer for mixing.

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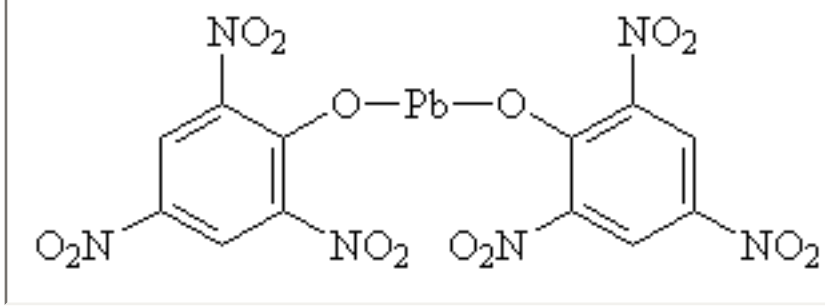
Megalomania's Controversial Chem Lab ©1997-2004 /lead nitratophosphite/ revised January 31, 2004

Lead Picrate

melting point explodes at 270 °C	boiling point ---	Lead Picrate	molecular mass 663.41 g/mol	density 2.831 g/mL
table key	sensitivity very high	chemical formula $Pb(C_6H_2(NO_2)_3O)_2 \cdot H_2O$	explosive velocity 4400 m/s	estimated cost $?.00/g



Lead picrate is a very unstable primary explosive compound. Its manufacture is simple, and the chemicals used in the preparation are not all that exotic. The main ingredient in lead picrate is the explosive picric acid, its manufacture is listed in its own section. Another chemical precursor, lead monoxide, also known as litharge or white lead, is supposedly available for use in plumbing. If my plumber used lead in my pipes he would get fired. Check out plumbing stores but do not hold your breath. Until I actually find some for sale it would seem better to make it. Lead picrate crystals are very sensitive to friction, shock, and heat. The crystals may even detonate from their own weight. This explosive is usually found in a monohydrate form. It was first patented in France in 1872 for use in blasting caps and bullet primers.

CHEMICALS	APPARATUS
lead monoxide	small beaker
methyl alcohol	crystallization dish
picric acid	stirring rod
	graduated cylinder

In a small beaker, dissolve 2 g of picric acid in 10 mL of methyl alcohol and stir with a wooden or plastic stirring rod until the picric acid dissolves. Slowly add 2 g of lead monoxide to the solution while stirring. The solution may thicken at this time, you must prevent the formation of large clumps in solution or dried crystals on the side of the beaker. At this point pour the solution onto a crystallization dish and let it evaporate. The lead picrate can be dried faster by heating on a steam or water bath, this will give the product more stability as well. Dried lead picrate is very sensitive to friction, shock, and heat. A large pile of the crystals may detonate themselves from their own weight, so spread them out as much as possible. You will need a graduated cylinder for measuring liquids.

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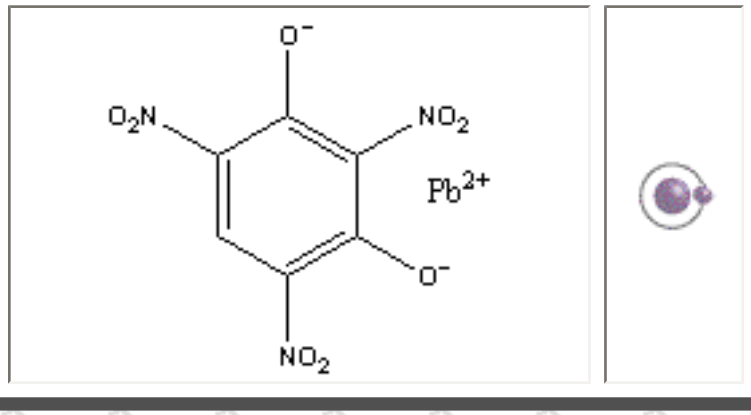
Lead Styphnate

melting point explodes at 275 °C	boiling point ---	lead styphnate	molecular mass ? g/mol	density 2.6 g/mL
table key	sensitivity high	chemical formula $PbC_6H(NO_2)_3O_2$	explosive velocity 4900 m/s	estimated cost $?.00/g



Lead styphnate, also called lead trinitroresorcinate, is an unstable primary explosive that resists shock but will detonate readily from heat or static. It is usually mixed with lead azide to improve its ability to detonate from flame or electric ignition. The preparation of lead styphnate is easy, but the chemicals used in its manufacture are of the kind only a lab would use. Lead acetate and nitric acid can be obtained but magnesium styphnate will be nearly impossible. Magnesium styphnate is derived from styphnic acid, or 2,4,6-trinitroresorcinol. Trinitro anything usually raises some danger flags, and dangerous chemicals are forbidden. Until I locate the method of preparation for styphnic acid, you will have to find some yourself.

CHEMICALS	APPARATUS
lead acetate	small beaker
magnesium styphnate	graduated cylinder
nitric acid	stirring rod
water	thermometer

Lead styphnate is prepared by adding a magnesium styphnate solution to lead acetate solution in a small beaker while stirring, and keeping the temperature at 70 °C. A precipitate will form, keep stirring for 15 minutes. After this time is up, add dilute nitric acid while stirring and cooling to 30 °C with a salt-ice bath, keep stirring until this temperature is reached. Collect the crystals on filter paper, wash with water, and allow them to dry in the open. The crystals should be reddish brown or orange in color.

Notice the lack of quantities of chemicals. The source I obtained this information from is reliable but sketchy. I suggest using 10 g of lead acetate in 30 mL of water, and the same for magnesium styphnate, to make the solutions. Add 10 mL of concentrated nitric acid to 70 mL of water for the dilute acid. Keep in mind the danger these crystals may pose, keep the dried crystals away from heat, friction, and shock. Store the crystals under water if they are not going to be used immediately. You will need a graduated cylinder for measuring liquids, a stirring rod for mixing, and a thermometer to monitor the temperature.

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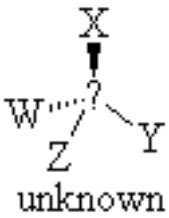
Lead 2,4,6-Trinitro-3-Oxybenzoate

melting point ---	boiling point ---	lead 2,4,6-trinitro-3-oxybenzoate	molecular mass ? g/mol	density ? g/mL
table key	sensitivity medium	chemical formula ???	explosive velocity ? m/s	estimated cost $?.00/g



This substance was first prepared by H. Ficheroulle and A. Kovache in 1949. This explosive is somewhat stable to mechanical shock but will explode when brought into contact with flame. The solid will pull moisture out of the air, being hygroscopic. The more moisture it contains, the less likely it is to explode, conversely the drier it is the more likely it is to explode. Keep this material tightly stoppered and perhaps damp when storing, but keep it dry for detonating. Thus far there have been no practical military or civilian applications for this compound.

CHEMICALS	APPARATUS
ethyl alcohol	beaker
lead nitrate	graduated cylinder
sodium benzoate	stirring rod
water	thermometer

Dissolve 2.4 g of lead nitrate in 50 mL of water heated to 90-95 °C in a beaker, and add, with stirring, a concentrated solution of sodium benzoate , prepared by neutralizing 2 g of benzoic acid with 0.6 g of sodium hydroxide. Evaporate the mixture on a water bath to a small volume while the liquid still remains clear. Cool and add 50 mL of 95% ethyl alcohol. This results in a very fine, light yellow

precipitate, which is separated by vacuum filtration. After drying at 50 °C, the yield should be about 41.82%. A moisture content in excess of 20% will make this explosive nearly impossible to detonate. You will need a graduated cylinder for measuring liquids, a stirring rod for mixing, and a thermometer to monitor the temperature.

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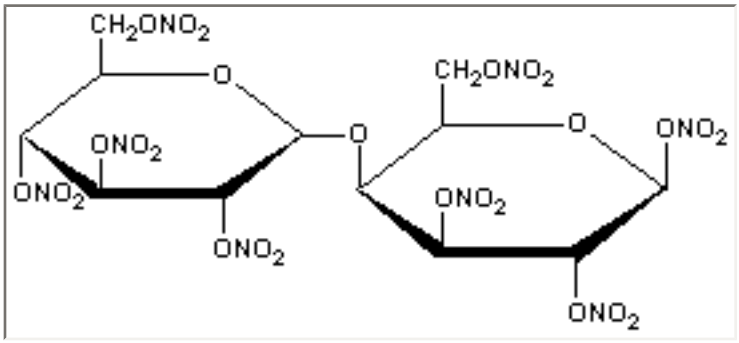
Maltose Octanitrate

melting point 135 °C	boiling point decomposes at 171 °C	maltose octanitrate	molecular mass 702.30 g/mol	density 1.62 g/mL
table key	sensitivity high	chemical formula $C_{12}H_{14}O_3(ONO_2)_8$	explosive velocity ? m/s	estimated cost $?.00/g



Maltose octanitrate, also called nitromaltose, is a powerful, somewhat sensitive explosive used militarily in blasting caps. This compound does decompose over time, losing about 23% over a 43 day period, so it is best to use this compound within a reasonable time after preparation. In the mean time keep it stored in a cool place as elevated temperatures will accelerate the decomposition. A useful detonator called maltobenzit can be made by thoroughly blending 10 g of maltose octanitrate with 5 g of *m*-dinitrobenzene at 70 ° in a kneading machine with 20 g of benzene. The resulting plastic mass is heated to 95 °C while the kneading is continued, and then cooled.

CHEMICALS	APPARATUS
ethyl alcohol	250-mL beaker/flask
ethyl ether	graduated cylinder
maltose	pipet/buret
nitric acid	stirrer/stirring rod
sodium bicarbonate	thermometer
sulfuric acid	

urea nitrate

water

Dehydrate 20 g of pure maltose by heating in a hot oven for 45-60 minutes. Throughly mix the dried maltose with 0.5 g of urea nitrate in a 250-mL beaker or Florence flask. Place the beaker or flask in a salt-ice bath and slowly add 40 mL of 99% nitric acid drop by drop with a pipet or buret. Stir the mixture constantly during the acid addition and maintain a temperature of 0-2 °C. The liquid should turn a brownish color at this point. While stirring, slowly add 55 mL of fuming sulfuric acid containing about 25% SO_3. If at any point brown fumes begin to evolve, stop adding the acid and let it cool before continuing. After all the acid has been added, the mixture is warmed to 80 °C and poured into a large volume of ice water. The yellow solid precipitate that should have formed is seperated by filtration and washed sequentially with 1% sodium bicarbonate solution and water. To remove any remaining urea nitrate, the precipitate is recrystallized twice from a 1:2 ethyl alcohol/ethyl ether solution and dried. The yield should be a whopping 159% of the theoritical yield, or 31.8 g. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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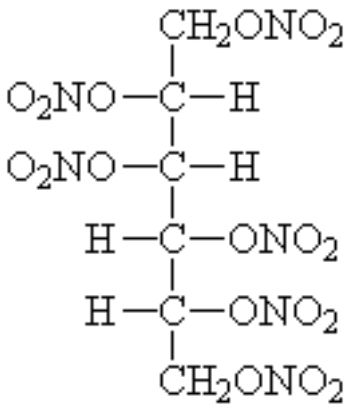
Mannitol Hexanitrate

melting point 112 °C	boiling point explodes at 160 °C	mannitol hexanitrate	molecular mass 452.17 g/mol	density 1.230-1.604 g/mL
table key	sensitivity low	chemical formula $C_6H_8N_6O_{18}$	explosive velocity 7000 m/s	estimated cost $?.00/g



Mannitol hexanitrate, or nitro mannitol, is a somewhat unstable primary explosive compound. Nitro mannitol is prepared by nitrating the sugar mannitol. Mannitol or, mannite, is not your everyday sugar so do not expect to find any in the grocery store. Mannitol comes in two stereoisomeric forms called L-mannitol and D-mannitol. A stereoisomer is a pair of molecules that are mirror images of each other, same formula but arranged differently. Like your hands they are equal but opposite. When a beam of polarized light passes through a solution of a stereoisomer and the angle changes, it is optically active. Polarized light are beams of light traveling in the same plane, sunglasses polarize light so only light waves of one plane, usually vertically, reach your eyes. If vertical light is rotated to horizontal the angle has changed. Light rotated left is called levorotatory, abbreviated L. Light rotated to the right is called dextrorotatory, abbreviated D. Why the lecture? First of all I love stereoisomerism, and second there is always a chance that chemicals will react differently if L and D. Now you know. In all probability the L or D mannitol will synthesize nitro mannitol. The difference commonly affects biological reactions. This explosive was first prepared back in 1847 by A. Sobrero when he mixed mannitol with nitric acid. It was prepared on a lab scale throughout the 19th century and was manufactured in the Royal Arsenal at Turin, Italy until 1853 when it blew up. Mannitol hexanitrate is also called nitromannite or hexanitromannite, the French call it nitromannitane, the Germans and Italians call it nitromannite, and the Russians call it

mannitazotnokislyy. Mannitol hexanitrate is used as a secondary explosive and in some cases as a safety blasting cap. It can be stored safely with the addition of 5-10% sodium, potassium, or lithium salicylates.

CHEMICALS	APPARATUS
ethyl alcohol	dropping funnel/buret
mannitol	300-mL Erlenmeyer flask
nitric acid	graduated cylinder
sodium bicarbonate	sintered-glass funnel
sulfuric acid	thermometer
water	

Cool 50 mL of 99% nitric acid in a 300-mL Erlenmeyer flask to 0 °C in a salt-ice bath. Slowly add 10 g of mannitol in small amounts at such a rate as to keep the temperature below 0 °C. After all the mannitol is dissolved, add 55 mL of 99% sulfuric acid from a dropping funnel, or buret, at such a rate that the temperature is held below 0 °C. The porridge-like mass is filtered on a sintered-glass funnel, washed with water, 5% sodium bicarbonate, and again with water. The crude product is dissolved in warm ethyl alcohol, filtered, and cooled to deposit crystals of pure mannitol hexanitrate. A second crop is obtained by heating the filtrate and washings to boiling, adding water until the solution is cloudy, and cooling. The yield is 23 g or 96.6% of the theoretical yield. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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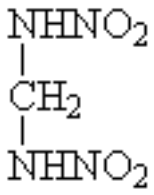
melting point 104 °C	boiling point explodes at 300 °C	MEDINA	molecular mass 136.17 g/mol	density ? g/mL
table key	sensitivity low	chemical formula $CH_4N_4O_4$	explosive velocity 8700 m/s	estimated cost $?.00/g



MEDINA stands for methylene dinitramine, and is also called methylenedinitramine and N,N-dinitromethanediamine. This compound was first prepared around 1949 at the University of Bristol by the hydrolysis of hexamine. This compound is not cruelty free (heh heh), it has been sprayed into rabbit eyes and injected under guinea pigs skins. The compound has been found to be non-toxic. This lab does not exactly fit in well with normal laboratory procedures as this information is the industrial laboratory method. Since this is the industrial method and it is still made in the lab I conclude this substance is either not used much or is to dangerous, I am leaning towards not used much. This is surprising as this explosive is quite powerful for such a small and simple molecule. Its real fault lies in the fact that it does not keep well, so use it soon after preparing.

CHEMICALS	APPARATUS
acetic anhydride	50 & 250-mL beaker
acetone	buret
charcoal	2-L Florence flask
ethyl acetate	graduated cylinder
ethyl alcohol	stirrer/stirring rod
ethyl chloride	thermometer

- formamide
- formic acid
- isopropyl alcohol
- methenamine
- nitric acid
- 2-nitropropane
- paraffin
- sodium hydroxide
- sodium sulfate
- water
- xylene

This is a three step process for the manufacture of MEDINA: In a round bottom 2-L Florence flask, mix 476 mL of formamide and 70 g of methenamine. The flask is set up for refluxing, and heated at 140 °C for 5 hours. It is then chilled in ice, the solid is filtered, and washed on a filter with 90 g of formamide. The crude product of methylenediformamide may be used in the next step or purified by dissolving in ethyl alcohol, decolorizing with charcoal, and chilling.

19 mL of 100% nitric acid is added dropwise with a buret while stirring to a suspension of 5 g of crude methylenediformamide in 19 mL of acetic anhydride cooled to 10-15 °C in a 50-mL beaker. The solution is then held at 0 °C for 2 hours, and poured with stirring into a 250-mL beaker filled with 150 mL of ice water. The precipitate is filtered, washed twice by mixing with ice water, pressed dry on the filter, and dissolved in 30 mL of ethyl acetate. The solution is seperated from water, dried over anhydrous sodium sulfate, concentrated in vacuum, 10 mL of isopropyl alcohol is added, and the product is collected. The product is methylene di(nitroformamide), which can be purified by recrystallization from either acetone, isopropyl alcohol, or from boiling ethyl chloride.

The crude methylene di(nitroformamide) is pressed dry on the filter, stirred into 105 mL of formic acid, and the paste is allowed to stand overnight. The next day the solution is filtered through an acid filter, the formic acid and water is removed by distilling with xylene, and the crude MEDINA, which seperates as a sand, is filtered and dried over paraffin and sodium hydroxide in vacuum. The crude MEDINA is recrystallized from 2-nitropropane or a 9:1 solution of ethyl chloride/isopropyl alcohol. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing,

and a thermometer to monitor the temperature.

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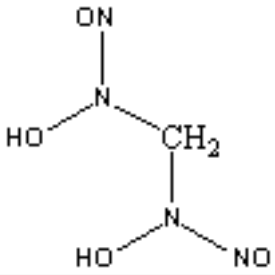
MEDNA

melting point ---	boiling point ---	MEDNA	molecular mass ---	density ---
table key	sensitivity high	chemical formula $CH_4N_4O_4$	explosive velocity ---	estimated cost ---



MEDNA is an acronym for methylenediisonitrosoamine, it is also called N,N' dinitrosomethanedihydroxylamine. The information here is actually for the explosive salts of MEDNA as the free acid is unstable, there are several of importance. The sodium salt would seem to be of greatest importance with other salts being derived from it. The other salts include barium, cadmium, calcium, cesium, copper, monohydroxylamine, iron, lead, mercury, potassium, rubidium, silver, thallium, and tin. Of these, I have information for the barium, calcium, lead, potassium, silver, and sodium salts. All of these explosives are rather sensitive to shock, friction, and heat. They are usually used as detonators in mixtures with other common explosives. The sodium salt was first discovered around 1894.

CHEMICALS	APPARATUS
acetic acid	various beakers
acetone	Buchner funnel
barium chloride	graduated cylinder
calcium chloride	stirring rod
ethyl alcohol	thermometer
nitric oxide	

potassium iodide

silver nitrate

sodium

water

Barium MEDNA

The barium salt of MEDNA is precipitated by adding barium chloride to a solution of either sodium or potassium MEDNA. This compound has the least explosive power of all the salts.

Calcium MEDNA

The calcium salt of MEDNA is prepared by adding calcium chloride solution to a solution of sodium MEDNA, thus precipitating out the calcium MEDNA. I have no other information on its explosive properties.

Lead MEDNA

The lead salt of MEDNA can be precipitated by adding a lead salt solution, such as lead acetate, lead chlorate, lead perchlorate, or lead nitrate, to a solution of sodium MEDNA. This explosive detonates at 250 °C. It can be mixed with lead picrate or lead styphnate for use in detonators.

Potassium MEDNA

Prepare a solution of 56.1 g of silver nitrate in 150 mL of water in a small beaker. Add this solution to a solution of 30 g of sodium MEDNA in 150 mL of water. The curdy silver salt is collected on a Buchner funnel, and washed on the filter paper with 450 mL of water. The damp salt is suspended in 200 mL of water, and the suspension is added slowly with stirring to a solution of 33.2 g of potassium iodide in 150 mL of water. The mixture is stirred for 3 hours, and allowed to stand for 16 hours more. A precipitate of silver iodide is filtered off, and the water is removed from the remaining solution in vacuum to give about 18.8 g of impure potassium MEDNA. This solid is dissolved in 50 mL of hot water, clarified with Celite, and cooled to 0 °C. A small amount of solid is filtered off, and the water is evaporated in vacuum to give 13.5 g of an almost white solid, this corresponds to approximatly 61% of the theoritical yield.

Silver MEDNA

The silver salt of MEDNA is made as above by simply adding silver nitrate solution to the sodium salt of MEDNA without the potassium iodide.

Sodium MEDNA

Very slowly add 13.8 g of sodium metal in small portions to 300 mL of anhydrous ethyl alcohol and cool to 6 °C under nitrogen (If you have some sodium ethoxide handy that would do the trick since that is what this reaction makes, it is also safer). 38.4 g of acetone is added slowly with vigerous stirring as

nitric oxide is passed in at 320 mL per minute for 140 minutes. A fine yellow solid should form and is collected on a Buchner funnel, then the damp solid is dissolved in 130 mL of water, made slightly acidic with glacial acetic acid, and heated on a steam bath until gassing ceases to come from the solution. The mixture is poured into 400 mL of ice cold ethyl alcohol to give 25.3 g of a brown solid which is recrystallized twice from a 2:1 ratio of ethyl alcohol and water to give a white solid which decomposes without melting at 225-260 °C.

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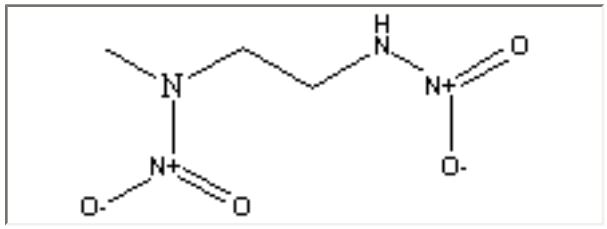
MeEDNA

melting point 120.5 °C	boiling point explodes at 360 °C	MeEDNA	molecular mass 164.13 g/mol	density ? g/mL
table key	sensitivity high	chemical formula $C_3H_8N_4O_4$	explosive velocity ? m/s	estimated cost $?.00/g



MeEDNA is an acronym for N-methylethylenedinitramine or N-methylEDNA. It was first prepared back in 1888, but did not gain interest until World War II. This explosive seems to have good stability, resists decomposition, and does not vaporize much. MeEDNA has about 120% the explosive power of TNT.

CHEMICALS	APPARATUS
acetic anhydride	dropping funnel
ammonium hydroxide	500-mL Florence flask
benzene	stirrer
ethylene dichloride	thermometer
hydrochloric acid	
3-nitrazabutylamine	
nitric acid	

Prepare a solution of 82.4 g of 3-nitrazabutylamine in 100 mL of dry benzene in a 3-necked 500-mL Florence flask fitted with a stirrer , a dropping funnel, and a thermometer. Cool the solution in a salt-ice

bath, and add 75 mL of acetic anhydride dropwise. A white solid precipitate should form and is collected and dried to give 71 g of N-acetyl-N'-methyl-N'-nitroethylenediamine, melting point 79-80 °C. 20 g of this compound is added in small portions to a mixture of 100 mL of 100% nitric acid and 100 mL of acetic anhydride cooled to -10 to -5 °C. The mixture is stirred for 45 minutes, poured onto crushed ice, the solid is filtered, washed with water, and finally dried to give a yield of 9.5 g of N-acetyl-N'-methyl-EDNA, melting point 55-56 °C. To 7.6 g of this compound, add 25 mL of 14% ammonium hydroxide, whereupon it dissolves with evolution of heat. The solution is cooled, acidified with dilute hydrochloric acid, the precipitated solid is collected on a filter, washed with water, and dried to give 5.1 g of MeEDNA which corresponds to a yield of 84.3%. The MeEDNA can be purified by recrystallizing from ethylene dichloride.

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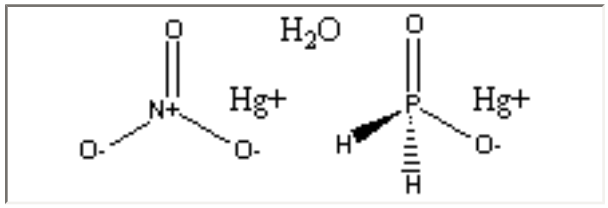
Mercurous Nitratophosphite

melting point explodes at 100 °C	boiling point ---	mercurous nitratophosphite	molecular mass 546.24 g/mol	density ? g/mL
table key	sensitivity medium	chemical formula $HgNO_3Hg(H_2PO_2)H_2O$	explosive velocity ? m/s	estimated cost $?.00/g



Mercurous nitratophosphite was first prepared by S. Hada in 1895 by the lab presented here. This explosive will decompose in water, or when wet, with the release of mercury vapor, so I suggest keeping it tightly stoppered and away from moisture, or even better in a desiccator to get the moisture. Mercurous nitratophosphite will explode when heated to 100 °C, or when it comes in contact with a hot wire. I do not know if shock and friction affect it. Further information about this compound is unavailable.

CHEMICALS	APPARATUS
mercuric oxide	beaker
mercury	Buchner funnel
nitric acid	desiccator
potassium hypophosphite	

Prepare a solution of mercurous nitrate by dissolving mercuric oxide to saturation in nitric acid, and then shake violently with metallic mercury for a few minutes. Mercurous nitratophosphite can be prepared by adding a fairly concentrated solution of potassium hypophosphite to a solution of mercurous nitrate in a small beaker, avoiding an excess of the hypophosphite. As the mercurous nitratophosphite precipitate decomposes when left in contact with the mother liquor, it must be filtered and dried

immediately by vacuum filtration on a Buchner funnel without washing to drive away any moisture. It can be dried and stored in a vacuum desiccator.

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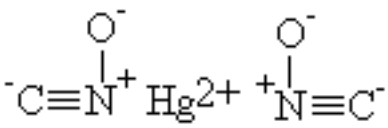
Mercury Fulminate

melting point explodes at 150 °C	boiling point ---	mercury fulminate	molecular mass 284.62 g/mol	density 2.5 g/mL
table key	sensitivity very high	chemical formula $Hg(ONC)_2$	explosive velocity 4000 m/s	estimated cost $?.00/g



Mercury fulminate is an unstable primary explosive compound. It was first prepared in the late seventeenth century by Johann Kunckel von Löwenstern by a procedure very similar to the modern method presented here. Löwenstern detailed mercury fulminate synthesis in his posthumously written *Laboratorium Chymicum*, he used aqua fortis, spiritum vini, and in fimum equinum. That last one is horse manure if you wanted to know. Mercury fulminate was first patented by Alfred Nobel in 1867 for blasting caps. It is not used today for that purpose because of more stable explosives from modern chemistry. Its manufacture is not complicated nor the chemicals in its makeup rare. Mercury can be extracted from a variety of products but it is very expensive. Only a chemical supply company could provide mercury in useful quantities. This lab produces nitrogen dioxide gas as a byproduct, this is a heavy red colored gas that is extremely toxic. The gas will turn moisture in your lungs to nitric acid and may cause fabric to ignite! This lab should be done outside or in a fume hood if possible.

CHEMICALS	APPARATUS
acetic acid	500-mL beaker
ammonium hydroxide	desiccator
ethyl alcohol	100mL Erlenmeyer flask
mercury	graduated cylinder
nitric acid	

water

In a 100mL Erlenmeyer flask, measure out 35 mL of 70% nitric acid, then add 5 g of mercury metal. This mixture should be left alone without shaking or stirring until all the mercury dissolves. Toxic gas will be produced. Keep the flask in a well ventilated area, or stopper the flask and lead a length of rubber tubing into water to safely dissolve the fumes. In a 500-mL beaker, place 50 mL of 90% ethyl alcohol, then add the acid-mercury mix in a well ventilated area. The temperature of the mixture will rise, a vigorous reaction will commence, white fumes will be released, and crystals of mercury fulminate should begin to precipitate. Red fumes of nitrogen dioxide will appear as the precipitation becomes more rapid, then white fumes again as the reaction moderates. After about 20 minutes the reaction should be over. Add water to the beaker and carefully decant off most of the water without losing any crystals. Add water and decant several times until the wash water is no longer acid to litmus. Finally, pour the neutral solution over a filter to collect the grayish-yellow crystals of mercury fulminate. The product may be purified by dissolving in strong ammonium hydroxide, filtering, and re-precipitating by the addition of 30% acetic acid. The pure fulminate is filtered off, washed with cold water, and stored in a container filled with water. Dry in a desiccator immediately before use. You will need a graduated cylinder for measuring liquids.

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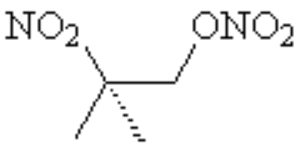
2-Methyl-2-Nitro-1-Propanolnitrate

melting point decomposes at 200 °C	boiling point ---	2-methyl-2-nitro-1-propanolnitrate	molecular mass 164.14 g/mol	density ? g/mL
table key	sensitivity low	chemical formula $CH_3C(NO_2)_2CH_2ONO_2$	explosive velocity ? m/s	estimated cost $?.00/g



This explosive comes from a study of nitroparaffin explosive derivatives done in 1941. This material is very resistant to heat, shock, friction, etc., it even resists blasting caps thus requiring a larger charge to detonate. Unfortunately it has poor stability after it is synthesized, it will not explode, but it will decompose. It has been deemed unworthy in the eyes of the military because of this. Otherwise it has 75% the power of nitroglycerine, it causes headaches like nitroglycerine, and it can gelatinize nitrocellulose pretty good.

CHEMICALS	APPARATUS
ethyl ether	500-mL Erlenmeyer flask
2-methyl-2-nitro-1-propanol	graduated cylinder
nitric acid	separatory funnel
sodium bicarbonate	stirrer/stirring rod
sulfuric acid	thermometer
water	vacuum desiccator

Prepare a mixture of 40 mL of 90.5% nitric acid and 130 mL of 103% sulfuric acid (oleum with 3% sulfur trioxide) in a 500-mL Erlenmeyer flask, and cool to 15 °C in a salt-ice bath. Slowly add, with fast stirring, 50 g of 2-methyl-2-nitro-1-propanol to the acid mix while maintaining the temperature as close to 15 °C as possible. Continue stirring for 1 hour after the addition then let it stand for 15 minutes. Pour the contents of the flask over some crushed ice to separate the product. Add this mixture to a separatory funnel where the bottom layer of spent acids can be removed. Wash the remaining product with water, sodium bicarbonate solution, and again

with water until the washings are neutral to litmus. Combine the washings with the spent acid and extract with ethyl ether to obtain additional product. Wash the ethyl ether until neutral to litmus and add it to the main product. Allow the ethyl ether to evaporate and dry the residue in a vacuum desiccator. The yield is about 50%. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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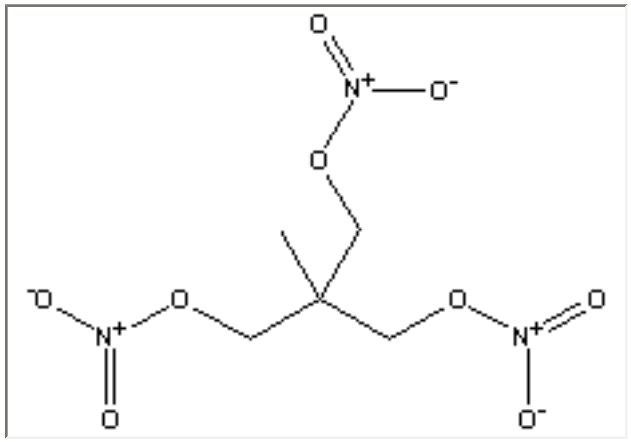
Metriol Trinitrate

melting point -3 °C	boiling point decomposes at 182 °C	metriol trinitrate	molecular mass 255.15 g/mol	density 1.47 g/mL
table key	sensitivity high	chemical formula $CH_3C(CH_2ONO_2)_3$	explosive velocity ? m/s	estimated cost $?.00/g



Metriol trinitrate, also called MTN; 1,1,1-trimethylolethane trinitrate; nitropentaglycerin; 1,3-propanediol, 2-methyl-2-[(nitrooxy)methyl]-, dinitrate (ester); 2-Methyl-2-hydroxymethyl-1,3-propanediol trinitrate; and metriolo in Italian, was first prepared and patented by the Bombrini-Parodi-Delfino Co of Italy under the name Metriolo. The Germans got wind of Metriolo before WWII and saw that it was a good flash and erosion reducing agent, so they began to manufacture it. Metriol trinitrate is a powerful liquid explosive that is somewhat sensitive to explosion, about as much as nitroglycerin. It has been used as a flash and corrosion reducing additive in propellants and as an ingredient in commercial explosives.

CHEMICALS	APPARATUS
calcium chloride	Erlenmeyer flask
ethyl ether	graduated cylinder
metriol	stirrer/stirring rod
nitric acid	thermometer

sodium bicarbonate

sulfuric acid

water

Prepare a mixture of 50 mL of concentrated (>90%) nitric acid and 20 mL of concentrated (>90%) sulfuric acid in a small Erlenmeyer flask, and cool to 20 °C in a salt-ice bath. Carefully add 3.5 g of metriol to the flask while maintaining a temperature of 20 °C. The mixture is stirred for 30 minutes after the addition, then cooled to 5 °C, and finally poured over ice. The solution is extracted with ethyl ether, the extract is washed with water, and the wash is adjusted to pH 7 by shaking with sodium bicarbonate solution, then washed with water three more times. It is then dried with calcium chloride, poured over a filter to remove impurities, and freed of ethyl ether by bubbling with dry air until a constant weight is obtained. Yield is about 88%. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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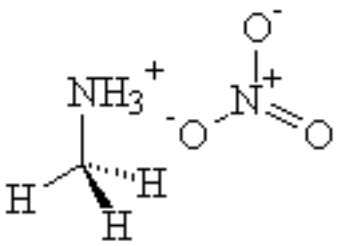
MMAN

melting point ? °C	boiling point 230 °C	MMAN	molecular mass 94.070 g/mol	density 1.2 g/mL
table key	sensitivity low	chemical formula $CH_3NH_3ONO_2$	explosive velocity 6100 m/s	estimated cost $?.00/g



MMAN is an acronym for monomethylamine nitrate, it is also called methylamine nitrate. It is a powerful and stable primary explosive compound. Its stability makes it a better choice for a primary explosive and as a test of the independent chemist's skill. When used as a blasting cap it will probably require some other more sensitive material to help it along, but when it explodes it will detonate even insensitive explosives. The only problem with it is that it is a hygroscopic compound, so keep it very tightly sealed in storage. Another snag is the methylamine solution used, it is not a supermarket item now that drug dealers have made it a DEA watched chemical, it is easy to make though. A note on nitric acid: You can use any concentration of acid from 20% and up, it is the volume of acid that is required. I have given the volume for pure acid, adjust as needed for lesser solutions.

CHEMICALS	APPARATUS
methylamine	1000-mL beaker
nitric acid	desiccator
	graduated cylinder
	stirrer/stirring rod

Place 250 mL of 33% methylamine solution in a 1000-mL beaker. Slowly add, with stirring, 385 mL of 100% nitric acid. It will be helpful to divide the acid into four equal portions of 96 mL each and use a salt-ice bath. The acid addition will generate substantial heat and may boil, wait until the solution cools a little before adding the next portion. It is not necessary to add concentrated nitric acid, a concentration as low as 20% will suffice. You must still add the equivalent of 385 mL of pure acid. Remember there is 1 mL of pure acid per 1% of solution in 100 mL. A 20% solution would require 1925 mL. After adding the acid, test the solution with pH paper, or litmus paper. The result must be near pH 7 if using the pH paper and be neutral if using litmus paper. If the solution is acidic add methylamine until pH 7 is reached. If the solution is basic add nitric acid until pH 7 is reached. Evaporate the liquid to precipitate the crystals of MMAN by heating until a slurry is reached, then use vacuum drying to remove the rest of the water. Because the MMAN is hygroscopic, it will be impossible to drive off all the water unless heated under vacuum or placed in a desiccator. Extreme care must be taken when heating an explosive **IT CAN EXPLODE**. MMAN is safe enough that it only burns when strongly heated. Use either a hotplate, steam bath, or oil bath to heat the explosive. If you have access to vacuum equipment use the vacuum drying method. You will need a graduated cylinder for measuring liquids, and a stirring rod or magnetic stirrer for mixing.

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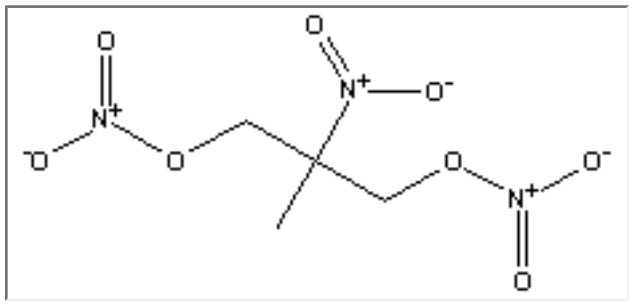
NIBGkDN

melting point 37.4 °C	boiling point decomposes at 200 °C	NIBGkDN	molecular mass 225.12 g/mol	density ? g/mL
table key	sensitivity high	chemical formula $CH_3C(NO_2)(CH_2ONO_2)_2$	explosive velocity ? m/s	estimated cost $?.00/g



NIBGkDN is an acronym for nitro-iso-butylglycol dinitrate. This substance is more commonly called nitromethylpropanediol dinitrate, and a more scientific name is 2-methyl-2-nitro-1,3-propanediol dinitrate. It was made on a lab scale by Germany in WWII and has not really found its way into the industrial mainstream as it has been designated too unstable for military use. It was proposed for use in commercial explosives as a substitute for nitroglycerine. It is a white waxy solid that is very sensitive to impact and has low tolerance for heat. Its explosive power is comparable to other detonating compounds.

CHEMICALS	APPARATUS
ethyl ether	beaker
2-methyl-2-nitro-1,3-propanediol	300-mL Erlenmeyer flask
nitric acid	graduated cylinder
sodium sulfite	seperatory funnel
sulfuric acid	stirrer/stirring rod
water	thermometer

vacuum desiccator

Gradually sift 50 g of dry, ground 2-methyl-2-nitro-1,3-propanediol into a mixture of 80 mL of 100% nitric acid and 98 mL of 100% sulfuric acid with mechanical stirring at a temperature of about 15 °C in a 300-mL Erlenmeyer flask. After the addition, the temperature is allowed to rise to 20 °C and is kept there for 30 minutes with stirring. Let the mixture stand for 1 hour, then transfer it to a separatory funnel where the heavier spent acid layer can be drawn off. The remaining oil is washed twice with aqueous sodium sulfite solution heated to around 45 °C, and then with warm water until neutral to litmus paper. Transfer the liquid to a beaker and dry under vacuum at 50 °C, the oil is chilled until it becomes milky in appearance and waxy crystals separate. An additional amount of material can be obtained by mixing all the washings and spent acid then extracting with ethyl ether. The ethyl ether is separated and washed with water. The ethyl ether is allowed to evaporate and the residue is dried in a vacuum desiccator. Their should be an additional 16.2% of product. Total yield is 92.2% altogether. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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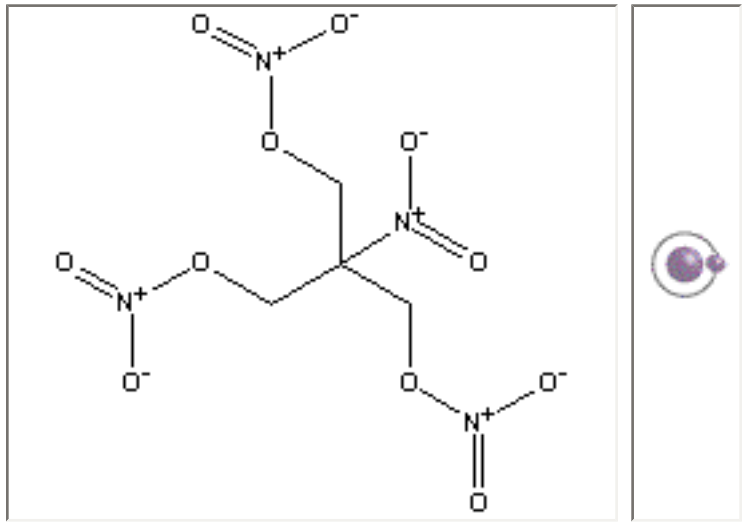
NIBGTN

melting point -50 °C	boiling point decomposes at 180 ° C	NIBGTN	molecular mass 286.12 g/mol	density 1.64 g/mL
table key	sensitivity high	chemical formula $O_2NC(CH_2ONO_2)_3$	explosive velocity 7860 m/s	estimated cost $?.00/g



NIBGTN is an acronym for nitroisobutylglycerol trinitrate. The proper name for this compound is 1,3-propanediol, 2-nitro-2-[(nitrooxy)methyl]-, dinitrate (ester). Other names include 1,3-propanediol, 2-(hydroxymethyl)-2-nitro-, trinitrate (ester); nitroisobutanetriol trinitrate; 1,3-propanediol, 2-nitro-2-[(nitrooxy)methyl]-, dinitrate; 1,3-propanediol, 2-(hydroxymethyl)-2-nitro-, trinitrate; nitroisobutyl glyceryl trinitrate; nitroisobutyl glycol trinitrate; nitroisobutylglycerintrinitrate; and trimethylol nitromethane trinitrate. This compound is a viscous, yellow, oderless, oily liquid similar to nitroglycerine. This compound was first experimented on back in 1912, and the current method of preperation was developed by Dr. A. Stettbacher in 1934. It was proposed to use NIBGTN as a substitute for nitroglycerin in commercial explosives, but its greater instability and poor thermal stability made it difficult to work with. The detonation velocity listed above can be achieved only by confining the explosive and using a powerful detonator, otherwise the detonation velocity is a rather low 1000-1500 m/s.

CHEMICALS | APPARATUS

ethyl ether	500-mL Erlenmeyer flask
nitric acid	graduated cylinder
tris(hydroxymethyl)nitromethane	separatory funnel
sodium bicarbonate	stirrer/stirring rod
sodium sulfite	thermometer
sulfuric acid	vacuum desiccator
water	

Prepare an acid mixture of 99.1 mL of 99% sulfuric acid and 76.3 mL of 99% nitric acid in a 500-mL Erlenmeyer flask, cool this mixture in a salt-ice bath. Slowly add, with stirring, 50 g of tris(hydroxymethyl)nitromethane to the flask while keeping the temperature below 15 °C. The addition should take about 30 minutes. Stir the mixture for an additional 30 minutes while allowing the temperature to drop to 5 °C. Transfer the contents of the flask to a separatory funnel and allow it to stand for several minutes while the layers separate, then draw off the bottom layer of acid. Wash the remaining oil with water, then with sodium bicarbonate solution, and finally twice more with water. The washed oil should be neutral to litmus, if not, wash with more water until it is. Combine all of the washings and mix them with the spent acid. Cool this mixture and extract it several times with ethyl ether to remove additional product. Wash the ethyl ether extracts with water, evaporate the ethyl ether, and add the remaining product to the other washed product. Dry all of the NIBGTN in a vacuum desiccator. The yield is around 95%. Sometimes the NIBGTN will form an emulsion that can take awhile for layers to separate fully, this can be mitigated by heating all wash water to 43.5 °C, using concentrated sodium sulfite solution instead of sodium bicarbonate, and bubbling in compressed air while washing. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

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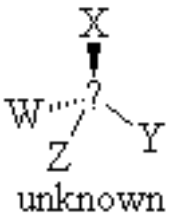
Nitrated Petroleum

melting point	boiling point	nitrated petroleum	molecular mass	density
---	---		---	---
table key	sensitivity	chemical formula	explosive velocity	estimated cost
	varies	---	varies	varies



This explosive procedure intrigues me because what chemical can be more readably available than gasoline, or for that matter motor oil, kerosine, and diesel. The nitration of petroleum generally produces either brown non-crystalline solids or liquid products that are explosive. The first attempts to nitrate petroleum were made in Russia at the end of the 19th century by one Dr. Konovaloff. Dilute nitric acid under pressure was used to nitrate the product, obtaining very low yields. In 1902 a nitration method patented by Edeleanu and Filti used mixed nitric-sulfuric acids, unfortunately for them no practical application of their patent was found. Others tried using different kinds of petroleum like A.S. Flexer, Freund, and Kharichkov to name a few. Not that it matters who they are, but I like to know. You may experiment yourself on everything from crude oil to that stuff you get at the hardware store for oil lamps. Things are screwed up nowadays, all of the good chemical additives that make petroleum nitrateable seem to be getting legislated by the government (only the democrat oppressors). This lab may have worked for scientists a hundred years ago, but it may not work for you today.

CHEMICALS	APPARATUS
gasoline	beaker
nitric acid	graduated cylinder
sulfuric acid	thermometer
water	

Standard gasoline, get the cheap stuff and not gasahol (gas/ethyl alcohol mix) if you can avoid it, is added gradually to a mixture of 15 parts 100% sulfuric acid and 3 parts 100% nitric acid in a large beaker. Add 1 part of gasoline per 18 parts of mixed acid. The reaction temperature should be somewhat cool, never let the temperature rise above 80 °C. A temperature below 20 °C should do, you can regulate this with a salt-ice bath. When the nitration is completed, the mixture is diluted with a large quantity of cold water to precipitate the product. The un-nitrated oil will float to the top of the acid-water solution. Collect the precipitate on a filter and wash with water, yield will be 30% to 90% depending on the crude oil used to manufacture the gasoline. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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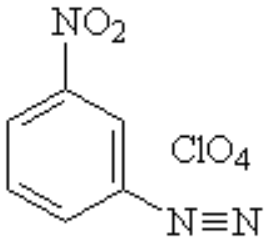
m-Nitrobenzenediazonium Perchlorate

melting point explodes at 154 °C	boiling point ---	*m*-nitrobenzenediazonium perchlorate	molecular mass 235.57 g/mol	density ? g/mL
table key	sensitivity very high	chemical formula $O_2NC_6H_4NN(ClO_4)$	explosive velocity ? m/s	estimated cost $?.00/g



m-nitrobenzenediazonium perchlorate, also called *m*-nitrodiazobenzeneperchlorate, was first patented back in 1911 by the German scientist E. von Hertz for use in detonators. This compound is sensitive to shock and friction and will explode if heated to 154 °C. Although this compound is not very soluble in water, it will draw moisture out of the air being hygroscopic. This compound has been used as a detonator when mixed with nitromannite or other explosive nitric esters.

CHEMICALS	APPARATUS
ethyl alcohol	beaker
ethyl ether	graduated cylinder
hydrochloric acid	stirring rod
m-nitroaniline	test tube
perchloric acid	
sodium nitrite	
water	

Suspend 0.5 g of *m*-nitroaniline in 5 mL of water in a wide test tube, then add 0.5 mL of concentrated hydrochloric acid and 2.2 mL of 20% perchloric acid solution. After the nitroaniline has dissolved, 15 mL of

water is added and the solution is cooled by immersing the test tube in a beaker filled with ice water. Prepare a solution of 0.25 g of sodium nitrite dissolved in 1 or 2 mL of water, add this solution to the test tube in three or four portions, the mixture being shaken after each addition or stirred with a stirring rod the end of which is covered with a rubber policeman or piece of rubber tubing. After standing in the cold for 5 minutes, the material is filtered to collect it, and the feltlike mass of pale yellow needles is washed with cold water, then with ethyl alcohol, then with ethyl ether. The product should be allowed to dry in several small portions on different pieces of filter paper. You will need a graduated cylinder for measuring liquids.

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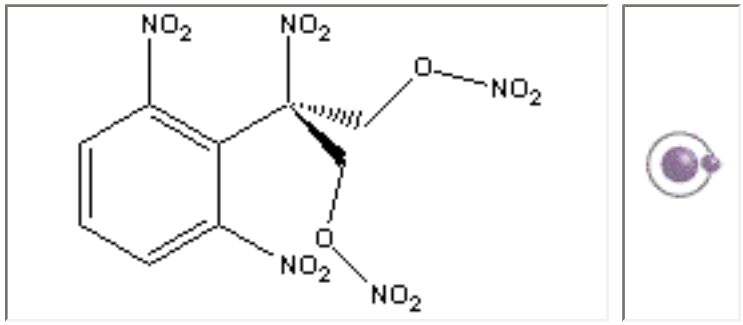
2-Nitro-2-(3',5'-Dinitrophenyl)-Propanediol-1,3 Dinitrate

melting point 115.2-115.8 °C	boiling point ? ° C	2-nitro-2-(3',5'-dinitrophenyl)-propanediol-1,3 dinitrate	molecular mass 377.19 g/mol	density ? g/mL
table key	sensitivity low	chemical formula $(NO_2)_2C_6H_3(NO_2)(CH_2ONO_2)_2$	explosive velocity ? m/s	estimated cost $?.00/g



This compound looks like flat rectangular crystalline plates or sometimes in the form of prisms. The explosive properties of this compound were discovered by R. McGill at the NDRC Research Lab in Bruceton, Pennsylvania. It is somewhat powerful, having 126% the strength of TNT, and has a somewhat low sensitivity to impact.

CHEMICALS	APPARATUS
acetone	beaker
ethyl alcohol	graduated cylinder
nitric acid	thermometer
2-nitro-2-(3',5'-dinitrophenyl)-propanediol-1,3	
water	

Add 20 g of 2-nitro-2-(3',5'-dinitrophenyl)-propanediol-1,3 in several portions to 130 mL of fuming nitric acid in a small beaker, cooled to 5 °C with a salt-ice bath. After about 6 minutes all of the material should be dissolved and the temperature will have risen to 10 °C. Drown the mixture in 1.5 L of ice water and allow it to stand for 15 minutes. Decant off most of the ice water and collect the hardened, gummy material on a filter then wash it with water. Purify by dissolving in acetone and crystallize it by adding ethyl alcohol to the solution. The yield varies between 67% and 86%. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

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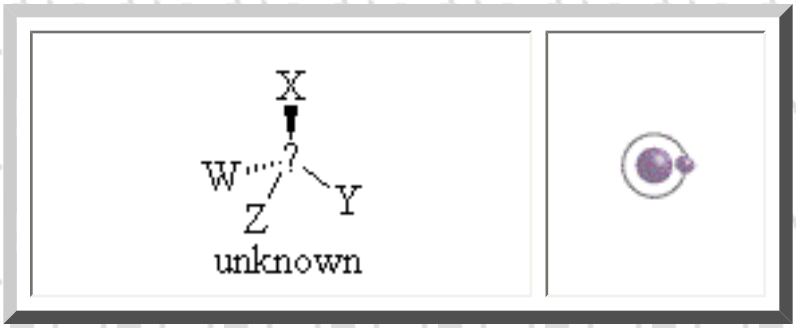
Nitrogen Sulfide



Nitrogen sulfide, also called sulfur nitride, nitrogen tetrasulfide, tetranitrogen tetrasulfide, or Schwefelstickstoff, is a very unstable primary explosive compound. Its manufacture is hazardous and rather complicated, yet is has found some industrial uses in detonators, diesel fuel as an ignition promoter, pesticides, fungicides, and as an accelerator in rubber vulcanization. Nitrogen sulfide is sensitive to heat, friction, shock, and will explode if heated over 160°C if impurities are present. The chemicals used in this lab are not easily obtainable, but can be made by the home chemist. The main ingredient is sulfur dichloride, an unstable and toxic compound, benzene is also used but it is about as popular as a rapist at a feminist gathering. Its stigma is "carcinogen," not even labs use it much anymore, so now labs do not sell it, and no public store will carry such toxins. It is possible to use toluene or carbon tetrachloride instead.

CHEMICALS	APPARATUS
ammonia	desiccator
benzene	Erlenmeyer flask
sulfur dichloride	graduated cylinder

Dissolve 131 mL of freshly prepared sulfur dichloride in 1950 mL of benzene in a large Erlenmeyer flask. You may pour the solution through a filter to remove any impurities that may have been in the sulfur dichloride, but it is best to purify it beforehand. Bubble anhydrous ammonia gas through the solution. A brown precipitate will begin to form, continue adding ammonia until this precipitate dissolves and forms an orange-yellow solution. Now large amounts of ammonium chloride will precipitate out of solution. Carefully heat the benzene until it boils. Immediately pour this solution over a filter to remove the crystals, collect the filtrate. Wash the crystals with 200 mL of benzene and add the

wash to the filtrate. Allow the benzene filtrate to evaporate until a crystalline slush remains, filter the slush, and allow to dry. Using vacuum drying or a desiccator can speed the process. The resulting product should be yellow to orange-red crystals of nitrogen sulfide. You will need a graduated cylinder for measuring liquids.

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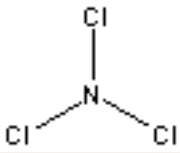
melting point 178 °C	boiling point decomposes at 185 °C	nitrogen sulfide	molecular mass 184.27 g/mol	density 2.22 g/mL
table key	sensitivity high	chemical formula N_4S_4	explosive velocity ? m/s	estimated cost $?.00/g

Nitrogen Trichloride

melting point -27 °C	boiling point 71 °C	nitrogen trichloride	molecular mass 120.38 g/mol	density 1.653 g/mL
table key	sensitivity very high	chemical formula NCl_3	explosive velocity ? m/s	estimated cost $?.00/g



Nitrogen trichloride, also called nitrogen chloride, agene, chlorine nitride, trichloramine, trichlorine nitride, chloride of azode, or Stickstofftrichlorid, is an unstable primary explosive compound. Its preparation is not complicated and the chemicals used are simple, cheap, and readily obtainable. You could pump the stuff out by the liter if it was not so sensitive. Nitrogen trichloride will explode if heated, exposed to sunlight, or mixed with organic compounds. It does not like to be friendly around many other chemicals, shock, sparks, and it will explode if frozen and thawed. The explosive properties were first reported in the 18th century by Sir H. Davy, he had this to say: "The fulminating oil which you mentioned roused my curiosity and nearly deprived me of an eye. After some months of confinement I am again well." Ouch, that must have hurt.

CHEMICALS	APPARATUS
ammonium nitrate	bubbler
chlorine	200-mL Erlenmeyer flask
water	graduated cylinder
	medicine dropper

Dissolve 30 g of ammonium nitrate in 70 mL water in a 200-mL Erlenmeyer flask. Prepare a chlorine generator as described in the synthesis section. Place a tube connected to the generator at the bottom of the flask so the chlorine gas can bubble into the liquid, a bubbler will help a lot with the reaction. Gently heat the flask to start the reaction while adding chlorine gas. An oily yellow liquid will begin to appear

on the bottom of the flask, that is the nitrogen trichloride. Stop heating the flask when the drops appear. After 20 to 30 minutes the reaction should be complete. Use a medicine dropper to extract the nitrogen trichloride from the flask, transfer it to a small test tube and remove any water accidently sucked up with it. You will need a graduated cylinder for measuring liquids. This explosive will decompose within 24 hours of its preparation.

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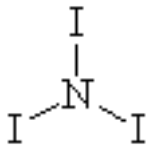
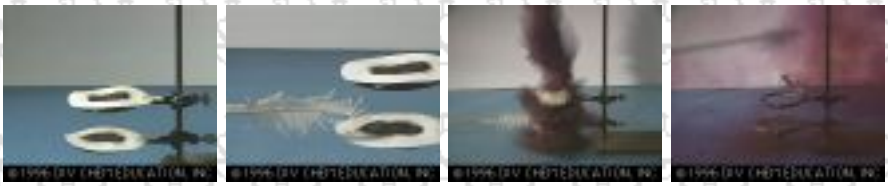
Nitrogen Triiodide

melting point ---	boiling point ---	nitrogen triiodide	molecular mass 394.77	density ? g/mL
table key	sensitivity very high	chemical formula NI_3	explosive velocity ? m/s	estimated cost $?.00/g



Nitrogen triiodide, also called ammonium triiodide, is a very unstable explosive that's not really practical due to its tremendous instability and cost. When wet it is stable but when dry the touch of a feather can cause it to detonate. Wet nitrogen triiodide should be spread out as much as possible or numerous small piles made. When dry the nitrogen triiodide will not explode from its own weight if spread out, a single large pile will.

A controlled lab demo using a feather to cause detonation:



The high cost of iodine, anywhere from $60 to $100 for a 500 g bottle, and its rarity, make it impractical from an economic standpoint. Those useless anarchist texts say iodine can be purchased in drug stores, it is sold in very tiny amounts heavily diluted with alcohol. The drug dealers have made iodine a restricted chemical, very few drug stores even carry it now, there are safer alternatives. The simplicity in which this explosive can be made gives wanna be punks an excuse to try. THIS EXPLOSIVE IS ONLY A CURIOSITY AND SHOULD NEVER BE MADE EXCEPT FOR A CONTROLLED DEMONSTRATION AS ABOVE! Stories abound about the dangers and ease of making nitrogen triiodide. There was a senior undergraduate student (no not me) given full access to a lab who made some, it exploded in a beaker showering him with glass. He was not wearing safety goggles. By some miracle the glass embedded in his face did not rip his eyes to shreds. Then there were the teenage

hoodlums that stole some iodine from their high school chem lab, made the nitrogen triiodide at home, and brought it back to school. With a pop and puff of purple gas the teacher knew what it was. A word of advise to them for next time: Leaving the instructions on top of your desk in full view of teach will save you a lot of time scrubbing iodine stains during your next suspension. It is best to leave it dry where you want to detonate it ASAP.

CHEMICALS	APPARATUS
ammonium hydroxide	beaker
iodine	stirring rod
water	graduated cylinder

Nitrogen triiodide is formed when iodine atoms displace the hydrogen atoms in ammonia NH_3 + I = NI_3. This reaction occurs when iodine crystals, I_2 are soaked in excess ammonium hydroxide. To begin, select a small beaker or even a disposable cup about 50-mL in capacity. This process may permanently stain any container so I suggest the cup. Add 2 g of iodine crystals to the beaker, crush them as much as possible with a stirring rod. Add 40 mL ammonium hydroxide to the beaker. After 2 hours the reaction should be complete. Pour the solution over a filter to collect the crystals, any excess can be rinsed out of the beaker with water. Put the crystals where you want them immediately because there only semblance of stability is when wet. Drying will take about 1 hour. You will need a graduated cylinder for measuring liquids.

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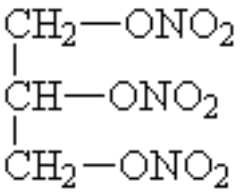
Nitroglycerin

melting point 13.5 °C	boiling point decomposes at 50-60 °C	nitroglycerin	molecular mass 227.09 g/mol	density 1.5918 g/mL
table key	sensitivity very high	chemical formula $C_3H_5N_3O_9$	explosive velocity 7700 m/s	estimated cost $?.00/g



Nitroglycerin was first prepared by a scientist named A. Sobrero around 1847 where it was used as a medicine. It was then mass produced by the great scientist Alfred Nobel in 1864 when he developed improvements on its synthesis and a method of detonating it. The devastation nitroglycerin caused on both the battlefield and the factory earned Nobel the title "Merchant of Death." Nobel was haunted by the lives nitroglycerin claimed so he created the Nobel Peace Prize to honor champions of peace, and later, supreme accomplishments in science. His exposure to nitroglycerin gave him constant agonizing headaches, and ironically he took nitro pills for a heart condition later in life. Nitroglycerin remains in use as a medicine, but not for explosives. Nitroglycerin is a very unstable high explosive compound. The first time I tried to make nitroglycerin was back in my early undergraduate days. I was impatient and decided to make some in the dorm *without observing proper safety procedures*. I was out of ice. Let me just say how important it is to keep this lab cool and slow. Nitrogen dioxide, a dense red-brown gas that is very deadly, it is the reward for nitro gone wrong. I used cool water instead of ice because I never believed all those warnings. Now I do. I began slowly adding the glycerine - not a change on the thermometer. I figured what the hell, I squirted all the glycerine in, stirred it up, checked for a temperature rise, and removed it from the coolant water. I set it on the dresser and stepped out for a minute. When next I looked down the hall and into my back bedroom, a plume of red smoke and acid was shooting out of the flask with increasing intensity. I knew immediately what trouble I was in. My dorm was in a pressurized building so no windows open, that means no ventilation. I rushed in to grab my gas mask and back out to evacuate my neighbors, except the faggot next door of course, who shared nearby rooms. To make a long story short I earned myself a reputation as a potentially dangerous individual and now have small holes in most of my shirts because my laundry was nearby. Read the Safety section again. This disastrous decomposition is about the worst thing that can happen during the

nitration, only very large industrial quantity batches risk detonation from runaway nitration. Nitroglycerin has more names than most, they include its proper name of glycerol trinitrate as well as 1,2,3-propanetriol trinitrate; glyceryl trinitrate; glycerol nitric acid triester; nitroglycerol; trinitroglycerol; glonoin; trinitrin; blasting gelatin; blasting oil; S.N.G.; Adesitrin; Angibid; Angiolingual; Anginine; Angorin; Aquo-Trinitrosan; Cardamist; Cordipatch; Coro-Nitro; Corditrine; Deponit; Diafusor; Discotrine; Gilucor; GTN; Klavikordal; Lenitral; Lentonitrina; Millisrol; Minitran; Myoglycerin; Nitradisc; Nitran; Nitriderm-TTS; Nitro-Bid; Nitrocine; Nitrocontin; Nitroderm TTS; Nitrodisc; Nitro-Dur; Nitrofortin; Nitrogard; Nitro-Gesanit; Nitroglin; Nitroglyn; Nitroglyn; Nitrolan; Nitrolande; Nitrolar; Nitrolent; Nitrolingual; Nitro Mack; Nitromex; Nitronal; Nitrong; Nitro PRN; Nitrorectal; Nitroretard; Nitrosigma; Nitrostat; Nitrozell-retard; Nysconitrine; Percutol; Perlinganit; Reminitrol; Suscard; Sustac; Sustonit; Transderm-Nitro; Transiderm-Nitro; Tridil; Trinalgon; Trinitrosan; and Vasoglyn. That is quite a list, most are drug names though.

CHEMICALS	APPARATUS
chloroform	1000-mL beaker
glycerol	buret
nitric acid	desiccator
sodium carbonate	1000-mL Florence flask
sodium chloride	graduated cylinder
sulfuric acid	separatory funnel
water	thermometer

Prepare a mixture of 200 mL of 98-100% nitric acid and 300 mL of 98-100% sulfuric acid by slowly adding one to the other in a 1000-mL beaker. Place the beaker into a salt-ice bath during the mixing so it may cool, allow the temperature to drop below 10 °C after mixing. You can keep the cold acid in the salt-ice bath or you can transfer the acid mix into a round-bottomed 1000-mL Florence flask for better heat dispersion. In either case, prepare a fresh salt-ice bath. Because of the possibility of friction, standard stirring methods are not advised. Instead, use an aquarium pump to blow air into the acids as a means to cool and stir them. Regulate the air flow so the acid is being well stirred yet not spattering out. Using a buret suspended above the flask, very slowly add drop by drop 112 mL of glycerol that has been previously cooled to 15 °C. Carefully monitor the temperature of the reaction at all times, the temperature must stay below 20 °C, preferably below 15 °C for extra safety. If at any time the temperature goes near this, stop adding glycerin until it cools. You can use the rate of addition to control the temperature. If the temperature ever rises above 20 °C it is ruined as no more nitro will be made and you are in great danger of the existing nitro detonating. If the temperature goes above 30 °C, there is a sudden rise in temperature, or a red gas is noticed, **DUMP IT INTO COLD WATER**

IMMEDIATELY!. Keep a bucket of ice water on hand for this task. After adding all of the glycerin, allow the temperature to drop to 15 °C and sit for 15 minutes. Carefully pour the reaction mix into a large beaker containing an equal volume of room temperature water. Add this mix to a separatory funnel and allow the nitroglycerin to settle out, it will form a layer on the bottom of the funnel. Drain off the nitro layer and keep the acid waste layer for further extraction. Place the nitro back into a clean separatory funnel and add plenty of 38-45 °C water, mix, then separate. Wash the nitro again, then wash with a warm 4% sodium carbonate solution. Wash with warm water three more times. Give it a final wash of concentrated sodium chloride solution, and let it sit one day before separating the layers. Separate and check the nitro for acidity with litmus paper. If it is still acidic keep washing. It **must** be neutral or it will explode. Dry the neutral nitro over sulfuric acid in a desiccator, this may take several days. You will need a graduated cylinder for measuring liquids, and a thermometer to monitor the temperature.

To extract any nitro that may still be in the waste acid, first neutralize the acid with sodium carbonate solution. Next add an equal volume of chloroform to the **neutral** waste acid. Mix well then place it into the separatory funnel. Remove the bottom nitro layer and let it stand in the open for one day so the chloroform may evaporate. Add this nitro to the washing process above.

One unit of glycerol will yield about 2.5 of nitro. Exposure to nitroglycerine will cause severe headaches. Keep it cool, the warmer it is the more sensitive it is to detonation. Frozen nitro can not be detonated therefore it is stable **BUT** partially frozen nitro is extra sensitive! Although nitroglycerin is very dangerous when confined, it is merely flammable when spread out in the open air. Nitroglycerin can be destroyed by boiling in a solution of potassium or sodium hydroxide and ethyl alcohol.

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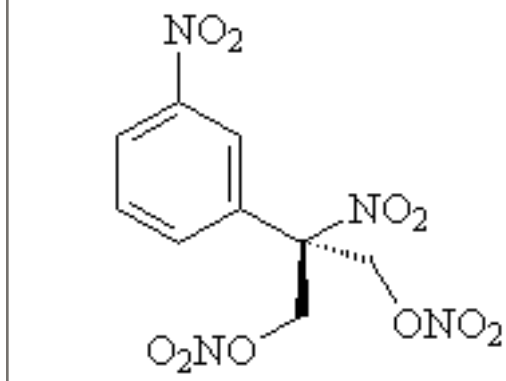
2-Nitro-2-(m-Nitrophenyl)-Propanediol-1,3 Dinitrate

melting point 73 °C	boiling point ignites at 270 °C	2-nitro-2-(m-nitrophenyl)-propanediol-1,3 dinitrate	molecular mass 332.19 g/mol	density ? g/mL
table key	sensitivity low	chemical formula $(O_2N)C_6H_4C(NO_2)(CH_2ONO_2)$	explosive velocity ? m/s	estimated cost $?.00/g



Another chemical name for this compound is 2-nitro-2-(3'-nitrophenyl)-propane-1,3-diol dinitrate. This compound is rather stable, it will not explode when heated, only ignite. It has about 114% the explosive strength of TNT while being more stable. This substance takes the form of colorless crystals. This procedure is brought to you by those wacky scientists Fieser and Gates from the days of yore in 1946.

CHEMICALS	APPARATUS
ethyl alcohol	50-mL beaker
nitric acid	sereological pipet
2-nitro-2-(m-nitrophenyl)-propanediol-1,3	

sulfuric acid

urea

water

Prepare a mixture of 0.4 mL of 95% sulfuric acid and 0.15 mL of 70% nitric acid in a 50-mL beaker, cool this mixture in a salt-ice bath. Before mixing the acids, add a small amount of urea to the nitric acid to remove any nitrous acid contamination. Slowly add 200 mg of 2-nitro-2-(m-nitrophenyl)-propanediol-1,3, then allow the reaction to commence for 10 minutes. After this time, drown the contents of the beaker with ice water. A heavy oil should separate, collect this oil and add a few mL of ethyl alcohol. Crystals of 2-nitro-2-(m-nitrophenyl)-propanediol-1,3 dinitrate form over a period of 2 weeks, whereupon they can be filtered to collect the crystals and dried. A second recrystallization from alcohol will yield a very pure product. You will need a sereological pipet for measuring liquids.

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