



## Acutely Toxic Chemicals (ATCs)

H300 H301 H304 H310 H311 H330 H331 H370 H372



**Areas with blue text indicate that information must be provided or modified by researcher prior to the SOP approval.**

**This SOP is not a substitute for hands-on training.**

Print a copy and insert into your laboratory SOP binder.

Department:	Chemistry
Date SOP was written:	Monday, October 24, 2016
Date SOP was approved by PI/lab supervisor:	
Principal Investigator:	Name: R. Sarpong
	Signature: _____
Internal Lab Safety Coordinator or Lab Manager:	Name: Rebecca Johnson/Melissa Hardy
	Lab Phone: 978-886-5808/406-696-1225
	Office Phone: 510-642-6312
Emergency Contact:	Name: Rebecca Johnson/Melissa Hardy
	Phone Number: 978-886-5808/406-696-1225
Location(s) covered by this SOP:	Latimer Hall 831,832,834,836,837,838,839,842,844,847,849

### 1. Purpose

This SOP covers the precautions and safe handling procedures for the use of Acutely Toxic Chemicals (ATCs).

For a list of ATCs covered by this SOP and their use(s), see "List of Chemicals". Procedures described in Section 12 apply to all materials covered in this SOP.

***If you have questions concerning the applicability of any recommendation or requirement listed in this procedure, contact the Principal Investigator/Laboratory Supervisor or the campus Chemical Hygiene Officer at [ucbcho@berkeley.edu](mailto:ucbcho@berkeley.edu).***



## 2. Acutely Toxic Chemicals Information

Acute toxicity refers to those adverse effects occurring following oral or dermal administration of a single dose of a substance, or multiple doses within 24 hours, or an inhalation exposure of 4 hours as defined by the Globally Harmonized System (GHS).

## 3. Potential Hazards/Toxicity

Substances can be allocated to one of five hazards categories based on acute toxicity by oral, dermal or inhalation route according to the numeric cut-off criteria as shown in the table *Acute Toxicity Hazard Categories* (Appendix 1). Acute toxicity values are expressed as (approximate) LD<sub>50</sub> (oral, dermal) or LC<sub>50</sub> (inhalation) values.

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS) designates acutely toxic chemicals by one or more of the following H codes:

- H300** Fatal if swallowed
- H301** Toxic if swallowed
- H304** May be fatal if swallowed and enters airways
- H310** Fatal in contact with skin
- H311** Toxic in contact with skin
- H330** Fatal if inhaled
- H331** Toxic if inhaled
- H370** Causes damage to organs (single exposure)
- H372** Causes damage to organs through prolonged or repeated exposure

ATCs may also have other hazardous properties in addition to toxicity. Safe use requires assessing all potential hazards.

It is the Principal Investigator's responsibility to ensure activity-specific laboratory procedures and/or processes are taken into account when using this Chemical Class SOP.

Please, review the SDS of any chemical before use (see Section 11 – SDS Location).

## 4. Engineering Controls

Use the engineering controls listed below unless other lab-specific information is included in the Protocol/Procedure section.

- Work with ATCs – the work must be conducted in a fume hood unless other controls are designated in the lab-specific Protocol/Procedure section. Sash height must be kept as low as possible to avoid escaping fumes and provide a physical barrier.
- Laboratories and rooms where ATCs are used must have general room ventilation that is negative pressure with respect to the corridors and external environment. The laboratory/room door must be kept closed at all times.

## 5. Personal Protective Equipment

At a minimum, the following PPE must be worn at all times.



### Eye and Face Protection

- A. ANSI Z87.1-compliant safety glasses with side shields, or chemical splash goggles.
  - Ordinary prescription glasses will NOT provide adequate protection unless they also meet ANSI standard and have compliant side shields.
- B. If the potential for explosion/splashing exists, and adequate coverage is not provided by the hood sash, a face shield must be worn.

### Skin and Body Protection

- A. Gloves are required when handling hazardous chemicals.
  - Refer to specific chemical SDS for information on glove selection.
  - For additional information on glove selection, go to:  
<http://ehs.berkeley.edu/hs/63-laboratory-safety/94-glove-selection-and-usage.html>
- B. Lab coats are required when handling hazardous chemicals in the lab. Select the type of lab coat according to the hazards at the specific workplace.
- C. Long pants, closed-toe/closed-heel shoes, covered legs, and ankles.

### Respiratory Protection

Respiratory protection is normally not required for UC Berkeley laboratory activities. Any lab personnel considering the use of a respirator (e.g. N-95 respirator, dust mask) must contact EH&S for a workplace assessment.

## 6. First Aid Procedures and Medical Emergencies

***In the event of an injury, notify your supervisor immediately and EH&S within 8 hours.***



***Go to the Occupational Health Facility (Tang Health Center, on campus); if after hours, go to the nearest emergency room (Alta Bates, 2450 Ashby Ave in Berkeley); or***



***Call 911 (from a cell phone: 510-642-3333) if:***

- ***it is a life threatening emergency; or***
- ***you are not confident in your ability to fully assess the conditions of the environment and/or the condition of the contaminated/injured person, or you cannot be assured of your own safety; or***
- ***the contaminated/injured person is not breathing or is unconscious.***

***Please remember to provide a copy of the appropriate manufacturer SDS (if available) to the emergency responders or physician. At a minimum, be ready to provide the identity/name of any hazardous materials involved.***

#### **In case of skin contact**

If skin contact occurs, and/or skin or clothing are on fire, immediately drench in the safety shower with copious amounts of water for no less than 15 minutes to remove any remaining contaminants. If possible to do so without further injury, remove any remaining jewelry or clothing.

#### **In case of eye contact**

Rinse thoroughly with plenty of water using an eyewash station for at least 15 minutes, occasionally lifting the upper and lower eyelids. Remove contact lenses if possible.

#### **If swallowed**



Do NOT induce vomiting unless directed otherwise by the SDS. Never give anything by mouth to an unconscious person. Rinse mouth with water.

#### **If inhaled**

Move into fresh air.

#### **Needle stick/puncture exposure**

Wash the affected area with antiseptic soap and warm water for 15 minutes.

## **7. Special Handling, Storage, and Disposal Requirements**

Lab-specific information on handling and storage may be included in Section 12-Protocol/Procedure.

### **Precautions for Safe Handling**

- Eliminate or substitute for a less hazardous material when possible.
- Design your experiment to use the least amount of material possible to achieve the desired result.
- Do not exceed the scale of procedures specified in Protocol/Procedure section without approval of the PI.
- Verify your experimental set-up and procedure prior to use.
- Know the location of the nearest eyewash, safety shower and fire extinguisher before beginning work.
- Upon leaving the work area, remove any personal protective equipment worn and wash hands.
- At the end of each project, thoroughly decontaminate the work area according to the material being handled.

### **Conditions for Safe Storage**

- Store non-flammable ATCs within secondary containment.
- Chemicals that require refrigeration must be stored appropriately.
- Store flammable ATCs within flammable storage cabinet.

### **Disposal**

- Waste materials generated must be treated as a hazardous waste.
- The empty container must be rinsed three times with a COMPATIBLE solvent; leave it open in the back of the hood overnight. Solvent rinses and water rinse must be disposed of as hazardous waste.
- As an alternative, unrinsed empty containers can be disposed of through EH&S as hazardous waste. The unrinsed empty containers must be capped.
- Do not mix with incompatible waste streams.

## **8. Chemical Spill**

**Spill** – Assess the extent of danger; if necessary request help by calling **911** (from a cell phone: **510-642-3333**) for emergency assistance or 510-642-3073 for non-life threatening situations. If you cannot assess the conditions of the environment well enough to be sure of your own safety, do not enter the area. If possible help contaminated or injured persons. Evacuate the spill area. Avoid breathing vapors from spill. If possible, confine the spill to a small area using a spill kit or absorbent material. Keep others from entering contaminated area (e.g., use caution tape, barriers, etc.).



- **Minor Spill** – In the event of a minor spill, if there is no potential for hazardous chemical exposure, report the spill to 510-642-3073 and if you are trained, proceed to clean it. Use appropriate personal protective equipment and clean-up material for chemical spilled. Double bag spill waste in clear plastic bags, label and request pick-up.
- **Major Spill** – Any hazardous chemical spill that involves chemical exposure, any chemical spill that due to size and/or hazard requires capabilities beyond your training, or any chemical spill that gives the perception (because of odor, for example) that there has been a hazardous release. Call **911** or 510-642-3073 for assistance.

## 9. Cleaning and Decontamination

Lab-specific information on decontamination may be included in Section 12 - Protocol/Procedure.

- Wearing proper PPE, laboratory work surfaces must be cleaned at the conclusion of each procedure and at the end of each work day.
- Decontaminate all equipment before removing from a designated area.

## 10. Hazardous Waste Disposal

Label Waste

- Label all waste containers. See the EH&S Fact Sheet, “Hazardous Waste Management” for general instructions on procedures for disposing of hazardous waste.

Dispose of Waste

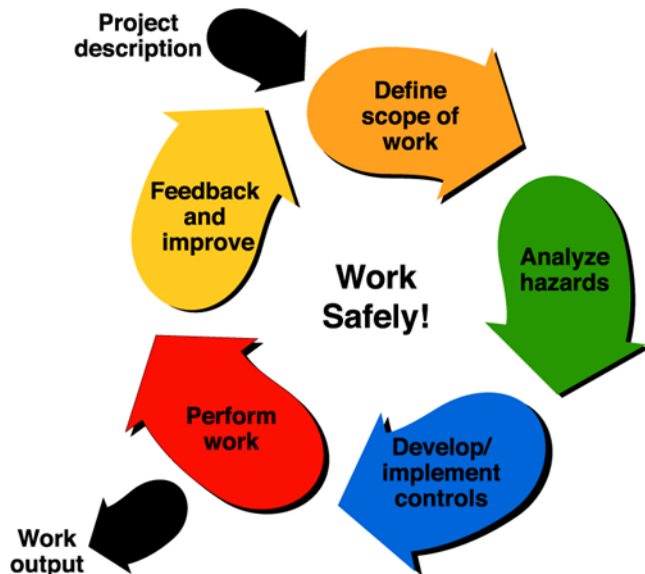
- Dispose of regularly generated chemical waste within 6 months.
- Contact EH&S at 642-3073 if you need assistance.

## 11. Safety Data Sheet (SDS) Location

SDS can be accessed online at <http://ucsdgs.com>



# -Take Ownership of Your Safety-



**Before starting any work, ask yourself:**

- 1- **What will I be doing?**
- 2- **Do I know what the hazards are?**
- 3- **Do I have everything I need to do the job safely?**
- 4- **Am I doing the job safely?**
- 5- **What can we do better?**



## 12. Protocol/Procedure for– Acutely Toxic Chemicals

Section 12 must be customized to your specific needs. Delete any procedure that does not apply to your laboratory.

Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Special Precautions for this Procedure
<p>1. Using Acutely Toxic Chemicals as reagents.</p>	<p>Up to 20 g or less as supplied in the reagent bottle.</p> <p style="color: red;">Remember to obtain PI approval if higher scale is necessary.</p>	<p>All reactions using these materials must be performed in a properly operating fume hood with the sash as low as possible. Or in an inert atmosphere glovebox.</p>	<p><b>Eye protection:</b> Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields.</p> <p><b>Face Protection:</b> Face shields are to be used when there is no protection from the hood sash.</p> <p><b>Hand Protection:</b> Confirm compatibility of glove material with chemical being used. General guidance (unless otherwise specified in the specific SDS): Nitrile gloves must be used to prevent incidental contact. For spill handling or for potential contact with larger quantities, use double nitrile or heavier gauge nitrile or neoprene gloves. Gloves must be inspected prior to use. Wash and dry hands after use.</p> <p><b>Clothing:</b> Wear lab coat; full length pants or equivalent; and close-toed, close-heeled shoes.</p>	<p>Avoid the formation of dusts with solids. Carefully weigh reagent in an enclosed or vented area. If this is not possible use the tared vessel method and cap the vessel during transport to and from the balance. Use a secondary container for transport of the tared vessel.</p> <p>Immediately move all operations to the fume hood when weighing is complete.</p> <p>In a properly functioning fume hood, add reagent to the reaction vessel.</p> <p>If the reagent is a liquid, dispense and transfer to the reaction vessel using the appropriate technique (syringe, pipettor, or cannula method).</p>
<b>Notes</b>	<b>Any deviation from this SOP requires approval from PI.</b>			



Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Special Precautions for this Procedure
<p>2. Using Acutely Toxic Chemicals as solvents in reactions, for extractions.</p>	<p>Up to 500 mL as supplied in the reagent bottle.</p> <p><b>Remember to obtain PI approval if higher scale is necessary.</b></p>	<p>All reactions using these materials must be performed in a properly operating fume hood with the sash as low as possible. Or in an inert atmosphere glovebox.</p>	<p><b>Eye protection:</b> Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields.</p> <p><b>Face Protection:</b> Face shields are to be used when there is no protection from the hood sash.</p> <p><b>Hand Protection:</b> Confirm compatibility of glove material with chemical being used. General guidance (unless otherwise specified in the specific SDS): Nitrile gloves must be used to prevent incidental contact. For spill handling or for potential contact with larger quantities, use double nitrile or heavier gauge nitrile or neoprene gloves. Gloves must be inspected prior to use. Wash and dry hands after use.</p> <p><b>Clothing:</b> Wear lab coat; full length pants or equivalent; and close-toed, close-heeled shoes.</p>	<p>Avoid inhalation of these materials.</p> <p>If a rotary evaporator is used, use an open cold trap system to condense the solvent.</p> <p>Pressure can be built up when these solvents are used in closed reaction vessels. Adequate ventilation (e.g. pressure bubbler on Schlenk manifold, or an equilibrating balloon) must be used to prevent dangerous over pressurization.</p> <p>Pressure may be built up when performing extractions. Adequate ventilation (open the valve frequently during the extraction) has to be used to prevent dangerous over pressurization. The vapor in such a process must be released in a fume hood.</p> <p>If heated, the reaction apparatus has to be fitted with an adequately sized condenser and an adequate flow of cooling water has to be provided to prevent evaporation.</p> <p>Cooling hoses have to be secured with hose clamps to the condenser and the outlet.</p>
<p><b>Notes</b></p>	<p><b>Any deviation from this SOP requires approval from PI.</b></p>			





Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Special Precautions for this Procedure
<p>3. Using Acutely Toxic Chemicals as solvents in column chromatography (CC) or thin layer chromatography (TLC).  </p>	<p>Up to 2 L as supplied in the reagent bottle.</p> <p style="color: red;">Remember to obtain PI approval if higher scale is necessary.</p>	<p>All reactions using these materials must be performed in a properly operating fume hood with the sash as low as possible. Or in an inert atmosphere glovebox.</p>	<p><b>Eye protection:</b> Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields.</p> <p><b>Face Protection:</b> Face shields are to be used when there is no protection from the hood sash.</p> <p><b>Hand Protection:</b> Confirm compatibility of glove material with chemical being used. General guidance (unless otherwise specified in the specific SDS): Nitrile gloves must be used to prevent incidental contact. For spill handling or for potential contact with larger quantities, use double nitrile or heavier gauge nitrile or neoprene gloves. Gloves must be inspected prior to use. Wash and dry hands after use.</p> <p><b>Clothing:</b> Wear lab coat; full length pants or equivalent; and close-toed, close-heeled shoes.</p>	<p>Avoid inhalation of these materials.</p> <p>Thin Layer Chromatography: allow the plate to dry in the fume hood after removal from the development bath.</p> <p>Column Chromatography: collect fractions of interest and concentrate as needed.</p> <p>If a rotary evaporator is used, use an open cold trap system to condense the solvent.</p> <p>After use in the column, allow the solvent to evaporate from the packing material prior to proper disposal of the packing material.  </p>
<p><b>Notes</b></p>	<p><b>Any deviation from this SOP requires approval from PI.</b></p>			





**Appendix 1 – Acute Toxicity Hazard Categories and acute Toxicity estimate (ATE) Values**  
**Defining the Respective Categories\***

<b><u>Exposure Route</u></b>	<b><u>Category 1</u></b>	<b><u>Category 2</u></b>	<b><u>Category 3</u></b>	<b><u>Category 4</u></b>	<b><u>Category 5</u></b>
Oral (mg/kg bodyweight)	5	50	300	2000	5000
Dermal (mg/kg bodyweight)	50	200	1000	2000	
Gases (ppmV)	100	500	2500	20000	-
Vapors (mg/l)	0.5	2.0	10	20	
Dusts and Mists (mg/l)	0.05	0.5	1.0	2	

(\* ) Globally Harmonized System of Classification and Labelling of Chemicals, Fifth Revised Edition



### List of Chemicals

Chemical(s)	Chemical(s)	Chemical(s)
(-)-beta-pinene	(-)-brucine	(-)-tetramisole hydrochloride
(e,e)-2,4-hexadien-1-ol	(e,e)-hexa-2,4-dien-1-ol	(phenylsulfonyl)acetonitrile
(r)-epichlorohydrin	(s)-(-)-1,1'-bi-2-naphthol	(s)-(-)-5-(2-pyrrolidinyl)-1h-tetrazole
(S)-(?)-?-Methylbenzylamine	(trimethylsilyl)acetonitrile	(trimethylsilyl)methyl lithium
?-cumene hydroperoxide	?-mercaptoacetic acid	?-methylcrotonaldehyde
1-(3-hydroxyphenyl)piperazine	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane
1,1,3,3-propanetetracarboxitrile	1,1-dimethylhydrazine	1,2,3-benzenetriol
1,2,4-trifluoro-5-nitrobenzene	1,2-benzenediamine	1,2-benzenedicarbonitrile
1,2-benzenedicarboxaldehyde	1,2-bis(2-chloroethoxy)ethane	1,2-dibromoethane
1,2-dichloro-4,5-dicyano-p-benzoquinone	1,2-dichloroethane	1,2-epoxy-5-hexene
1,2-ethanedithiol	1,3,5-cycloheptatriene	1,3-benzenedicarbonyl dichloride
1,3-dibromo-5,5-dimethylhydantoin	1,3-dichloro-2-butene	1,3-dichloroacetone
1,3-dinitrobenzene	1,3-dioxol-2-one	1,3-diphenylguanidine
1,3-phenylenediamine	1,3-propanediamine	1,4-benzenediamine
1,4-benzenedicarbonyl dichloride	1,4-benzoquinone	1,4-butanediamine
1,4-dibromobutane	1,4-dinitrobenzene	1,4-naphthalenedione
1,5-difluoro-2,4-dinitrobenzene	1,7-octadiene	1,8-diazabicyclo[5.4.0]undec-7-ene
12-crown-4	1-amino-2,4-dinitrobenzene	1-aminocyclopentanecarboxylic acid
1-aminonaphthalene	1-bromo-2-chloroethane	1-bromo-2-methoxyethane
1-bromo-3-chloropropane	1-butanamine	1-butyl-3-methylimidazolium chloride
1-butyl-3-methylimidazolium tetrafluoroborate	1-butyl-3-methylimidazolium trifluoromethanesulfonate	1-chloro-2,4-dinitrobenzene
1-cyanovinyl acetate	1-decanamine	1-dimethylamino-2-propyne
1-dodecene	1-ethynyl-1-cyclohexanol	1-fluoro-3-nitrobenzene
1-fluoro-4-nitrobenzene	1-formylpiperidine	1-heptyne
1-hexanethiol	1-hexyne	1-iodo-2,6-dimethoxybenzene
1-iodo-2-methylpropane	1-iodopropane	1-naphthalenol
1-pentene	1-pentyne	2-(diisopropylamino)ethyl chloride hydrochloride
2-(tributylstannyl)furan	2-(tributylstannyl)thiophene	2,2,2-trifluoroethanol
2,2,4-trimethylpentane	2,2,6,6-tetramethylpiperidine	2,2'-azobis(2-methylpropionitrile)
2,2'-bipyridine	2,3-butanedione	2,3-dichloro-1-propene
2,3-dichloroaniline	2,3-dichloroquinoxaline	2,3-dimethyl-2-butene
2,4,6-collidine	2,4,6-trichloroaniline	2,4,6-trimethylaniline
2,4-dichloroaniline	2,4-dichlorophenol	2,4-difluoroaniline
2,4-difluoronitrobenzene	2,4-dimethylaniline	2,4-dimethylphenol



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2,4-hexadienal	2,4-lutidine	2,5-dimethoxyaniline
2,5-dimethylpyrrole	2,6-dichloroaniline	2,6-dichloropyridine
2,6-dimethylphenol	2,6-pyridinediamine	2-acetylfuran
2-acetylthiophene	2-allylphenol	2-amino-3,5-dibromopyrazine
2-amino-3-picoline	2-amino-4,5-dimethylphenol	2-amino-4-methylpyridine
2-amino-5-bromobenzoic acid	2-amino-5-methylpyridine	2-amino-6-methylpyridine
2-aminopyridine	2-bromo-3-methyl-2-butene	2-bromo-5-nitropyridine
2-bromoacetamide	2-bromoaniline	2-bromoethanol
2-bromophenyl isocyanate	2-bromothiophene	2-butenal
2-butyne-1,4-diol	2-chloro-1,3-butadiene	2-chloro-4-nitrophenyl isocyanate
2-chloroacrylonitrile	2-chlorobenzyl chloride	2-chloroethanol
2-chloropyridine	2-cyclohexen-1-one	2'-deoxyadenosine monohydrate
2-ethylacrolein	2-ethylaniline	2-fluorobenzenesulfonamide
2-furanmethanol	2-hydroxyethyl acrylate	2-hydroxyethylhydrazine
2-hydroxypyridine	2-iodoethanol	2-isocyanatopropane
2-mercaptobenzimidazole	2-mercaptoethanol	2-mercaptopyridine-n-oxide
2-methoxyethanol	2-methyl-1-buten-3-yne	2-methyl-2-butene
2-methyl-2-pentenal	2-methyl-5-nitroaniline	2-methylfuran
2-nitrophenyl selenocyanate	2-nitropropane	2-phenethylamine
2-picoline	2-propanamine	2-propen-1-amine
2-propen-1-ol	2-propenenitrile	2-propenoyl chloride
2-pyridinecarboxaldehyde	2-thiazolidinethione	2-vinylpyridine
3-(methylthio)propionaldehyde	3,3-dimethyl-1-butene	3,4-diaminopyridine
3,4-dichloroaniline	3,4-dinitroaniline	3,4-methylenedioxy-&#946;-nitrostyrene
3,5-bis(trifluoromethyl)phenyl isothiocyanate	3,5-dibromophenol	3,5-dichloroaniline
3,5-dichlorophenyl isocyanate	3,5-dinitroaniline	3-acetylpyridine
3-amino-2-bromopyridine	3-bromo-2-nitropyridine	3-bromopropionitrile
3-butyne-2-ol	3-butyne-2-one	3-chloro-2-chloromethyl-1-propene
3-chloropropionyl chloride	3-dimethylamino-1-propyne	3-dimethylamino-2-methylpropiophenone hydrochloride
3-fluorobenzenesulfonamide	3-fluorophenol	3h-1,2,3-triazolo[4,5-b]pyridin-3-ol
3-hexyne	3-mercaptopropionic acid	3-methoxyphenol
3-methyl-1-butene	3-methyl-2-butenal	3-methylpyridine
4-(2-chloroethyl)morpholine hydrochloride	4-(trifluoromethyl)-phenol	4,4'-bipyridine
4-aminopyridine	4-biphenylacetic acid	4-bromoaniline
4-bromobenzonitrile	4-chlorobutyronitrile	4-chlorobutyryl chloride
4-chloro-dl-phenylalanine	4-chloroquinazoline	4-dimethylaminopyridine



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4-ethylaniline	4-fluorophenylurea	4-methoxy-2-nitroaniline
4-methyl-2-nitroaniline	4-methylbenzenesulfonhydrazide	4-methylstyrene
4-nitro-o-toluidine	4-nitrophenol	4-Octene, (E)-
4-octyne	4-picoline	4-tolyl chlorothionoformate
5-bromo-2,4-dichloropyrimidine	5-chloro-2-nitroaniline	5-fluoro-2-nitroaniline
5-methyl-2-nitroaniline	8-hydroxy-5-nitroquinoline	9-bbn triflate
acetic acid, dichloro-	acetic anhydride	acetone cyanohydrin
acetylacetone	acetylferrocene	acetylthiocholine iodide
aconitine	acryloyl chloride	actidione
adenine	adiponitrile	allenyltributyltin(iv)
allyl acetate	allyl bromide	allyl chloroformate
allyl ether	allyl iodide	allyltributyltin
alpha-pinene	aluminium chloride	ammonia
ammonia, 0.05 mol/l in dioxane	ammonia, 0.2 mol/l in EtOH	ammonia, 0.2 mol/l in MeOH
ammonia, 0.7 mol/l in MeOH	ammonium fluoride	ammonium metavanadate
amylamine	aniline	aniline hydrochloride
antimony pentachloride	azidotrimethylsilane	azidotrimethyltin(iv)
barium dichloride dihydrate	barium oxide	benzal bromide
benzene	benzenemethanethiol	benzenethiol
benzoic acid	benzoyl cyanide	benzoylhydrazine
benzyl azide	benzyl chloride	benzyl cyanoformate
benzyltrimethylammonium chloride	benzyltrimethylammonium hydroxide	benzyltriphenylphosphonium chloride
bicyclo[4.4.0]decane	bis(2-(dimethylamino)ethyl) ether	bis(4-nitrophenyl)phosphoric acid
bis(acetonitrile)dichloropalladium(ii)	bis(tributyltin) oxide	borane dimethylamine complex
borane dimethylsulfide complex	borane-tert-butylamine complex	boron tribromide
boron trichloride	boron trifluoride etherate	Bromine
bromoacetaldehyde diethyl acetal	bromoacetic acid	bromoacetonitrile
bromoform	butyl isocyanate	cadmium chloride
caesium fluoride	carbon disulfide	carbon monoxide
carbon tetrachloride	cesium azide	cesium fluoride
cetylpyridinium chloride	chloroacetaldehyde	chloroacetic acid
chloroacetic acid anhydride	chloroacetone	chloroacetyl chloride
chlorodimethylsilane	chloromethyl cyanide	chloromethyl methyl ether
chloroselenobenzene	chlorotriethylsilane	chlorotrimethylsilane
chlorotrimethylstannane	chromium hexacarbonyl	chromium trioxide
cinnamyl chloride	cis-1,4-dichloro-2-butene	cis-1-ethoxy-2-(tri-n-butylstannyl)ethylene
cisplatin	citraconic anhydride	cobalt octacarbonyl
copper cyanide	coumarin	crotonaldehyde, predominantly



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		trans
cumene	cyanamide	cyanoacetic acid allyl ester
cyclohexane	cyclohexene	cyclohexene oxide
cyclohexyl isocyanate	cyclohexylamine	cyclopentanamine
cyclopentene	decaborane(14)	diallylamine
diarsenic pentaoxide	dibutyl tin dichloride	dibutylamine
dibutylboryl trifluoromethanesulfonate	dibutyltin dilaurate	dibutyltin(iv) oxide
dichloroacetyl chloride	dichlorodimethylsilane	dichlorodiphenylsilane
dichlorophenylphosphine	dicobalt octacarbonyl	dicyclohexylamine
dicyclohexylcarbodiimide	dicyclopentadiene	diethyl chlorophosphate
diethyl cyanophosphonate	diethyl oxalate	diethylaluminum cyanide
diethylamine	diethylaminotrimethylenamine	Diethylenetriamine
diisobutylaluminum chloride	diisopropylamine	diisopropylcarbodiimide
diisopropylethylamine	diketene	dimethyl chlorophosphate
dimethyl dicarbonate	dimethyl disulfide	dimethyl sulfate
dimethylcarbamoyl chloride	dimethyldichlorosilane	dimethylglyoxime
diphenyldiselenide	diphenylphosphoryl azide	di-tert-butyl dicarbonate
epichlorohydrin	ethyl 4-chloroacetoacetate	ethyl acrylate
ethyl bromoacetate	ethyl chloroacetate	ethyl chloroformate
ethyl cyanoformate	ethyl iodoacetate	ethylbenzene
ethylene sulfide	ethylenediamine	ethylphosphonic dichloride
ethyltriphenylphosphonium bromide	ethyltriphenylphosphonium iodide	ethynyltributylstannane
formaldehyde	formaldehyde, 37% in water	formic acid
furan	furfural	glutaraldehyde
glutaryl dichloride	haloperidol	hexabutyliditin
hexafluoroacetone	hexafluoroacetone trihydrate	hexamethyldisilazane
hexamethyldisilthiane	hexamethylditin	hexamethylene diisocyanate
hydrazine hydrate	hydrazine sulfate	hydrazine, anhydrous
hydrocinnamoyl chloride	hydrogen bromide	hydrogen chloride
hydrogen chloride, 0.2 mol/l in Diethyl ether	hydrogen chloride, 0.4 mol/l in dioxane	hydrogen chloride, 4N in 1,4-dioxane
hydrogen fluoride	hydrogen fluoride pyridine	indene
indole	iodine	iodoacetamide
iodomethane	iodotributyltin	iron pentacarbonyl
isoamyl nitrite	isobutyl chloroformate	isobutyl nitrite
isobutylamine	isobutyric acid	isobutyronitrile
isocyanic acid 3,4-dichlorophenyl ester	isopropyl chloroformate	isopropyl isocyanate
isoquinoline	lead dichloride	lithium aluminum deuteride



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lithium aluminum hydride	lithium diisobutyl-tert-butoxyaluminum hydride	lithium fluoride
lithium hydride	lithium sulfide	lithium tetrahydroborate
l-menthyl chloroformate	maleic anhydride	maleimide
malononitrile	m-cresol	mercuric acetate
mercuric trifluoroacetate	mercury dicyanide	mercury diiodide
mercury monoxide	mercury(ii) chloride	mercury(ii) sulfate
mesityl oxide	methacrylic acid	methanesulfonyl chloride
methanol	methanol-d	methyl 4-(bromomethyl)benzoate
methyl acrylate	methyl bromoacetate	methyl chloroacetate
methyl chloroformate	methyl cyanoformate	methyl orange
methyl thioglycolate	methyl vinyl ketone	methyl-3,5-dichlorobenzoate
methyl-5-iodo-salicylate	methylaluminum dichloride	methylphosphonyl dichloride
m-nitroaniline	m-nitrobenzoyl chloride	molybdenum hexacarbonyl
morpholine	m-toluidine	n,n-diethyl-1,4-phenylenediamine
n,n-diethylaniline	n,n-diethylethylenediamine	n,n-dimethyl-1,4-phenylenediamine
n,n-dimethyl-1,4-phenylenediamine dihydrochloride	n,n-dimethylacetamide	n,n-dimethylacetamide dimethyl acetal
n,n-dimethylaminoethanol	n,n-dimethylaniline	n,n-dimethylsulfamoyl chloride
naproxen	n-boc-ethanolamine	n-boc-piperidine
n-butyllithium	n-butyryl chloride	n-ethylmorpholine
n-hexane	nickel	nickel dibromide
nickel dioxide	nickel sulfate hexahydrate	nickel(ii) chloride hexahydrate
nickel(ii) perchlorate hexahydrate	nitrobenzene	nitromethane
nitrosobenzene	n-methylacetanilide	n-methylaniline
n-methylimidazole	n-methylpiperazine	n-nitroso-n-methylurea
nonane	n-vinylcaprolactam	o-anisidine
o-bromopyridine	o-cresol	octane
octanoyl chloride	o-nitroaniline	o-phenanthroline
o-phenylhydroxylamine hydrochloride	osmium tetroxide	osmium(iii) chloride hydrate
o-toluidine	oxalyl chloride	palladium dichloride
p-aminobenzotrifluoride	p-aminotoluene	p-anisidine
p-chloroaniline	p-chloro-o-nitroaniline	p-cresol
pentabromophenol	peracetic acid	phenanthridine
phenol	phenyl chloroformate	phenyl isocyanate
phenyl selenocyanate	phenyl trifluoromethanesulfonate	phenylacetylene
phenylethynyltri-n-butyltin	phenylhydrazine	phenylmercuric chloride
phenylselenenyl bromide	phenyltrimethyltin	phosgene
phosphorus oxychloride	phosphorus pentachloride	phosphorus trichloride





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pivalyl chloride	platinum tetrachloride	platinum(0)-1,3-divinyl-1,1,3,3-tetramethyldisiloxane
p-nitroaniline	potassium bromate	potassium cyanide
potassium dichromate	potassium fluoride	potassium hydrogendifluoride
potassium osmate(vi) dihydrate	propanenitrile	propanoyl chloride
propargyl alcohol	propargyl bromide	propargylamine
propionic acid	propylamine	propylene oxide
p-toluenesulfonyl isocyanate	pyrocatechol	pyrrole
quercetin dihydrate	quinoline	resorcinol
rhodium, dicarbonyl(2,4-pentanedionato-o,o'), (sp-4-2)-	sec-butyllithium	sec-butyllithium, 1.3 M in hexanes
selenium	selenium(iv) oxide	sodium azide
sodium bis(2-methoxyethoxy)aluminiumhydride	sodium borodeuteride	sodium borohydride
sodium chlorite	sodium cyanide	sodium cyanoborohydride
sodium dichromate dihydrate	sodium iodoacetate	sodium mercury amalgam
sodium metavanadate	sodium nitrite	sodium nitrite-15n
sodium nitroferrocyanide (iii) dihydrate	sodium periodate	stannane, tributylethenyl-
strychnine	styrene	styrene oxide
sulfur monochloride	sulphuryl dichloride	tebbe reagent
tert-butyl acrylate	tert-butyl hydroperoxide	tert-butyl hydroperoxide (5.0-6.0M in decane)
tert-butylamine	tert-butyldimethylsilyl cyanide	tert-butyllithium
tert-butyllithium, 0.155 mol/l in pentane	tetrabutylammonium cyanide	tetrachlorophthalic anhydride
tetralin	tetramethyl-1,3-diaminopropane	tetramethylammonium chloride
tetramethylammonium hydroxide	tetranitromethane	tetravinylstannane
thallic acetate	thallium chloride	thallium(i) carbonate
thallium(i) ethoxide	thallium(iii) nitrate trihydrate	thallium(iii) trifluoroacetate
thioacetic acid	thionyl chloride	thiophene
thiophosgene	thiophosphoryl trichloride	titanium tetrachloride
TMEDA	toluene	toluene-2,6-diol
tosyl azide	tosylmethyl isocyanide	trans-2-hexen-1-al
tributyl(3-methyl-2-butenyl)tin	tributyl(trimethylsilyl)stannane	tributylamine
tributyltin acetate	tributyltin chloride	tributyltin cyanide
tributyltin hydride	tributyltin methoxide	tributylvinyl stannane
Tricaprylylmethylammonium chloride	trichloroacetonitrile	trichloroacetyl chloride
trichloroacetyl isocyanate	trichloroethyl chloroformate	trichloromethyl chloroformate
trichloromethyl isocyanate	trichlorosilane	triethoxysilane



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triethylamine	triethylborane	Triethylenetetramine
triisopropyl phosphite	trimethyl borate	trimethylsilyl cyanide
trimethylsilyl isothiocyanate	trimethylsilyldiazomethane	triphenylarsine
triphenyltin hydride	triphosgene	tris(2-aminoethyl)amine
tungsten hexacarbonyl	xanthone	xtalfluor-e
xtalfluor-m	xylene	zinc cyanide
5-indanol		