Slide 1

Introductions and Welcome

- Course coordinator's welcome
- Instructor introductions
- Participant introductions

Slide 2

Administrative Information

- Breaks and start times
- Restroom location
- Eating or smoking in classroom

Slide 3

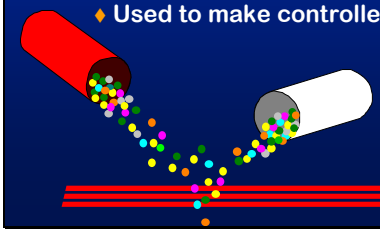
Course Overview & Objectives

- Purpose: Train first responders to…
  - Recognize a clandestine drug lab…
  - Recognize drug lab paraphernalia…
  - Implement appropriate actions.

Slide 4

Drug Lab Definitions

- Lab—General Definition
  - Covert or secret illicit operation
  - Combination of apparatus & chemicals
  - Used to make controlled substances.



Slide 5

Routine Call ?

- Emergency response personnel must recognize and understand the potential hazards to themselves and to the public whenever they become aware of the possible presence of an illicit drug lab.

Fires are a common occurrence with meth labs.

Slide 6

Meth Lab Locations

- Houses
- Apartments
- Motels
- Vehicles
- Wooded Areas
- Rental Storage
- Industrial Areas
- RVs

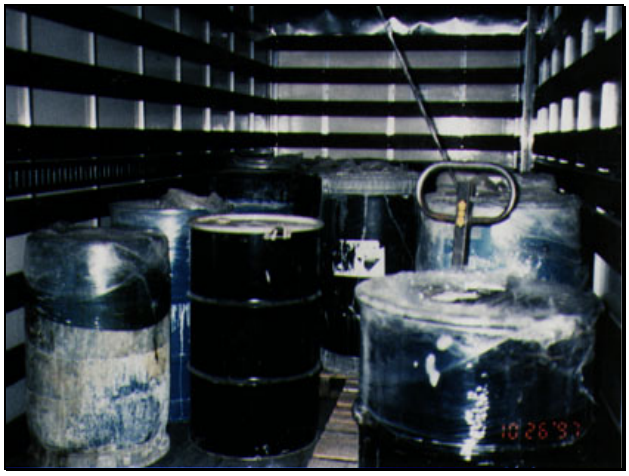
Slide 7

Slide 8

Slide 9

Slide 10

Slide 11



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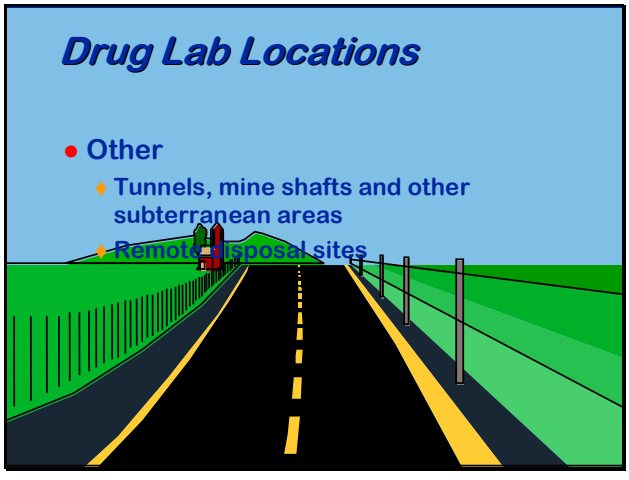


Slide 13

Drug Lab Definitions

- Waste/Abandonment/Disposal Site
  - Location at which…
  - Apparatus, equipment & chemicals used to…
  - Make controlled substances…
  - Have been deposited, disposed of, dumped or stored

Slide 14

Waste/Abandonment/Disposal Site

Slide 15

Slide 16

Slide 17

Slide 18

Slide 19

Slide 20

Physical Hazards

- Dangerous suspects.
  - Armed or
  - Under influence of illicit drugs

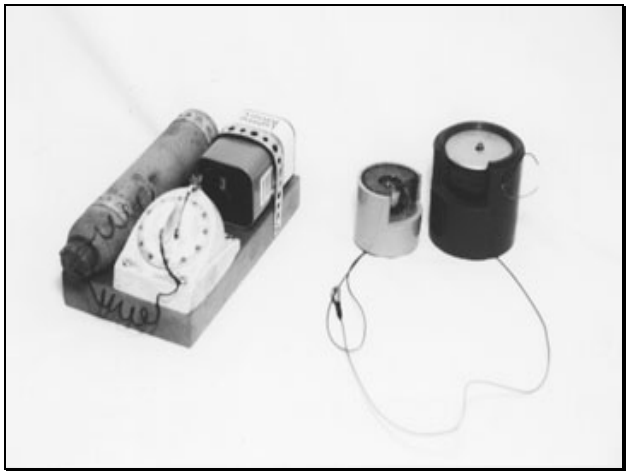
Slide 21

Physical Hazards

- Defensive systems
  - Explosive devices
  - Mechanical & electrical security devices
  - Alarm systems
  - Animals

Slide 22

Slide 23



Slide 24

Chemical Hazards

- Unidentified chemicals
  - Flammable/combustible
  - Reactive
  - Corrosive
  - Toxic
- Any/all DOT Hazard Classes

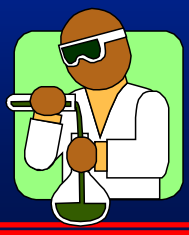
Slide 25

Slide 26

Slide 27

Chemical Hazards

- Unsafe practices and
- Improvised/incompatible lab equip



Slide 28

Slide 29

Slide 30

Slide 31

Chemical Hazards

- Incompatible storage
  - Locations
  - Arrangements
- Containers incompatible with contents
- Unsafe electrical devices
- Improper handling practices

Slide 32

Slide 33

Slide 34

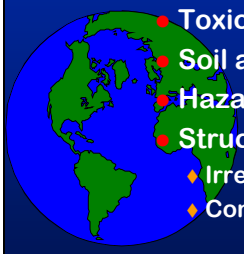
Facility/Structural Hazards

- Crawl spaces and attics
- Uneven or unstable flooring
- Improvised or Jury-rigged Equipment
  - Power supplies & wiring
  - Water supply plumbing & piping
  - Ventilation & cooling systems

Slide 35

Slide 36

Environmental Hazards



- Toxic air emissions
- Soil and water contamination
- Hazardous waste accumulations
- Structures & vehicles
  - Irreversible damage
  - Contamination

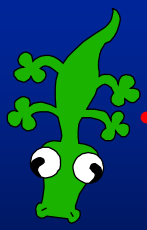
Slide 37

First Responder "Awareness"

- Likely to witness/discover a release…
  - Initiate response by notifying authorities
  - Take no further action
- Limits of this level:
  - No PPE
  - Not trained to contain or stop a release

Slide 38

Methamphetamine Synthesis



- Most commonly synthesized controlled substance

Slide 39

History of Methamphetamine

- First synthesized in 1880's.
- Therapeutic possibilities not investigated until 1927.
- Benzedrine inhaler marketed 1932.
- Japan, US, Great Britain, and Germany gave drug to troops to fight fatigue and maintain alertness.
- Medical use increased during 1950's as diet pills and antidepresant.

Slide 40

History of Methamphetamine

- During 1960's biker gangs discover drug and start producing.
- Legal production peaked in 1971 at an estimated twelve billion tablets.
- 1972 production quota limited output to 20% of amount manufactured in 1971.

Slide 41

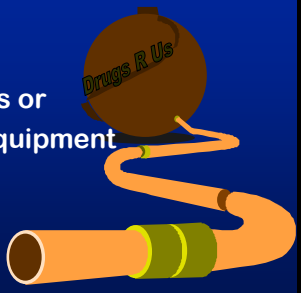
Methods of Production

- Ephedrine reduction with…
  - Hydriodic acid and red phosphorus
  - Lithium metal and anhydrous ammonia
  - Thionyl chloride, hydrogen gas, palladium black and chloroform

Slide 42

Exterior Recognition Clues

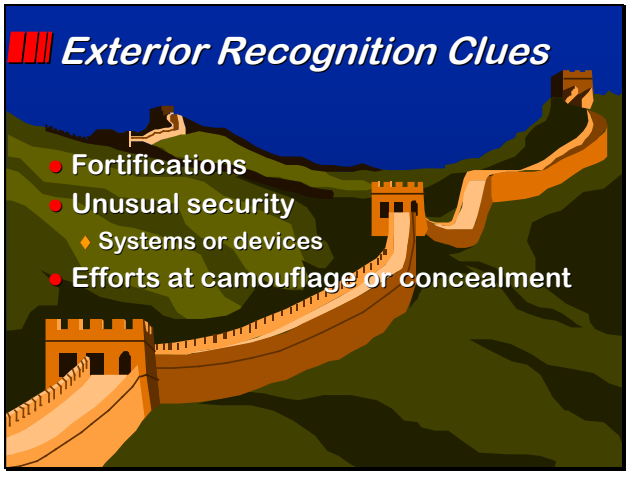
- Unusual structures or
- Assemblages of equipment



Slide 43

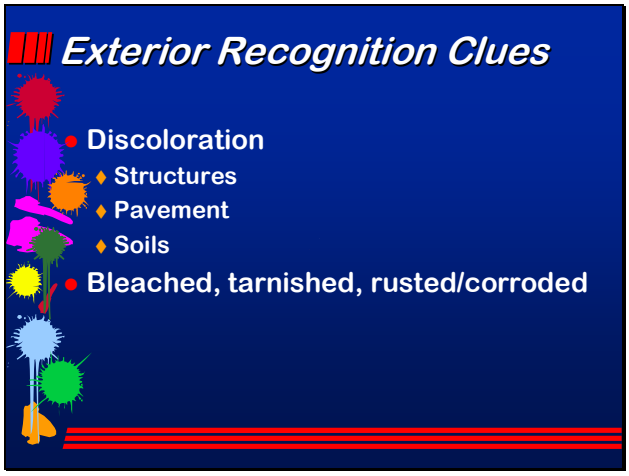
Slide 44

Slide 45



Slide 46

Slide 47



Slide 48

Slide 49

Slide 50

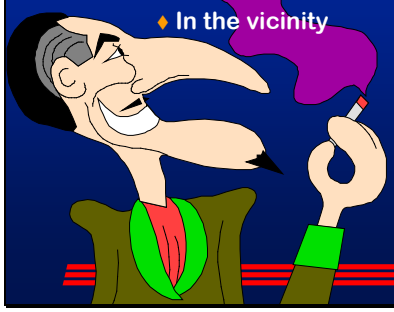
Exterior Recognition Clues

- Strong or unusual chemical odors
  - Ether-like (anesthetic, sweet), common solvent, vinegar-like, ammonia, pungent, acrid or sour
- May cause nose, eye or throat irritation

Slide 51

Exterior Recognition Clues

- Unusual behaviors of people
  - At the location or
  - In the vicinity



Slide 52

Recognition Clues

- Access denied to landlords, neighbors, and other visitors.
- "Cooks" have no visible means of support but make cash payments and purchases.
- Covering or blacking-out of windows.
- Other security measures such as cameras or baby monitors outside of buildings.

Slide 53

Recognition Clues cont.

- Unusual traffic and activities, such as excessive night traffic or purchases taking place.
- Burn pits, stained soil or dead vegetation indicating dumping of chemicals or waste.
- Apartments or buildings that smell like chemicals, including sweet, bitter, ammonia, or solvent smells.

Slide 54

Recognition Clues cont.

- **Waste in trash, pits or piles, such as:**
  - Packaging from over-the-counter ephedrine or pseudoephedrine cold, diet or allergy pills.
  - Empty containers from antifreeze, white gas, ether, starting fluids, Freon, lye or drain openers paint thinner, acetone, or alcohol.
  - Compressed gas cylinders, or camp stove fuel containers.
  - Packaging from Epsom salts or rock salt.

Slide 55

Recognition Clues cont.

Anhydrous ammonia tanks, propane tanks, or coolers containing anhydrous ammonia.

Pyrex/glass/Corning containers, with dried chemical deposits remaining.

Bottles or containers connected with rubber hosing and duct tape.

Coolers, thermos bottles, or other cold storage containers.

Respiratory masks and filters or dust masks.

Funnels, hosing and clamps.

Slide 56

Recognition Clues cont.

Coffee filters, pillow cases or bed sheets stained red (used to filter red phosphorous), yellow stains (used to filter anhydrous ammonia) or containing a white powdery residue.

- Large amounts of household chemicals found in odd places (bathrooms, kitchens, laundry rooms, or motel rooms).
- People coming outside to smoke.

Slide 57

Equipment and Glassware

- Container types
- Glassware
- Associated equipment

Slide 58

Equipment and Glassware cont.

- Aluminum Foil
- Blenders
- Chemistry glassware
- Cheesecloth
- Cotton balls
- Electric hot plates
- Garden spray jugs
- Jugs
- pH test strips
- Bed sheets
- Bottles; pop, water, milk
- Camp stoves
- Coffee filters
- Duct tape
- Funnels
- Gas cans
- Paper towels
- Plastic tubing

Slide 59

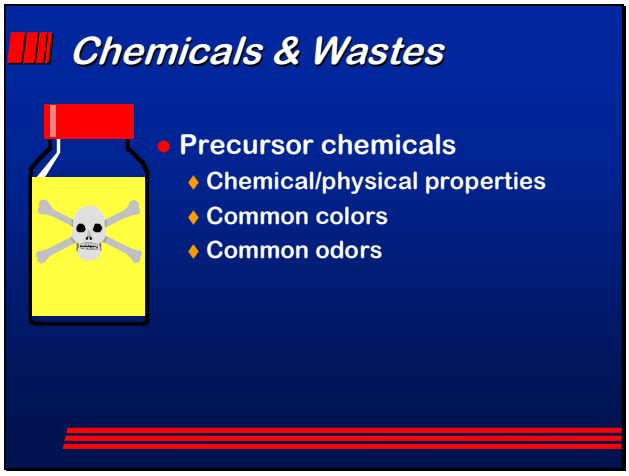
Equipment and Glassware cont.

- Pressure cookers
- Pyrex dishes
- Rubber and latex gloves
- Swimming pool chemicals
- Turkey basting wands
- Syrup containers from fountain drinks
- Propane tanks
- Thermos bottles
- Rags
- Strainers
- Thermometers
- Fire extinguishers
- Freon bottles

Slide 60

Slide 61

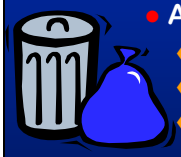
Slide 62



Slide 63

Slide 64

Chemicals & Wastes



- Associated wastes
  - Chemical/physical properties
  - Common colors
  - Common odors

Slide 65

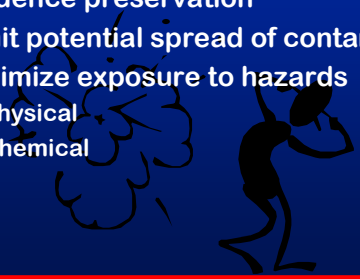
Initial First Responder Actions

- Need for scene control
  - Safety
    - Responder safety
    - Safety of the public

Slide 66

Initial First Responder Actions

- Evidence preservation
- Limit potential spread of contamination
- Minimize exposure to hazards
  - Physical
  - Chemical



Slide 67

Initial Safety Procedures

- *First Operational Thought is **Safety***
  - Think safety first, last and always
  - Must slow down—fools rush in!

Slide 68

Initial Safety Procedures

- Must have a "Positive" safety attitude
  - Don't eat, drink or smoke at the scene
  - Expect secondary and tertiary hazards
  - Eliminate sources of ignition (e.g. radios)
  - Treat *everything* as if it were hazardous

Slide 69

Initial Safety Procedures

- "Mental Safe Approach Tactic"
  - Always keep your distance
  - Approach upwind, upgrade and upstream!

Slide 70

Initial Safety Procedures

- Initial scene control
  - Remove people from immediate area
    - Suspects
    - Potential victims
  - Withdraw to a safe distance from the scene
  - Upwind, upgrade and upstream!

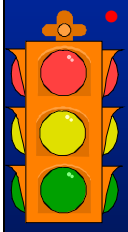
Slide 71

Isolation and Scene Control

- Need for isolation and scene control.
  - Drug lab sites are crime scenes.
  - Sites may have significant health and safety hazards.

Slide 72

Isolation and Scene Control

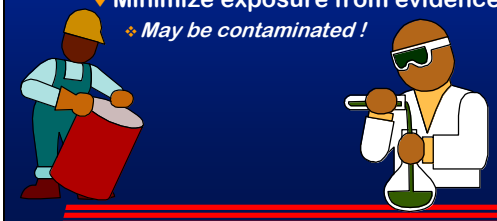


- Restrict scene access
  - Close access points
  - Restrict unauthorized access
    - Including non-essential responders
  - Establish initial perimeter
    - Barricades, barrier tape, cones, vehicles
  - Follow standard procedures

Slide 73

Isolation and Scene Control

- Evidence preservation
  - Maintain integrity of evidence
  - Minimize exposure from evidence
    - *May be contaminated !*



Slide 74

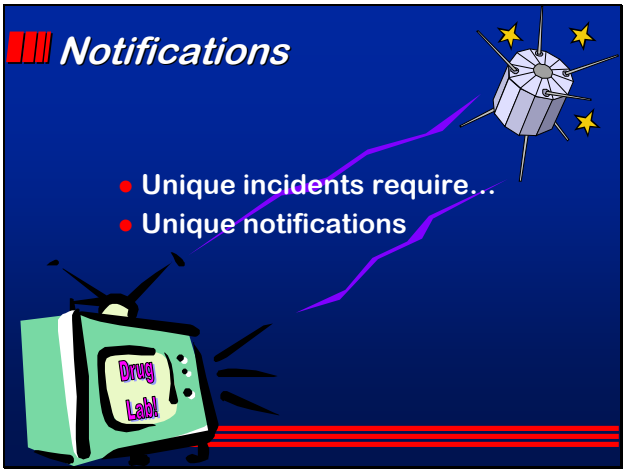
Isolation and Scene Control

- Establish command
  - Establish Command Post
    - Upwind, upgrade and upstream!
    - Expect wind shifts and prepare to move the CP
  - OSHA “Hazwoper” standard requires establishing command
- Commence necessary notifications

Slide 75

Notifications

- Unique incidents require…
- Unique notifications



Slide 76

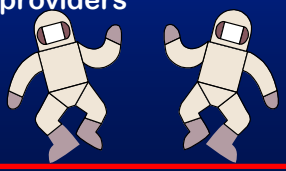
Response Agencies

- Law enforcement
  - Specialized clandestine laboratory teams
  - Drug law enforcement organizations

Slide 77

Response Agencies (cont.)

- Fire service
  - Hazmat teams
- Environmental & public health agencies
- EMS providers



Slide 78

Notifications (continued)

- Support agencies
  - Firearms and explosives technicians
  - Animal regulation or control organizations
  - Child protective services
  - Public social services agencies

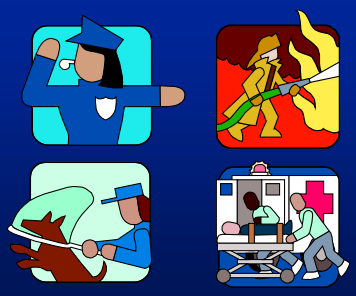
Slide 79

Notifications (continued)

- Support organizations
  - Private hazmat response teams
  - Private clean-up organizations

Slide 80

First Responder Actions



Slide 81

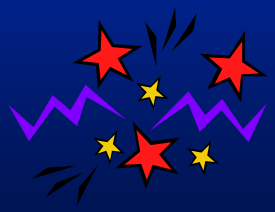
Protective Equipment

- Routes of entry
  - Inhalation
  - Absorption
  - Ingestion
  - Injection

Slide 82

Responder Limitation

- Number 1 responder limitation:
  - Lack of Chemical Protective Clothing



Slide 83

Responder Limitation (cont.)

- Firefighter turnouts are *not* CPC
  - Even with SCBA they are Level D
- Police equip. may absorb haz mats
  - Leather gear and ballistic protection

Slide 84

Health Effects

Slide 85

"Acute" vs. "Chronic"

- Acute: One time, limited or short term
  - *May not manifest themselves immediately*
- Chronic: Repeated or long term

Slide 86

"Acute" vs. "Chronic" Effects

- Acute effects
  - Range from no immediate effects to death within minutes
  - Could cause death, injury, illness or systemic damage;

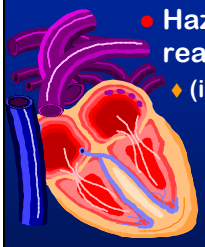
Slide 87

"Acute" vs. "Chronic" Effects

- Chronic effects
  - May not be detectable for years
  - Could cause death, injury, illness or systemic damage

Slide 88

Health Effects (continued)

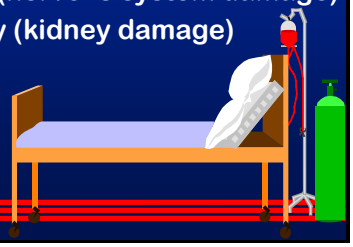


- Haz Mats harm/kill via chemical reaction to "toxic end points"
  - (i.e. target organs)

Slide 89

Health Effects (continued)

- Carcinogenicity (cancer)
- Hepatotoxicity (liver damage)
- Neurotoxicity (nervous system damage)
- Nephrotoxicity (kidney damage)



Slide 90

Toxicology Variables

- Kind of hazardous material
- Type of toxin
- Dose (concentration) received
- Duration & frequency of exposure

Slide 91

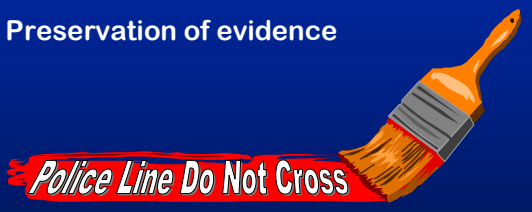
Toxicology Variables

- Personal tolerances
- Variable sensitivities.
  - Age, medical history, gender, general state of health, personal habits, medications taken, etc.

Slide 92

Initial Response Actions

- Preservation of evidence



Slide 93

Initial Response Actions

- Hazards of laboratory processes
- Three “Strategies” to stabilize an event:
  - Non-Intervention
  - Defensive/Contain
  - Offensive/Control

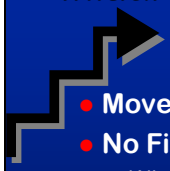
Slide 94

Initial Response Actions (cont)

- Non-Intervention
  - No direct actions other than S.I.N.
- Defensive/Contain
  - Slows & restricts Haz Mat spread (FROs)
- Offensive/Control
  - Stops Haz Mat release (Techs or Specs)

Slide 95

Initial Response Actions (cont)



- Move from:
- No Fight, to Defensive, to Offensive
  - When level, resources & capabilities of responders are in line with strategy

Slide 96

When to Not Intervene?

- Unsafe
- No life threat
- Lack resources
- Lack PPE, etc.

Slide 97

Methods of Non-intervention

- Isolate and deny entry
- Retention
  - (e.g. let collect in natural low area or sump)

Slide 98

Role of the FRA

- Recognize hazard
- Initiate response actions
- Notify proper authorities
- *And that's it!*

Slide 99

IF YOU SUSPECT A METH LAB: cont.

- Leave at once and report it.
- Do not open any coolers, containers or boxes.
- Do not touch any items.

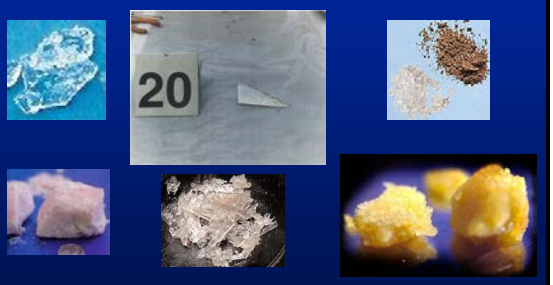
Slide 100

IF YOU SUSPECT A METH LAB:

- Don't shut off electrical supplies.
- Limit time inside scene.
- Handling meth chemicals and/or meth lab waste residue can burn your skin and eyes. Breathing the gases can cause respiratory damage.
- Try not to alert the suspects of your suspicions.

Slide 101

Finished Product



Appendix A
Chemical & Physical Properties

Acetic Acid

Other Names**:** Ethanoic acid; methanecarboxylic acid; glacial acetic acid.

Molecular Formulas: $C_2H_4O_2$; CH_3COOH

Molecular Weight: 60.05

Density: 1.05

Boiling Point: 118ºC

Description: Colorless corrosive liquid with a pungent odor. A 5-6% solution in water is vinegar. Glacial acetic acid refers to a solution which is at least 99.5% concentrated.

Hazards: Flammable; vapor irritating to respiratory system, eyes and skin; can cause severe burns to eyes and skin; ingestion causes irritation and damage.

Illicit Use: Clandestine manufacture of P2P for amphetamine and methamphetamine synthesis; possibly used to produce acetic anhydride for heroin production.

Where Controlled or Regulated: OAS

Legitimate Uses: Manufacture of vinyl acetate (45%), cellulose acetate (20%), acetic anhydride, acetate rayon, plastics and rubber; in tanning; printing calico and dyeing silk; food preservative; solvent for gums, resins, volatile oils and many other substances; used in other organic syntheses.

Manufacturing Process: Carbonylation of methanol; direct oxidation of saturated hydrocarbons, oxidation of acetaldehyde.

Shipping and Storage: Containers lined with stainless steel, glass or polyethylene.

Remarks: The reaction of acetic acid and phenylacetic acid to yield P2P has not been frequently encountered in U.S. clandestine labs. The majority of the companies manufacturing acetic acid in the U.S. convert it to either vinyl acetate or cellulose acetate. Reports from Southeast Asian countries indicate that acetic acid has been used in the past to produce acetic anhydride through a reaction with ketone. Acetic acid alone will not

acetylate morphine to heroin. It can be used as a substitute for ammonium chloride in the extraction of morphine from opium.

Acetic Anhydride

Other Names**:** Acetic oxide, acetyl oxide.

Molecular Formulas: $C_4H_6O_3$; $(CH_3CO)_2O$

Molecular Weight: 102.09

Density: 1.08

Boiling Point: 139ºC

Description: Colorless liquid with a penetrating, strong acetic odor. Fumes in moist air.

Hazards: Flammable; vapors are irritating to respiratory system and eyes; liquid may burn eyes and skin severely; ingestion causes irritation, pain and vomiting.

Illicit Use: Acetylating agent in the production of heroin, P2P and N-acetylanthranilic acid.

Where Controlled or Regulated: CSA; UN; OAS

Thresholds: Domestic 1023 Kg or 250 Gal. Import/Export 1023 Kg or 250 Gal

Legitimate Uses: Acetylating and dehydrating agent; acetylation of cellulose (80%); production of polymethylacrylamide (hard foam); acetylated plastic auxiliaries; explosives; production of certain types of brake and drilling fluids; production of cold-bleaching activators; dyeing, chiefly with nitric acid; preparation of organic intermediates; production of pharmaceuticals, e.g. aspirin, acetanilide, phenacetin, theophylline; acetylation of animal and plant fats; production of flavors, fragrances and herbicides.

Manufacturing Process: Dehydration of acetic acid and carbonylation of methylacetate.

Shipping and Storage: Containers lined with stainless steel or polyethylene.

Remarks: Acetic anhydride reacts with morphine to yield heroin. It also reacts with anthranilic acid to form N-acetyl-anthranilic acid, the immediate precursor of methaqualone and mecloqualone. It reacts with phenylacetic acid to give P2P, a precursor of amphetamine and methamphetamine.

Acetone

Other Names**:** Dimethyl ketone; ß-ketopropane; pyroacetic ether; 2-propanone.

Molecular Formulas: C_3H_6O; $(CH_3)_2CO$

Molecular Weight: 58.08

Density: 0.79

Boiling Point: 56.5ºC

Description: Colorless, mobile, flammable liquid with a mildly pungent and somewhat aromatic odor.

Hazards: Highly flammable; vapor is irritating to eyes and nose in high concentrations; inhalation of vapor may cause dizziness, narcosis and coma; liquid is irritating to eyes and may cause severe damage; ingestion of liquid may cause gastric irritation, narcosis and coma.

Illicit Use: Solvent in purification of morphine base leading to the manufacture of heroin; conversion of cocaine base to cocaine hydrochloride.

Where Controlled or Regulated: CAS; UN; OAS

Thresholds: Domestic 150 Kg or 50 Gal. Import/Export 1500 Kg or 500 Gal

Legitimate Uses: Solvent and chemical intermediary for a variety of substances including plastics, paints, lubricants, pharmaceuticals, cosmetics, agricultural products, fats, oils, waxes, resins, rubber, lacquers, varnishes and rubber cements; used in the extraction of various principals from animal and plant substances; in varnish removers, purifying paraffin; hardening and dehydrating tissue; manufacture of methyl isobutyl ketone, mesityloxide, acetic acid, diacetone alcohol, chloroform, iodoform, bromoform, explosives, rayon, photographic films and isoprene.

Manufacturing Process: Fermentation of cornstarch and molasses; chemical synthesis from isopropanol; from cumene or a by-product in phenol manufacture; oxidation of propene.

Shipping and Storage: Shipped in steel drums, tank trucks, and rail cars; stored in closed containers in well ventilated area away from heat, sparks and flames.

Remarks: It is a solvent used in the conversion of cocaine base to cocaine hydrochloride and in the purification of morphine base in the production of heroin. It can be produced by a reaction of diacetone alcohol with an alkaline material such as sodium hydroxide or in the presence of a catalyst such as zinc or aluminum oxide. It may also be produced from isopropyl alcohol at cocaine laboratory sites.

Benzaldehyde

Other Names**:** Benzoic aldehyde; artificial essential oil of almond; benzenecarbonal.

Molecular Formulas: C_7H_6O; C_6H_5CHO

Molecular Weight: 106.12

Density: 1.05

Boiling Point: 179^{o}C

Description: Strongly refractive liquid, becoming yellowish on storage; oil of almond odor; burning aromatic taste.

Illicit Use: Production of P2P and amphetamine.

Where Controlled or Regulated: CSA

Thresholds: Domestic 4 Kg. Import/Export 4 Kg

Legitimate Uses: Manufacture of dyes, perfumes, cinnamic and mandelic acids, pharmaceutical, agricultural and other organic chemicals; solvent; ingredient in flavors.

Manufacturing Process: Hydrolysis of benzyl chloride; partial oxidation of toluene.

Shipping and Storage: Keep tightly closed and protected from heat.

Remarks: Oxidizes in air to form benzoic acid. It can be used to clandestinely manufacture a nitropropene intermediate by a reaction with nitroethane and butylamine. This intermediate can then be converted into P2P or amphetamine. This reaction has been encountered in clandestine P2P and amphetamine labs.

Benzyl Chloride

Other Names**:** Chloromethylbenzene; α-chlorotoluene.

Molecular Formulas: C_7H_7Cl; $C_6H_5CH_2Cl$

Molecular Weight: 126.59

Density: 1.10

Boiling Point: 179ºC

Description: Colorless liquid which fumes in moist air; pungent odor; powerful lachrymatory effect.

Hazards: Vapor is irritating to respiratory system, mucous membranes, eyes and skin; liquid can cause burns; ingestion causes severe internal irritation and damage.

Illicit Use: Production of phenylacetone (P2P), amphetamine and methamphetamine.

Where Controlled or Regulated: CSA; OAS

Thresholds: Domestic 1 Kg. Import/Export 4 Kg

Legitimate Uses: Manufacture of plasticizers, benzyl alcohol and phenylacetic acid; production of quaternary ammonium salts for disinfectants and catalysts; benzyl esters for the flavor and perfume industry; dyes of the triphenylmethane series; dibenzyl disulfide (antioxidant) for lubricants; benzylphenol and benzylamines.

Manufacture Process: Chlorination of toluene.

Remarks: It is used in one of the methods to manufacture P2P, a precursor of amphetamine and methamphetamine. This method is not the primary method used to produce P2P.

Ephedrine

Other Names**:** α-[1-(methylamino)ethyl]-benzene-methanol; α -[1-(methylamino)ethyl] benzyl alcohol; 2-methylamino-1-phenyl-1-propanol; 1-phenyl-1-hydroxy-2-methylamino-

propane; 1-phenyl-2-methyl-aminopropanol; a-hydroxy-ß-methylaminopropyl-benzene.

Molecular Formula: $C_{10}H_{15}NO$

Molecular Weight: 165.23

Melting Point: 40-42ºC

Description: Racemic ephedrine and its hydrochloride and sulfate salts are white crystals; 1-ephedrine is a waxy hygroscopic solid, crystals or granules with a soapy feel; 1-ephedrine hydrochloride and sulfate are orthorhombic needles which are affected by light.

Hazards: Harmful if swallowed in large quantities; do not breathe dust; avoid contact with skin and eyes.

Illicit Use: Production of methamphetamine/N-methylcathinone.

Where Controlled or Regulated: CSA; UN; OAS

Thresholds: Domestic 0 Kg. Import/Export 0 Kg

Legitimate Uses: 1-ephedrine is used in medicinal preparations as a bronchodilator.

Manufacturing Process: 1-ephedrine can be extracted from several species of the plant genus ephedra; 1-ephedrine is produced synthetically by the fermentation of a mixture of benzaldehyde and molasses, followed by dehydrogenation in a methylamine solution (Meubery Process). It can also be synthesized by the catalytic hydrogenation of (-)-1-phenyl-2-methylaminopropanone.

Shipping and Storage: Keep tightly closed in cool, dry place and out of light.

Remarks: Ephedrine is the primary precursor used in the clandestine synthesis of methamphetamine in the U.S. The process involves the reduction of ephedrine with hydriodic acid in the presence of red phosphorus. The reaction is relatively simple and the yield is high. Ephedrine is an ingredient in over-the-counter medications and look-alike preparations. There are no manufacturers of ephedrine in the U.S.

Ethylamine

Other Names**:** Ethanamine; monoethylamine.

Molecular Formula: C_2H_7N

Molecular Weight: 45.08

Description: At room temperature ethylamine is a gas with an ammonia-like odor; below 16ºC it is a highly flammable and corrosive liquid; the hydrochloride and hydriodide salts are hygroscopic crystals.

Hazards: Vapor irritates the mucous membranes, respiratory system and eyes; in high concentrations it may affect the central nervous system; liquid may irritate eyes and skin; if ingested may be irritating and poisonous.

Illicit Use: Used with P2P to synthesize N-ethylamphetamine and with 3,4-methylenedioxyphenyl-2-propanone to synthesize MDE; also used to make diethyltryptamine (DET).

Where Controlled or Regulated: CSA

Thresholds: Domestic 1 Kg. Import/Export 1 Kg

Legitimate Uses: Production of herbicides, dyes and pharmaceuticals; also used as a stabilizer for rubber latex; in resin chemistry.

Manufacturing Process: Produced from ethanol and ammonia or ethyl iodide and ammonia.

Shipping and Storage: Stored and shipped in carbon steel or stainless steel containers; small amounts can be kept in glass or ceramic; since ethylamine is a vapor at room temperature it is stored under pressure; often produced in 50% or 70% solutions to facilitate storage and shipping; shelf life very long but should be stored under nitrogen to prevent contact with carbon dioxide and atmospheric moisture; keep out of light.

Remarks: Ethylamine is not to be confused with diethylamine, used in the synthesis of LSD, or triethylamine.

Ethyl Alcohol

Other Names**:** Ethanol; anhydrous alcohol; ethyl hydroxide; methyl carbinol.

Molecular Formulas: C_2H_6O; C_2H_5OH

Molecular Weight: 46.07

Density: 0.79

Boiling Point: 78.5ºC

Description: Clear, colorless liquid with a pleasant odor.

Hazards: Highly flammable; in high concentrations causes impaired perception and uncoordination.

Illicit Use: Solvent used in conversion of cocaine base to cocaine hydrochloride.

Where Controlled or Regulated: OAS

Legitimate Uses: Alcoholic beverages; industrial solvent; gasoline octane booster; perfumery; organic syntheses and pharmaceuticals.

Manufacturing Process: Fermentation of starch, sugar and other carbohydrates; hydration of ethylene.

Shipping and Storage: Railroad tank cars, tank trucks, drums and smaller glass or metal containers; some drums may be lined with phenolic resin.

Remarks: This chemical has been identified in cocaine hydrochloride samples seized in the U.S. This solvent is not essential to the cocaine hydrochloride production since other alcohols such as methyl isopropyl, etc. can be used. This solvent is used in combination with water insoluble solvents. Ethanol can be used in a process with sulfuric acid to produce ethyl ether.

Ethyl Ether

Other Names**:** 1,1'-oxybisethane; ethyl oxide; diethyl oxide; ethoxyethane; sulfuric ether; diethyl ether; ether.

Molecular Formulas: $C_4H_{10}O$; $(C_2H_5)_2O$

Molecular Weight: 74.12

Density: 0.71

Boiling Point: 34.6ºC

Description: Colorless, very volatile liquid with a sweet pungent odor and burning taste. Ether vapors are heavier than air.

Hazards: Highly flammable; vapor may cause drowsiness, dizziness, mental confusion, faintness, and in high concentrations, unconsciousness; ingestion may also produce these effects; continued inhalation of low concentrations may cause loss of appetite, dizziness, fatigue and nausea; repeated inhalation or swallowing may lead to "ether habit" with symptoms resembling chronic alcoholism.

Illicit Use: Processing of heroin base to heroin hydrochloride and cocaine base to cocaine hydrochloride.

Where Controlled or Regulated: CSA; UN; OAS

Thresholds: Domestic 135.8 Kg 50 Gal. Import/Export 1,364 Kg 500 Gal

Legitimate Uses: Solvent or extractant for fats, waxes, oils, perfumes, resins, dyes, gums and alkaloids; manufacture of munitions and plastics; denaturant in several denatured alcohol formulas; starting fuel for diesel engines and as a general anesthetic in surgery; commercial source of ethylene in plants that do not have access to petroleum refinery gases; analytical laboratories.

Manufacturing Process: Dehydration of ethanol; hydration of ethylene; both processes are carried out in the presence of sulfuric acid.

Shipping and Storage: Shipped in metal containers, drums, tank cars and boxcars; stored in cool, dark, well ventilated areas in tightly closed inert containers for limited time periods.

Remarks: Commonly referred to as ether. Ethyl ether is a solvent used in the conversion of cocaine base to cocaine hydrochloride and in other clandestine processes where hydrochloride salts are produced. It may be used in conjunction with a water miscible

solvent such as acetone. Its presence has markedly decreased in cocaine hydrochloride samples seized in the U.S. It can be synthesized from sulfuric acid and ethanol.

Hydriodic Acid

Other Names**:** Hydrogen iodide (aqueous solution).

Molecular Formula: HI

Molecular Weight: 127.91

Density: 1.5 (47%); 1.7 (57%)

Boiling Point: 127^{o}C (57%)

Description: Corrosive acid which is colorless when freshly prepared. However, upon exposure to light and air it turns yellow to brown. It is a solution of hydrogen iodide gas in water.

Hazards: Vapor is irritating to respiratory system, skin and eyes; liquid causes severe burns to eyes and skin; if ingested, may cause severe internal irritation and damage.

Illicit Use: Reducing agent in the clandestine manufacture of methamphetamine from ephedrine or pseudoephedrine.

Where Controlled or Regulated: CSA

Thresholds: Domestic (57% HI) 1.7 Kg 1 L. Import/Export (57% HI) 1.7 Kg 1 L

Legitimate Uses: Manufacture of organic and inorganic iodo compounds; remove of iodine from iodo compounds; disinfectant; chemical reagent; pharmaceutical application in adding iodine to iodine-deficient human diets. (Hydriodic Acid Syrup).

Manufacturing Process: Hydrogen iodide gas in water; iodine in the presence of hydrogen sulfide; iodine with red phosphorus and water.

Shipping and Storage: Keep protected from air and light and at temperatures below 30^{o}C.

Remarks: Main reducing agent in methamphetamine synthesis, however, other reducing agents can be used. There has been increasing production of hydriodic acid in clandestine laboratories from iodine, red phosphorus and water. Produced in various concentrations (e.g. 47% HI, 57% HI).

Hydrochloric Acid

Other Names**:** Muriatic acid; hydrogen chloride.

Molecular Formula: HCl

Molecular Weight: 36.46

Density: 1.2 (39.1% solution)

Boiling Point: 108.58ºC (20.22% solution)

Description: A solution of hydrogen chloride gas in water. Corrosive, colored to light yellow liquid from traces of iron, chlorine and organic matter. Fumes in air. Reagent grade contains 36.5%-38% hydrochloric acid. Hydrogen chloride gas is also available.

Hazards: Inhalation may cause coughing or choking, inflammation and ulceration of the respiratory tract; concentrated solutions cause severe burns; strongly corrosive, irritant to the mucous membranes, eyes and respiratory tract; exposure to vapors may result in pulmonary edema and possible death.

Illicit Use: Manufacture of hydrochloride salts of clandestinely produced controlled substances, including cocaine.

Where Controlled or Regulated: OAS; CSA; UN

Threshold: Export 50 Gal (exports to selected South American countries)

Legitimate Uses: Production of chlorides and hydrochlorides; neutralization of basic systems; catalyst and solvent in organic syntheses.

Manufacturing Process: Produced industrially by the interaction of sodium chloride and sulfuric acid; from sodium chloride, sulfur dioxide, air and water vapor; as a by-product of the synthesis of chlorinated hydrocarbons.

Shipping and Storage: Carboys in boxes, steel portable tanks, lined with a polyethylene, for hydrochloric acid not over 20%; tank cars for acid not over 30%; cargo tanks lined with rubber or equally acid-resistant material, glass bottles, polyethylene containers, metal drums (lined); store below 30º in airtight containers of glass or other inert material.

Remarks: An acid is essential in the production of water soluble salts of controlled substances. However, other acids such as sulfuric acid, phosphoric acid, etc. can be used for this purpose.

Cocaine hydrochloride is the most commonly encountered salt of cocaine. A small percentage of the hydrochloric acid produced in the U.S. is exported. It is easily obtainable in retail outlets as muriatic acid. Hydrochloric acid can be produced in clandestine laboratories by the reaction of sodium chloride and sulfuric acid. Hydrochloride gas can be bubbled into an organic solvent containing the base form of the drug to form the hydrochloride salt.

Iodine

Molecular Formula: I_2

Molecular Weight: 253.82

Melting Point: 113.6ºC

Description: Bluish-black scales or plates. It has a characteristic odor, a sharp acrid taste and produces a violet corrosive vapor.

Hazards: Vapor is irritating to respiratory system and eyes; solid irritates the eyes and may burn the skin; if ingested there may be severe internal irritation and damage.

Illicit Use: Production of methamphetamine and PCP.

Where Controlled or Regulated: Unknown

Legitimate Uses: Manufacture of iodine solutions, germicides, fungicides and antiseptics; reduces friction of hard surfaces including stainless steel and glass; reagent in analytical chemistry; manufacture of iodide salts.

Manufacturing Process: Extracted from Cholean nitrate-bearing earth (Caliche) and from seaweed.

Remarks: Iodine and water can be mixed with hydrogen sulfide to produce hydriodic acid which, in turn, is the primary reducing agent for methamphetamine synthesis. This is a hazardous procedure. Iodine is also mixed with red phosphorus and water to make hydriodic acid. In a clandestine laboratory setting, a little acid may be added to this reaction mixture.

Isopropyl Alcohol

Other Names**:** 2-propanol; isopropanol; dimethyl carbinol; petrohol; secondary propyl alcohol; IPA.

Molecular Formulas: C_3H_8O; C_3H_7OH

Molecular Weight: 60.09

Density: 0.78

Boiling Point: 82.5ºC

Description: Colorless, liquid with a slightly bitter taste.

Hazards: Flammable; inhalation of the vapor in high concentrations and ingestion of the liquid may result in headache, dizziness, mental depression, nausea, vomiting, narcosis, anesthesia, and coma; liquid may damage eyes severely.

Illicit Use: Recrystallization of hydrochloride salts of some clandestinely produced controlled substances; solvent used in the conversion of cocaine base to cocaine hydrochloride.

Where Controlled or Regulated: Columbia

Legitimate Uses: Solvent; extractant; dehydration and defrosting agent; disinfectant; feedstock for manufacture of acetone and other compounds; premium grade IPA is formulated into skin lotions, hair care products, nail polish and other personal care products.

Manufacturing Process: Sulfuric acid oxidation of propylene; hydrogenation of acetone.

Shipping and Storage: Polyethylene bottles and drums, metal tanks.

Remarks: Isopropyl alcohol can be used to incorporate hydrochloric acid into the solvents used in the production of cocaine hydrochloride. IPA is not essential in cocaine hydrochoride production, since other alcohols (ethyl, isobutyl and methyl) can be used. Isopropyl alcohol has been found in combination with other solvents in liquid samples obtained from South America and in cocaine hydrochloride samples seized in the U.S. It can be used as a starting material in the production of acetone.

Methylamine

Other Names**:** Methanamine; monomethylamine; aminomethane.

Molecular Formulas: CH_5N; CH_3NH_2

Molecular Weight: 31.06

Description: Gas at ordinary temperature and pressure; corrosive liquid when liquefied by cooling in ice and salt mixture; commonly sold as 33-40% aqueous solutions. The hydrochloride exists as deliquescent tetragonal crystals.

Hazards: Gas and liquid are flammable; gas irritates the skin, eyes and respiratory system; sustained contact may cause burns; highly corrosive to the skin, mucous membranes and respiratory tract.

Illicit Use: Used with P2P to produce methamphetamine and with 3,4-methylenedioxy- phenyl-2-propanone to produce MDMA.

Where Controlled or Regulated: CSA covers monomethylamine. Dimethylamine and trimethylamine are not included.

Thresholds: Domestic 1 Kg. Import/Export 1 Kg

Legitimate Uses: Production of bactericides, insecticides (36%), explosives (31%) and N-methylpyrrolidine (lube oil additive) 15%.

Manufacturing Process: Produced from methanol and ammonia; by heating methanol, ammonium chloride and zinc chloride; by heating ammonium chloride and formaldehyde.

Shipping and Storage: Stored in carbon steel or stainless steel containers; small amounts are stored in glass or ceramic vessels. Methylamine must be stored under pressure at room temperature. It should be kept under nitrogen to avoid contact with carbon dioxide (forms carbonates) and moisture.

Remarks: The P2P/methylamine process to manufacture methamphetamine is used in less than one third of the clandestine laboratories seized in the U.S. Methylamine is a necessary chemical in these processes. It is also a necessary chemical for the clandestine production of MDMA. Methylamine is readily available from U.S. chemical supply houses.

Methyl Alcohol

Other Names**:** Methanol; carbinol; wood spirit; wood alcohol; methyl hydroxide, mono-hydroxy methane.

Molecular Formulas: CH_4O; CH_3OH

Molecular Weight: 32.04

Density: 0.79

Boiling Point: 64.7ºC

Description: Clear, colorless, mobile liquid; burns with a bluish flame.

Hazards: Flammable; inhalation of high concentrations of vapor may cause dizziness, stupor, cramps and digestive disturbances; lower concentrations may cause headache, nausea, vomiting, and irritation of the mucous membranes; vapor and liquid are very dangerous to the eyes; ingestion damages the central nervous system especially the optic nerve causing temporary or permanent blindness; ingestion also injures kidneys, liver, heart and other organs; unconsciousness may develop after some hours and may be followed by death.

Illicit Use: Recrystallization of hydrochloride salts of some clandestinely produced controlled substances; solvent in the conversion of cocaine base to cocaine hydrochloride.

Where Controlled or Regulated: Colombia

Legitimate Uses: Industrial solvent; antifreeze; octane booster, to denature ethanol; raw material for making formaldehyde and methyl esters of inorganic and organic acids; solvent used in the manufacture of pharmaceuticals.

Manufacturing Process: Destructive distillation of wood; from hydrogen and carbon monoxide or carbon dioxide; oxidation of hydrocarbons. By-product in the manufacture of polyethylene terephthalate when dimethyl terephthalate is used.

Shipping and Storage: Preserve in tight containers, remote from heat, sparks and open flames.

Remarks: Methanol can be used to dissolve hydrochloric acid in the manufacture of cocaine hydrochloride. This solvent is not essential to cocaine hydrochloride production, since other alcohols such as ethyl, isopropyl, etc. can be used. This solvent is used in combination with water insoluble solvents. It has been identified in cocaine hydrochloride samples.

Nitroethane

Other Names**:** None found.

Molecular Formula: $C_2H_5NO_2$

Molecular Weight: 75.07

Density: 1.05

Melting Point: 114-115ºC

Description: Oily liquid with a pleasant odor. Miscible with methanol, ethanol and ether.

Hazards: Vapor irritates eyes and respiratory system; liquid irritates eyes and mucous membranes; absorption by skin contact or ingestion may cause liver and kidney damage.

Illicit Use: Synthesis of P2P, amphetamine, MDA and its analogues.

Where Controlled or Regulated: CSA

Thresholds: Domestic 2.5 Kg. Import/Export 2.5 Kg

Legitimate Uses: Solvent in organic syntheses and experimentally as a liquid propellant.

Manufacturing Process: Nitration of ethane with nitric acid.

Remarks: Nitroethane, in combination with benzaldehyde and butylamine, has been used to clandestinely manufacture a nitropropene intermediate which can be converted to P2P and/or amphetamine. This reaction is being encountered more frequently in clandestine P2P/amphetamine labs. Nitroethane can also be reacted with piperonal to produce MDA/MDMA or reacted with benzaldehyde derivatives to product other amphetamine analogues.

Petroleum Ether

Other Names**:** Petroleum benzin; naphtha; benzin; petroleum naphtha.

Molecular Formulas: Mixture of low boiling fractions of petroleum; chiefly pentanes and hexanes.

Density: 0.62-0.66

Boiling Point: 35-80^{o}C

Description: Clear, colorless, nonfluorescent, highly flammable, volatile liquid.

Hazards: Highly flammable; toxicity similar to hexane.

Illicit Use: Solvent to produce hash oil from marijuana; also used in cocaine production.

Where Controlled or Regulated: Peru

Legitimate Uses: Pharmaceutical aid (solvent)

Manufacturing Process: Distillation of petroleum.

Shipping and Storage: Keep tightly closed in a cool place and away from fire.

Remarks: Petroleum ether could be used to extract cocaine from coca leaves, however, the physical properties (flammability and volatility) make it less desirable than kerosene. It can also be used in the conversion process of cocaine base to cocaine hydrochloride.

Phenylacetic Acid

Other Names**:** Benzeneacetic acid; α-toluic acid.

Molecular Formula: $C_8H_8O_2$

Molecular Weight: 136.14

Melting Point: 76-77ºC

Description: White powder with a very disagreeable pungent odor; salts usually sold as 50% aqueous solutions; available as sodium or potassium salts.

Hazards: Moderately toxic by ingestion; teratogen in experimental animals; when heated to decomposition it emits acrid smoke and irritating fumes.

Illicit Use: Production of amphetamine, methamphetamine and P2P.

Where Controlled or Regulated: CSA; OAS; UN

Thresholds: Domestic 1 Kg. Import/Export 1 Kg

Legitimate uses: Manufacture of perfumes, phenylacetic acid esters, herbicides, penicillin and other pharmaceutical products; flavoring agent for beverages and sweetened foods.

Manufacturing Process: Hydrolysis of benzyl cyanide using dilute sulfuric or hydrochloric acid.

Shipping and Storage: Solutions sold in 4,000 gallon lots, shipped by bulk tank car or truck; also sold in 55 gallon (208.2 liter) drums as the potassium or sodium salts in carbon steel tanks; sodium salt requires heating since it freezes at 10ºC; non-salt form should be stored in dark bottles in a cool dry area.

Remarks: Phenylacetic acid is used in the two most frequently employed methods to synthesize P2P in clandestine laboratories. P2P is then used in the clandestine production of amphetamine and methamphetamine. Esters of phenylacetic acid (e.g. phenylacetic acid ethyl ester) can be easily converted to the parent compound by heating with an aqueous acid or base and are now regulated under the CSA.

Phenyl-2-propanone

Other Names**:** 1-phenyl-2-propanone; phenylacetone; P2P; benzyl methyl ketone; methyl benzyl ketone; BMK.

Molecular Formula: $C_9H_{10}O$

Molecular Weight: 134.18

Density: 1.02

Boiling Point: 214°C

Description: Clear, moderately viscous liquid.

Hazards: Irritating to skin and eyes.

Illicit Use: Production of amphetamine and methamphetamine.

Where Controlled or Regulated: Controlled as an immediate precursor in Schedule II of the US CSA; UN; OAS

Legitimate Uses: Production of amphetamine, methamphetamine and propylhexedrine; in organic syntheses.

Manufacturing Process: From phenylacetic and acetic acids; from benzyl cyanide through α-phenylacetoacetonitrile; from benzaldehyde and nitroethane through a nitropropene intermediate.

Shipping and Storage: Tightly closed containers in cool dry areas; 55 gallon drums (208.2 liters) containing 460 lbs (209.1 kg) net.

Remarks: P2P was the most widely used precursor in the synthesis of amphetamine/methamphetamine in the U.S. until its control in Schedule II of the CSA in 1980. It has been replaced by ephedrine as the most widely used precursor. P2P continues to be used in less than one-third of the amphetamine/methamphetamine clandestine labs but most often it is synthesized in these laboratories.

Pseudoephedrine

Other Names**:** α-[1-(methylamino)ethyl]-benzenemethanol; 2-methylamino-1-phenyl-1-propanol; 1-phenyl-1-hydroxy-2-methylamino-propane; α-hydroxy-ß-methylaminopropyl-benzene; 1-[1-(methylamino)ethyl]benzyl alcohol.

Molecular Formula: $C_{10}H_{15}NO$

Molecular Weight: 165.23

Melting Point: 117-119ºC

Description: Base and salts (hydrochloride and sulfate) are crystalline materials.

Hazards: Harmful if swallowed in large quantities; do not breathe dust; avoid contact with skin and eyes.

Illicit Use: Production of methamphetamine and methcathinone.

Where Controlled or Regulated: CSA; OAS; UN

Thresholds: Domestic 1 Kg. Import/Export 1 Kg

Legitimate Uses: Pharmaceutical preparations as nasal decongestants (d-form) and bronchodilators (l-form).

Manufacturing Process: Extracted from several species of the plant genus Ephedra; produced from ephedrine.

Shipping and Storage: Keep in well-closed container and protected from light.

Remarks: Pseudoephedrine is used in the same way as ephedrine in the clandestine synthesis of methamphetamine. It is produced in the U.S. from ephedrine which is imported into the U.S. Pseudoephedrine is an ingredient in over-the-counter preparations such as Sudafed and is sold by generic firms. D-pseudoephedrine is the preferred form since this is converted to d-methamphetamine.

Red Phosphorus

Atomic Symbol: P

Atomic Weight: 30.97

Description: Red to violet powder. Insoluble in organic solvents.

Hazards: Vapor from ignited phosphorous irritates the nose, throat, lungs and eyes.

Illicit Use: Manufacture of methamphetamine.

Where Controlled or Regulated: Unknown

Legitimate Uses: Pyrotechnics; manufacture of safety matches; organic synthesis; manufacture of phosphoric acid, phospine, phosphoric anhydride and phosphorous hydrochloride; manufacture of fertilizers, pesticides, incendiary shells, smoke bombs and tracer bullets.

Manufacturing Process: Purified from mineral phosphates; chlorapatite, fluorapatite, vivianite and phosphorite.

Remarks: Phosphorus exists in three allotropic forms: white, black and red. Only the red form is used. It is a catalyst in the HI reduction of ephedrine to methamphetamine. It also catalyzes the formation of HI from iodine and water.

Sodium Hydroxide

Other Names**:** Caustic soda; soda lye; sodium hydrate.

Molecular Formula: NaOH

Molecular Weight: 40.01

Melting Point: 318ºC

Description: White hygroscopic powder or white flakes, plates, pellets or sticks; rapidly absorbs water from the air; available as commercial solutions of 15%, 27%, 31% and 50% or 97-98% solid.

Hazards: Concentrated material is very corrosive to human tissue, generates considerable heat when dissolved in water or when mixed with acid; solids and strong solutions cause severe burns of the eyes and skin; ingestion may cause severe internal irritation and damage.

Illicit Use: Alkaline material used in the production of coca paste, cocaine base and other substances.

Where Controlled or Regulated: OAS

Legitimate Uses: Solutions are used to neutralize acids and make sodium salts, e.g., in petroleum refining to remove sulfuric and organic acids; to treat cellulose in making viscose rayon and cellophane; in reclaiming rubber to dissolve out the fabric; in making plastics; to hydrolyze fats and form soaps; to precipitate alkaloids (bases such as cocaine) and most metals (as hydroxides) from water solutions of their salts; in the preparation of glycerin suppositories.

Manufacturing Process: Electrolysis of sodium chloride; reaction of calcium hydroxide with sodium carbonate; from sodium metal and water vapor at low temperature.

Shipping and Storage: Solid is hygroscopic and must be kept in tightly sealed containers made of glass, metal, plastic or fiber board; sold in 50 pound bags, 100, 450, 500 and 750 pound drums; bulk sold in tank cars, tank trucks and barges; liquid sold as 50% solutions in 15 and 55 gallon drums, tank cars and tank trucks.

Remarks: An alkaline material is essential for the production of cocaine. Sodium hydroxide has been found in clandestine cocaine laboratories. Sodium hydroxide is one of a number of alkaline substances such as sodium, calcium or potassium

carbonate or calcium oxide, which may be used in the production of cocaine and other substances.

Sodium Thiosulfate

Other Names**:** Sodium hyposulfite; “hypo”; antichlor; sodothiol; sulfothiorine; ametox.

Molecular Formula: $Na_2O_3S_2$

Molecular Weight: 158.13

Density: 1.69

Description: Powder; odorless crystals or granules which melt at 48^{o} when rapidly heated.

Hazards: Moderately toxic by subcutaneous routes.

Illicit Use: Clandestine manufacture of methamphetamine.

Where Controlled or Regulated: Unknown

Legitimate Uses: Remove chlorine from solutions; antichlor in bleaching of paper pulp; fixer in photography; extraction of silver from ores; mordant in dyeing and printing textiles; reducer in chrome dyeing; manufacturing leather; bleaching bone, straw and ivory.

Shipping and Storage: Keep in cool, dry place.

Remarks: Sodium thiosulfate is used in some clandestine methamphetamine laboratories which use the ephedrine-HI reduction method. It removes the remaining iodine from solution which makes the product less colored.

Sulfuric Acid

Other Names**:** Oil of vitriol; hydrogen sulfate.

Molecular Formula: H_2SO_4

Molecular Weight: 98.08

Density: 1.84 (concentrated solution)

Boiling Point: 290^{o}C

Description: Colorless, odorless, oily liquid; considerably more viscous than water; concentrated sulfuric acid is 93-98% hydrogen sulfate in water.

Hazards: Concentrated acid is extremely corrosive to skin; causes severe burns; when mixed with other liquids it should be added slowly, stirring constantly; when diluting always add acid to water, never add water to acid; reacts with water or steam to produce heat.

Illicit Use: Dilute solutions (5-10%) are used in the extraction of cocaine from coca leaves and in the conversion of the paste to the base; production of sulfate salts of controlled substances.

Where Controlled or Regulated: OAS; CAS; UN

Thresholds: Export 50 gal (exports to selected South American counties)

Legitimate Uses: Manufacture of fertilizers, explosives, dyestuffs, other acids, paper and glue; purification of petroleum; oxidation of metals and other materials; drying agent; component of toilet bowl cleaners, drain cleaners, metal cleaners and antirust compounds and automobile battery fluids.

Manufacturing Process: Catalytic oxidation of sulfur dioxide to sulfur trioxide which is converted to sulfuric acid by the "Contact Process;" reaction of sulfur dioxide, oxygen, water vapor and nitrogen oxides in a lead-lined chamber (lead-chamber process).

Shipping and Storage: Corrosive substance; shipped in glass carboys in boxed, steel portable tanks, lined tank cars and trucks and metal barrels and drums, depending on the concentration of the sulfuric acid; stored in airtight containers of glass or other inert material.

Remarks: More sulfuric acid is produced in the U.S. and the world than any other chemical. U.S. exports are relatively low

compared to production; sulfuric acid is produced and available throughout the world. An acid such as sulfuric acid is essential to the production of coca paste and cocaine base. Although other acids such as nitric, hydrochloric or phosphoric may be used, sulfuric acid is most commonly used when available. A procedure for the extraction of cocaine alkaloids from coca leaves using less organic solvent (kerosene) is being seen in South America. Dilute sulfuric acid is added to the leaves to convert the cocaine alkaloids into water soluble sulfate salts which are dissolved in the acid solution, made alkaline and extracted with kerosene.

Thionyl Chloride

Other Names**:** Sulfurous oxychloride

Molecular Formula: $SOCl_2$

Molecular Weight: 118.98

Boiling Point: 76ºC

Description: Colorless to pale yellow or reddish, fuming, refractive liquid.

Hazards: Reacts violently with water; contact causes burns; irritating to respiratory system if inhaled; may ignite other combustible material.

Illicit Use: Manufacture of methamphetamine.

Where Controlled or Regulated: Unknown.

Legitimate Uses: Making acyl chlorides, to replace OH or SH groups with chlorine atoms; reacts with grignard reagents to form sulfoxides.

Manufacturing Process: Oxidation of sulfur dichloride with sulfur trioxide.

Shipping and Storage: Keep away from temperatures greater than 140º; hydrolyzed by water.

Remarks: Thionyl chloride is used in a two step synthesis of methamphetamine occasionally seen at clandestine laboratories. Ephedrine or pseudoephedrine is reacted with thionyl chloride to form an intermediate which is reduced with hydrogen gas in the presence of a catalyst (palladium or platinum) to yield methamphetamine. Phosphorus pentachloride can be substituted for thionyl chloride in this synthesis.

Toluene

Other Names**:** Methylbenzene; toluol; phenylmethane; Methacide.

Molecular Formula: C_7H_8

Molecular Weight: 92/13

Density: 0.87

Boiling Point: 110.6°C

Description: Refractive liquid with a benzene-like odor.

Hazards: Flammable, avoid inhalation; may burn or irritate mucous membranes, eyes and respiratory tract; severe exposure may result in pulmonary edema; incompatible with strong oxidants; vapors may cause dizziness.

Illicit Use: Solvent used in the production of cocaine hydrochloride and other controlled substances.

Where Controlled or Regulated: CSA; OAS; UN

Thresholds: Domestic 159 Kg 50 Gal. Import/Export 1591 Kg 500 Gal

Legitimate Uses: Manufacture of benzoic acid, benzaldehyde, explosives, dyes and many other organic substances; solvent for paints, lacquers, gums, resins; extraction of various plant principals; gasoline additive; substitute for benzene in chemical laboratories; production of toluene diisocyanate which is used to make polyurethane foams and other elastomers; about 45% of the toluene in the U.S. is converted to benzene.

Manufacturing Process: Obtained from tar oil and petroleum.

Shipping and Storage: Shipped in glass carboys, metal barrels and drums, fiberboard boxes lined with glass or earthware; tank cars, tank trucks, barges, tankers and ocean vessels; store in airtight containers.

Remarks: Toluene is a solvent used in the conversion of cocaine base to cocaine hydrochloride. It is identified in cocaine hydrochloride samples seized in the U.S. It is also found in fuels.

Appendix B
Chemical Precursors

Precursors

The operator of a clandestine lab may be forced to used intermediate chemicals to produce a key chemical if it cannot be obtained through legal or black market channels. Because of this the chemicals used may vary from lab to lab. Listed below are the most common chemicals used by clandestine labs in the manufacture of amphetamines:

Acetaldehyde
Acetic Acid
Acetic anhydride
Acetone
Allyl chloride
Allylbenzene
Aluminum
Ammonia
Ammonium acetate
Ammonium formate
Ammonium hydroxide
Benzaldehyde
Benzene
Benzyl chloride
Chloroform
Ephedrine
Ethyl ether
Formamide
Freon
Hexane
Hydrochloric acid
Hydrogen peroxide
Hydroxylamine
Iodine
Isopropanol
Lead acetate
Lithium aluminum hydride
Magnesium
Mercuric chloride
Methanol
Methylamine
Monomethylamine
N-Methylformamide
Nitroethane
Norpseudoephdrine
Palladium
Phenyl-2-propanone
Phenylacetic acid
Phenylpropanolamine
Phosphoric acid
Propiophenone
Pyridine
Red phosphorous
Sodium
Sodium carbonate
Sodium cyanide
Sodium hydroxide
Sulfuric acid
Thionyl chloride
Toluene

Appendix C
Effects of Meth

Effects

Depending on the individual and the amount of the drug ingested, a high can last for four to twelve hours. As the effects begin to wear off, the heavy user is faced with the alternative of taking another dose or going through the "crash" and depression of withdrawal. Most users choose to "rehit" and the cycle of heavy use continues. Prolonged use of higher doses brings on many physical and mental problems. The most common conditions are:

- Irritability
- Mental confusion
- Aggressiveness
- Restlessness
- Increased heartbeat and blood pressure
- Increased respiration and body temperature
- Weight loss
- Anxiety and tension
- Defective reasoning
- Poor judgment
- Dryness of lips and mouth

Appendix D
Common Clandestine Laboratory Processes

Common Clandestine Laboratory Processes

Purification	The removal of extraneous materials from a compound or mixture by one or more of the following techniques or processes.
Reaction	A chemical change that involves rupturing the bonds that hold molecules together. These changes may cause molecules and atoms to combine, be replaced, decompose or some combination of these. Usually involves addition or release of heat.
Distillation	A separation process. The laboratory operators convert a liquid to a vapor which is normally of a different composition than the original liquid. They then condense that vapor back to a liquid to obtain a purer sample of the compound they want.
Reflux	A method of improving the purity of a distillate by allowing the distillate to flow down a column back towards the distillation vessel and come into contact with the rising vapor.
Filtration	A process to remove suspended solids from a liquid or gas by forcing the mixture through a filtering media.
Separation	A process using one or more methods such as evaporation, distillation, sedimentation, drying, or filtration to isolate the components of a mixture or compound.
Agitation	A method to uniformly mix compounds by means of mechanical agitation. Laboratory operators often use this procedure to mix liquids of varying viscosities or combinations of liquids and granular solids or powders. They often accomplish this by using some sort of impeller that is in direct contact with the mixture.
Heating/cooling	The transmission of thermal energy to cause a chemical reaction.
Gasification	The production of a gas or liquid from a solid material. Often requires the addition of heat.

Crystallization	A purification process that seeks to evaporate a liquid then return the substance to its normal form in its solid state.
Desiccation	A process to remove water vapor. Usually done in a closed vessel, often under a partial vacuum, using a substance (e.g. activated alumina, calcium chloride, silica gel, or zinc chloride) to absorb water vapor.

Appendix E
Common Odors From Clandestine Laboratories

Common Odors From Clandestine Laboratories

Ether-like	Aromatic odor often accompanied by a sweet taste. Commonly described as a "hospital odor" due to the common use of ethyl ether as an anesthetic. May also be a sweet odor. Nasal irritant.
Solvent-like	Sweet odor from common solvents used in paint thinners, paint removers, adhesives, and cleaning fluids. Type of odor often found in an auto body shop or furniture finishing shop. Eye and nasal irritant.
Vinegar-like	Typical pungent, acrid, or sour odor found in vinegar, mayonnaise, salad dressings or pickled food. Eye irritant.
Ammonia-like	A sharp, irritating odor similar to that from wet diapers, glass cleaners, cattle feed lots, or fertilizers. Eye and nasal irritant.

Odor & Detectable Odor Level

Odor Type	Material	Detectable Odor Level*
Acrid, sharp	Acrylic acid	0.094 ppm
Airplane glue	Toluene	2-3 ppm
Aldehyde/alcohol	Methanol	1000 ppm
Beer, gin, vodka	Ethanol	10 ppm
Benzene (gasoline)	Benzene	4-12 ppm
Boat resin	Styrene	0.03-0.08 ppm
Chloroseptic, library paste	Phenol	0.04-5.0 ppm
Elmer's glue	Vinyl acetate	0.5 ppm
Fingernail polish remover	Acetone	13-100 ppm
Green and sweet	Acetaldehyde	0.03-2.3 ppm
Pumpkins (foul)	Carbon disulfide	0.001-7.7 ppm
Sweet plastic	Xylene	1 ppm
Sweet garbage, solvent	Methyl ethyl ketone	10 ppm
Vinegar	Acetic acid	0.4-24 ppm

Appendix F
Chemical/Precursor List

Chemical/Precursor List

Methamphetamine

Synthesis Method 1:
Phenyl-2-propanone (P2P)
Formic acid
Methylamine
Hydrochloric acid
Ether or benzene
Potassium hydroxide

Extraction Method:
Vicks inhalers
Hydrochloric acid
Sodium hydroxide
Ether

Synthesis Method 2:
Phenyl-2-propanone
Methylamine
Methanol
Lithium aluminum hydride
Ether
Hydrochloric acid
Sodium borohydride

Synthesis Method 4:
Ephedrine or pseudoephedrine
Red phosphorus
Hydriodic acid or iodine
Sodium hydroxide
Freon or ether
Acetone
Hydrogen chloride gas

Synthesis Method 3:
Phenyl-2-propanone
Methylamine
Isopropyl alcohol
Aluminum foil
Mercuric chloride
Acetone
Ether
Sodium hydroxide
Hydrochloric acid

Synthesis Method 5:
Ephedrine or pseudoephedrine
Lithium or sodium metal
Anyhdrous ammonia
Freon or ether
Hydrogen chloride gas

Hydriodic Acid

Synthesis Method 1:
Iodine
Red phosphorus
Water

Synthesis Method 2:
Hydrogen sulfide
Iodine
Water
Hydrogen gas or carbon dioxide gas

Synthesis Method 3:
Iron filings
Sulfur
Hydrochloric acid
Iodine
Water

Hydrogen Chloride

Synthesis:
Sodium chloride (salt)
Sulfuric acid

Phenyl-2-Propanone (P-2-P)

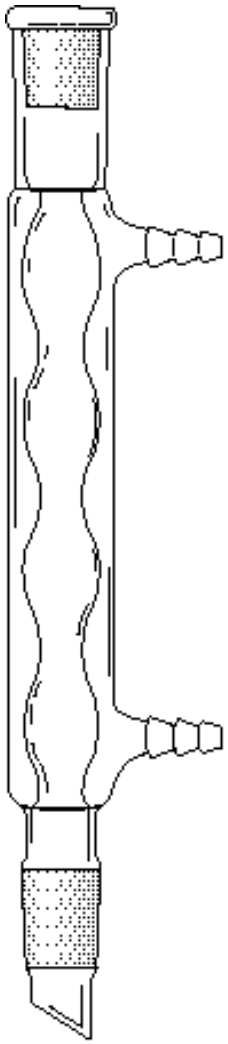
Synthesis Method 1:
Phenylacetic acid
Acetic anhydride
Sodium acetate of pyridine
Sodium hydroxide
Ether
Sodium bisulfite
Ether

Synthesis Method 2:
Benzyl cyanide
Ethyl Acetate
Sodium Metal
Ethanol
Acetic acid
Sulfuric acid or phosphoric acid

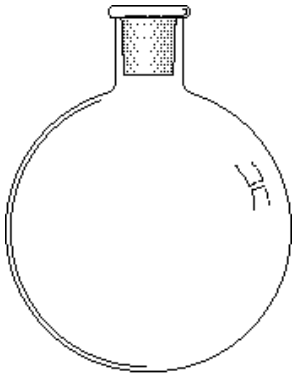
Appendix G
Laboratory Glassware

Laboratory Glassware

Condenser Column



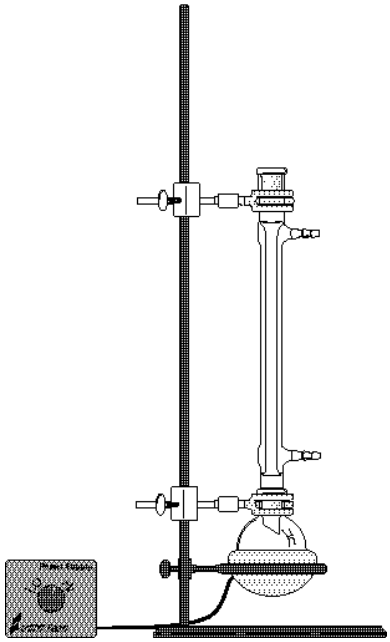
Flask (round bottom)



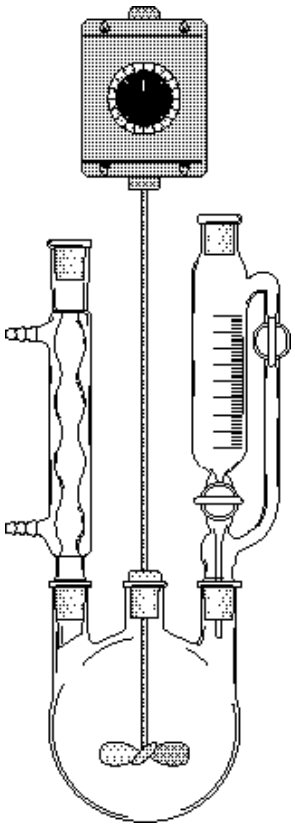
Laboratory Glassware (continued)

Reflux Apparatus

(Reaction Vessel, Condenser Column, Ring Stand & Clamps and Heating Mantle)

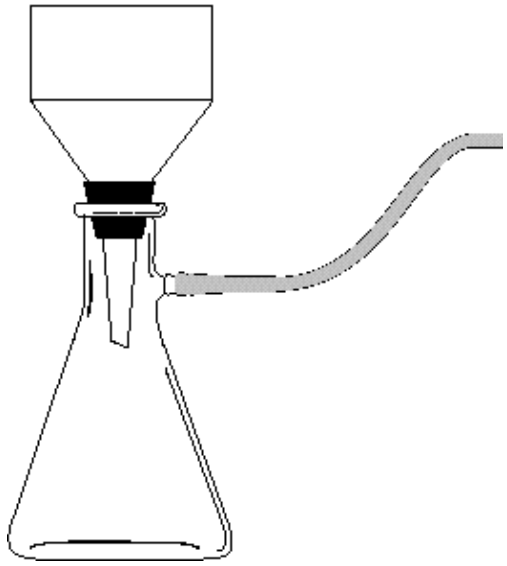


Reflux Column on Triple Neck Flask

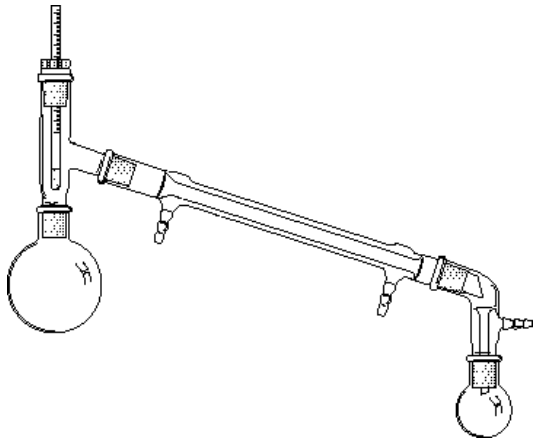


Laboratory Glassware(continued)

Vacuum Flask with Buchner Funnel (filtration)



Distillation Apparatus



Appendix H
Lab Type Identification Table

Lab Type Identification Table

Methamphetamine Production

Lab Type	Characteristic Chemical	Characteristic Equipment	Characteristic Hazards
Hydriodic Acid Method	Hydriodic Acid Hydrogen Chloride gas Red Phosphorous	Triple neck flask Heat source Reflux column	Acutely corrosive and toxic atmosphere Flammable, explosive, O_2 deficient atmosphere Exposure to phosphine gas
Thionyl Chloride Method	Thionyl Chloride Hydrogen gas Palladium Black	Round bottom flask Vacuum filtration Pressure vessel (hydrogenator)	Acutely corrosive atmosphere Catalyst induced explosions Flammable atmospheres
Phenyl-2-propanone Method	Phenyl-2-Propanone Aluminum foil Mercuric Chloride	Triple neck flask Heat source Condenser column	Flammable, explosive atmospheres Acute toxic chemical exposure Acutely corrosive atmospheres
Nazi Method	Anhydrous Ammonia Sodium or Lithium metal Hydrochloric Acid	Beverage containers Kitchen utensils Cooling apparatus	Flammable, explosive atmospheres Acutely reactive metals Acutely corrosive atmospheres

Phenyl-2-Propanone Production

Lab Type	Characteristic Chemical	Characteristic Equipment	Characteristic Hazards
Phenyl Acetic Acid Method	Phenyl Acetic Acid Acetic Anhydride Sodium Acetate	Triple neck flask Heat source Condenser column	Flammable atmosphere Acute toxic chemical exposure May involve exposure to suspect carcinogens
Benzyl Cyanide Method	Benzyl Cyanide Sodium Metal Ethyl Acetate	Flask (reactor vessel) Vacuum filtration Ice bath	Waste reactive metal (fire, explosion) Flammable atmospheres Acutely corrosive atmospheres Exposure to ammonia
Benzaldehyde Method	Benzaldehyde Nitroethane Iron filings	Flask, container or buckets Filtration Heat source	Flammable and explosive atmosphere Exposure to strong corrosives Exposure to highly toxic amine compounds Exposure to suspect carcinogen
Lead Acetate Method	Lead Acetate	Flask Distillation column Heat source	Exposure to suspect carcinogen

Lab Type Identification Table

Phyenyl Acetic Acid Production

Lab Type	Characteristic Chemical	Characteristic Equipment	Characteristic Hazards
Benzyl Cyanide Method	Benzyl Cyanide Sulfuric Acid	Round bottom flask Reflux column Filtration	Exposure to hydrogen cyanide gas Acutely corrosive atmosphere Exposure to toxic substances

Benzyl Cyanide Production

Lab Type	Characteristic Chemical	Characteristic Equipment	Characteristic Hazards
Benzyl Chloride Method	Benzyl Chloride Cyanide Salt Solvents	Round bottom flask Filtration	Exposure to cyanide Flammable atmosphere

Appendix I
Haz Mat Notification Guide

Haz Mat Notification Guide

Agency/Organization	Phone #	Time	Person Notified
Local			
First Responders (Fire, PD, etc.)*	_____	_____	_____
Administering Agency*	_____	_____	_____
County OES	_____	_____	_____
County Agriculture Dept.	_____	_____	_____
County Health	_____	_____	_____
Local Haz Mat Team	_____	_____	_____
Animal Control	_____	_____	_____
Child Protective Services	_____	_____	_____
Other	_____	_____	_____
State			
Emergency Services/Disaster Mgt*	_____	_____	_____
Highway Patrol/State Police	_____	_____	_____
Fish and Game	_____	_____	_____
Environmental Agencies	_____	_____	_____
Other	_____	_____	_____
Federal			
National Response Center*	_____	_____	_____
Coast Guard	_____	_____	_____
EPA Regional Office	_____	_____	_____
DEA	_____	_____	_____
Other	_____	_____	_____
Private			
CHEMTREC	_____	_____	_____
Local Cleanup Company	_____	_____	_____
Poison Control Center	_____	_____	_____
Hospitals	_____	_____	_____
Other	_____	_____	_____
Special Districts/Other			
Air Quality Agencies	_____	_____	_____
Water Quality Agencies	_____	_____	_____
Flood Control Districts	_____	_____	_____
School Districts	_____	_____	_____
Sewer Districts	_____	_____	_____
Other	_____	_____	_____

**May be mandatory notifications*