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**HEALTH, HEAT, AND WATER
HAZARDS ASSOCIATED WITH
ILLEGAL DRUG MANUFACTURING**

**(AMPHETAMINE, METHAQUALONE,
PHENCYCLIDINE, AND
METHAMPHETAMINE)**



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**(AMPHETAMINE, METHAQUALONE,
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(AMPHETAMINE, METHAQUALONE,
PHENCYCLIDINE, AND METHAMPHETAMINE)

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HEALTH, HEAT, AND WATER HAZARDS ASSOCIATED WITH ILLEGAL DRUG MANUFACTURING

**(AMPHETAMINE, METHAQUALONE,
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INTRODUCTION:

The EMS Authority is pleased to make this information on the health, heat, and water hazards of chemicals used to manufacture illegal drugs available to law enforcement, fire service, emergency medical service, and other first responders.

These basic guidelines provide critical information on what to expect from chemicals found in illegal drug laboratories and to assist them with making a first rapid assessment of potential hazards. Once a hazardous chemical is identified the appropriate protective equipment should be worn by trained personnel when handling it. Reactivity of the various substances with water applies to adding water to a concentrate of the substance and should not deter the use of water to decontaminate the skin of an exposed patient.

Specific information regarding health effects, risks of an exposure, and medical management of victims can be obtained by contacting your local Regional Poison Control Center. Additional information on the chemical, fire, and reactivity of these chemicals can be obtained from CHEMTREC (1-800-424-9300) or from your Regional Poison Control Center. A list of these centers is attached. General guidelines "Hazardous Materials Medical Management Protocols" on how to prevent exposures and medically manage victims for emergency medical responders is available from the Authority.

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**AMPHETAMINE: HEALTH, HEAT, AND WATER
REACTIVITY OF CHEMICALS ASSOCIATED WITH
ITS ILLEGAL MANUFACTURE.**

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Acetic Acid	Strong irritant of eyes, nose, throat and lungs. Repeated exposure may produce congestion of the pharynx. Skin contact may produce deep burns (6).	Flash point 109°F. Vapor forms explosive mixture with air (2). When burned, decomposes to CO ₂ and CO (6).	Diluted with water, acetic acid can react with metals to produce hydrogen gas (6). May react violently with water (1).	May react violently with strong oxidizing agents and alkaline material (6). Nitric acid or chromic acid can explode with acetic acid if not kept cold (6). Reacts strongly with many compounds including peroxides, acetaldehyde, perchloric acid (1).
Acetonitrile	Irritation of nose and throat, HA, N, V, lassitude (6). Respiratory depression, coma, shock,, seizures (1). Treat as a cyanide exposure. Absorbed through skin and resp tract (2).	Flash point 42°F. Flammable. Container may explode in heat of fire (1). Combustion produces nitrogen oxides (D, CO ₂ and HCN) (6).	Hot water or steam yields toxic and flammable vapors (6).	Decomposes in presence of alkali to HCN gas (1).
Allylbenzene (phenylpropylene)	No information available.			
Allyl Chloride	Irritating to eyes, skin, nose, & throat (1). Absorbed rapidly by dermal route. Causes CNS, pulmonary, renal, & liver damage (1). Skin contact causes vasoconstriction and numbness and burns (4). Inhalation can cause HA, dizziness and in high concentrations loss of consciousness (4).	Flash point -25°F. Container may explode in heat of fire (1). Vapor forms explosive mixture with air (2). Combustion products include hydrogen chloride (2), phosgene and CO (6).		Vigorously reacts with nitric acid, sodium hydroxide, sulfuric acid, ammonia, zinc, brass, aluminum, and amines (1), and ferric chloride (2).
Aluminum Grit/Foil	Aluminum powder can cause eye irritation or coughing and dyspnea. Chronic exposure can cause fibrosis of the lungs (1).	Powdered aluminum forms explosive mixtures with air (2).	Bulk, dust, when damp, may heat spontaneously (2).	Reacts with acids and alkali solutions to form explosive H ₂ (1,2).

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Ammonia	Extreme respiratory irritant; may cause pneumonitis or pulmonary edema (1). High gas concentrations can cause burning and blistering of skin and severe eye irritation with permanent corneal damage (6).	Container may explode in heat of fire (1). Decomposes to H ₂ and N ₂ at temperatures above 450°C (6).		Forms explosive compounds in contact with silver, gold, mercury (1), chlorine, iodine, bromine, and hypochlorites (6). The reaction of sodium plus CO plus liquid ammonia forms sodium carbonyl which explodes when heated in air (2). Reacts with acids with heat evolution (6).
Ammonium Acetate	Irritating to nose, mouth and respiratory tract. Contact with dust causes irritation to eyes and mild irritation to skin (6).	Thermal decomposition occurs at temperatures above 237°F. Hazardous decomposition products include ammonia and acetic acid (6).		Decomposes in contact with hypochlorite (6).
Ammonium Formate	No toxic information available.	Decomposes at 180°C (4).		
Benzaldehyde (Benzoic Aldehyde)	Acts as a local anesthetic. Contact with skin or eyes causes irritation. CNS depression in small oral doses (2).	Combustible. Flammable. Flash point 148°F (2).	Not soluble in water (2).	
Benzene	Inhalation can be lethal. An eye and skin irritant (2). Causes lung irritation, cardiac arrhythmias, respiratory failure, pulmonary edema, HA, giddiness, vertigo, ataxia, fatigue, confusion, seizures, coma, hepatotoxicity, aplastic anemia, and leukemia (1).	Flammable liquid. Combustible. Vapors explosive. Flash point 12°F (2).	Not soluble in water (2).	

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Butylamine	Vapors are irritating to the eyes, nose & throat and may produce pulmonary edema and HA (6). Exposure to excessive amounts causes erythema, N, V, faintness, coughing, chest pains, dizziness, depression, convulsions, narcosis and possibly unconsciousness. The liquid in contact with skin causes severe burns and contact with eye causes severe damage and loss of vision (6).	Vapors form explosive mixtures with air (6). Containers may explode in fire. Thermal decomposition produces toxic gases such as oxides of nitrogen and CO (6).		Can react with oxidizing materials (4).
Copper	Copper dusts or fumes can cause metal fume fever. Chronic or long term exposure may result in CXR changes not associated with harmful effects (6).	Can cause metal fume fever (1). Fine particles in the air can produce an explosion hazard (6).		Copper foil burns spontaneously in gaseous chlorine (2).
Chloroform	Eye contact causes moderate irritation. Prolonged skin exposure causes mild burn. Inhalation of high concentrations causes HA, dizziness, N, intoxication, coma and anoxia which increases cardiac irritability (1,2,5). Carcinogen (5).	Nonflammable. Decomposes to form HCl and phosgene (1).	Poorly soluble in water (5).	Reacts violently with aluminum, potassium and strong bases (1).
Ethanol	Excessive inhalation of vapors is irritating to eyes and upper respiratory tract (6). Inhalation of vapors causes drowsiness, ataxia, stupor (6). Eye contact causes burning and stinging and skin contact has a defatting action (6)	Flammable. Combustible. Container may explode in heat (1). Vapor explosion hazard (1). Flash point 55°F (6).		The addition of alcohols to highly concentrated hydrogen peroxide forms powerful explosives that can be detonated by shock (2). Ethanol plus iodine and methanol and mercuric oxide produce an explosive reaction (2). Reacts with alkali metals to liberate H ₂ (6).

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Ethyl Ether (Diethyl Ether) (Ether)	Inhalation results in dizziness, giddiness, euphoria, CNS depression and unconsciousness (1). Prolonged exposure to high concentrations can cause eye injury and cough and laryngeal spasms (1). Can cause liver and kidney damage (1).	Forms flammable mixtures with air. Flash point -49°F (2). In presence of air unstable peroxides can form which may explode spontaneously or when heated (2).	Not soluble in water (2). Water can help prevent peroxide formation (6).	Explodes when mixed with chlorine gas (2). A drop of anhydrous perchloric acid in ether causes a violent explosion (2).
Ferric Chloride	Excessive mist or fume inhalation causes irritation of throat and upper respiratory tract (6). Prolonged or repeated contact will cause skin staining, irritation or dermatitis. Eye contact can cause burns (6).	When heated to decomposition, emits toxic fumes of HCl (4).	Will react with water to produce toxic and corrosive fumes (4).	Violent reaction with allyl chloride, sodium and potassium (4).
Formamide (Methanamide)	Excessive inhalation of vapors causes HA, irritation, N, and loss of consciousness depending on concentration and time of exposure. Eye and skin contact is irritating (6).	Thermal degradation at 180°C to CO and ammonia (6).		Suggestive teratogen (6).
Formic Acid	Corrosive acid - irritation and burns to eye, skin and respiratory tract. Excessive inhalation will produce cough, difficulty breathing, bronchitis, HA, and body weakness (6). Produces blisters and burns on contact with skin (2).	Flash point 156°F (2).		Reacts with concentrated sulfuric acid to produce CO. Reacts explosively with hydrogen peroxide and furfuryl alcohol (6).
Hexane	Excessive inhalation causes upper respiratory tract irritant and CNS depression. Sx include dizziness, numbness of extremities, giddiness and intoxication. Irritating to eye and skin (defatting effect) (6).	Dangerous explosive hazard (6). Thermal-oxidative decomposition products in air can include CO (6). Flash point -7°F (5).		Incompatible with oxidizing agents (6).

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Hydrochloric Acid	Causes irritation to the eyes, skin and respiratory tract (2). Causes dyspnea, chest pain, hypoxemia, pulmonary edema, vomiting and severe burns (1).	Not combustible (2).	Soluble in water (2).	Contact with common metals forms H ₂ , which is explosive (2).
Hydrogen Gas	Itself is NT, but can cause asphyxiation by displacement of air (1). Liquid hydrogen can cause frostbite or burns.	Extremely flammable (1). Container may explode in heat of fire (1). Vapor explosion hazard. Fire produces irritating or poisonous gas (1).		Finely divided platinum and some other metals will cause a mixture of hydrogen and oxygen to explode at ordinary temperatures (2). Also explosive with chlorine and bromine (2).
Hydroxylamine HCl	Corrosive to skin (5), eyes, and mucous membranes.	Explosion hazard (2).		Spontaneously flammable in chlorine (2).
Lithium Aluminum Hydride (Lithium Tetrahydroaluminate)	Caustic on inhalation or on contact with eye or skin (2).	Heating causes an exothermic reaction evolving H ₂ (2). Often enough heat is evolved to cause ignition (2). Other decomposition products are aluminum and lithium hydride (4).	Contact with moisture causes an exothermic reaction evolving H ₂ . Enough heat is evolved to cause ignition (2). Contact with water forms lithium hydroxide which is very caustic (2).	Reacts violently with air, acids, alcohols, and ether (2).
Magnesium Sulfate	Eye contact or repeated skin contact may cause irritation (6).	Not combustible (6). Above 392°F, anhydrous magnesium sulfate is formed which on heating to 1652°F will decompose to magnesium oxide and oxides of sulfur (6).	No effect noted.	
Mercury	Mercury vapors are severe lung irritants; also corrosive to skin and mucous membranes (1). Also causes nephrotoxicity and gingivitis (6).	Fire may produce poisonous mercury oxide fumes (1). Which may cause pneumonitis, chest pain, dyspnea, and coughing (6). Later stomatitis, gingivitis, and nephrotoxicity (6).		Reacts violently with acetylene, ammonia, chlorine, and chlorine dioxide (1, 2), nitric acid plus ethanol (6).

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Mercuric Chloride	Corrosive and nephrotoxic (1). Inhalation of dust is poisonous (1). Acute inhalation causes irritation to mucous membranes of respiratory tract, abdominal pain, V, D, gingivitis and stomatitis (6).	May explode with friction or heat (1). Fire may produce mercury fumes (1).		May explode on impact with phosphorus, arsenic, silver salts, sulfides, acetylene, ammonia, alkali metals and sulfides oxalic acid, metal sulfates, and metal phosphate (6).
Methanol	Effects are delayed for 18-24 hours. Causes CNS depression, anion gap metabolic acidosis, visual defects (1). Contact with skin causes dermatitis and erythema (6). Direct contact with eye causes irritation and pain and transient corneal opacity (6).	Flash point 52°F (1). Container may explode in heat of fire. Vapor explosion hazard (1). Thermal decomposition produces CO, CO ₂ , and possibly toxic formaldehyde (6).		Explosive when exposed to oxide mixtures (1). Reacts violently with many products including chromic anhydride, iodine plus ethanol, mercuric oxide, and metallic aluminum (6).
Methylamine	Eye, skin and respiratory irritant. Direct or prolonged contact can cause burns and serious injury (2).	Flammable. Vapor forms explosive mixture with air (2).	No effect noted.	Contact with mercury can cause an explosive reaction (2).
Nitroethane	Toxic by inhalation (2). Irritant to the respiratory tract. Excessive inhalation causes HA, N, and narcosis (6). Prolonged or repeated skin contact caused defatting, and dermatitis (6). High concentrations may cause liver and kidney damage and methemoglobinemia (6). Irritating to eyes (5).	Vapors form explosive mixtures with air (2). Flash point 106°F (2). Products of decomposition are highly toxic - CO and nitrogen oxides (6). Can explode when exposed to extreme shock at elevated temperatures (6).		Reacts with hydroxides (NaOH, KOH, Ca(OH) ₂) to form salts that are explosive (2). Added sensitivity to heat may result from mixing with amines, strong alkalis and acids, and metal oxides (6).
Palladium Black	No information available			

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Petroleum Ether	Causes irritation to respiratory tract (6) and HA, dizziness, N, inebriation and CNS depression (6). Contact with high vapor levels or with liquid irritates the eyes (6). Repeated or prolonged skin contact causes defatting or dermatitis (6).	May be ignited by heat. Container may explode in heat of fire (1). Vapor-air mixture explosion hazard (1). Fire produces irritating gas (1). Also produces CO and CO ₂ (6).		React with oxidizing materials (1).
Phenylacetic Acid (α -Toluic Acid)	Causes irritation or burns to eye and skin (1).	When heated to decomposition, emits toxic fumes (4).		
Phenylpropanolamine Hydrochloride	No information available.			
Phenyl-2-Propanone (Ethyl Phenyl Ketone and Propiophenone)		Flash point 99°F (5). Slight fire hazard (4).		Reacts with oxidizing materials (4).
Potassium Hydroxide	Solid or concentrated solution destroys tissue on contact (2). Permanent eye injury and severe skin damage may result (6). Dust/mist inhalation can injure the entire respiratory tract (6).		Not combustible, but solid form in contact with water or moisture may generate sufficient heat to ignite combustible materials (2).	Contact with some metals ie aluminum generates H ₂ (2). Reacts violently with strong acid, chlorine dioxide, nitroethane (2). Forms phosphine when mixed with phosphorus (2).
Raney Nickel	Carcinogen of nasal cavity, paranasal and lungs (6).	If allowed to dry, will smolder, generate heat and ignite spontaneously if allowed to come in contact with air (6). Under fire conditions, produces toxic nickel carbonyl (2) a few breaths may be lethal. This gas is also explosive (2).		Reaction with oxygen causes smoldering and heating (6). Reacts with strong acids producing H ₂ (2).

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Sodium Metal	Solid metal causes severe skin and eye burns (2). Burning fumes are highly irritating to skin, eyes, and mucous membranes (2). Sx include conjunctivitis, rhinorrhea, bronchitis, cough, dyspnea, sneezing, asthma, dermatitis, urticaria, lymphocytosis, eosinophilia (1).	Burns violently accompanied by explosions (2).	Combined with water releases H ₂ with sufficient heat to cause ignition or explosion (2).	Ignites spontaneously in air or oxygen (2).
Sodium Acetate	Moderate oral toxicity (4). Irritating to eyes, skin and respiratory tract (6).	Acrid fumes emitted when heated. Yields CO ₂ , CO and acetic acid (6).	Very soluble in water (5).	
Sodium Cyanotrihydridoborate	No information available.			
Sodium Hydroxide	Severely hazardous. Can destroy tissue on contact. Corrosive to all tissue (5,2). Causes stridor, dyspnea, pulmonary edema, severe burns of eyes and skin (1).	Not combustible.	With acids and water, can generate enough heat to ignite combustible materials (5).	Contact with metals can generate H ₂ gas (2).
Sodium Sulfate	Inhalation of dust causes irritation of nose, throat and lungs. Repeated contact causes skin irritation. Contact with eyes is irritating (6).	Products of thermal decomposition include oxides of sulfur (6).		Melted with aluminum is a potential explosion hazard (2,6).
Sulfuric Acid	Damaging to all human tissue with which it comes in contact (6). Severe eye injury may occur. Inhalation of mists can damage upper respiratory tract and the lungs. (6).	Decomposition products are sulfur oxides (6).	Reacts violently with water with evolution of heat (2).	Reacts with organic materials with evolution of heat (2). Attacks many metals releasing H ₂ (2). Can ignite or explode on contact with acetic acid, acetone and nitric acid, acetone nitrile, alcohols and hydrogen peroxide, aldehydes, carbides, chlorides, ethylene, glycol, p-nitrotoluene perchlorates, etc. (6)

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Tetrahydrofuran	Skin, eye, mucous membrane irritant. CNS depressant causing N, dizziness, HA, anesthesia (1). Can cause liver and kidney damage (6).	Container can explode in heat of fire (1). Vapor explosion hazard. Reacts with air or sunlight to form peroxides (1), which may be explosive (6). Fire produces irritating vapors (6).		May react with oxidizing materials (1). Explosive with sodium and potassium hydroxide (2), lithium aluminum hydride, and sodium aluminum hydride (2).

**METHAMPHETAMINE: HEALTH, HEAT, AND WATER
REACTIVITY OF CHEMICALS ASSOCIATED WITH
ITS ILLEGAL MANUFACTURE.**

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Acetaldehyde (Ethyl Aldehyde)	Mucous membrane irritation. High concentrations causes narcosis and in severe cases, respiratory paralysis (1,6). Skin and eye contact causes irritation and burning (1).	Flash point -36°F. Oxidizes readily in air to unstable peroxides that may explode spontaneously (2). Container may explode in heat of fire (1). Decomposes at >400°C to methane and CO (6).		Should not be stored with alkaline material, halogens, alcohols, ketones, acid anhydrides, phenols, or oxidizing agents (2). Condensation reactions may be violent (2).
Acetone	Inhalation of high concentrations causes CNS depression, ataxia, sedation, to various degrees of coma (1,6). Inhalation of lower concentrations causes irritation of the respiratory tract, coughing, H.A. Prolonged contact with the skin can cause drying, irritation, and dermatitis (1,6). Splash contact in eye can cause mild epithelial damage (1).	Container may explode in heat (1). Explosive when heated or combined with strong oxidizing materials (6).		
Acetic Anhydride	An acute irritant to eyes, skin and respiratory tract (1,2). Can cause necrosis of tissue in liquid or vapor form (5).	Flammable vapor. Forms explosive mixture with air. Flash point 125°F. Produces toxic fumes (1).	Forms acetic acid. Slowly soluble in water (5).	
Acetic Acid	Strong irritant of eyes, nose, throat and lungs. Repeated exposure may produce congestion of the pharynx. Skin contact may produce deep burns (6).	Flash point 109°F. Vapor forms explosive mixture with air (2). When burned, decomposes to CO ₂ and CO (6).	Diluted with water, acetic acid can react with metals to produce hydrogen gas (6). May react violently with water (1).	May react violently with strong oxidizing agents and alkaline material (6). Nitric acid or chromic acid can explode with acetic acid if not kept cold (6). Reacts strongly with many compounds including peroxides, acetaldehyde perchloric acid (1).

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Aluminum	Aluminum powder can cause eye irritation or coughing and dyspnea. Chronic exposure can cause fibrosis of the lungs (1).	Powdered aluminum forms explosive mixtures with air (2).	Bulk dust when damp may heat spontaneously (2).	Reacts with acids and alkali solutions to form explosive H_2 (1,2).
Benzaldehyde (Benzoin Aldehyde)	Acts as a local anesthetic. Contact with skin or eyes causes irritation. CNS depression in small oral doses (2).	Combustible. Flammable. Flash point 148°F (2).	Not soluble in water (2).	
Barium Sulfate	No information available.			
Benzyl Chloride	Severe irritant to eyes, skin and respiratory tract. Causes CNS depression, pulmonary edema, irritation of mucous membranes (1). Liquid is corrosive to skin and eyes (6).	Flash point 135°F (4). Moderate explosion hazard. If in presence of metals, may cause violent explosion (4). Thermal decomposition produces toxic gases-phosgene, HCl, and CO (6).	Water or steam causes reaction that produces HCl fumes (6).	Readily undergoes a condensation reaction with liberation of heat and HCl in the presence of copper, aluminum, zinc, iron, magnesium, tin and various other metals (2).
Benzyl Cyanide (Phenyl Acetonitrile)	Slight concentration may cause N, V, HA, lassitude. High concentrations cause severe lassitude, respiratory depression, shock, coma, seizures. Splash contact causes faint erythema (1).	Combustion produces nitrogen oxides (1) which cause N, slight cough, or severe sx of pulmonary edema, or methemoglobinemia. Vapor explosion hazard (1). Flash point 42°F (2).		Decomposes in presence of alkali to HCN gas (1).
Calcium Hydroxide	Irritating to the skin and respiratory tract. Can cause dermatitis and irritation of eyes and mucous membranes (4).	Not combustible (6).		Boiled with phosphorus, forms mixed phosphines which may ignite spontaneously in air (2).
Chloroephedrine	No information available.			

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Carbon	In the form of graphite, can cause a dust irritation, particularly to the eyes (4).	Dust clouds can ignite on exposure to a heated surface (6). On burning produces CO, CO ₂ , and small quantities of sulfur dioxide (6).	No effect.	Carbon powder intimately mixed with as oxidizing agent can result in fire or explosion (6). May react violently with nitric acid (6).
Carbon Disulfide (Benzoic Aldehyde)	Skin and eye exposure causes severe burns. Inhalation exposure causes HA, delirium, dizziness, tremor, convulsions, coma. Dyspnea and respiratory failure may occur following exposure to high concentrations. Adverse effects of both male and female reproductive functions have been reported (1).	Highly flammable combustible material. Auto-ignites at 100°C. Container may explode in heat of fire (1). On combustion, produces CO and sulfur dioxide (1). Sulfur dioxide is extremely irritating and causes bronchoconstriction, pulmonary edema, chronic bronchitis (1).		Nitric oxide fumes mixed with carbon disulfide react explosively (2).
Chloroform	Eye contact causes moderate irritation. Prolonged skin exposure causes mild burn. Inhalation of high concentrations causes HA, dizziness, N, intoxication, coma and anoxia which increases cardiac irritability (1,2,5). Carcinogen (5).	Nonflammable. Decomposes to form HCl and phosgene (1).	Poorly soluble in water (5).	Reacts violently with aluminum, potassium and strong bases (1).
Copper Sulfate (Cupric Sulfate)	Inhalation of copper dust or solution mist can cause pneumonitis, ulceration of nasal septum (6,1). Eye exposure causes ulceration and conjunctivitis (6). Can cause kidney and liver damage. Skin contact results in severe irritation.	This product is not combustible (6). At elevated temperatures (>400 °C), may yield cupric oxide and sulfur compounds (6).		Magnesium plus cupric sulfate solution causes the evolution of H ₂ which is explosive if exposed to flames (2).

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Ephedrine	Not absorbed by inhalation, or skin exposure.	When heated, emits toxic fumes (4).		
Ethanol	Excessive inhalation of vapors is irritating to eyes and upper respiratory tract (6). Inhalations of vapors causes drowsiness, ataxia, stupor (6). Eye contact causes burning and stinging and skin contact has a defatting action (6).	Flammable/combustible material. Container may explode in heat (1). Vapor explosion hazard (1). Flash point 55°F (6).		The addition of alcohols to highly concentrated hydrogen peroxide forms powerful explosives that can be detonated by shock (2). Ethanol plus iodine and methanol and mercuric oxide produce and explosive reaction (2). Reacts with alkali metals to liberate H ₂ (6).
Ethyl Ether (Diethyl Ether) (Ether)	Inhalation results in dizziness, giddiness, euphoria, CNS depression and unconsciousness (1). Prolonged exposure to high concentrations can cause eye injury, cough and laryngeal spasms (1). Can cause liver and kidney damage (1).	Forms flammable mixtures with air. Flash point -49°F (2). In presence of air, unstable peroxides can form which may explode spontaneously or when heated (2).	Not soluble in water (2). Water can help prevent peroxide formation (6).	Explodes when mixed with chlorine gas (2). A drop of anhydrous perchloric acid in ether causes a violent explosion (2).
Formamide	Excessive inhalation of vapors causes HA, irritation, N, and loss of consciousness depending on concentration and time of exposure. Eye and skin contact is irritating (6).	Thermal degradation at 180°C to CO and ammonia (6).		Suggestive teratogen (6).
Formic Acid	Corrosive acid irritation and burns to eye, skin and respiratory tract. Excessive inhalation will produce cough, difficulty breathing, bronchitis, HA, and body weakness (6). Produces blisters and burns on contact with skin (2).	Flash point 156°F (2).		Reacts with concentrated sulfuric acid to produce CO. Reacts explosively with hydrogen peroxide and furfuryl alcohol (6).

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Freon	In very high concentrations can cause ventricular arrhythmias and sudden death. Can cause bronchial irritation and constriction. Low concentrations cause transient eye, nose and throat irritation (1). Skin contact can cause freezing (6).	Heating causes toxic gases - phosgene, chloride, and fluoride fumes (1). These are severe pulmonary and ocular irritants.	Insoluble in water (6).	May react with aluminum violently (4).
Hydriodic Acid (Solution of hydrogen iodide in water)	Irritant to skin, eyes, and mucous membranes (4,5).	When heated to decomposition, emits toxic fumes of iodides (4).	Reacts with water or steam to produce toxic and corrosive fumes (4).	
Hydrochloric Acid	Causes irritation to the eyes, skin and respiratory tract (2). Causes dyspnea, chest pain, hypoxemia, pulmonary edema, vomiting and severe burns (1).	Not combustible (2).	Soluble in water (2).	Contact with common metals forms H_2 , which is explosive (2).
Hydrogen Gas	Itself is NT, but can cause asphyxiation by displacement of air (1). Liquid hydrogen can cause frostbite or burns.	Extremely flammable (1). Container may explode in heat of fire (1). Vapor explosion hazard. Fire produces irritating or poisonous gas (1).		Finely divided platinum and some other metals will cause a mixture of hydrogen and oxygen to explode at ordinary temperatures (92). Also explosive with chlorine and bromine (2).
Hydrogen Peroxide	Low concentrations are mild skin irritants. High concentrations can cause severe skin burns, ocular damage and pulmonary irritation (1).	An increase in temperature causes an increase in decomposition rate. With hydrogen peroxide concentration > 52%, this may cause detonation (2). Clothing can ignite on contact with this material (6).	No reaction (2). need water for dilution and cooling.	Can cause spontaneous combustion if allowed to remain in contact with readily oxidizable material (92). Violent decomposition may be caused by contact with iron, copper, chromium, gold, brass, bronze, lead, platinum, silver, manganese, etc. and their salts (2). Can be explosive when mixed with organic matter i.e. acetone (2) or ethanol (6).

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Iodine	Very irritating to mucous membranes, eyes, and skin, severity dependent on duration of exposure and concentration of iodine (1).	Can produce toxic iodine vapors and iodide fumes.		May react violently with acetaldehyde (2) and acetylene (6). Reacts with ammonium hydroxide to form iodides which are shock sensitive and explosive when dry (6). Aluminum powder plus iodine will ignite spontaneously (2). Reacts violently with liquid chlorine (2).
Isopropyl Alcohol	Excessive inhalation of vapor is irritating to eyes and upper respiratory tract (6). Inhalation of vapors cause drowsiness, ataxia, stupor (6). Eye contact causes burning and stinging and skin contact has a defatting action (6).	Container may explode in heat (1). Fire may produce irritating or poisonous gas (1). Thermal-oxidative degradation products can include CO (6).		Can react vigorously with oxidizing agents (4). Reacts violently with H ₂ and palladium (4).
Lithium Aluminum Hydride (Lithium Tetra-Hydroaluminate)	Caustic on inhalation or on contact with eye or skin (2).	Heating causes an exothermic reaction evolving H ₂ (2). Often enough heat is evolved to cause ignition (2). Other decomposition products are aluminum and lithium hydride (4).	Contact with moisture causes an exothermic reaction evolving H ₂ . Enough heat is evolved to cause ignition (2). Contact with water forms lithium hydroxide which is very caustic (2).	Reacts violently with air, acids, alcohols and ether (2).
Magnesium Metal	Dust is a slight irritant (2). Fumes may cause metal fume fever (1,5).	Fine powder, turnings, and thin sheets are easily ignited. Powders form explosive mixtures with air and may be ignited with a spark (2).	In finely divided form, reacts with steam or water to produce highly explosive H ₂ (1,2).	Dangerous reaction with halogens, arsenic, nitrogen, sulfur, phosphorus (1). Reacts with acids to liberate H ₂ (1,5).

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Magnesium Sulfate	Eye contact or repeated skin contact may cause irritation (6).	Not combustible (6). Above 392°F, anhydrous magnesium sulfate is formed which on heating to 1652°F, will decompose to magnesium oxide and oxides of sulfur (6).		
Mercuric Chloride	Corrosive and nephrotoxic (1). Inhalation of dust is poisonous (1). Acute inhalation causes irritation to mucous membranes of respiratory tract, abdominal pain, V, D, gingivitis and stomatitis (6). Inhalation of vapors cause drowsiness, ataxia, stupor (6). Eye contact causes burning and stinging and skin contact has a defatting action (6).	May explode with friction or heat (1). Fire may produce mercury fumes (1).		May explode on impact with phosphorus, arsenic, silver salts, sulfides, acetylene, ammonia, alkali metals and sulfides, oxalic acid, metal oxalates, metal sulfites and metal phosphates (6).
Methanol	Effects are delayed for 18-24 hours. Causes CNS depression, anion gap, metabolic acidosis, visual defects (1). Contact with skin causes dermatitis & erythema (6). Direct contact with eye causes irritation, pain & transient corneal opacity (6).	Flash point 52°F (1). Container may explode in heat of fire. Vapor explosion hazard (1). Thermal decomposition produces CO, CO ₂ , and possibly toxic formaldehyde (6).		Explosive when exposed to oxide mixtures (1). Reacts violently with many products including chromic anhydride, iodine plus ethanol, mercuric oxide, and metallic aluminum (6).
Methylamine	Eye, skin and respiratory irritant. Direct or prolonged contact can cause burns and serious injury (2).	Flammable. Vapor forms explosive mixture with air (2).		Contact with mercury can cause an explosive reaction (2).
N-Methylformamide	No information available.			
Palladium Metal	No information available.			
Palladium Black	No information available.			

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Perchloric Acid	Very irritating to skin, eyes, and mucous membranes (2,4). May cause severe pain and burns (6). Inhalation of fumes may cause coughing, HA, dizziness and weakness (6).	Can decompose explosively at atmospheric pressure (2). Combines with flammables, combustibles, organic compounds and other oxidizing materials in explosive reactions, esp. if heated (6). Thermal decomposition products include HCl, Cl ₂ (6).	Combines vigorously with water with evolution of heat (5).	Reacts violently with acetic acid, acetic anhydride, alcohols, cellulose, charcoal, ether, glycols, hydriotic acid, all organic materials including paper (2). Contact with metals can liberate H ₂ (6).
Phenylacetic Acid (α -Toluic Acid)	Causes irritation or burns to eye and skin (1).	When heated to decomposition, emits toxic fumes (4).		
Phenyl-2-Propanone (Ethyl Phenyl Ketone) (Propiophenone)		Flash point 99°F (5). Slight fire hazard (4).		Reacts with oxidizing materials (4).
Phosphorous Pentachloride	Corrosive (5). Highly irritating to eyes, skin, mucous membranes and via inhalation (4).	When heated to decomposition, emits highly toxic fumes of chlorides (4).	Reacts violently with water (2). Forms phosphoric acid and hydrogen chloride (5).	
Platinum	No effect from pure metal.			With hydrogen peroxide solution, can cause an explosion (2).
Platinum Chloride	May cause dermatitis, wheezing, coughing, rhinitis, SOB and cyanosis (4).			
Platinum Oxide	See platinum chloride.			
Pseudoephedrine	No effect via dermal or inhalation exposure. Produces mydriasis on ocular exposure (1).			

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Pyridine	Eye, skin and respiratory irritant (2). Excessive inhalation produces irritation of respiratory tract, asthmatic breathing, HA, dizziness, and CNS depression (6). Also causes liver and kidney damage (6).	Vapor fumes explosive mixtures with air (2). Flash point 68°F. Thermal oxidative reaction produces toxic nitrogen containing products including oxides of nitrogen, and cyanide (6).		Reacts exothermically with acids (6).
Red Phosphorus	Relatively non-toxic (2,3,4,5).	Fumes from burning red phosphorus are highly irritating to eyes, lungs and skin (1).		Explosive when mixed with oxidizing material (2). Mixed with chlorates, red phosphorus bursts into flames (2). Boiled w/ alkaline hydroxides, yields mixed phosphines wh/ may ignite spontaneously in air (2).
Sodium Metal	Solid metal causes severe skin and eye burns (2). Burning fumes are highly irritating to skin, eyes and mucous membranes (2). Sx include conjunctivitis, rhin-orrhea, bronchitis, cough, dyspnea, sneezing, asthma, dermatitis, urticaria, lymph-ocytosis, eosinophilia (1).	Burns violently accompanied by explosions (2).	Combined with water releases H ₂ with sufficient heat to cause ignition or explosion (2).	Ignites spontaneously in air or oxygen (2).
Sodium Acetate	Moderate oral toxicity (4). Irritating to eyes, skin and respiratory tract (6).	Acrid fumes emitted when heated. Yields CO ₂ , CO, and acetic acid (6).	Very soluble in water (5).	
Sodium Cyanotrihydroborate	No information available.			

Chemical	Health Effects of Chemical	Effect of Heat	Water Reactivity	Comments
Sodium Hydroxide	Severely hazardous. Can destroy on contact. Corrosive to all tissue (5,2). Causes stridor, dyspnea, pulmonary edema, severe burns or eyes and skin (1).	Not combustible (2).	With acids and water can generate enough heat to ignite combustible materials (5).	Contact with metals can generate H ₂ gas (2).
Sulfuric Acid	Damaging to all human tissue with which it comes in contact (6). Severe eye injury may occur. Inhalation of mists can occur. Inhalation of mists can damage upper respiratory tract and the lungs (6).	Decomposition products are sulfur oxides (6).	Reacts violently with water with evolution of heat (2).	Reacts with organic materials with evolution of heat (2). Attacks many metals releasing H ₂ (2). Can ignite or explode on contact with acetic acid, acetone, and nitric acid, acetonitrile, alcohols and hydrogen peroxide, aldehydes, carbides, chlorates, ethylene glycol, p-nitrotoluene, perchlorates, etc. (6).
Thionyl Chloride	Strongly irritating or caustic to eyes, lungs, skin and mucous membranes. Decomposes into hydrogen chloride and sulfur dioxide; both are irritating gases (1).	Decomposes when heated above 284°F forming chlorine, sulfur dioxide and sulfur monochloride (2).	May react violently with water or moist air (2,6). Exposure to moisture can liberate HCl gas (6).	
Vicks Inhaler Vapor Tubes (L-desoxyephedrine)	No information available.			