
Appendix F: Toxicology Table

Chemical	Effects	Target Organs	IDLH (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)
Acetaldehyde	Causes severe eye irritation; vapors may cause eye irritation; may cause transient corneal injury or lachrymator (substance which increases the flow of tears); may cause skin irritation; may cause skin sensitization, an allergic reaction, which becomes evident upon reexposure to this material; may cause gastrointestinal irritation with nausea, vomiting, and diarrhea; may be harmful if swallowed; causes respiratory tract irritation; may cause narcotic effects in high concentrations; exposure produces central nervous system depression; vapors may cause dizziness or suffocation; can produce delayed pulmonary edema; inhalation of large amounts may cause respiratory stimulation, followed by respiratory depression, convulsions, and possible death due to respiratory paralysis	Eyes, skin, respiratory system, kidneys, central nervous system, reproductive system	200		200
Acetic acid	Causes severe eye irritation; contact with liquid or vapor causes severe burns and possible irreversible eye damage; causes skin burns; may be harmful if absorbed through the skin; contact with the skin may cause blackening and hyperkeratosis of the skin of the hands; may cause severe and permanent damage to the digestive tract; causes severe pain, nausea, vomiting, diarrhea, and shock; may cause polyuria, oliguria, and anuria; rapidly absorbed from the gastrointestinal tract; effects may be delayed; causes chemical burns to the respiratory tract; exposure may lead to bronchitis, pharyngitis, and dental erosion; may be absorbed through the lungs	Eyes, skin, respiratory system, teeth	50	10	10
Acetic anhydride	In case of contact with eyes — immediately flush eyes with plenty of water for at least 15 min, and get medical aid immediately; in case of contact with skin — immediately flush skin with plenty of water for at least 15 min, while removing contaminated clothing and shoes, and get medical aid immediately, wash clothing before reuse; if swallowed — do NOT induce vomiting, get medical aid immediately, give a cupful of water to victim if fully conscious (never give anything by mouth to an unconscious person); if inhaled — remove to fresh air, give artificial respiration if victim is not breathing, give oxygen if breathing is difficult, and get medical aid	Central nervous system, eyes, skin, mucous membranes	200	5	5

Acetone	Flush eyes with plenty of water for at least 15 min, occasionally lifting the upper and lower eyelids, and get medical aid immediately; flush skin with plenty of soap and water for at least 15 min, while removing contaminated clothing and shoes, and get medical aid if irritation develops or persists, wash clothing before reuse; If swallowed — do NOT induce vomiting, give two to four cupfuls of milk or water to victim if conscious and alert (never give anything by mouth to an unconscious person), get medical aid immediately; If inhaled — remove from exposure to fresh air immediately, give artificial respiration if victim is not breathing, give oxygen if breathing is difficult, get medical aid immediately, do NOT use mouth-to-mouth resuscitation, apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask if breathing has ceased	Eyes, skin, respiratory system, central nervous system	2500	250	1000
Acetonitrile	Causes eye irritation; lachrymator (substance which increases the flow of tears); may produce superficial reversible injury; causes mild skin irritation; harmful if absorbed through the skin; may be metabolized to cyanide which in turn acts by inhibiting cytochrome oxidase and impairing cellular respiration; may cause gastrointestinal irritation with nausea, vomiting, and diarrhea; may cause effects similar to those for inhalation exposure; may cause tissue anoxia, characterized by weakness, headache, dizziness, confusion, cyanosis (bluish skin due to deficient oxygenation of the blood), weak and irregular heartbeat, collapse, unconsciousness, convulsions, coma, and death; may cause central nervous system depression; metabolism may release cyanide, which may result in headache, dizziness, weakness, collapse, unconsciousness, and possible death; aspiration may lead to pulmonary edema; vapors may cause dizziness or suffocation; causes upper respiratory tract irritation	Respiratory system, cardiovascular system, central nervous system, liver, kidneys	500	20	40
Allylbenzene	Contact with eyes — immediately flush eyes with plenty of water for at least 15 min, occasionally lifting the upper and lower eyelids, and get medical aid; Skin contact — flush skin with plenty of soap and water for at least 15 min while removing contaminated clothing and shoes, get medical aid if irritation develops or persists, wash clothing before reuse; If swallowed — give two to four cupfuls of milk or water to victim if conscious and alert (never give anything by mouth to an unconscious person), and get medical aid; If inhaled — remove from exposure to fresh air immediately, give artificial respiration if victim is not breathing, give oxygen if breathing is difficult, and get medical aid if cough or other symptoms appear	None	None listed	None listed	None listed

Chemical	Effects	Target Organs	IDLH (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)
Allylchloride	Irritation of eyes, skin, nose, mucous membranes; pulmonary edema; in animals: liver, kidney injury	Eyes, skin, respiratory system, liver, kidneys	250	1	1
4 Allyl 1,2 methylenedioxybenzene	None listed	None listed	None listed	None listed	None listed
Aluminum chloride	Causes severe eye burns; causes skin burns; causes gastrointestinal tract burns; may cause corrosion and permanent tissue destruction of the esophagus and digestive tract; causes delayed lung injury; causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma	Eyes, skin, mucous membranes		10 mg/m ³	15 mg/m ³
Ammonia gas	Irritation of eyes, nose, throat; dyspnea (breathing difficulty), wheezing, chest pain; pulmonary edema; pink frothy sputum; skin burns, vesiculation; liquid: frostbite	Eyes, skin, respiratory system	300	25	50
Ammonium chloride	Irritation of eyes, skin, respiratory system; cough, dyspnea (breathing difficulty), pulmonary sensitization	Eyes, skin, respiratory system		10 mg/m ³	none
Ammonium formate	Causes eye irritation; causes skin irritation; may cause gastrointestinal irritation with nausea, vomiting, and diarrhea; toxicological properties of this substance have not been fully investigated; may cause respiratory tract irritation	None listed	None listed	None listed	None listed
Ammonium hydroxide	Contact with liquid or vapor causes severe burns and possible irreversible eye damage; causes severe skin irritation; causes skin burns; may cause deep, penetrating ulcers of the skin; contact with the skin may cause staining, inflammation, and thickening of the skin; harmful if swallowed; may cause severe and permanent damage to the digestive tract; causes gastrointestinal tract burns; causes throat constriction, vomiting, convulsions, and shock; effects may be delayed; causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma	Eyes, skin, mucous membranes	None listed	None listed	None listed
Aniline	Headache, lassitude (weakness, exhaustion), dizziness; cyanosis; ataxia; dyspnea (breathing difficulty) on effort; tachycardia; irritation of eyes; methemoglobinemia; cirrhosis; [potential occupational carcinogen]	Blood, cardiovascular system, eyes, liver, kidneys, respiratory system	100	None listed	5

Benzaldehyde	Causes eye irritation; causes skin irritation; harmful if swallowed; may cause gastrointestinal irritation with nausea, vomiting, and diarrhea; may cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea; advanced stages may cause collapse, unconsciousness, coma, and possible death due to respiratory failure; inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness, and coma; may cause respiratory tract irritation; may cause narcotic effects in high concentrations; prolonged or repeated skin contact may cause dermatitis; may cause kidney injury	Kidneys, central nervous system	None listed	None listed	None listed
Benzene	Irritation of eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow Cancer Site [leukemia]	500	0.1	1
Benzyl chloride	Irritation of eyes, skin, nose; lassitude (weakness, exhaustion); irritability; headache; skin eruption; pulmonary edema	Eyes, skin, respiratory system, central nervous system	10	1	1
Benzyl cyanide	Causes eye irritation; causes skin irritation; harmful if absorbed through the skin; may be metabolized to cyanide which, in turn, acts by inhibiting cytochrome oxidase and impairing cellular respiration; harmful if swallowed; may cause irritation of the digestive tract; metabolism may release cyanide, which may result in headache, dizziness, weakness, collapse, unconsciousness, and possible death; ingestion may result in symptoms similar to cyanide poisoning, which is characterized by asphyxiation; may be fatal if inhaled; may cause effects similar to those described for ingestion	Blood, kidneys, liver, spleen, brain	Not listed	Not listed	5 mg/m ³
Bromobenzene	Causes eye irritation; causes skin irritation; may be absorbed through the skin in harmful amounts; if absorbed, may cause liver injury; causes gastrointestinal irritation with nausea, vomiting, and diarrhea; may cause central nervous system depression; inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness, and coma; causes respiratory tract irritation; may cause narcotic effects in high concentrations; may cause liver abnormalities; vapors may cause dizziness or suffocation; may cause blood changes	Blood, central nervous system, liver	Not listed	Not listed	Not listed

Chemical	Effects	Target Organs	IDLH (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)
Bromoethane	Irritates the eyes, the skin, and the respiratory tract; inhalation may cause lung edema; rapid evaporation of the liquid may cause frostbite; may cause effects on the central nervous system, kidneys, and lungs; exposure to high concentrations may result in death; effects may be delayed	Central nervous system, kidneys, lungs	Not listed	Not listed	Not listed
Carbon dioxide	Headache, dizziness, restlessness, paresthesia; dyspnea (breathing difficulty); sweating, malaise (vague feeling of discomfort); increased heart rate, cardiac output, blood pressure; coma; asphyxia; convulsions; frostbite (liquid, dry ice)	Respiratory system, cardiovascular system	40,000	5000	5000
Carbon tetrachloride	Irritation of eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, uncoordination; [potential occupational carcinogen]	Central nervous system, eyes, lungs, liver, kidneys, skin	200	2	10
Chloro-2-propanone (chloroacetone)	Causes eye burns; lachrymator (substance which increases the flow of tears); may cause chemical conjunctivitis and corneal damage; may be fatal if absorbed through the skin; causes skin burns; may cause cyanosis of the extremities; may cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color; harmful if swallowed; may cause severe and permanent damage to the digestive tract; may cause gastrointestinal irritation with nausea, vomiting, and diarrhea; may cause liver and kidney damage; may cause perforation of the digestive tract; ingestion of large amounts may cause CNS depression; may cause spleen damage; may cause systemic effects; may be fatal if inhaled; causes chemical burns to the respiratory tract; aspiration may lead to pulmonary edema; vapors may cause dizziness or suffocation; may cause systemic effects; vapors are extremely irritating to the respiratory tract; may cause burning sensation in the chest	Kidneys, central nervous system, liver, spleen	None listed	None listed	None listed

Copper sulfate	Exposure to particulates or solution may cause conjunctivitis, ulceration, and corneal abnormalities; causes eye irritation and possible burns; may cause skin sensitization, an allergic reaction, which becomes evident upon reexposure to this material; causes skin irritation and possible burns; may cause eczema; harmful if swallowed; may cause severe gastrointestinal tract irritation with nausea, vomiting, and possible burns; ingestion of large amounts of copper salts may cause bloody stools and vomit, low blood pressure, jaundice, and coma; ingestion of copper compounds may produce systemic toxic effects to the kidney and liver and central nervous excitation followed by depression; may cause ulceration and perforation of the nasal septum if inhaled in excessive quantities; causes respiratory tract irritation with possible burns	Blood, kidneys, liver	100 mg/m ³	1 mg/m ³	1 mg/m ³
Copper oxide	Causes eye irritation; may result in corneal injury; may cause conjunctivitis; causes skin irritation; may cause skin discoloration; may cause central nervous system depression, kidney damage, and liver damage; may cause gastrointestinal irritation with nausea, vomiting, and diarrhea; may cause circulatory system failure; may cause vascular collapse and damage; causes respiratory tract irritation; may cause ulceration and perforation of the nasal septum if inhaled in excessive quantities; inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain, and increased white blood cell count	Kidneys, central nervous system, liver, red blood cells	100 mg/m ³	1 mg/m ³	1 mg/m ³
Cyclohexanone	May result in corneal injury; vapors may cause eye irritation; contact produces irritation, tearing, and burning pain; causes skin irritation; harmful if absorbed through the skin; causes gastrointestinal irritation with nausea, vomiting, and diarrhea; may cause liver and kidney damage; may cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea — advanced stages may cause collapse, unconsciousness, coma, and possible death due to respiratory failure; may be harmful if swallowed; inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness, and coma; may cause liver and kidney damage; may cause narcotic effects in high concentrations; inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema; may cause irritation of the mucous membranes	Eyes, skin, respiratory system, central nervous system, liver, kidneys	700	25	50

Chemical	Effects	Target Organs	IDLH (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)
Dichloroethane	Contact with eyes may cause severe irritation and possible eye burns; may be absorbed through the skin; causes irritation with burning pain, itching, and redness; prolonged exposure may result in skin burns; causes gastrointestinal irritation with nausea, vomiting, and diarrhea; may cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea — advanced stages may cause collapse, unconsciousness, coma, and possible death due to respiratory failure; may be harmful if swallowed; inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness, and coma; causes respiratory tract irritation; may cause narcotic effects in high concentrations; vapors may cause dizziness or suffocation; may cause blood changes; overexposure may cause an increase in carboxyhemoglobin levels in the blood; can produce delayed pulmonary edema	Blood, heart, central nervous system, liver, pancreas	3000	100	100
Ephedrine	May cause eye irritation; may cause skin irritation; contact with the skin may cause a local anesthetic effect; may cause irritation of the digestive tract; may cause respiratory tract irritation; toxicological properties of this substance have not been fully investigated	Heart, nerves	None listed	None listed	None listed
Ethyl acetate	Causes eye irritation; vapors may cause eye irritation; may cause skin irritation; prolonged or repeated contact may cause irritation and dermatitis; may cause irritation of the digestive tract; may cause liver and kidney damage; ingestion of large amounts may cause central nervous depression; may cause headache, nausea, fatigue, and dizziness; may cause respiratory tract irritation; may be harmful if inhaled; inhalation of high concentrations may cause narcotic effects	Kidneys, central nervous system, liver	2000	400	400
Formamide	Causes eye irritation; causes skin irritation; may cause irritation of the digestive tract; inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness, and coma; may cause respiratory tract irritation	Central nervous system	None listed	10	None listed

Formic acid	Contact with liquid is corrosive to the eyes and causes severe burns; lachrymator (substance which increases the flow of tears); may cause corneal edema, ulceration, and scarring; may cause skin sensitization, an allergic reaction, which becomes evident upon reexposure to this material; contact with liquid is corrosive and causes severe burns and ulceration; it is absorbed through the skin; may cause erythema (redness) and blistering; causes severe digestive tract burns with abdominal pain, vomiting, and possible death; may be harmful if swallowed; may cause central nervous system depression; ingestion may produce corrosive ulceration and bleeding and necrosis of the gastrointestinal tract accompanied by shock and circulatory collapse; may cause asthmatic attacks due to allergic sensitization of the respiratory tract; causes chemical burns to the respiratory tract; aspiration may lead to pulmonary edema; vapors may cause dizziness, nausea, itching, burning, and swelling of the eyes	Kidneys, central nervous system, liver, respiratory system, eyes, skin	30	5	5
Hydrobromic acid (HBr)	Eye contact may result in corneal injury; causes severe eye irritation and burns; causes severe skin irritation; may be absorbed through the skin; contact with liquid is corrosive and causes severe burns and ulcerations; causes gastrointestinal tract burns; may cause respiratory failure; may cause circulatory system failure; may cause hemorrhaging of the digestive tract; may cause corrosion and permanent tissue destruction of the esophagus and digestive tract; irritation may lead to chemical pneumonitis and pulmonary edema; causes chemical burns to the respiratory tract; may cause effects similar to those described for ingestion	None	30	3	3
Hydrochloric acid (HCl)	May cause irreversible eye injury; vapor or mist may cause irritation and severe burns; contact with liquid is corrosive to the eyes and causes severe burns; may cause painful sensitization to light; may be absorbed through the skin in harmful amounts; may cause skin sensitization, an allergic reaction, which becomes evident upon reexposure to this material; contact with liquid is corrosive and causes severe burns and ulcerations; may cause circulatory system failure; causes severe digestive tract burns with abdominal pain, vomiting, and possible death; may cause corrosion and permanent tissue destruction of the esophagus and digestive tract; may be harmful if swallowed; may cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath, and delayed lung edema; causes chemical burns to the respiratory tract; exposure to the mist and vapor may erode exposed teeth; causes corrosive action on the mucous membranes	Toxic by inhalation; causes severe burns; corrosive; mutagen	50	5	5

Chemical	Effects	Target Organs	IDLH (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)
Hydrogen	Defined as a simple asphyxiant; inhalation of high concentrations of hydrogen may cause dizziness, headache, deeper breathing due to air hunger, possible nausea, and eventual unconsciousness; eyes/skin/oral: not likely to occur	Lungs and central nervous system			
Hydrogen peroxide	Contact with liquid is corrosive to the eyes and causes severe burns; contact with the eyes may cause corneal damage; causes severe skin irritation and possible burns; may cause discoloration, erythema (redness), swelling, and the formation of papules and vesicles (blisters); causes gastrointestinal irritation with nausea, vomiting, and diarrhea; causes gastrointestinal tract burns; may cause vascular collapse and damage; may cause damage to the red blood cells; may cause difficulty in swallowing, stomach distension, possible cerebral swelling, and death; ingestion may result in irritation of the esophagus, bleeding of the stomach, and ulcer formation; causes chemical burns to the respiratory tract; may cause ulceration of nasal tissue, insomnia, nervous tremors with numb extremities, chemical pneumonia, unconsciousness, and death; at high concentrations, respiratory effects may include acute lung damage and delayed pulmonary edema	Blood, central nervous system	75	1	1
Hydriodic acid (HI)	Causes eye burns; causes skin burns; may cause severe and permanent damage to the digestive tract; causes gastrointestinal tract burns; may cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath, and pulmonary edema; causes chemical burns to the respiratory tract; inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema	None known	None Listed	None Listed	None Listed

Hydroxylamine HCl	Corrosive; extremely destructive to tissues of the mucous membranes and upper respiratory tract; symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting; inhalation may be fatal as a result of spasm inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema; may convert hemoglobin to methemoglobin, producing cyanosis; may also cause nausea, vomiting, drop in blood pressure, headache, vertigo, ringing in the ears, shortness of breath, severe blood oxygen deficiency, and convulsions; high concentrations cause coma and death from circulatory collapse; irritant and possible sensitizer; may cause burns; corrosive to the eyes; may cause severe irritation and corneal damage	Kidneys, central nervous system, eyes, blood, skin, liver, or lungs	None Listed	None Listed	None Listed
Iodine	Causes severe eye irritation; may cause eye burns; vapor or mist may cause irritation and severe burns; causes skin burns; may cause skin sensitization, an allergic reaction, which becomes evident upon reexposure to this material; may cause gastrointestinal irritation with nausea, vomiting, and diarrhea; may cause kidney damage; may cause burns to the digestive tract; may cause thyroid abnormalities; may cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath, and pulmonary edema; may cause epiphoria, which is an excessive flow of tears	Kidneys, thyroid	None Listed	2	0.1
Isosafrole	May cause eye irritation; may cause skin irritation; may cause irritation of the digestive tract; may cause liver damage; may cause cyanosis (bluish discoloration of the skin due to deficient oxygenation of the blood), weakness, acidosis, and shock; may be harmful if swallowed; may cause respiratory tract irritation; may cause effects similar to those described for ingestion	Liver	None Listed	None Listed	None Listed
Lithium	There is no known long-term hazard from lithium in its solid state — however, lithium metal is extremely reactive with body moisture and is corrosive to the skin, nose, throat, and eyes	None	None Listed	None Listed	None Listed

Chemical	Effects	Target Organs	IDLH (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)
Lithium aluminum hydroxide	Causes eye burns; causes irritation when substance becomes wet or comes in contact with moisture of the mucous membranes; may cause chemical conjunctivitis and corneal damage; causes skin burns; contact with skin causes irritation and possible burns, especially if the skin is wet or moist; may cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color; may cause severe and permanent damage to the digestive tract; causes gastrointestinal tract burns; may cause perforation of the digestive tract; may cause systemic effects; causes chemical burns to the respiratory tract; aspiration may lead to pulmonary edema; may cause systemic effects	None	None Listed	15 mg/m ³	10 mg/m ³
Magnesium turnings	Dust may cause mechanical irritation; may cause skin irritation; particles embedded in the skin may cause “chemical gas gangrene” with symptoms of persistent lesions, inflammation, and gas bubbles under the skin; may cause irritation of the digestive tract; may cause respiratory tract irritation; inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain, and increased white blood cell count	None	None Listed	None Listed	None Listed
Manganous carbonate	Acute poisoning can occur from excessive inhalation causing symptoms noted under Chronic Exposure; extremely large oral dosages may produce gastrointestinal disturbances and acute poisoning, as noted under Chronic Exposure; no adverse effects are expected with dermal exposure; in the case of eye contact, no adverse effects are expected, but dust may cause mechanical irritation	None	None Listed	None Listed	5 mg/m ³
Manganous chloride	Inhalation can cause a flu-like 24 h to 48 h illness (metal fume fever) characterized by chills, fever, aching muscles, dryness in the mouth and throat, and headache; may irritate the respiratory tract; may increase the incidence of upper respiratory infections (pneumonia); absorption of inorganic manganese salts through the lungs is poor but may occur in chronic poisoning; ingestion — may cause abdominal pain and nausea, and although poorly absorbed through the intestines, inorganic manganese salts may produce hypoglycemia and decreased calcium blood levels should absorption occur; may cause irritation with redness and pain	Brain, kidney, blood			

Mercuric chloride	Inhalation — causes irritation to the respiratory tract, with symptoms including sore throat, coughing, pain, tightness in chest, breathing difficulties, shortness of breath, and headache; pneumonitis may develop; can be absorbed through inhalation, with symptoms similar to those if ingested; vapor inhalation can burn the mucous membranes of the nose and throat; Ingestion — Highly Toxic! with an average lethal dose of about 1 g for inorganic mercury salts; may cause burning of the mouth and pharynx, abdominal pain, vomiting, corrosive ulceration, bloody diarrhea which may be followed by a rapid and weak pulse, shallow breathing, paleness, exhaustion, central nervous system problems, tremors, and collapse; delayed death may occur from renal failure; causes irritation and burns to skin with symptoms including redness and pain; may cause skin allergy and sensitization; can be absorbed through the skin with symptoms to parallel ingestion; causes irritation and burns to eyes with symptoms including redness, pain, blurred vision; may cause serious and permanent eye damage	Eyes, skin, respiratory system, central nervous system, kidneys	10 mg/m ³	0.05 mg/m ³	0.1 mg/m ³
Mercury	Eye exposure — exposure to mercury or mercury compounds can cause discoloration on the front surface of the lens that does not interfere with vision, causes eye irritation and possible ulcers, contact with mercury or mercury compounds can cause ulceration of the conjunctiva and cornea; Dermal contact — may be absorbed through the skin in harmful amounts, may cause skin sensitization (an allergic reaction that becomes evident upon reexposure to this material), causes skin irritation and possible burns, may cause skin rash (in milder cases), and may cause cold and clammy skin with cyanosis or pale color; may cause severe and permanent damage to the digestive tract, may cause perforation of the digestive tract; may cause effects similar to those for inhalation exposure; may cause systemic effects; causes chemical burns to the respiratory tract; inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain, and increased white blood cell count; may cause central nervous system effects including vertigo, anxiety, depression, muscle uncoordination, and emotional instability; aspiration may lead to pulmonary edema; may cause systemic effects; may cause respiratory sensitization	Blood, kidneys, central nervous system, liver, brain	10 mg/m ³	0.05 mg/m ³	0.1 mg/m ³

Chemical	Effects	Target Organs	IDLH (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)
Methanol	Causes moderate eye irritation; vapors may cause eye irritation; may cause painful sensitization to light; may cause skin irritation; may be absorbed through the skin; may be fatal or cause blindness if swallowed; may cause irritation of the digestive tract; may cause kidney damage; may cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea — advanced stages may cause collapse, unconsciousness, coma, and possible death due to respiratory failure; may cause respiratory tract irritation; may cause adverse central nervous system effects including headache, convulsions, and possible death; may cause visual impairment and possible permanent blindness; may cause effects similar to those described for ingestion; may cause kidney damage	Kidneys, central nervous system, eyes	6000	200	200
Methylamine	Causes eye burns; may result in corneal injury; may cause chemical conjunctivitis and corneal damage; may cause tearing, conjunctivitis, and corneal edema when vapor is absorbed into the tissue of the eye; causes skin burns; may be absorbed through the skin; may cause dermatitis; methylamine is readily absorbed through the skin and may cause malaise, discomfort, injury, and death unless treated promptly; harmful if swallowed; causes gastrointestinal tract burns; causes chemical burns to the respiratory tract; may cause pulmonary edema and severe respiratory disturbances; may cause liver abnormalities; inhalation of methylamine may cause coughing, nausea, and pulmonary edema; in an unpublished report, allergic or chemical bronchitis was reported in a worker exposed to methylamine (actual exposure concentrations were not reported)	Liver, respiratory system, eyes, skin	100	10	10
Methylformamide	Causes eye irritation; may cause chemical conjunctivitis; causes skin irritation; may cause gastrointestinal irritation with nausea, vomiting, and diarrhea; causes respiratory tract irritation; can produce delayed pulmonary edema	Reproductive system	None listed	None listed	None listed

Nitroethane	Causes eye irritation; may cause chemical conjunctivitis and corneal damage; causes skin irritation; may cause dermatitis; may cause cyanosis of the extremities; may cause gastrointestinal irritation with nausea, vomiting, and diarrhea; methemoglobinemia is characterized by dizziness, drowsiness, headache, shortness of breath, cyanosis with bluish skin, rapid heart rate, and chocolate-brown colored blood; ingestion of large amounts may cause CNS depression; may be harmful if swallowed; may form methemoglobin which in sufficient concentrations causes cyanosis (bluish discoloration of skin due to deficient oxygenation of the blood); causes respiratory tract irritation; aspiration may lead to pulmonary edema; vapors may cause dizziness or suffocation; may cause burning sensation in the chest	Kidneys, central nervous system, liver, respiratory system, skin	1000	100	100
Norpseudoephedrine	May cause eye irritation; may cause skin irritation; contact with the skin may cause a local anesthetic effect; may cause irritation of the digestive tract; may cause respiratory tract irritation; toxicological properties of this substance have not been fully investigated	Heart, nerves	None listed	None listed	None listed
Palladium sulfate	May be harmful by inhalation, ingestion, or skin absorption; may cause eye and skin irritation; to the best of the manufacturer's knowledge, the toxicological properties have not been thoroughly investigated	None listed	None listed	None listed	None listed
Perchloric acid	Causes eye burns; may cause retinal damage; causes skin burns; may cause skin sensitization, an allergic reaction that becomes evident upon reexposure to this material; may cause deep, penetrating ulcers of the skin; causes gastrointestinal tract burns; may be harmful if swallowed; ingestion may produce corrosive ulceration and bleeding and necrosis of the gastrointestinal tract accompanied by shock and circulatory collapse; may cause severe irritation of the respiratory tract, with sore throat, coughing, shortness of breath, and delayed lung edema; inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema	Eyes, skin, mucous membranes	None Listed	None Listed	None Listed
Phenylacetic acid	Causes eye irritation and possible burns; may cause chemical conjunctivitis; causes skin irritation and possible burns; may cause gastrointestinal irritation with nausea, vomiting, and diarrhea; causes respiratory tract irritation; can produce delayed pulmonary edema	None listed	None listed	None listed	None listed

Chemical	Effects	Target Organs	IDLH (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)
Phenylmagnesium bromide	NA	NA	NA	NA	NA
Phenylacetone	NA	NA	NA	NA	NA
Phosphorus	Not considered highly toxic, but acute exposure may cause coughing, bronchitis, possible liver or kidney impairment if contaminated with yellow phosphorus; red phosphorus is not readily absorbed and, in pure form, is considered nonpoisonous, however, possible contamination with the yellow form must be considered, and symptoms such as nausea, vomiting, abdominal pain, or garlic odor on breath will indicate poisoning by the latter — estimated lethal adult human dose for white phosphorus is 50 to 100 mg; red phosphorous is not harmful to skin; if contaminated with white phosphorus, however, contact may cause deep slow-healing burns; red phosphorus causes eye irritation; if contaminated with yellow phosphorus, eye contact can cause severe irritation and burns	Kidneys, liver	5 mg/m ³	0.1 mg/m ³	0.1 mg/m ³
Phosphorus pentachloride	Causes severe eye burns; causes skin burns; causes digestive tract burns with immediate pain, swelling of the throat, convulsions, and possible coma; may be harmful if swallowed; may cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath, and delayed lung edema; causes chemical burns to the respiratory tract	None known	70 mg/m ³	1 mg/m ³	1 mg/m ³
Piperonal	Dust may cause mechanical irritation; causes skin irritation; may cause irritation of the digestive tract; may cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea — advanced stages may cause collapse, unconsciousness, coma, and possible death due to respiratory failure; inhalation of dust may cause respiratory tract irritation	Central nervous system	None listed	None listed	None listed

Piperidine	Contact with liquid or vapor causes severe burns and possible irreversible eye damage; contact may cause ulceration of the conjunctiva and cornea; eye damage may be delayed; may cause conjunctivitis; may cause blindness; harmful if absorbed through the skin; may be absorbed through the skin, and if absorbed, causes symptoms similar to those of ingestion; penetration may continue for several days; causes severe skin irritation and burns; harmful if swallowed; may cause severe and permanent damage to the digestive tract; causes gastrointestinal tract burns; can cause nervous system damage; may cause tremors and convulsions; may cause severe irritation of the respiratory tract, with sore throat, coughing, shortness of breath, and delayed lung edema; causes chemical burns to the respiratory tract; may cause effects similar to those described for ingestion; damage may be delayed; may cause bronchial pneumonia	Nervous system			
Platinum	Irritates skin, respiratory system; dermatitis	Eyes, skin, respiratory system	ND	1 mg/m ³	ND
Platinum chloride	Exposure can cause severe allergies affecting the nose, skin, and lungs; irritation and even ulcers can develop in the nose; inhalation may cause platinosis, with symptoms including wheezing, coughing, tightness of the chest, shortness of breath, cyanosis, and pronounced asthmatic symptoms; may cause vomiting and bloody diarrhea; skin contact may cause platinosis, with symptoms including severe irritation, eczema, urticaria, itching, and dermatitis; may cause skin allergy; eye contact may cause irritation, itching, and conjunctival vasodilation	None	None listed	None listed	None listed
Platinum oxide	Causes eye irritation; may cause chemical conjunctivitis; causes skin irritation; may cause gastrointestinal irritation with nausea, vomiting, and diarrhea; causes respiratory tract irritation; can produce delayed pulmonary edema; toxicological properties of this substance have not been fully investigated	None	None listed	None listed	None listed

Chemical	Effects	Target Organs	IDLH (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)
Potassium carbonate	Causes irritation to the respiratory tract with symptoms including coughing, shortness of breath; causes irritation to the gastrointestinal tract with symptoms including nausea, vomiting, and diarrhea; may have moderate toxic effects if consumed in large enough quantities; ingestion of large amounts may be corrosive to mouth, throat, and GI tract and may produce abdominal pains, vomiting, diarrhea, and circulatory collapse; contact with dry material causes irritation; in aqueous solution, it is a strong caustic and, as such, may have corrosive effects on the skin; causes extreme irritation, redness, pain, and possibly corneal damage	Eyes, skin, mucous membranes	None listed	None listed	None listed
Potassium cyanide	Contact with eyes may cause severe irritation, and possible eye burns; may be absorbed through the skin in harmful amounts; contact with skin causes irritation and possible burns, especially if the skin is wet or moist; if absorbed, causes symptoms similar to those of ingestion — skin absorption may cause unconsciousness, absorption into the body may cause cyanosis (bluish discoloration of skin due to deficient oxygenation of the blood); may be fatal if swallowed; causes gastrointestinal tract burns; may cause tissue anoxia, characterized by weakness, headache, dizziness, confusion, cyanosis (bluish skin due to deficient oxygenation of the blood), weak and irregular heartbeat, collapse, unconsciousness, convulsions, coma, and death; contains cyanide; human fatalities have been reported from acute poisoning; large doses of cyanide may result in sudden loss of consciousness and prompt death; small doses will prolong the above symptoms 1 to 2 h; can cause central nervous system damage and death, which can be caused by inhalation of high concentrations that may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness, and coma; causes respiratory tract irritation; may cause effects similar to those described for ingestion; inhalation may result in symptoms similar to cyanide poisoning that include tachypnea, hyperpnea (abnormally rapid or deep breathing), and dyspnea (labored breathing) followed rapidly by respiratory depression, and pulmonary edema may occur	Central nervous system, respiratory system, cardiovascular system	25 mg/m ³	5 mg/m ³	5 mg/m ³

Potassium hydroxide	Severe irritant; effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on the severity of exposure; symptoms may include coughing, sneezing, damage to the nasal or respiratory tract; high concentrations can cause lung damage; Toxic! Estimated lethal dose: 5 g; swallowing may cause severe burns of mouth, throat, and stomach; other symptoms may include vomiting and diarrhea; severe scarring of tissue and death may result; Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures; Highly Corrosive! Causes irritation of eyes with tearing, redness, swelling; greater exposures cause severe burns with possible blindness resulting	Eyes, skin, respiratory system	ND	2 mg/m ³	ND
Pumice	NA	NA	NA	NA	NA
Pyridine	Irritation of eyes; headache, anxiety, dizziness, insomnia; nausea, anorexia; dermatitis; liver, kidney damage	Eyes, skin, central nervous system, liver, kidneys, gastrointestinal tract	1000	5	5
Raney nickel	NA	NA	NA	NA	NA
Sodium	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract; symptoms may include irritation of the nose and throat and labored breathing; may cause lung edema, a medical emergency; is an extremely dangerous, corrosive material that will react immediately with saliva to cause serious burns and possible local combustion and even explosion of hydrogen in the mouth or esophagus; the metal's low melting point can cause further complications; as a corrosive material, can cause serious burns due to almost immediate reaction with water, especially on moist skin; if metal ignites, very deep burns and tissue destruction can occur; corrosive to eyes and may cause redness, pain, blurred vision, and damage from severe alkali burns	None listed	None listed	None listed	None listed
Sodium acetate	May cause irritation to the respiratory tract with symptoms including coughing, sore throat, labored breathing, and chest pain; large doses may produce abdominal pain, nausea, and vomiting; contact may cause irritation, redness, and pain	None	None listed	None listed	None listed

Chemical	Effects	Target Organs	IDLH (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)
Sodium bisulfate	Causes eye burns; when substance becomes wet or comes in contact with moisture of the mucous membranes, it will cause irritation; may cause chemical conjunctivitis and corneal damage; causes skin burns; contact with skin causes irritation and possible burns, especially if the skin is wet or moist; may cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color; may cause severe and permanent damage to the digestive tract; causes gastrointestinal tract burns; may cause perforation of the digestive tract; may cause systemic effects; may cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath, and delayed lung edema; causes chemical burns to the respiratory tract; aspiration may lead to pulmonary edema; may cause systemic effects	None	None listed	None listed	None listed
Sodium hydroxide	Causes eye burns; may cause chemical conjunctivitis and corneal damage; causes skin burns; may cause deep, penetrating ulcers of the skin; may cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color; may cause severe and permanent damage to the digestive tract; causes gastrointestinal tract burns; may cause perforation of the digestive tract; causes severe pain, nausea, vomiting, diarrhea, and shock; may cause systemic effects; irritation may lead to chemical pneumonitis and pulmonary edema; causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma; causes chemical burns to the respiratory tract; aspiration may lead to pulmonary edema; may cause systemic effects	Eyes, skin, mucous membranes	10 mg/m ³	2 mg/m ³	2 mg/m ³
Sodium sulfate	May cause eye irritation; may cause skin irritation; ingestion of large amounts may cause gastrointestinal irritation; low hazard for usual industrial handling	None	None listed	None listed	None listed

Sulfuric acid	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract; symptoms may include irritation of the nose and throat, and labored breathing; may cause lung edema, a medical emergency; corrosive; swallowing can cause severe burns of the mouth, throat, and stomach, leading to death; can cause sore throat, vomiting, diarrhea; circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact; circulatory shock is often the immediate cause of death; corrosive with dermal contact, showing symptoms of redness, pain, and severe burn; corrosive with eye contact, causing blurred vision, redness, pain, and severe tissue burns, and can cause blindness	Eyes, skin, respiratory system, teeth	15	1	1
Thionyl chloride	Corrosive upon dermal contact, where it is extremely destructive to tissues of the mucous membranes and upper respiratory tract, with symptoms that may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting; inhalation may be fatal as a result of spasm inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema; corrosive upon inhalation, which may cause burning pain in throat, abdominal pain, nausea, and vomiting; corrosive with skin — liquid contact may cause blistering burns, irritation, and pain; vapors may be severely irritating to the skin; Corrosive! Vapors are irritating and may cause damage to the eyes; contact may cause severe burns and permanent eye damage	None known	None listed	1	None listed
Thorium nitrate	Thorium nitrate is a radioactive material; may cause irritation and possible eye damage with eye contact; with skin contact, irritation and dermatitis in sensitive persons is seen; effects of ingestion and inhalation are not known	None listed	None listed	None listed	None listed
