Hazard Assessment Signage Program "HASP"

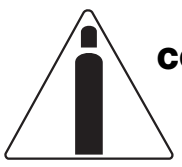
Hazard Definition Sheet

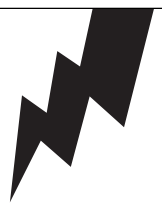
Use the following hazard definitions to assess the hazards present in your lab. You may choose up to 8 applicable hazards. Fill in the hazards and their associated risk levels on the HASP Data Entry Form. HASP is based on categories of hazards. Each hazard is represented by a distinctive icon. An explanation of each type of hazard and examples are given on the following pages. Note that HASP uses 3 color-coded risk categories to classify the degree of risk that each hazard may pose.

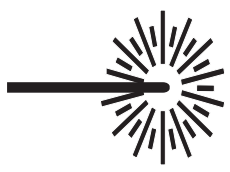
GRAY = LOW
No special precautions need to be taken. No special restriction on who may enter the area.

YELLOW = MODERATE
Standard laboratory precautions should be followed. Access usually restricted to trained laboratory staff or accompanied visitor.

RED = HIGH
Special precautions are followed, special equipment in use. Access limited to designated staff members.

Hazard Type	Biohazards	Carcinogens	Chemical Storage	Compressed Gases
Definition & Examples	■ **Organisms or their products that may cause harm to humans or animals.** *Example:* disease-causing microorganisms. ➜ *Immuno-compromised individuals (who lack resistance to infection) may be at an increased risk of health effects from bio-hazards. These people should discuss their condition with their supervisors so that, if appropriate, additional precautions would be followed.*	■ **Chemicals that cause malignant tumors, or other forms of cancer.** *Examples:* some organic compounds (anthracene, aflatoxin), some solvents (chloroform, benzene), and some metals (hexavalent chromium).	■ **Storage of material that is not in use, excluding the hazard classes of flammable gases, flammable liquids, oxidizers, poison inhalation hazards, and water reactives, which are considered separately.**	■ **Containers of compressed, liquified, or solidified gases which pose a risk of asphyxiation, and/or the risk of rapid freezing of tissue.** *Examples:* Compressed oxygen, liquid nitrogen, and dry ice (solid carbon dioxide). ➜ *Flammable and highly toxic gases (poison inhalation hazards) are excluded from this category, and are considered separately.*
Risk Level				
	■ **Microbiology lab using well-defined microorganisms that do not cause disease in healthy adults.** **Biosafety Level 1** *Examples:* *E. coli* bacteria, (used in recombinant DNA work) yeast	■ **Occasional use of small amounts or dilute solutions.** *Example:* Entomology lab using small quantities of dilute formaldehyde/water solutions to preserve specimens.	■ **Storage of small quantities of chemicals. Storage where the amount on hand would not cause a fire or serious health hazard if it came into accidental contact with water. No storage of poison inhalation hazards.** *Example:* chemical storage in a teaching lab.	■ **Use where a) the release rate of the gas can be controlled and b) the area is well ventilated and air is not recirculated.** *Example:* Gas cylinder with regulator used in a well ventilated laboratory where air is exhausted by fume hoods that vent to the roof.
	■ **Organisms that can cause moderate to serious illness in healthy adults. Infections seldom occur via inhalation unless the organism is dispersed as an aerosol. Infections readily occur from needle sticks, ingestion or accidental contact with mucous membranes of the mouth, nose, or eyes.** **Biosafety Level 2** *Examples:* *Salmonella bacteria,* hepatitis B.	■ **Routine use of material in pure form, such as acrylamide powder or diaminobenzidine (DAB), or use of several liters per week of carcinogenic solvents, such as phenol/chloroform extraction procedures.**	■ **Storage of hundreds of chemical containers. Minimal amounts of air or water reactive material, unstable or incompatible chemicals, or compressed or liquefied gases** *Example:* chemical inventory of a large research group.	■ **(1) Use of compressed gas with a low, well controlled flow rate in a area with poor ventilation or (2) the use of a container or gas supply system that could cause the sudden release of a large amount of gas.**
	■ **Organisms that can cause serious illness or death in healthy adults. Exposure by inhalation is a risk from any sort of handling procedures or from spills or contaminated waste. Infections can also occur from needle sticks, accidental contact with mucous membranes of the mouth, nose, or eyes.** **Biosafety Level 3** *Example:* the bacteria that cause TB.	■ **Routine use of larger quantities of carcinogenic material where the risk of exposure is high because the material can be absorbed through skin or inhaled.** *Example:* veterinary embalming facility	■ **Chemical stockrooms, large quantities of hazardous materials, including 55 gallon drums. Storage of significant amounts of air or water reactive material, unstable or incompatible chemicals, and/or compressed or liquefied gases.**	■ **Use of any compressed gases, including solidified or liquified gases, in small unventilated space.** *Example:* Use of liquid nitrogen or dry ice in a cold room or environmental chamber or other small work spaces that do not have a ventilation system that supplies fresh air. (Note: This applies to rooms/chambers with circulating fans. They do not supply fresh air.)
	 **BIOHAZARD**	 **CARCINOGEN**	 **CHEMICAL STORAGE**	 **COMPRESSED GAS**

Hazard Type	Corrosives	Electrical Hazards	Explosive Materials	Flammable Gases
Definition & Examples	■ Any material that irritates or destructively attacks body tissues such as skin. Corrosive chemicals are typically acids such as hydrochloric acid and sulfuric acid, and bases such as sodium hydroxide and ammonium hydroxide.	■ A situation where a person could be injured through contact with an energized electrical conductor. The degree of hazard depends on the type of contact (wet vs. dry, small area vs. large area), the voltage of the conductor, and the shock protection designed into the system (such as ground fault interruption—GFI).	■ A chemical compound, usually containing nitrogen, that detonates as a result of shock or heat. Wetted explosives are Flammable Solids because they ignite easily at low temperatures. *Examples:* nitroglycerin (dynamite) and ammonium nitrate. ➜ *For extensive information about the potential for a compound to detonate or react to form an explosive mixture, consult Bretherick's Handbook of Reactive Chemical Hazards.*	■ Gases that ignite easily and burn rapidly. Common flammable gases are hydrogen, carbon monoxide, and acetylene.
Risk Level				
	■ Routine use of dilute acid and base solutions, infrequent use of concentrated acids and bases. *Example:* undergraduate teaching laboratory	■ Use of only new, grounded, commercially available electrical devices. GFI circuits in wet areas.	■ Work that involves amounts that can not produce a harmful explosion or use of the material in form that is not explosive. *Example:* histology lab using picric acid solution as a stain.	■ Use of small individual low-pressure containers or piped supply systems. Example: aerosol can of spray paint with a flammable gas as a propellant.
	■ Routine use of a variety of strong acids and bases in concentrated form. *Example:* average chemistry laboratory	■ Use of old electrical devices which are not grounded. Work in dry areas that involves the construction or modification of equipment that operates at 24 volts or above.	■ Work that involves amounts that can produce an explosion under certain conditions. *Example:* conc. perchloric acid	■ Routine use of large high-pressure flammable gas cylinders. Use and storage of up to five large, high pressure cylinders of flammable gases.
	■ Labs with large quantities (more than 10 gallons) of concentrated mineral acids or bases in frequent use, and benchtop use of acid baths with acid concentrations of greater than 6 molar. *Example:* Kjeldahl extraction laboratory	■ Work that involves construction or modification of equipment that operates at 120 volts or above. Any area with electrical equipment under wet conditions, unless protected by GFI.	■ Use of explosive compounds, in quantities that can produce a harmful explosion, in procedures that could produce a form that is explosive. *Examples:* refluxing diethyl ether (potentially concentrating peroxides), drying of picric acid.	■ Daily use of several large high pressure cylinders of flammable gas. Use and storage of 6 or more cylinders in a laboratory. Use or storage of propane cylinders greater than 1.5 pounds.
	 **CORROSIVE**	 **ELECTRICAL HAZARD**	 **EXPLOSIVE**	 **FLAMMABLE GAS**

Hazard Type	Flammable Liquids	Flammable Solids/ Air Reactives/ Pyrophorics	Lasers	Oxidizers
Definition & Examples	■ Liquids that ignite easily and burn rapidly, and have a flash point less than 100F (37.7C). *Examples:* 95% ethanol, ether, hexane, acetone, and ethyl acetate	■ (1) Solids that ignite easily at low temperatures such as metal hydrides, some organic solids, and wetted explosives. *Examples:* lithium hydride, nitronaphthalene, wetted dinitrophenol. ■ (2) Any liquid or solid that ignites spontaneously in air. Examples: phosphorus, tributylaluminum (liquid); titanium dichloride, many fine metal powders ■ (3) Materials that are spontaneously flammable in moist air because they react with water. *Examples:* sodium, lithium hydride, butyllithium.	■ Equipment that emits energy as a beam of electro-magnetic radiation. Some laser beams are visible light that can be seen when they are present. Some lasers emit infra-red or ultraviolet radiation that is invisible. Medium and high intensity lasers can cause serious eye damage. High intensity lasers can also burn skin and can ignite combustible materials.	■ Compounds that readily provide oxygen to support combustion. Oxidizers can initiate a fire as well as cause other materials to burn much more intensely than normal. *Examples:* peroxides, chlorates, perchlorates, nitrates, and permanganates
Risk Level				
	■ Daily use of small quantities. *Example:* microbiology lab using alcohol for wiping bench tops.	■ Infrequent use of small quantities under conditions known to be controllable. *Example:* undergraduate teaching lab burning small pieces of magnesium ribbon to demonstrate oxidation.	■ Only class I, II or IIIa lasers are in use. Beams from class I and II lasers are always visible. There is no risk of injury unless an individual looks directly into the beam for an extended period of time. *Example:* HeNe laser pointers used in classrooms	■ Infrequent use of small quantities under conditions known to be controllable. *Examples:* teaching lab using 10% hydrogen peroxide in an experiment
	■ Routine use of highly volatile solvents in moderate quantities, away from ignition sources or the storage of up to 50 gallons. *Examples:* solvent extractions, refluxing or solvent distillation.	■ Routine use of moderate quantities of flammable solids or air reactive/ pyrophoric materials.	■ Class IIIb laser is in use. Momentary viewing of the direct beam, or a beam reflected from a mirror-like surface, may produce serious eye injury. Beams may not be visible.	■ Routine use and storage of moderate quantities of oxidizers. *Examples:* chromic acid bath used to clean glassware.
	■ (1) Routine use of large quantities (2) any work with flammable liquids near an open flame or at elevated temperatures.	■ Routine use of large quantities of flammable solids or air reactive/ pyrophoric materials	■ Class IV laser is in use. Viewing of the direct beam and viewing of any type of reflection is likely to cause serious eye injury. Beams can cause skin burns. Beams can cause materials to burn and/or release hazardous materials to the air.	■ Routine use and storage of large quantities of strong oxidizers *Examples:* hot perchloric acid digestion, fertilizer storage areas.
	 **FLAMMABLE LIQUID**	 **FLAMMABLE SOLID**	 **LASER**	 **OXIDIZER**

Hazard Type	Poisonous Gases (Poison Inhalation Hazards)	Poisonous Liquids and Solids	Ionizing Radiation	Water Reactive
Definition & Examples	■ Highly toxic materials that are easily inhaled (gases, or liquids that have a high vapor pressure). *Examples:* chlorine, ethyl chloroformate, and phosgene.	■ Any substance which, in small quantities, can cause serious illness or death. *Examples:* arsenic, lead, and pesticides that block nerve transmission. ➜ *For extensive information about poisons, consult Prudent Practices in the Laboratory published by the National Research Council.*	■ Energy emitted from radioactive materials (alpha, beta, gamma radiation) or emitted by radiation producing equipment (X-rays) that can cause chemical changes in living cells that may result in immediate injury or an increased risk of cancer.	■ Materials that react, sometimes violently, on contact with water, releasing heat. Flammable or toxic gases may also be released. *Examples:* sodium metal, sodium amide, and lithium aluminum hydride.
Risk Level				
	■ None — Because of the toxicity, all use or storage of this material results in a moderate or high hazard level.	■ Use and storage of materials for which the lethal dose is more than an ounce (LD50 more than 500mg per kilogram) and that are not readily absorbed through the skin *Examples:* methyl ethyl ketone, acetaldehyde, benzoic acid, methanol, hexane	■ Locations where an individual could not receive a harmful exposure to ionizing radiation under any circumstances. *Example:* 1) laboratory where the total amount of radioactive material is less than the annual limit of intake for a radiation worker or 2) an X-ray diffraction unit that is entirely enclosed by shielding	■ Infrequent use of small quantities under conditions known to be controllable. Storage where the amount on hand would not cause a fire or serious health hazard if it came into accidental contact with water. *Example:* Demonstration of hydrogen production using sodium in a teaching laboratory.
	■ Any use or storage of **liquid** poison inhalation hazards. *Examples:* silicon tetrachloride, trimethyl gallium	■ Use and storage of materials for which the lethal dose is between an ounce and a teaspoon (LD50 between 50 to 500 mg per kilogram) OR less toxic compounds which can be absorbed through the skin *Examples:* pyridine (skin absorbed), phenol (skin absorbed), butylamine, coomassie blue, guanidine hydrochloride, zinc chloride	■ Locations where an individual will not receive a harmful exposure if basic precautions are followed. *Examples:* use of several millicuries of radioactive material that emit gamma or high energy beta radiation that requires shielding.	■ Routine use of small quantities under conditions known to be controllable. The amount on hand could cause a fire or serious health hazard if it came into accidental contact with water. *Examples:* an organic synthesis laboratory drying organic solvents using sodium metal.
	■ Any use or storage of a **gaseous** poison inhalation hazard. *Examples:* an ethylene oxide gas sterilizer, chlorine, phosphorus pentafluoride, vinyl chloride	■ Use and storage of materials for which the lethal dose is less than a teaspoon (LD50 less than 50mg per kilogram). *Examples:* sodium cyanide, osmium tetroxide, sodium azide, heptafluorobutyric acid	■ Locations where an individual could receive a harmful exposure to radiation unless appropriate precautions are followed. *Example:* use of sealed sources that contain curie amounts of radioactive material.	■ Use of large quantities or use in new or original procedures that do not have a history of predictable results.
	 **POISON GAS**	 **POISON**	 **IONIZING RADIATION**	 **WATER REACTIVE**