Hazardous Chemicals, Medical Gas Safety, and Personal Protective Equipment

Container Labels

Information about chemicals on product labels
When on the job, workers may be required to work with different chemicals that could cause injury if not used properly.

These are examples of products that contain harmful chemicals:

- Paint
- Cleaners
- Disinfectants
- Pesticides
- Printer cartridges
- Bleach
- Toners
- Computer supplies
- Anesthetic gases

You have the right to know about the different chemicals that you come in contact with and how to safely handle them. Much of this "right to know" information is available on the label of the product.

General safety precautions when working with chemicals
There are so many different chemicals used in a hospital, it is very difficult to remember how to deal with each one. However, there are some general safety precautions you can take, when it is appropriate:

- Wear gloves.
- Work in a well-ventilated area.
- Wear eye protection.
- Do not mix chemicals.
- Exercise caution when working with combustible or flammable materials.
- Wear a mask to protect from fumes.

Always protect yourself when working with chemicals. As the saying goes, 'It is better to be SAFE than SORRY.'

Labeling

All products and solutions are labeled - some of the following categories are listed on container labels:

- NAME of the product
- LIST of the chemical ingredients, unless it is a trade secret
- NAME of the manufacturer
- DIRECTIONS for using the product
- HARMFUL EFFECTS of the product
• PRECAUTIONS to take when using the product, including special clothing such as mask or gloves
• FIRST AID procedures if accidental exposure occurs
• CLEAN-UP procedures if the product spills
• STORAGE procedures

All labels must be readable. If a label gets torn or otherwise cannot be read, it has to be replaced immediately.

Before you use any kind of chemical product, **read the label.** That is your best protection.

**Universal symbols that are used on labels**

Labels on products have symbols that tell you how dangerous the product is to use. Many manufacturers have adopted the symbol of the National Fire Protection Association (NFPA) for quick identification of the hazards involved in using a product. The NFPA's symbol is a diamond and, if you are using a product labeled with the NFPA diamond, you need to know what it means.

The NFPA diamond consists of four smaller diamonds. Each of the smaller diamonds is a different color. Each color tells you about a different risk factor:

- Blue diamond: health risk
- Red diamond: flammability risk
- Yellow diamond: chemical reactivity risk
- White diamond: special considerations
In each colored diamond is a number 0 - 4. This number is a rating for how high your risk is when you use the product. The LARGER the number, the GREATER the risk:

0 = Minimal risk
1 = Slight risk
2 = Moderate risk
3 = Severe risk
4 = Extreme risk

**Health (Blue):**
0 = No unusual hazard
1 = May be irritating (caution)
2 = May be harmful if inhaled or absorbed (caution)
3 = Corrosive or toxic - avoid skin contact or inhalation (warning)
4 = May be fatal on short exposure - specialized protective equipment required (danger)

**Flammability (Red):**
0 = Not combustible
1 = Combustible if heated
2 = Combustible liquid with flash point of 100 to 200 F (caution)
3 = Flammable liquid with flash point below 100 F (warning)
4 = Flammable gas or extremely flammable liquid (danger)

**Reactivity (Yellow):**
0 = Not reactive when mixed with water
1 = May react if heated or mixed with water, but not violently (caution)
2 = Unstable and may react violently if mixed with water (warning)
3 = May be explosive if shocked, heated under confinement, or mixed with water (danger)
4 = Explosive material at room temperature (danger)

Special Notice (White):
W = Water reactive
Oxy = Oxidizing agent
- = No special hazard

There may also be some specific words on the label to warn you of potential problems:

- CAUTION means there is some hazard involved when using the product, but the potential is not great.
- WARNING means that there is a moderate potential hazard present when using the product.
- DANGER means that there is a serious potential hazard present when using the product.

If you have any questions about using a particular chemical or solution, ask your supervisor.

New OSHA Labeling Requirements Effective June 1, 2015
(Content in this section will not appear in the exam.)

In 2012, OSHA adopted new requirements for manufacturers when labeling hazardous products. Compliance with these standards is voluntary until June 1, 2015.

Label requirements now include:

- Name, Address, and Telephone Number
- Product Identifier
- Signal Word
- Hazard Statement(s)
- Precautionary Statement(s)
- Pictogram(s)
Name, Address, and Telephone Number
This is information about the manufacturer, importer, or other responsible party.

Product Identifier
This is how the product is identified how the hazardous chemical is identified. This can be (but is not limited to) the chemical name, code number or batch number. The manufacturer, importer or distributor can decide the appropriate product identifier. The same product identifier must be both on the label and in section 1 of the SDS (See below in section titled New Safety Data Sheets—SDS Effective June 1, 2015).

Signal Word
Signal Words alert the reader to a potential hazard on the label. There are only two words used as signal words, "Danger" and "Warning." Within a specific hazard class, "Danger" is used for the more severe hazards and "Warning" is used for the less severe hazards. There will only be one signal word on the label no matter how many hazards a chemical may have. If one of the hazards warrants a "Danger" signal word and another warrants the signal word "Warning," then only "Danger" should appear on the label.

Hazard Statement(s)
Hazard Statement(s) describe the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard. For example: "Causes damage to kidneys through prolonged or repeated exposure when absorbed through the skin." All of the applicable hazard statements must appear on the label. Hazard statements may be combined where appropriate to reduce redundancies and improve readability. The hazard statements are specific to the hazard classification categories, and chemical users should always see the same statement for the same hazards no matter what the chemical is or who produces it.

Precautionary Statement(s)
Precautionary Statements describe recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to the hazardous chemical or improper storage or handling. There are four types of precautionary statements: prevention (to minimize exposure); response (in case of accidental spillage or exposure emergency response, and first-aid); storage; and disposal. For example, a chemical presenting a specific target organ toxicity (repeated exposure) hazard would include the following on the label: "Do not breathe dust/fume/gas/mist/vapors/spray. Get medical advice/attention if you feel unwell.

Warnings
Harmful if swallowed.
Wash hands and face thoroughly after handling. Do not eat, drink or smoke when using this product. Dispose of contents/container in accordance with local, state and federal regulations.

First aid:
If swallowed: Call a doctor if you feel unwell. Rinse mouth.

GHS Example Company, 123 Global Circle, Anyville, NY 130XX
Telephone (888) 888-8888
Dispose of contents/container in accordance with local/regional/national and international regulations.”

Pictogram(s)
Pictograms are graphic symbols used to communicate specific information about the hazards of a chemical. On hazardous chemicals being shipped or transported from a manufacturer, importer or distributor, the required pictograms consist of a red square frame set at a point with a black hazard symbol on a white background, sufficiently wide to be clearly visible. A square red frame set at a point without a hazard symbol is not a pictogram and is not permitted on the label.

![Pictograms](image)

Material Safety Data Sheets (MSDS)

**What is an MSDS?**
When on the job, workers may be required to work with different chemicals that could cause injury if not used properly.

These are examples of products that contain harmful chemicals:

- Paint
- Cleaners
- Disinfectants
You have the right to know about the different chemicals you come in contact with and how to handle them safely. All of this "right to know" information is available on the Material Safety Data Sheet, or "MSDS."

> An MSDS is a separate document that comes with every chemical-containing product that you use on the job. The MSDS lists information about the chemical, like how to handle the chemical safely and what to do if it spills. The MSDS gives more detailed information than would fit on the label of the product.

The MSDS for each chemical solution that you might use on the job has to be easily available to you while you are working. If you do not know where the Material Safety Data Sheets are kept, ask your supervisor.

**Information on an MSDS**

While the MSDS format for different products may differ, they all must contain the following information:

**Product identification:**
- Name of the manufacturer
- Emergency number for any questions
- Chemical formula of the product, unless it is a trade secret

**Hazardous ingredients of mixture:**
- Hazardous chemicals by percent contained in the product
- Carcinogens
- Exposure limits which must be followed

**Physical data:**
- Physical properties of the substance
- Specific gravity
- Boiling point (at which a liquid becomes a vapor)
- Melting point (at which a solid becomes a liquid)
- Appearance
- Odor
- Other pertinent information

**Fire and explosion hazard data:**
- How flammable a substance is
- Under what circumstances it might cause a fire or explode
- Fire fighting information
- Hazardous conditions that could be present if substances ignites

**Health hazard data:**
Medical signs and symptoms that could occur during normal exposure
Medical signs and symptoms that could occur during overexposure
How to distinguish between short-term and long-term exposure to the product

Emergency and first aid procedures:

- Procedures to follow based upon the toxicity and type of exposure that occurs

Reactivity data:

- How product needs to be stored and under what conditions it becomes unstable (decomposes or disintegrates leading to a risk of fire or explosion)
- List of chemicals that are unsafe to combine with the substance
- Hazardous chemicals that could be released if the product is burned
- Conditions that could cause the substance to explode

Spill, leak, and exposure procedures:

- How to clean up the substance if it should spill or leak
- How to dispose of the product safely

PPE (Personal Protection Equipment):

- Special clothing to be worn when using the substance - for example, goggles, gloves, respirator (breathing) equipment, masks, or gowns

Sometimes the PPE listed are needed only when the worker is exposed to large quantities of the substance and not during normal use. This section needs to be read carefully.

When dealing with products that contain chemicals, read through the MSDS to be sure you are appropriately handling them.

**How to get particular information from an MSDS**

When reading an MSDS, it is best to read the entire sheet to become familiar with the chemical information. But what if you need specific information to do your job right now?

To quickly find the exact information you need on an MSDS, think through the situation you are in and determine what are the most important things you need to know.

For example, these are some common situations when you might need to read an MSDS:

- A substance has spilled or leaked.
- You are a new employee.
- Someone is feeling ill around a substance.

For each situation, you would need some very specific information in order to safely deal with a chemical.

**Substance has spilled or leaked**

If something has spilled or is leaking, you need to know how to clean it up safely. **DO NOT ASSUME** you know what to do or make guesses about how to do it.

Read the following sections on the MSDS:
Cross Country University’s Caregiver Safety Series

- Spills and leaks
- PPE (personal protection equipment)
- Health hazard sections

New employee
If you are a new employee, and your job involves the use of chemicals, you should be familiar with the type of information contained in an MSDS. You need to know general information about common chemicals, and you should read the entire MSDS for each product you use routinely.

Someone is feeling ill around a substance
If you or someone nearby is suddenly feeling ill - nauseous, lightheaded, warm, flushed - you need to know health information.
Read the following sections on the MSDS:

- Health hazard data
- Emergency and first aid procedures

There are many other reasons you may need to read the Material Safety Data Sheets in your daily work life. Think of a few now and decide where on the MSDS you should read first for the most helpful information.

Each MSDS provides a lot of information, too much to read through if you are in a hurry. Prioritize exactly what you need, and then locate that content on the MSDS.

Using this method will narrow down the amount of information you have to read, and you will more easily get what you need.

New Safety Data Sheets—SDS Effective June 1, 2015
(Formerly Material Safety Data Sheets)
(Content in this section will not appear in the exam.)

What is an SDS?
The Hazard Communication Standard (HCS) requires chemical manufacturers, distributors, or importers to provide Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets or MSDSs) to communicate the hazards of hazardous chemical products. As of June 1, 2015, the HCS will require new SDSs to be in a uniform format, and include the section numbers, the headings, and associated information under the headings below:

When on the job, workers may be required to work with different chemicals that could cause injury if not used properly.

These are examples of products that contain harmful chemicals:

- Paint
- Cleaners
- Disinfectants
- Pesticides
- Printer cartridges
- Bleach
- Toners
You have the right to know about the different chemicals you come in contact with and how to handle them safely. All of this "right to know" information is available on the Safety Data Sheet, or "SDS."

SDS is a separate document that comes with every chemical-containing product that you use on the job. The MSDS lists information about the chemical, like how to handle the chemical safely and what to do if it spills. The MSDS gives more detailed information than would fit on the label of the product.

The SDS for each chemical solution that you might use on the job has to be easily available to you while you are working. If you do not know where the Safety Data Sheets are kept, ask your supervisor.

Information on an SDS
While the SDS format for different products may differ, they all must contain the following information:

Section 1: Identification
This section identifies the chemical on the SDS as well as the recommended uses. It also provides the essential contact information of the supplier. The required information consists of:

- Product identifier used on the label and any other common names or synonyms by which the substance is known.
- Name, address, phone number of the manufacturer, importer, or other responsible party, and emergency phone number.
- Recommended use of the chemical (e.g., a brief description of what it actually does, such as flame retardant) and any restrictions on use (including recommendations given by the supplier).

Section 2: Hazard(s) Identification
This section identifies the hazards of the chemical presented on the SDS and the appropriate warning information associated with those hazards. The required information consists of:

- The hazard classification of the chemical (e.g., flammable liquid, category 1).
- Signal word.
- Hazard statement(s).
- Pictograms (the pictograms or hazard symbols may be presented as graphical reproductions of the symbols in black and white or be a description of the name of the symbol (e.g., skull and crossbones, flame).
- Precautionary statement(s).
- Description of any hazards not otherwise classified.
- For a mixture that contains an ingredient(s) with unknown toxicity, a statement describing how much (percentage) of the mixture consists of ingredient(s) with unknown acute toxicity. Please note that this is a total percentage of the mixture and not tied to the individual ingredient(s).

Section 3: Composition/Information on Ingredients
This section identifies the ingredient(s) contained in the product indicated on the SDS, including impurities and stabilizing additives. This section includes information on substances,
mixtures, and all chemicals where a trade secret is claimed. The required information consists of:

Substances

- Chemical name.
- Common name and synonyms.
- Chemical Abstracts Service (CAS) number and other unique identifiers.
- Impurities and stabilizing additives, which are themselves classified and which contribute to the classification of the chemical.

Mixtures

- Same information required for substances.
- The chemical name and concentration (i.e., exact percentage) of all ingredients which are classified as health hazards and are:
  - Present above their cut-off/concentration limits or
  - Present a health risk below the cut-off/concentration limits.
- The concentration (exact percentages) of each ingredient must be specified except concentration ranges may be used in the following situations:
  - A trade secret claim is made,
  - There is batch-to-batch variation, or
  - The SDS is used for a group of substantially similar mixtures.
- Chemicals where a trade secret is claimed
  - A statement that the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret is required.

Section 4: First-Aid Measures

This section describes the initial care that should be given by untrained responders to an individual who has been exposed to the chemical. The required information consists of:

- Necessary first-aid instructions by relevant routes of exposure (inhalation, skin and eye contact, and ingestion).
- Description of the most important symptoms or effects, and any symptoms that are acute or delayed.
- Recommendations for immediate medical care and special treatment needed, when necessary.

Section 5: Fire-Fighting Measures

This section provides recommendations for fighting a fire caused by the chemical. The required information consists of:

- Recommendations of suitable extinguishing equipment, and information about extinguishing equipment that is not appropriate for a particular situation.
- Advice on specific hazards that develop from the chemical during the fire, such as any hazardous combustion products created when the chemical burns.
- Recommendations on special protective equipment or precautions for firefighters.

Section 6: Accidental Release Measures

This section provides recommendations on the appropriate response to spills, leaks, or releases, including containment and cleanup practices to prevent or minimize exposure to people, properties, or the environment. It may also include recommendations distinguishing
between responses for large and small spills where the spill volume has a significant impact on the hazard. The required information may consist of recommendations for:

- Use of personal precautions (such as removal of ignition sources or providing sufficient ventilation) and protective equipment to prevent the contamination of skin, eyes, and clothing.
- Emergency procedures, including instructions for evacuations, consulting experts when needed, and appropriate protective clothing.
- Methods and materials used for containment (e.g., covering the drains and capping procedures).
- Cleanup procedures (e.g., appropriate techniques for neutralization, decontamination, cleaning or vacuuming; adsorbent materials; and/or equipment required for containment/clean up).

Section 7: Handling and Storage

- This section provides guidance on the safe handling practices and conditions for safe storage of chemicals. The required information consists of:
  - Precautions for safe handling, including recommendations for handling incompatible chemicals, minimizing the release of the chemical into the environment, and providing advice on general hygiene practices (e.g., eating, drinking, and smoking in work areas is prohibited).
  - Recommendations on the conditions for safe storage, including any incompatibilities. Provide advice on specific storage requirements (e.g., ventilation requirements).

Section 8: Exposure Controls/Personal Protection

- This section indicates the exposure limits, engineering controls, and personal protective measures that can be used to minimize worker exposure. The required information consists of:
  - OSHA Permissible Exposure Limits (PELs), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available.
  - Appropriate engineering controls (e.g., use local exhaust ventilation, or use only in an enclosed system).
  - Recommendations for personal protective measures to prevent illness or injury from exposure to chemicals, such as personal protective equipment (PPE) (e.g., appropriate types of eye, face, skin or respiratory protection needed based on hazards and potential exposure).
  - Any special requirements for PPE, protective clothing or respirators (e.g., type of glove material, such as PVC or nitrile rubber gloves; and breakthrough time of the glove material).

Section 9: Physical and Chemical Properties

This section identifies physical and chemical properties associated with the substance or mixture. The minimum required information consists of:

- Appearance (physical state, color, etc.);
- Upper/lower flammability or explosive limits;
- Odor;
- Vapor pressure;
- Odor threshold;
- Vapor density;
- pH;
- Relative density;
- Melting point/freezing point;
- Solubility(ies);
- Initial boiling point and boiling range;
- Flash point;
- Evaporation rate;
- Flammability (solid, gas);
- Upper/lower flammability or explosive limits;
- Vapor pressure;
- Vapor density;
- Relative density;
- Solubility(ies);
- Partition coefficient: n-octanol/water;
- Auto-ignition temperature;
- Decomposition temperature; and
- Viscosity.

The SDS may not contain every item on the above list because information may not be relevant or is not available. When this occurs, a notation to that effect must be made for that chemical property. Manufacturers may also add other relevant properties, such as the dust deflagration index (Kst) for combustible dust, used to evaluate a dust's explosive potential.

Section 10: Stability and Reactivity

This section describes the reactivity hazards of the chemical and the chemical stability information. This section is broken into three parts: reactivity, chemical stability, and other. The required information consists of:

- Reactivity
  - Description of the specific test data for the chemical(s). This data can be for a class or family of the chemical if such data adequately represent the anticipated hazard of the chemical(s), where available.

Chemical stability

- Indication of whether the chemical is stable or unstable under normal ambient temperature and conditions while in storage and being handled.
- Description of any stabilizers that may be needed to maintain chemical stability.
- Indication of any safety issues that may arise should the product change in physical appearance.

Other

- Indication of the possibility of hazardous reactions, including a statement whether the chemical will react or polymerize, which could release excess pressure or heat, or create other hazardous conditions. Also, a description of the conditions under which hazardous reactions may occur.
- List of all conditions that should be avoided (e.g., static discharge, shock, vibrations, or environmental conditions that may lead to hazardous conditions).
- List of all classes of incompatible materials (e.g., classes of chemicals or specific substances) with which the chemical could react to produce a hazardous situation.
- List of any known or anticipated hazardous decomposition products that could be produced because of use, storage, or heating. (Hazardous combustion products should also be included in Section 5 (Fire-Fighting Measures) of the SDS.)

Section 11: Toxicological Information
This section identifies toxicological and health effects information or indicates that such data are not available. The required information consists of:

- Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact). The SDS should indicate if the information is unknown.
- Description of the delayed, immediate, or chronic effects from short- and long-term exposure.
- The numerical measures of toxicity (e.g., acute toxicity estimates such as the LD50 (median lethal dose)) - the estimated amount [of a substance] expected to kill 50% of test animals in a single dose.
- Description of the symptoms. This description includes the symptoms associated with exposure to the chemical including symptoms from the lowest to the most severe exposure.
- Indication of whether the chemical is listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions) or found to be a potential carcinogen by OSHA

Section 12: Ecological Information (non-mandatory)

This section provides information to evaluate the environmental impact of the chemical(s) if it were released to the environment. The information may include:

- Data from toxicity tests performed on aquatic and/or terrestrial organisms, where available (e.g., acute or chronic aquatic toxicity data for fish, algae, crustaceans, and other plants; toxicity data on birds, bees, plants).
- Whether there is a potential for the chemical to persist and degrade in the environment either through biodegradation or other processes, such as oxidation or hydrolysis.
- Results of tests of bioaccumulation potential, making reference to the octanol-water partition coefficient (Kow) and the bioconcentration factor (BCF), where available.
- The potential for a substance to move from the soil to the groundwater (indicate results from adsorption studies or leaching studies).
- Other adverse effects (e.g., environmental fate, ozone layer depletion potential, photochemical ozone creation potential, endocrine disrupting potential, and/or global warming potential).

Section 13: Disposal Considerations (non-mandatory)

This section provides guidance on proper disposal practices, recycling or reclamation of the chemical(s) or its container, and safe handling practices. To minimize exposure, this section should also refer the reader to Section 8 (Exposure Controls/Personal Protection) of the SDS. The information may include:

- Description of appropriate disposal containers to use.
- Recommendations of appropriate disposal methods to employ.
- Description of the physical and chemical properties that may affect disposal activities.
- Language discouraging sewage disposal.
- Any special precautions for landfills or incineration activities

Section 14: Transport Information (non-mandatory)

This section provides guidance on classification information for shipping and transporting of hazardous chemical(s) by road, air, rail, or sea. The information may include:

- UN number (i.e., four-figure identification number of the substance).
UN proper shipping name.
Transport hazard class(es).
Packing group number, if applicable, based on the degree of hazard.
Environmental hazards (e.g., identify if it is a marine pollutant according to the International Maritime Dangerous Goods Code (IMDG Code)).
Guidance on transport in bulk (according to Annex II of MARPOL 73/783 and the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (International Bulk Chemical Code (IBC Code))).
Any special precautions which an employee should be aware of or needs to comply with, in connection with transport or conveyance either within or outside their premises (indicate when information is not available).

Section 15: Regulatory Information (non-mandatory)

- This section identifies the safety, health, and environmental regulations specific for the product that is not indicated anywhere else on the SDS. The information may include:
  - Any national and/or regional regulatory information of the chemical or mixtures (including any OSHA, Department of Transportation, Environmental Protection Agency, or Consumer Product Safety Commission regulations)
  - Sometimes the PPE listed are needed only when the worker is exposed to large quantities of the substance and not during normal use. This section needs to be read carefully.
  - When dealing with products that contain chemicals, read through the SDS to be sure you are appropriately handling them.

Safe Use of Medical Gases

What is a medical gas?

Medical gases are gasses, in any form, prescribed for use with patients. Uses can include inhalation, application, ventilation, inflation of a body cavity, support of extracorporeal circulation, etc.

The most common are, Oxygen, Medical Air, Vacuum, Nitrous Oxide, and Entonox (50/50 Oxygen and Nitrous Oxide). This module is intended for general care areas, so only oxygen safety is addressed here.

The air we breathe is mainly Nitrogen (78%) and Oxygen (21%). Oxygen is highly reactive, though it is not flammable, it supports combustion and will causes other substances to become more highly flammable.

Altering the concentration of gases in a work environment such as a patient room or storage area can seriously affect the health and safety of patients and personnel. Consequences include poisoning, intoxication, asphyxiation, fire, and explosion.

Basic Gas Safety

Oxygen enrichment is a gas hazard that occurs when ambient oxygen exceeds the usual 21%. The gas is colorless and odorless and an excess cannot be detected without monitoring equipment. This hazard increases the risk of fire and explosion; even fire-retardant materials can become flammable in the presence of oxygen. A 4% increase of oxygen concentration in the air doubles the risk of fire, and the higher the concentration, the greater the risk.

Oxygen enrichment is caused by any of the following:

- Leaks from damaged equipment
Poor connections  
Excessive flow rates  
Poor area ventilation

These are common items vulnerable to combustion, especially in an oxygen enriched environment:

- Hair and clothing
- Linens, mattresses, curtains
- Dressings
- Disinfectants
- Hand-rubs and gels
- Paper and cardboard
- Cleaning supplies
- Electrical and electronic equipment

Reduce the risk of fire when using oxygen, nitrous oxide, and Entonox as follows:

- Keep hands and clothes clean and free of oil, grease, and hand rubs and creams
- Use only authorized gas equipment
- Ensure gas equipment such as flowmeters and regulators are inspected and serviced regularly
- Use appropriate flow rates appropriate to the delivery method
- Always turn gases off at the source when not in use
- Store cylinders only in designated areas
- Never store cylinders with flammable materials

Personal Protective Equipment (PPE)

**What is a PPE?**
PPE stands for "Personal Protective Equipment." A PPE is an item you use for safety when working with chemicals.

These are some examples of PPEs:

- Utility gloves
- Safety glasses
- Goggles
- Gowns
- Ventilators
- Masks
You work with a lot of chemicals every day. It is important to know how to safely handle them. These are some examples of hazardous chemicals you may use:

- Paint thinner
- Ethylene oxide
- Some chemotherapy drugs
- Pesticides
- Certain cleaning solutions, especially hazardous if undiluted

Whenever you are around hazardous chemicals, be sure to use the appropriate PPEs to keep you safe.

**Which PPEs are appropriate in different situations**
PPEs are listed on the MSDS (Material Safety Data Sheet) for all the chemicals you work with. The PPEs necessary for each substance are determined by the ways the substance can harm you.

There are three ways that a chemical substance may harm you:

- Breathing the chemical
- Having physical contact with the chemical
- Swallowing the chemical

**Breathing the chemical**
The chemical may have toxic fumes that can injure your lungs if you breathe them. For example, cleaning materials, especially bleach, are toxic when inhaled.

Appropriate PPEs for toxic fumes may include:

- Special mask
- Ventilator
In addition, always use these products in a well-ventilated area. If you begin to feel dizzy or weak or have difficulty breathing when using a product, you need to leave the area immediately.

**Having physical contact with the chemical**
The chemical may injure any part of the body that comes in contact with it. Your eyes are in danger from liquid splashing into them. Any exposed skin is also at risk.

Appropriate PPEs to prevent physical contact may include:

- Goggles, safety glasses, or other eye protection
- Gown
- Gloves
- Mask

In addition, flushing with water is usually the most immediate treatment for any accidental splashing of solutions in your eyes or on your skin.

**Swallowing the chemical**
Some chemicals are dangerous if swallowed. To prevent swallowing a solution that may have splashed on your fingers, always wash your hands thoroughly after coming in contact with anything that should not be swallowed.

Appropriate PPEs to prevent swallowing may include:

- Mask (that covers your nose and mouth to prevent the solution from being splashed onto your lips)
- Gloves (to protect against hand to mouth transfer).

In addition, if you should accidentally swallow a harmful chemical, tell your supervisor immediately. You will probably be sent to the Employee Health Nurse or to your Emergency Department.

To prevent dangerous exposure in the first place, be sure to read the MSDS and use the appropriate PPEs listed. If exposure does occur, you need to tell your supervisor and get further treatment.

**What to do if a chemical spills**
Some chemical solutions can be dangerous if they are spilled. They may give off dangerous fumes, or they may be toxic if they come in contact with skin.

Any time that a potentially toxic solution is spilled, you should do two things:

1. Remove everyone from the area.
2. Read the MSDS for the solution before trying to clean the spill up.

If you decide that you CAN safely clean up the spill, determine which PPEs to use. It may require some special equipment and PPEs to clean it up safely.

If you CANNOT safely clean it up, you should immediately call your safety officer or the Environmental Services Department. Always notify your supervisor as well.

End of Hazardous Chemicals Lesson