HealthStream Regulatory Script

[Hazard Communication]

Version: [11.18.04]

Lesson 1: Introduction
Lesson 2: Hazardous Materials
Lesson 2: Material Safety Data Sheets
Lesson 3: Labeling of Hazardous Chemicals
Lesson 4: Personal Protective Equipment
Welcome to the introductory lesson on hazard communication.

Under its Hazard Communication Standard (HCS), the Occupational Safety and Health Administration (OSHA) requires all employers to develop written hazard communication programs.

These programs must address hazard-related issues such as employee training, chemical warning labels, and material safety data sheets.
### Course Rationale

The primary goal of the Hazard Communication Standard (HCS) is to help ensure the safety of employees who work with hazardous materials.

This course has been designed to aid in ensuring the safety of hospital employees by:

- Describing the measures that must be taken to safeguard against exposure to hazardous materials
- Emphasizing how hazard communication relates to each employee and his or her personal safety
After completing this course, you should be able to:

- Define hazardous materials, including how and why certain materials are considered hazardous.
- Explain what a material safety data sheet (MSDS) is, and how to read an MSDS.
- Recall the general requirements for chemical container labels.
- Recognize sections of a chemical container label and how to read each section.
- Explain the importance of using personal protective equipment (PPE).
Course Outline

<table>
<thead>
<tr>
<th>Lesson 2: Hazard Communication</th>
<th>Lesson 3: MSDS's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Places hazard communication in the context of hazardous materials. You will learn basic information about hazardous materials and how they can harm you.</td>
<td>Discusses material safety data sheets (MSDS's). You will learn what an MSDS is, what OSHA requires of manufacturers and employers with regard to MSDS's, and how to read an MSDS.</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Lesson 4: Labeling</th>
<th>Lesson 5: PPE</th>
</tr>
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<tbody>
<tr>
<td>Covers labeling of hazardous materials. You will learn about OSHA-mandated requirements and responsibilities related to container labels. You also will learn how to read a container label.</td>
<td>Discusses personal protective equipment (PPE). You will learn about OSHA requirements related to PPE. You also will learn about different types of PPE used during work with hazardous chemicals.</td>
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**FLASH ANIMATION: 1004.SWF/FLA**
<table>
<thead>
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<tr>
<td>Welcome to the lesson on hazardous materials.</td>
</tr>
<tr>
<td>This lesson discusses what makes a chemical hazardous, gives examples of hazardous chemicals, and describes routes of exposure to the three forms of hazardous chemicals.</td>
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<tr>
<td>FLASH ANIMATION: 2001.SWF/FLA</td>
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</tbody>
</table>
### 2002 Objectives

After completing this lesson, you should be able to:

- Define and distinguish between physical and health hazards of chemicals, and list examples of each.
- Recall potential routes of exposure to hazardous chemicals.
- List the three different forms of hazardous chemical.
A chemical is considered hazardous if that chemical is likely to cause harm.

Chemicals can have two types of hazards:

- **Physical hazards**
- **Health hazards**

Click on each type of hazard to learn more.

**Physical hazards** are related to the way that a chemical interacts with other substances or the environment. A chemical that is physically hazardous can harm you by:

- Exploding
- Igniting
- Reacting violently with other substances

**Health hazards** are related to the way that a chemical interacts with your body. If you are exposed to a chemical hazardous to human health, you could suffer:

- Death
- Long-term damage
- Short-term injury or illness
Examples of chemicals that are physical hazards include:

- Trinitrotoluene
- Compressed gas in a cylinder
- Isopropanol and other alcohols

Click on each example to reveal more information.
Examples of chemicals that are health hazards include:

- **Lead**: Exposure to lead can cause mental retardation in children.
- **Mercury**: This chemical can cause brain damage, as well as damage to other parts of the body.
- **Formalin**: Used as a fixative, ten percent formalin is a carcinogen and severe eye and skin irritant. It can cause instant and irreversible lung damage; dry, flaky skin; and/or allergic reactions.
- **Glutaraldehyde**: Used to disinfect and clean heat-sensitive equipment such as surgical instruments and endoscopes, glutaraldehyde can cause throat and lung irritation, asthma-like symptoms and breathing difficulty, nose irritation and bleeding, headache, nausea, skin and eye irritation and other allergic reactions.
To be harmed by a chemical that is a health hazard, you must be exposed to the chemical.

Exposure can occur in any of a number of ways. Routes of exposure include:

- **Eyes**
- **Skin**
- **Inhalation**
- **Ingestion**
- **Injection**

Click on each route of exposure to learn more.

<table>
<thead>
<tr>
<th>CLICK TO REVEAL</th>
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<tbody>
<tr>
<td><strong>Eyes</strong></td>
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<tr>
<td>Many chemicals can burn or irritate the eyes. In some cases, chemicals can be absorbed through the eyes (or other mucous membranes) and enter the bloodstream.</td>
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</tbody>
</table>

**Skin**:
Some chemicals can burn the skin. Other chemicals can pass through the skin and enter the bloodstream.

**Inhalation**:
The most common type of exposure to toxic chemicals occurs when chemicals are breathed into the lungs. Depending on the nature of the chemical, inhaled chemicals can:

- Irritate the nose or throat.
- Damage the lungs.
- Enter the bloodstream through the lungs.

**Ingestion**:
You may ingest hazardous chemicals if you handle chemicals while:

- Smoking
- Eating
- Drinking

It is never safe to eat, drink, or smoke near hazardous chemicals. Always wash your hands after working with hazardous chemicals and before eating, drinking, or smoking.

**Injection**:
Injection of hazardous chemicals may occur if you are cut with a tool, instrument, or needle that has been contaminated with a chemical.
When exposure occurs, toxic chemicals can have local and/or systemic health effects.

A local effect occurs when the chemical causes damage at the point where it first contacts the body, for example:

- Eyes
- Skin
- Nose

A systemic effect occurs when the chemical enters the bloodstream (via the skin, eyes, lungs, ingestion, or injection) and travels throughout the body. The organs most commonly harmed by chemicals with systemic health effects include:

- Liver
- Kidneys
- Heart
- Brain
- Reproductive organs
Forms of Hazardous Chemicals

When you think of hazardous chemicals, you may think of liquid solvents and other liquid products.

In fact, hazardous chemicals come in the forms of:

- Solid
- Liquid
- Gas

Let’s take a closer look at each.
Hazardous Chemicals: Solid

Solids are not usually hazardous, as solid materials are not readily absorbed into the body. Certain form of solids, however, can be highly hazardous. These include:

- **Hazardous dust**
- **Hazardous fume**
- **Hazardous fibers**

Click on each type of solid to learn more.

**Dust**
Dust consists of very small solid particles, suspended in the air. Hazardous dust is created when certain solids are pulverized, or certain powders (settled dust) become airborne. Dust can:

- Be inhaled.
- Enter the bloodstream through the lungs.
- Explode or react violently with other substances, if the dust material is combustible or unstable.

An example of hazardous dust is silica, which can cause the disease silicosis.

**Fume**
Fume consists of very small, fine solid particles, suspended in the air. Fume is created when solid chemicals (often metals) are heated to very high temperatures, evaporate to the gaseous state, then re-solidify. Fume is easily inhaled, and metal fumes can be highly toxic.

An example of hazardous fume is lead oxide, which can be produced during soldering.

**Fiber**
A fiber is long, thin solid particle. Small fibers can be inhaled. Very small fibers can lodge in the lungs and cause damage.

An example of hazardous fiber is asbestos.
### Hazardous Chemicals: Liquid

Many hazardous chemicals are in liquid form at normal temperatures and pressures. Hazardous liquids may:

- Damage the skin.
- Enter the body through the skin.
- Evaporate, forming toxic gases that can be inhaled.

#### Mists

A mist consists of liquid particles produced by agitating or spraying a liquid. Mists can be hazardous if inhaled or sprayed on the skin.
Gases can be:

- Flammable
- Explosive
- Toxic

Hazardous gases also can be difficult to detect, as many gases do not have a distinctive color or odor.

**Vapor**

Vapor is the gaseous form of a substance that is primarily a liquid at normal temperatures and pressures, but evaporates readily.

For example, alcohol is a liquid at room temperature, but evaporates rapidly to form vapors.

Vapors can:

- Be inhaled.
- Irritate the eyes, skin, or respiratory tract.
- Be flammable, explosive, and/or toxic.
Regarding the physical hazards of chemicals, all of the following are true EXCEPT:

- a. An example of a material with physical hazards is TNT.
- b. **Only materials in a solid form can have physical hazards.**
- c. Physical hazards are related to the way in which a chemical interacts with other substances or the environment.
- d. A chemical with physical hazards can harm you by exploding, igniting, or reacting violently with other substances.

**MULTIPLE CHOICE INTERACTION**

Correct answer: B

Feedback for A: Incorrect. A, C, and D all are true. The correct answer is B. Solids, liquids, and gases all can have physical hazards. For examples, TNT (a solid) can explode. Alcohol (a liquid) can ignite. Containers containing compressed gas can rupture and take off like torpedoes.

Feedback for B: Correct. Solids, liquids, and gases all can have physical hazards. For examples, TNT (a solid) can explode. Alcohol (a liquid) can ignite. Containers containing compressed gas can rupture and take off like torpedoes.

Feedback for C: Incorrect. A, C, and D all are true. The correct answer is B. Solids, liquids, and gases all can have physical hazards. For examples, TNT (a solid) can explode. Alcohol (a liquid) can ignite. Containers containing compressed gas can rupture and take off like torpedoes.

Feedback for D: Incorrect. A, C, and D all are true. The correct answer is B. Solids, liquids, and gases all can have physical hazards. For examples, TNT (a solid) can explode. Alcohol (a liquid) can ignite. Containers containing compressed gas can rupture and take off like torpedoes.
Which of the following is (are) true?

a. It is safe to smoke while working with hazardous chemicals, as long as you wear gloves.
b. It is safe to smoke around hazardous chemicals, as long as the chemicals are not flammable.
c. It is safe to smoke around hazardous chemicals, as long as you are careful to extinguish the cigarette butt appropriately.
d. A, B, and C all are true.
e. None of these is true.

MULTIPLE CHOICE INTERACTION

Correct answer: E

Feedback for A: Incorrect. It is NEVER safe to eat, drink, or smoke around hazardous chemicals.

Feedback for B: Incorrect. It is NEVER safe to eat, drink, or smoke around hazardous chemicals.

Feedback for C: Incorrect. It is NEVER safe to eat, drink, or smoke around hazardous chemicals.

Feedback for D: Incorrect. It is NEVER safe to eat, drink, or smoke around hazardous chemicals.

Feedback for E: Correct. It is NEVER safe to eat, drink, or smoke around hazardous chemicals.
You have completed the lesson on hazardous materials.

Remember:

- Chemicals can have physical and/or health hazards.
- Physical hazards are related to the way in which a chemical interacts with other substances or the environment. A chemical with physical hazards can harm you by exploding, igniting, or reacting violently with other substances.
- Examples of chemicals with physical hazards include TNT, compressed gas, and alcohol.
- Health hazards are related to the way in which a chemical interacts with your body. If you are exposed to a chemical with health hazards, you could suffer death, long-term damage, or short-term injury or illness.
- Examples of chemicals with health hazards include lead, mercury, formalin, and glutaraldehyde.
Remember:

- Routes of exposure to hazardous chemicals include the eyes, the skin, inhalation, ingestion, and injection.
- Toxic chemicals can have local or systemic health effects.
- Hazardous chemicals may be solids, liquids, or gases.
- Solids are not usually hazardous. Dust, fume, and fibers, however, can be highly hazardous, depending on the material.
- Many hazardous chemicals are in liquid form at normal temperatures and pressures. Hazardous liquids can damage the skin; enter the body through the skin; and/or evaporate, forming toxic gases that can be inhaled.
- Gases can be flammable, explosive, and/or toxic.
Welcome to the lesson on material safety data sheets (MSDS’s).

This lesson covers the material safety data sheet, including related responsibilities of the manufacturer, the healthcare employer, and the healthcare employee. Sections of the MSDS will be examined to help you better understand the MSDS’s that you may encounter in the workplace.

FLASH ANIMATION: 3001.SWF/FLA
<table>
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<th>Objectives</th>
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<td><strong>After completing this lesson, you should be able to:</strong></td>
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</tbody>
</table>
| - Describe the responsibilities of the following groups of people with regard to MSDS’s:  
  - Manufacturers and distributors of hazardous chemicals  
  - Employers  
  - Employees  
- Read an MSDS and understand its contents.  
- Recall the importance of following all storage and use instructions contained in an MSDS. |
The Hazard Communication Standard (HCS) requires that all manufacturers of hazardous materials determine the specific physical and health hazards of their products.

The manufacturer then must record all relevant hazard information for each product in the form of a material safety data sheet (MSDS).

Finally, the manufacturer (or distributor) is responsible for providing the relevant MSDS to all purchasers of hazardous products.
Under the HCS, your healthcare facility is responsible for compiling a list of all hazardous chemicals to which workers in the facility might be exposed.

Each of the chemicals on the list must have a corresponding MSDS. In other words, your employer also is responsible for compiling a file of MSDS’s.

This file must be readily available to all workers in their work areas at all times during their work shifts.
All employees must know how to obtain information on any chemical they use.

You should know:

- Which hazardous chemicals are used in your work area
- Where MSDS's are located on your unit
- How to read an MSDS

Under the HCS, your employer is responsible for training you at the time you are assigned to work with any hazardous chemical. This training should consist of more than directing you to the appropriate MSDS's.

Nevertheless, you are responsible for reading all relevant MSDS's before starting a job that may require the use of a hazardous chemical.
To help simplify your reading of MSDS’s, note that the information is divided into sections:

- Product identification
- Hazardous ingredients
- Physical data
- Fire and explosion hazard data
- Health hazard data
- Emergency and first aid procedures
- Reactivity data
- Spill, leak, and disposal procedures
- Personal protection information

Let’s take a closer look at each section.
The Product Identification section of the MSDS contains general information such as the:

- Brand name of the product
- Chemical name of the product
- Chemical formula of the product, if applicable
- Name and address of the product manufacturer
- Emergency phone number for questions regarding product toxicity and other hazards
This section lists the hazardous chemicals present in the product.

Exposure limits [link to glossary] for each chemical also are listed, if applicable.
This section lists physical properties of the product, such as:

- Boiling point
- Melting point
- Appearance and odor
This section of the MSDS provides information regarding flammability of the product, and how to fight fires involving the product.

Information includes:

- Flashpoint
- Auto-ignition temperature
- Extinguishing media
- Fire-fighting procedures
- Fire or explosion hazards

Click on each item to learn more.

**Flashpoint**: lowest temperature at which this product gives off enough vapor to ignite, if an ignition source (spark or flame) is present

**Auto-ignition temperature**: temperature at which this product will ignite without a source of ignition

**Extinguishing media**: appropriate materials for extinguishing a fire involving this product. To fight a fire involving this product, be certain to choose the appropriate extinguisher, based on the approved list of extinguishing media.

**Fire or explosion hazards**: conditions that may cause this product to explode or ignite. Be certain to avoid these conditions. And never smoke in areas where chemicals may be present. A match, lighter, or cigarette could set off an explosion or start a fire.

**Fire-fighting procedures**: any special instructions, equipment, or methods for limiting hazards during a fire involving this product. Be certain to follow these instructions in the event of a fire.
The Health Hazard section lists signs and symptoms of:

- Normal exposure to the product
- Overexposure to the product

This section also may contain information about toxicity, most often based on animal studies.
In this section of the MSDS, first aid procedures are given, based on route of exposure:

- Eyes
- Skin
- Inhalation
- Ingestion
- Injection
The reactivity data section provides information regarding the product's stability, as well as any special storage or use instructions. **Be certain to follow these instructions.**

Specific information in this section includes:

- **Stability**
- **Incompatibility**
- **Hazardous decomposition products**
- **Hazardous polymerization**

Click on each item to learn more.

**Stability:** If the product is marked as unstable, it may react spontaneously under normal conditions (normal temperature, pressure, and mechanical shocks), potentially causing a fire or explosion. A list of conditions to avoid may be provided. **Do not expose the product to any of these conditions.**

**Incompatibility:** Certain materials may be considered incompatible with this product, because, when mixed with the product, these materials create hazardous conditions. **Do not store this product with any materials listed as incompatible.**

**Hazardous decomposition [link to glossary] products:** These are chemical substances created when the product decomposes or burns.

**Hazardous polymerization [link to glossary]:** If hazardous polymerization is indicated, this product may polymerize rapidly, creating enough heat to cause its container to explode. A list of conditions to avoid may be provided. **Do not expose the product to any of these conditions.**
This section of the MSDS provides:

- General procedures, precautions, and methods for cleanup of spills
- Appropriate waste disposal methods

Always follow instructions for appropriate disposal methods.

### Hazardous Chemical Spills

Chemical spills can be serious in nature and **MUST** be reported immediately!

Contact the appropriate person and report:

- Name of the spilled chemical
- Location of the spill
- Quantity of material spilled

Cleanup may require the assistance of the safety team, chemical spill team, or hazmat team.
This section provides general information about the personal protective equipment (PPE) and ventilation required to handle the product safely.

Proper ventilation helps to protect against inhalation hazards. Ventilation requirements may include the use of a fume hood. **Never ignore the requirement to work under a hood.**

A hood is designed to prevent inhalation hazards by:

- Removing hazardous vapors from the source
- Not allowing the release of vapors into the environment
- Venting vapors safely

Use of PPE (respiratory, eye, and skin protection) will be discussed further in lesson 5.
FLASH INTERACTION: 3016.SWF/FLA

Manufacturers, employers, and employees all have responsibilities related to material safety data sheets. Drag and drop responsibilities from the word bank to complete the table of responsibilities below.

<table>
<thead>
<tr>
<th>Manufacturer Responsibilities</th>
<th>Employer Responsibilities</th>
<th>Employee Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine the physical and health hazards of products.</td>
<td>Compile a list of all hazardous chemicals used in a facility.</td>
<td>Know where MSDS’s are located.</td>
</tr>
<tr>
<td>Develop MSDS’s for all hazardous products.</td>
<td>Acquire and maintain a file of MSDS’s for all hazardous chemicals used in a facility.</td>
<td>Know how to read an MSDS.</td>
</tr>
<tr>
<td>Distribute MSDS’s to purchasers.</td>
<td>Ensure that appropriate MSDS’s are readily available to workers.</td>
<td>Follow MSDS instructions for chemical use and storage.</td>
</tr>
</tbody>
</table>
The information in the Fire and Explosion Hazard section of an MSDS is only useful to professional firefighters, after a fire involving the material has broken out.

a. True  
b. False

**TRUE / FALSE INTERACTION**

Correct answer: B

Feedback for A: Incorrect. The information in this section of an MSDS contains important information for all users of the material. As a user, be careful to avoid any conditions listed as fire or explosion hazards. If a fire should break out, be sure to use the recommended extinguishing agent.

Feedback for A: Correct. The information in this section of an MSDS contains important information for all users of the material. As a user, be careful to avoid any conditions listed as fire or explosion hazards. If a fire should break out, be sure to use the recommended extinguishing agent.
Summary

You have completed the lesson on material safety data sheets.

Remember:

- The manufacturer of any hazardous chemical is responsible for researching, developing, and distributing a corresponding MSDS.
- Your employer is responsible for acquiring and maintaining a file of MSDS’s for all hazardous chemicals used in your facility. This file must be readily available to all workers.
- Employees are responsible for knowing where to find MSDS’s, and how to read them. Employees also are responsible for following MSDS instructions for chemical use and storage.
- Information in an MSDS is divided into sections.
- The Product Identification section contains general information about the product and the manufacturer.
- The Hazardous Ingredients section lists the hazardous chemicals present in the product.
Summary (continued)

<table>
<thead>
<tr>
<th>Remember:</th>
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<tbody>
<tr>
<td>• The Physical Data section lists physical properties of the product,</td>
</tr>
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</tr>
<tr>
<td>regarding the flammability of the material, and how to fight fires</td>
</tr>
<tr>
<td>involving the material. <strong>Be certain to follow all instructions</strong></td>
</tr>
<tr>
<td><strong>provided in this section</strong>.</td>
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<tr>
<td>• The Health Hazard Data section lists signs and symptoms of</td>
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<tr>
<td>exposure to the product.</td>
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<tr>
<td>• The Emergency and First Aid Procedures section provides first aid</td>
</tr>
<tr>
<td>instructions for exposure to the product, according to route of</td>
</tr>
<tr>
<td>exposure.</td>
</tr>
<tr>
<td>• The Reactivity Data section provides information regarding the product's</td>
</tr>
<tr>
<td>stability and compatibility with other materials. <strong>Carefully</strong></td>
</tr>
<tr>
<td><strong>follow any use or storage instructions provided in this section.</strong></td>
</tr>
<tr>
<td>• The Spill, Leak, and Disposal Procedures section provides instructions</td>
</tr>
<tr>
<td>for cleanup of spills and appropriate disposal methods. <strong>Follow these</strong></td>
</tr>
<tr>
<td><strong>instructions carefully.</strong></td>
</tr>
</tbody>
</table>
Welcome to the lesson on labeling of hazardous chemicals.

This lesson defines the responsibilities of the manufacturer, employer, and employee with regard to the labeling of hazardous chemicals. Labeling protocols and label examples are provided, to help you recognize and use label information more easily.
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<tr>
<td>o Employees</td>
</tr>
<tr>
<td>• Read and recognize the contents of a container label, including the NFPA 704 hazard-warning label.</td>
</tr>
<tr>
<td>Container Labels: Manufacturer Responsibilities</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Under the Hazard Communication Standard (HCS), chemical manufacturers are required to label all containers of hazardous materials.</td>
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</tbody>
</table>

Chemical container labels must be written in English, and must include the following information:

- Name of the hazardous product or chemical (as it appears on the MSDS)
- Appropriate hazard warnings
- The name and address of the manufacturer
Your employer is responsible for ensuring that all chemical containers within your facility are labeled properly.

Incoming chemicals should be inspected to verify proper labeling by the manufacturer.

If a chemical is transferred to an unmarked container after arriving at your facility, the new container must be labeled with:

- The name of the product
- Appropriate hazard warnings
- The name and address of the manufacturer
As an employee, it is your responsibility to read product labels carefully.

Check for:

- Instructions
- Hazard warnings

Follow instructions carefully, and heed all warnings.
Hazard Warnings

As we have seen:

- Manufacturers are responsible for labeling chemicals with hazard warnings.
- You are responsible for heeding these warnings.

Warnings may appear in the form of text, but frequently include standardized symbols for quick reference.

You can greatly enhance your ability to heed hazard warnings by learning to interpret these symbols.

Let’s take a closer look on the following screens.
One common symbol system used to indicate chemical hazards is the NFPA 704 chemical hazard label.

This label provides a standard system for indicating degree of hazard in three major color-coded categories:

- Health (blue)
- Flammability (red)
- Reactivity (yellow)

Degree of hazard in each of these categories is indicated by number:

- 4: Severe
- 3: Serious
- 2: Moderate
- 1: Slight
- 0: Minimal
NFPA 704 also provides for communication of any special hazards associated with a chemical. Special hazards are located in the white corner of the label, and are indicated by symbol, rather than by number.

Let's take a closer look at each corner of the NFPA 704 label.
Degree of health hazard is indicated in the blue corner of the NFPA 704 label.

A four (4) in this corner indicates **severe health hazard:**
- Very short-term exposure to this material could cause death or major residual injury [glossary], even with prompt medical treatment.
- This material is too dangerous to be approached without appropriate PPE.

A three (3) in this corner indicates **serious health hazard:**
- Short-term exposure to this material could cause serious temporary or residual injury, even with prompt medical treatment.
- Avoid all bodily contact with this material, including skin contact and inhalation.

A two (2) in this corner indicates **moderate health hazard:**
- Intense or prolonged exposure to this material could cause temporary damage or possible residual injury, if prompt medical treatment is not received.
A one (1) in this corner indicates **slight health hazard:**
- Exposure to this material could cause irritation, but only minor residual injury, even without medical treatment.

A zero (0) in this corner indicates **minimal health hazard:**
- Exposure to this material poses essentially no health hazard.
Degree of fire hazard is indicated in the red corner of the NFPA 704 label.

A four (4) in this corner indicates **severe fire hazard**:
- This material is extremely flammable.

A three (3) in this corner indicates **serious fire hazard**:
- This material is flammable, and will readily ignite under almost all ambient temperature conditions.

A two (2) in this corner indicates **moderate fire hazard**:
- This material is **combustible** [glossary], but must be heated moderately or exposed to relatively high ambient temperatures before it will burn.

A one (1) in this corner indicates **slight fire hazard**:
- This material is only slightly combustible, requiring considerable preheating before it will burn.

A zero (0) in this corner indicates **minimal fire hazard**:
- This material will not burn.
Degree of reactivity hazard is indicated in the yellow corner of the NFPA 704 label.

A four (4) in this corner indicates **severe reactivity hazard:**
- This material could readily detonate or explode at normal temperatures and pressures.

A three (3) in this corner indicates **serious reactivity hazard:**
- This material could detonate or explode, but would require a strong outside force or heat under pressure to initiate the explosion.
- This material may react explosively with water.

A two (2) in this corner indicates **moderate reactivity hazard:**
- This material is normally unstable and could readily undergo a violent chemical reaction, but will not detonate.
- This material may react violently with water.
A one (1) in this corner indicates **slight reactivity hazard:**
- This material is normally stable, but could become unstable at high temperatures and pressures
- This material may react with water energetically, but not violently.

A zero (0) in this corner indicates **minimal reactivity hazard:**
- This material is normally unstable, even at extremely high temperatures.
- This material is not reactive with water.
Special hazards are indicated in the white corner of the NFPA 704 label. The official NFPA 704 code specifies only two symbols for special hazards:

- **OX**: oxidizing agent [glossary]
- **W** or **W**: reacts energetically with water

Other commonly used symbols, however, may include:

- **ACID**: acid
- **ALK**: alkaline (base)
- **SA**: simple asphyxiant [glossary]
- **COR**: corrosive [glossary]
- **HF**: hydrofluoric acid

If the product has no special hazards, the white corner of the NFPA 704 label may be left blank.
Hazard Warnings: Other Symbols

| In addition to the NFPA 704 label, other symbols also may be used to indicate hazard warnings. |
| These symbols may appear in the bottom (white) corner of NFPA 704, or may stand alone. |
| Various symbols and their meanings are presented in the table to the right. |

*IMAGE: 4012.GIF*
Under the Hazard Communication Act, all of the following are true of container labeling EXCEPT:

a. **Labels must include the NFPA 704 symbol.**
b. Labels must include appropriate hazard warnings.
c. Labels must include the name of the product, as it appears on the MSDS.
d. Manufacturers of hazardous chemicals must label their products in English.

**MULTIPLE CHOICE INTERACTION**

Correct answer: A

Response for A: Correct. Although the NFPA 704 hazard-warning symbol provides a standard system for indicating chemical hazards, manufacturers are not required to use this symbol. Hazard warnings may be presented in text and/or using alternate symbols.

Response for B: Incorrect. B, C, and D all are true concerning the labeling of containers under the Hazard Communication Act. The correct answer is A. Although the NFPA 704 hazard-warning symbol provides a standard system for indicating chemical hazards, manufacturers are not required to use this symbol. Hazard warnings may be presented in text and/or using alternate symbols.

Response for C: Incorrect. B, C, and D all are true concerning the labeling of containers under the Hazard Communication Act. The correct answer is A. Although the NFPA 704 hazard-warning symbol provides a standard system for indicating chemical hazards, manufacturers are not required to use this symbol. Hazard warnings may be presented in text and/or using alternate symbols.

Response for D: Incorrect. B, C, and D all are true concerning the labeling of containers under the Hazard Communication Act. The correct answer is A. Although the NFPA 704 hazard-warning symbol provides a standard system for indicating chemical hazards, manufacturers are not required to use this symbol. Hazard warnings may be presented in text and/or using alternate symbols.
You are creating an NFPA 704 label for a new product. The product has the following characteristics:

- The material is normally stable, but could become unstable at high temperatures and pressures.
- Short-term exposure to this material could cause serious temporary or residual injury, even with prompt medical treatment.
- The material is extremely flammable.
- The material is corrosive.

FLASH INTERACTION: 4014.SWF/FLA

Drag and drop the following numbers and/or symbols, to create the appropriate NFPA 704 label:

0 1 2 3 4
OX COR ALK

[Drag and drop to blank NFPA 704 symbol as follows]

3 to blue
4 to red
1 to yellow
COR to white
Summary

You have completed the lesson on chemical container labeling.

Remember:

- The manufacturer is responsible for labeling all containers in English, with chemical name and appropriate hazard warnings.
- Your employer is responsible for ensuring that all chemical containers within your facility are labeled properly. Incoming chemicals should be inspected to verify proper labeling. If a chemical is transferred to an unmarked container after arriving at your facility, the new container must be labeled appropriately.
- Employees are responsible for reading product labels carefully. Follow all instructions, and heed all warnings.
- The NFPA 704 chemical hazard label provides a standard system for indicating degree of hazard in three major color-coded categories: health (blue), flammability (red), and reactivity (yellow).
- Degree of hazard in each category is indicated by number:
  - 4: Severe
  - 3: Serious
  - 2: Moderate
  - 1: Slight
  - 0: Minimal
- Special hazards are shown in the white corner of the NFPA label, and may include warnings such as OX (oxidizing agent) or W (reacts energetically with water).
- In addition to the NFPA 704 label, other symbols also may be used to indicate warnings such as compressed gas, corrosive, or poisonous.
### Introduction

Welcome to the lesson on personal protective equipment (PPE). This lesson explains the importance of personal protective equipment when working with hazardous chemicals. Employer and employee responsibilities regarding the use of PPE are reviewed, and types of PPE are described.
### Objectives

After completing this lesson, you should be able to:

- Distinguish between the responsibilities of employers and employees, with regard to PPE.
- Recall the various types of PPE that may be used during work with hazardous material.
The purpose of PPE is to shield or isolate workers from physical and health hazards that may be encountered during work with hazardous materials.

FLASH ANIMATION: 5003.SWF/FLA
Your employer is responsible for selecting and providing appropriate PPE for all hazards present in your work environment.

Your employer also must provide training for all workers required to use PPE. Training should educate employees regarding:

- When to use PPE
- Which types of PPE to use
- How to put on PPE
- How to use PPE
- How to remove PPE
- How to store and maintain reusable PPE
- How to dispose of single-use PPE
After receiving training, employees are responsible for following facility procedures for PPE:

- Selection
- Use
- Storage
- Maintenance
- Disposal

Reusable PPE should be decontaminated (as necessary), cleaned, and stored after each use.

Single-use PPE, or heavily contaminated reusable PPE, should be disposed of, according to facility protocol.
Types of PPE used during work with hazardous materials may include:

- Protective clothing
- Respiratory equipment
- Eye protection
Types of PPE: Protective Clothing

Protective clothing may include:

- Gloves
- Suits/gowns
- Coveralls
- Hoods
- Boots

When using gloves, be certain to choose a glove material appropriate for the chemical. Latex gloves are permeable to many types of chemicals, and, therefore, do not provide adequate protection.

Gowns, coveralls, and other protective clothing should be worn if there is a possibility that hazardous chemicals might splash or spill on your regular work clothes.

As with gloves, be sure to choose protective clothing appropriate for the chemical. Some chemicals require special impermeable gowns for adequate protection.
Types of PPE: Respiratory Equipment

Respirators cover the mouth and nose to prevent the inhalation of hazardous substances.

Respirators are only effective if:

- The proper respirator for the chemical/situation is selected.
- The worker is trained in use of the respirator.
- The respirator fits the worker properly.
- The respirator is properly maintained, with appropriate replacement of parts, as necessary.
Goggles protect the eyes from hazardous chemical splashes.

Face shields protect the entire face, including the:
- Eyes
- Nose
- Mouth
- Skin

Ordinary prescription glasses are not a substitute for goggles. Glasses may break, and do not shield the eyes from all angles.
Regarding PPE, all of the following are true EXCEPT:

- **a. You cannot use too much PPE.**
- **b. Latex gloves do not provide protection against many types of chemicals.**
- **c. Heavily contaminated reusable PPE should be disposed of according to facility protocol.**
- **d. Employers are responsible for selecting and providing appropriate PPE for all hazards present in the work environment.**

**MULTIPLE CHOICE INTERACTION**

Correct answer: A

Feedback for A: Correct. Always select adequate PPE, but not too much. Excess PPE can create hazards such as heat stress; physical and psychological stress; and impaired vision, mobility, and/or communication.

Feedback for B: Incorrect. B, C, and D all are true. The correct answer is A. Always select adequate PPE, but not too much. Excess PPE can create hazards such as heat stress; physical and psychological stress; and impaired vision, mobility, and/or communication.

Feedback for C: Incorrect. B, C, and D all are true. The correct answer is A. Always select adequate PPE, but not too much. Excess PPE can create hazards such as heat stress; physical and psychological stress; and impaired vision, mobility, and/or communication.

Feedback for D: Incorrect. B, C, and D all are true. The correct answer is A. Always select adequate PPE, but not too much. Excess PPE can create hazards such as heat stress; physical and psychological stress; and impaired vision, mobility, and/or communication.
You have completed the lesson on PPE.

Remember:

- Employers are responsible for selecting and providing appropriate PPE for all hazards present in the work environment.
- Employers also are responsible for training workers in the safe and effective use of PPE.
- After receiving training, employees are responsible for following facilities procedures and protocols regarding the selection, use, storage, maintenance, and disposal of PPE.
- Types of PPE used during work with hazardous materials may include protective clothing, respiratory equipment, and/or eye protection.
- Be sure to choose protective clothing appropriate for the chemical.
- Use respirators responsibly and appropriately, to ensure that you are protected.
- Use goggles or a face shield when there is a risk of splash or splatter from a hazardous chemical.
## Course Glossary

<table>
<thead>
<tr>
<th>#</th>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>exposure limit</td>
<td>the maximum concentration of a chemical in the workplace to which most people can be exposed without experiencing harmful effects</td>
</tr>
<tr>
<td>2</td>
<td>flammability</td>
<td>the measure of a material’s ability to burn</td>
</tr>
<tr>
<td>3</td>
<td>decomposition</td>
<td>chemical separation of a substance into two or more products that may differ from each other and from the original substance</td>
</tr>
<tr>
<td>4</td>
<td>polymerization</td>
<td>a chemical reaction in which one or more small molecules combine to form larger molecules</td>
</tr>
<tr>
<td>5</td>
<td>residual injury</td>
<td>long-lasting health damage</td>
</tr>
<tr>
<td>6</td>
<td>combustible</td>
<td>able to be burned</td>
</tr>
<tr>
<td>7</td>
<td>oxidizing agent</td>
<td>chemical that can act as an electron acceptor; often a very reactive chemical, which, in contact with combustible material such as paper, sawdust, fabrics, or powdered metals, may form unstable mixtures that create a risk of fire or explosion</td>
</tr>
<tr>
<td>8</td>
<td>asphyxiant</td>
<td>vapor or gas that can cause unconsciousness or death by suffocation (lack of oxygen)</td>
</tr>
<tr>
<td>9</td>
<td>corrosive</td>
<td>able to cause visible destruction or irreversible alteration of living tissue by chemical action at the site of contact</td>
</tr>
</tbody>
</table>
Pre-Assessment

1. Which of the following chemicals presents a physical hazard?
   a. Chemical A: This chemical reacts violently with water.
   b. Chemical B: This chemical causes liver damage when absorbed into the bloodstream through the skin.
   c. Chemical C: This chemical irritates the nose and throat when inhaled.
   d. All of these are physical hazards.
   e. None of these is a physical hazard.

   Correct answer: A
   Rationale: Physical hazards are related to the way in which a chemical interacts with other substances or the environment. A chemical with physical hazards can harm you by exploding, igniting, or reacting violently with other substances.

2. Regarding routes of exposure to hazardous chemicals, which of the following statements is TRUE?
   a. Intact skin provides an impermeable barrier against all hazardous chemicals.
   b. It is safe to smoke around hazardous chemicals, as long as you wear gloves.
   c. Inhaled chemicals can enter the bloodstream through the lungs.
   d. Strong acids can burn the eyes, but strong alkalines (bases) cannot.

   Correct answer: C
   Rationale: Depending on the nature of the chemical, inhaled chemicals can irritate the nose or throat, damage the lungs, and/or enter the bloodstream through the lungs.

3. Although solid chemicals are not usually hazardous, solids in the form of dust, fume, or fibers can be highly hazardous.
   a. True
   b. False

   Correct answer: A
   Rationale: Solids are not usually hazardous, as solid materials are not readily absorbed into the body. Dust, fume, and fibers, however, can be highly hazardous.

4. You are working to bring a healthcare facility into compliance with the MSDS-related provisions of OSHA’s Hazard Communication Standard (HCS). You interview administrative personnel at the facility, and learn that the facility has compiled a list of all hazardous chemicals to which workers in the facility might be exposed. An MSDS corresponding to each chemical on the list has been obtained and filed. For full compliance, you advise that this facility also must:
   a. Verify the accuracy of all health hazard information contained in the MSDS file.
b. Ensure that the MSDS file is readily available to all workers (in their work areas, at all times during their work shifts).

c. Review the MSDS file, in order to compile a list of manufacturer emergency phone numbers (for questions regarding product toxicity and other hazards).

d. All of these are requirements under OSHA’s HCS.

e. None of these is a requirement under OSHA’s HCS.

Correct answer: B  
Rationale: Under the HCS, employers are responsible for 1) cataloguing the hazardous chemicals used in their facilities, 2) acquiring and maintaining a file of corresponding MSDS’s, and 3) making the MSDS file readily available to all workers. Employers are not responsible for verifying the accuracy of MSDS information, or compiling a list of emergency numbers.

5. As an employee who works with hazardous chemicals:

   a. You should know where to find MSDS’s and how to read them, in the event of a chemical spill or other problem.
   b. As long as you never have a spill or other problem, you never have to worry about the information contained in an MSDS.
   c. You should verify the accuracy of all information contained in an MSDS before working with the corresponding chemical.
   d. All of these are true.
   e. None of these is true.

Correct answer: A  
Rationale: As an employee who works with hazardous chemicals, you should know where to find MSDS’s and how to read them, in the event of a chemical spill or other problem. You also are responsible for reading all relevant MSDS’s before starting a job that may require the use of a hazardous chemical. Always follow MSDS instructions for chemical use and storage. Manufacturers are required to provide accurate information and instructions you can trust.

6. You are preparing to work with Chemical A. You open the appropriate storage cabinet, and notice Chemical B, as well as Chemical A. Based on your knowledge of both chemicals, you suspect that they should not be stored together. Which section of the MSDS should you consult, in order to confirm your suspicion?

   a. Hazardous Ingredients
   b. Physical Data
   c. Fire and Explosion Hazard Data
   d. Reactivity Data

Correct answer: D  
Rationale: The Reactivity Data section of an MSDS provides information regarding the material’s stability, as well as any special storage or use instructions. Any products or substances that should not be stored with the material are listed under Incompatibility in the Reactivity section.

7. If you spill a hazardous chemical, you should immediately obtain a mop, sponge, or other appropriate materials and clean the spill.

   a. True
   b. False
Correct answer: B  
Rationale. Chemical spills can be serious in nature and must be reported. Cleanup may require the assistance of the safety team, chemical spill team, or hazmat team.

8. If a chemical is transferred to an unmarked container after arriving at your facility, the new container must be labeled with:
   a. The name of the product
   b. Appropriate hazard warnings
   c. The name and address of the chemical manufacturer
   d. All of these
   e. None of these

Correct answer: D  
Rationale: All of this information must be transferred to the new container.

9. You are preparing an NFPA 704 chemical hazard label for a new product. You know that the product has severe reactivity hazards, serious flammability hazards, and moderate health hazards. There are no special hazard warnings associated with the product. How should you label each corner of the NFPA 704 label?

Correct answer: B  
Rationale: This answer choice indicates moderate health hazards (blue: 2), serious flammability hazards (red: 3), severe reactivity hazards (yellow: 4), and no special hazards (white: blank).

10. You are preparing to work with a chemical. Prior to opening the container, you inspect the label for any special instructions or warnings. You notice the symbol COR in one corner of the NFPA 704 chemical hazard label. You are wearing prescription glasses, jeans, a t-shirt, and tennis shoes. Based solely on this information, which of the following types of PPE should you consider including in your PPE ensemble?
    a. Goggles
    b. Gloves
    c. Lab coat
    d. All of these
    e. None of these

Correct answer: D  
Rationale: The symbol COR indicates that the chemical is corrosive. A corrosive chemical is able to destroy living tissue upon short- or long-term contact. When working with a corrosive chemical, select PPE to protect the eyes and all exposed skin: goggles for the eyes (prescription glasses are not a substitute for goggles); gloves for the skin of the hands; and a lab coat for the skin of the arms.
Question Title: Question 1

Question: Regarding health hazards of chemicals, all of the following are true except:

Answer 1: Only liquid chemicals have health hazards.
Answer 2: Health hazards are related to the way in which a chemical interacts with your body.
Answer 3: If you are exposed to a chemical with health hazards, you could suffer death, long-term damage, or short-term injury or illness.
Answer 4: An example of a chemical with health hazards is Cidex (a glutaraldehyde-containing disinfectant).

Correct Answer: Only liquid chemicals have health hazards.

Answer Rationale: Solids, liquids, and gases all can have health hazards. For examples, lead (a solid) can cause mental retardation. Mercury (a liquid) can damage the brain. Carbon monoxide (a gas) can have a variety of toxic effects, including death.

Question Title: Question 2

Question: Inhaled chemicals can:

Answer 1: Irritate the nose or throat.
Answer 2: Damage the lungs.
Answer 3: Enter the bloodstream through the lungs.
Answer 4: All of these are correct.
Answer 5: None of these is correct.

Correct Answer: All of these are correct.

Answer Rationale: Inhaled chemicals can have all of these effects.

Question Title: Question 3

Question: Intact skin provides an impermeable barrier against all hazardous chemicals.

Answer 1: True
Answer 2: False
Answer 3:
Question Title: Question 4

Question: Regarding the local and systemic effects of toxic chemicals, all of the following are true EXCEPT:

Answer 1: A chemical burn on the skin is an example of a local effect.
Answer 2: Brain damage from ingested lead is an example of a systemic effect.
Answer 3: All toxic chemicals have both local and systemic effects.
Answer 4: The liver and the heart are two of the organs most commonly harmed by chemicals with systemic effects.
Answer 5:  

Correct Answer: All toxic chemicals have both local and systemic effects.

Answer Rationale: Toxic chemicals may have local effects only, systemic effects only, or both local and systemic effects.

Question Title: Question 5

Question: Under the Hazard Communication Standard, the manufacturer of a hazardous chemical is responsible for all of the following EXCEPT:

Answer 1: Researching the specific physical and health hazards of the chemical
Answer 2: Developing an MSDS for the chemical
Answer 3: Distributing MSDS's to all purchasers of the chemical
Answer 4: Training all purchasers in the safe use of the chemical
Answer 5:  

Correct Answer: Training all purchasers in the safe use of the chemical

Answer Rationale: Employees are responsible for training workers in the safe use of hazardous chemicals.

Question Title: Question 6

Question: Under the Hazard Communication Act, employers are responsible for which of the following?

Answer 1: Developing MSDS's for all hazardous chemicals used in their facilities
Answer 2: Verifying the accuracy of MSDS's received with hazardous chemical shipments
Correct Answer: Maintaining a file of MSDS’s for all hazardous chemicals used in their facilities

Answer Rationale: Employers are responsible for maintaining a file of relevant MSDS’s. They are NOT responsible for creating MSDS’s, or verifying MSDS accuracy. The manufacturer of each hazardous chemical is responsible for creating a corresponding MSDS, and providing accurate information.

Question Title: Question 7

Question: Employees are responsible for reading all relevant MSDS’s before starting a job, and following MSDS instructions for chemical use and storage.

Answer 1: True
Answer 2: False
Answer 3:
Answer 4:
Answer 5:

Correct Answer: True

Answer Rationale: Employees must read all relevant MSDS’s, follow their instructions, and heed their warnings.

Question Title: Question 8

Question: Regarding the Reactivity Data section of an MSDS, all of the following are true EXCEPT:

Answer 1: If a product is marked as unstable, it may react spontaneously under normal conditions, potentially causing a fire or explosion.
Answer 2: A product may be stored near a material listed as incompatible, as long as both containers are sealed tightly.
Answer 3: Decomposition products are created when a material burns.
Answer 4: Rapid polymerization can cause explosions.
Answer 5:

Correct Answer: A product may be stored with a material listed as incompatible, as long as both containers are sealed tightly.

Answer Rationale: Never store a product with any material listed as incompatible on the MSDS.

Question Title: Question 9
Question: Regarding the NFPA 704 label, which of the following is correct?

Answer 1: Blue indicates health hazard level. Red indicates reactivity hazard level. Yellow indicates flammability hazard level. White indicates special hazard warnings.
Answer 2: Blue indicates reactivity hazard level. Red indicates health hazard level. Yellow indicates flammability hazard level. White indicates special hazard warnings.
Answer 3: Blue indicates health hazard level. Red indicates flammability hazard level. Yellow indicates reactivity hazard level. White indicates special hazard warnings.
Answer 4: Blue indicates reactivity hazard level. Red indicates flammability hazard level. Yellow indicates health hazard level. White indicates special hazard warnings.
Answer 5: Correct Answer: Blue indicates health hazard level. Red indicates flammability hazard level. Yellow indicates reactivity hazard level. White indicates special hazard warnings.

Answer Rationale: This is the correct key for the NFPA 704 chemical hazard label.

Question Title: Question 10

Question: A product labeled with the NFPA 704 symbol has a three (3) in the red corner of the symbol. This indicates that:

Answer 1: Exposure to the product could cause death or severe residual injury.
Answer 2: This product will ignite under almost all ambient temperature conditions.
Answer 3: This material could readily undergo a violent chemical reaction, but will not detonate.
Answer 4: This material is acidic.
Answer 5:

Correct Answer: This product will ignite under almost all ambient temperature conditions.

Answer Rationale: A three (3) in the red corner of the NFPA 704 symbol indicates serious flammability hazard: the material is flammable, and will ignite under almost all ambient temperature conditions.