HealthStream Regulatory Script

Hazard Communication
Release Date: August 2011
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HLC CE Version: 1

Lesson 1: Introduction
Lesson 2: Hazardous Materials
Lesson 3: Safety Data Sheets
Lesson 4: Labeling of Hazardous Chemicals
Lesson 5: Personal Protective Equipment
Welcome to the introductory lesson on hazard communication. This lesson gives the course rationale, goals, and outline.

As your partner, HealthStream strives to provide its customers with excellence in regulatory learning solutions. As new guidelines are continually issued by regulatory agencies, we work to update courses, as needed, in a timely manner. Since responsibility for complying with new guidelines remains with your organization, HealthStream encourages you to routinely check all relevant regulatory agencies directly for the latest updates for clinical/organizational guidelines.

If you have concerns about any aspect of the safety or quality of patient care in your organization, be aware that you may report these concerns directly to The Joint Commission.
Under its Hazard Communication Standard (HCS), OSHA [glossary] requires all employers to develop written hazard communication programs.

The primary goal of the HCS is to ensure the safety of employees who work with hazardous materials.

To keep safe at work:
- Learn about hazardous materials and how they can hurt you
- Identify your potential for exposure and recognize signs of overexposure
- Learn how to safeguard against exposure

This course will give you the information you need to keep safe when working with hazardous materials.
### Course Goals

After completing this course, you should be able to:

- Define hazardous materials that include a description of why certain materials are hazardous to healthcare workers.
- Explain the requirements and how to interpret a chemical container label that will help ensure healthcare worker safety.
- Cite the importance of using personal protective equipment that can assist in improving healthcare worker safety.
Lesson 1 provided the course rationale and goals.

Lesson 2 will focus on hazardous materials.

Lesson 3 will discuss safety data sheets.

Lesson 4 will cover labeling of hazardous materials.

Lesson 5 will discuss personal protective equipment.
Welcome to the lesson on hazardous materials.

This lesson will review:
- Physical and health hazards of chemicals
- Potential routes of exposure to hazardous chemicals
- The three different forms of hazardous chemicals
What Makes a Chemical Hazardous?

A chemical is hazardous if it 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.

Reference 1

**CLICK TO REVEAL**

**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
### Physical Hazards: Examples

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.

Reference 2
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**: This chemical is 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**: This chemical is 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
  - Other allergic reactions

References 3-6
Health Hazards: Routes of Exposure

You must be exposed to the chemical for it to harm you.

Routes of exposure include:

- Eyes
- Skin
- Inhalation
- Ingestion
- Injection

Click on each route of exposure to learn more.

Reference 7

CLICK TO REVEAL

Eyes:
Many chemicals can burn or irritate the eyes. In some cases, chemicals may be absorbed through the eyes and enter the bloodstream.

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

Inhalation:
The most common type of exposure occurs when chemicals are inhaled into the lungs. Inhaled chemicals may:

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

Ingestion:
You may ingest hazardous 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. Wash your hands before eating, drinking, or smoking.

Injection:
Injection may occur if you are cut with a tool, instrument, or needle that has been contaminated with a chemical.
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 and travels throughout the body. The organs most commonly harmed include:

- Liver
- Kidneys
- Heart
- Brain
- Reproductive organs

Reference 7
### Forms of Hazardous Chemicals

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. This is because solid materials are not readily absorbed into the body.

Certain forms of solids, however, can be highly hazardous. These include:

- **Dust**
- **Fume**
- **Fibers**

Click on each type of solid to learn more.

Reference 8

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dust</strong></td>
<td>Dust consists of very small solid particles. These are suspended in the air. Hazardous dust is created when certain solids are pulverized, or settled dust becomes airborne. Dust can:</td>
<td>An example of hazardous dust is silica.</td>
</tr>
<tr>
<td><strong>Fume</strong></td>
<td>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. After they evaporate to the gaseous state, they re-solidify. Fume is easily inhaled. Metal fumes can be highly toxic.</td>
<td>An example of hazardous fume is lead oxide, which can be produced during soldering.</td>
</tr>
<tr>
<td><strong>Fiber</strong></td>
<td>A fiber is long, thin solid particle. Small fibers can be inhaled. Very small fibers can lodge in the lungs and cause damage.</td>
<td>An example of hazardous fiber is asbestos.</td>
</tr>
</tbody>
</table>
### Hazardous Chemicals: Liquid

Many hazardous chemicals are liquids 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

Reference 8

### 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.
### Hazardous Chemicals: Gas

<table>
<thead>
<tr>
<th>Gases can be:</th>
<th>Vapor</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Flammable</td>
<td>Vapor is the gaseous form of a substance that is primarily a liquid at normal temperatures and pressures, but evaporates readily.</td>
</tr>
<tr>
<td>• Explosive</td>
<td>For example, alcohol is a liquid at room temperature, but evaporates rapidly to form vapors.</td>
</tr>
<tr>
<td>• Toxic</td>
<td>Vapors can:</td>
</tr>
</tbody>
</table>

Hazardous gases can be difficult to detect. Many gases do not have a distinctive color or odor.

Reference 8

Vapors can:

- Be inhaled.
- Irritate the eyes, skin, or respiratory tract.
- Be flammable, explosive, and/or toxic.
Select the answer that best fits the question.

All of the following are true EXCEPT:
   a. Trinitrotoluene is a physical hazard.
   b. Physical hazards are defined by the way in which a chemical interacts with other substances or the environment.
   c. A chemical with physical hazards can harm you by exploding, igniting, or reacting violently with other substances.
   d. All of the above are true.

Correct answer: D

Feedback for A: Incorrect. All of these statements are true.
Feedback for B: Incorrect. All of these statements are true.
Feedback for C: Incorrect. All of these statements are true.
Feedback for D: Correct. All of these statements are true.
Select the answer that best fits the question.

Which of the following is (are) true?

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

MULTIPLE CHOICE INTERACTION

Correct answer: B

Feedback for A: Incorrect. It is NEVER safe to smoke around hazardous chemicals.

Feedback for B: Correct. It is NEVER safe to smoke around hazardous chemicals.

Feedback for C: Incorrect. It is NEVER safe to smoke around hazardous chemicals.

Feedback for D: Incorrect. It is NEVER safe to smoke around hazardous chemicals.

Feedback for E: Incorrect. It is NEVER safe to 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 a chemical interacts with other substances or the environment.
- Health hazards are related to the way a chemical interacts with your body.
- 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 liquids at normal temperatures and pressures.
- Gases can be flammable, explosive, and/or toxic.
Welcome to the lesson on safety data sheets (formerly known as Material Safety Data Sheets or MSDSs).

This lesson will review:

- The responsibilities of:
  - Manufacturers and distributors of hazardous chemicals
  - Employers
  - Employees
- How to read a safety data sheet and understand its contents
- The importance of following all storage and use instructions contained in a safety data sheet

Reference 1
<table>
<thead>
<tr>
<th>3002</th>
<th>The Manufacturer’s Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The HCS requires that all manufacturers of hazardous materials determine the specific physical and health hazards of their products.</td>
</tr>
<tr>
<td></td>
<td>The manufacturer must record all hazard information for the product in a Safety Data Sheet (SDS).</td>
</tr>
<tr>
<td></td>
<td>Finally, the manufacturer (or distributor) is responsible for providing the relevant safety data sheet to those who purchase the product.</td>
</tr>
<tr>
<td></td>
<td>Reference 1</td>
</tr>
<tr>
<td>Your Employer’s Responsibility</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td></td>
</tr>
</tbody>
</table>

The HCS requires your facility to compile a list of all hazardous chemicals used in the facility.

Each of the chemicals on the list must have a safety data sheet.

This file must be readily available to all workers in their work areas at all times.

Reference 1

**Key Thought**

Your employer is responsible for acquiring and maintaining a file of safety data sheets for all hazardous chemicals used in your facility.
3004

Your Responsibility

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 safety data sheets are located on your unit
- How to read a safety data sheet

You must be trained by your employer when you are assigned to work with any hazardous chemical.

You are responsible for reading all safety data sheets before using a hazardous chemical.

Reference 1
OSHA’s Hazard Communication Standard specifies the information that has to be on the safety data sheet, but no specific format is required. A 16-section format has been developed and is recommended by OSHA.

Reference 9

<table>
<thead>
<tr>
<th>Identification</th>
<th>Physical and chemical properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard(s) identification</td>
<td>Stability and reactivity</td>
</tr>
<tr>
<td>Composition</td>
<td>Toxicology information</td>
</tr>
<tr>
<td>First-aid measures</td>
<td>Ecological information</td>
</tr>
<tr>
<td>Fire-fighting measures</td>
<td>Disposal considerations</td>
</tr>
<tr>
<td>Accidental release measures</td>
<td>Transport information</td>
</tr>
<tr>
<td>Handling &amp; storage</td>
<td>Regulatory information</td>
</tr>
<tr>
<td>Personal Protection</td>
<td>Other information</td>
</tr>
</tbody>
</table>
Information in a safety data sheet is divided into sections:

- Identification
- Composition/information on ingredients
- Hazard(s) identification
- First-aid measures
- Fire-fighting measures
- Accidental release measures
- Handling and storage
- Exposure controls/personal protection
- Physical and chemical properties
- Stability and reactivity
- Toxicological information
- Ecological information
- Disposal considerations
- Transport information
- Regulatory information
- Other information

Let's take a closer look at each section.

Reference 9
Section 1: Identification

The Identification section contains general information such as the:

- Product identifier used on the label
- Name and address of the product manufacturer
- Emergency phone number for questions regarding product toxicity and other hazards
- Recommended use of the chemical and restrictions on use

Reference 10
Section 2: Hazards Identification

This section should include:

- The **hazard class** of the chemical
- The **hazard category** of the chemical

Click on each to learn more.

Reference 10

**Hazard Class**: The nature of the physical or health hazards such as flammable solid, carcinogen, or oral acute toxicity

**Hazard Category**: Divisions within each hazard class that compare hazard severity within the class.
Section 3: Composition/Information on Ingredients

Except for trade secrets, this section lists:

- Chemical name
- Common name and synonyms
- **CAS number (glossary)** and other unique identifiers
- Impurities or additives

For mixtures, the name and concentration of all ingredients which are classified as health hazards is required.

Reference 10
First aid measures are based on exposure route:

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

The most important symptoms or effects should be listed, as well as immediate and delayed reactions.

Specific advice to health care personnel should be provided.

Click on each route for examples.

Reference 10

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**Eye:** Eye irritation. Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get immediate medical attention.

**Skin:** Itching or burning of the skin. Immediately flush the skin with plenty of water while removing contaminated clothing and shoes. Get immediate medical attention. Wash contaminated clothing before reuse.

**Inhalation:** Nasal irritation, headache, dizziness, nausea, vomiting, heart palpitations, breathing difficulty, cyanosis, tremors, weakness, red flushing of face, irritability. Remove exposed person from source of exposure to fresh air. If not breathing, keep airway open and start cardiopulmonary resuscitation (CPR). Avoid mouth-to-mouth resuscitation.

**Ingestion:** Get immediate medical attention. Do not induce vomiting unless directed by medical personnel.
**Inhalation:** Nasal irritation, headache, dizziness, nausea, vomiting, heart palpitations, breathing difficulty, cyanosis, tremors, weakness, red flushing of face, irritability. Remove exposed person from source of exposure to fresh air. If not breathing, clear airway and start cardiopulmonary resuscitation (CPR). Avoid mouth-to-mouth resuscitation.

**Ingestion:** Get immediate medical attention. Do not induce vomiting unless directed by medical personnel.
Section 5: Fire-fighting Measures

This section provides information about flammability of the product. It also lists how to properly extinguish fires involving the product.

Information includes:

- Extinguishing media
- Fire or explosion hazards
- Fire-fighting procedures

Click on each item to learn more.

Reference 10

5. Fire Fighting Measures

Suitable Extinguishing Media: Use dry chemical, foam, or carbon dioxide to extinguish fire. Water may be ineffective but should be used to cool fire-exposed containers, structures, and to protect personnel. Use water to dilute spills and to flush them away from sources of ignition.

Fire Fighting Procedures: Do not flush down sewers or other drainage systems. Exposed firefighters must wear NIOSH-approved positive pressure self-contained breathing apparatus with full-face mask and full protective clothing.

Unusual Fire and Explosion Hazards: Dangerous when exposed to heat or flame. Will form flammable or explosive mixtures with air at room temperature. Vapor or gas may spread to distant ignition sources and flash back. Vapors or gas may accumulate in low areas. Runoff to sewer may cause fire or explosion hazard. Containers may explode in heat of fire. Vapors may concentrate in confined areas. Liquid will float and may reignite on the surface of water.

Combustion Products: Irritating or toxic substances may be emitted upon thermal decomposition. Thermal decomposition products may include oxides of carbon and nitrogen.

Extinguishing media: Appropriate materials for extinguishing a fire involving this product. To extinguish a fire involving this product, be certain to choose the appropriate extinguisher.

Fire or explosion hazards: Conditions that may cause this product to explode or ignite. Be certain to avoid these conditions. Never smoke in areas where chemicals may be present. A match, lighter, or cigarette could set off an explosion or start a fire.
<table>
<thead>
<tr>
<th><strong>Fire-fighting procedures</strong>: Any special instructions, equipment, or methods for limiting hazards during a fire involving this product. <strong>Be certain to follow these instructions in the event of a fire.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
Section 6: Accidental Release Measures

This section covers spills and leaks:
  - Personal precautions, protective equipment, and emergency procedures
  - Methods and materials for containment and clean up

Reference 10
Section 7: Handling and Storage

This section provides precautions for safe handling and storage, including any incompatibilities.

Reference 10

7. Handling and Storage

Handling
Do not get in eyes, on skin or on clothing. Do not breathe vapors or mists. Keep container closed. Use only with adequate ventilation. Use good personal hygiene practices. Wash hands before eating, drinking, smoking. Remove contaminated clothing and clean before re-use. Destroy contaminated belts and shoes and other items that cannot be decontaminated.

Keep away from heat and flame. Keep operating temperatures below ignition temperatures at all times. Use non-sparking tools.

Storage
Store in tightly closed containers in cool, dry, well-ventilated area away from heat, sources of ignition and incompatibles. Ground lines and equipment used during transfer to reduce the possibility of static spark initiated fire or explosion. Store at ambient or lower temperature. Store out of direct sunlight. Keep containers tightly closed and upright when not in use. Protect against physical damage.

Empty containers may contain toxic, flammable and explosive residue or vapors. Do not cut, grind, obli, or weld on or near containers unless precautions are taken against these hazards.
Section 8: Exposure Controls and Personal Protection Information

This section provides information about exposure limits (glossary) and required personal protective equipment (PPE).

Reference 10

8. Exposure Controls / Personal Protection

Exposure Limits

- Component, Methytox - TWA: 3 ppm (skin) - STEL: ≤ 15 ppm (15 min.)

Engineering Controls: Local exhaust ventilation may be necessary to control air contaminants to their exposure limits. The use of local ventilation is recommended to control emissions near the source. Provide mechanical ventilation for confined spaces. Use explosion-proof ventilation equipment.

Personal Protective Equipment (PPE)

- Eye Protection: Wear chemical safety goggles and face shield. Have eye-wash stations available where eye contact can occur.
- Skin Protection: Avoid skin contact. Wear gloves impervious to conditions of use. Additional protection may be necessary to prevent skin contact including use of apron, face shield, boots or full body protection. A safety shower should be located in the work area. Recommended protective materials include: Butyl rubber and for limited contact Teflon.

Respiratory Protection: If exposure limits are exceeded, NIOSH approved respiratory protection should be worn. A NIOSH approved respirator for organic vapors is generally acceptable for concentrations up to 10 times the PEL. For higher concentrations, unknown concentrations and for oxygen deficient atmospheres, use a NIOSH approved air-supplied respirator. Engineering controls are the preferred means for controlling chemical exposures. Respiratory protection may be needed for non-routine or emergency situations. Respiratory protection must be provided in accordance with OSHA 29 CFR 1910.134.
This section lists physical properties of the product. For example:

- Appearance
- Odor
- Odor threshold
- pH
- Melting point/freezing point
- Boiling point and range
- **Flash point (glossary)**
- Evaporation rate
- Flammability
- Vapor pressure and density
- Solubility
- **Partition coefficient (glossary):** in octanol/water
- Auto-ignition temperature
- **Decomposition (glossary) temperature**
- Viscosity

Reference 10
Section 10: Stability and Reactivity

The reactivity data section provides information about the product's stability. It also contains any special storage or use instructions. Follow these instructions.

Specific information in this section includes:

- **Chemical Stability**
- **Possibility of hazardous reactions**
- **Conditions to avoid**
- **Incompatible materials**
- **Hazardous decomposition (glossary) products**

Click on each item to learn more.

Reference 10

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**CLICK TO REVEAL**

**Chemical Stability**: Unstable products may react spontaneously under normal conditions. This can potentially cause a fire or explosion. A list of conditions to avoid may be provided. **Do not expose the product to any of these conditions.**

**Possibility of hazardous reactions**: Some materials may react under certain conditions, such as exposure to alkalis, air, or carbon monoxide.

**Conditions to avoid**: Some examples include static discharge, shock, or vibration.

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

**Hazardous decomposition products** [link to glossary]: These are chemical substances created when the product decomposes or burns.
A description of the various health effects and how to identify them should be listed, including:

- Information on likely routes of exposure
- Symptoms related to the physical, chemical, and toxicological characteristics
- Delayed and immediate effects and also chronic effects from short- and long-term exposure

The most common routes of exposure are inhalation, ingestions, skin and eye contact.

Reference 10
| Information on ecological, disposal, transport, and regulatory considerations is outside the jurisdiction of OSHA. While not required by OSHA, this information may be necessary for GHS compliance. |
| GHS is the Globally Harmonized System of Classification and Labeling of Chemicals adopted by the United Nations. OSHA’s Hazard Communication Standard (HCS) is aligned with the GHS. |

Reference 10

Reference 11
Section 16: Other Information

The date of preparation of the safety data sheet, or its most recent revision, should be listed here.

Reference 10
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 SDSs are located</td>
</tr>
<tr>
<td>Develop SDSs for all hazardous products</td>
<td>Acquire and maintain a file of SDSs for all hazardous chemicals used in a facility</td>
<td>Know how to read an SDS</td>
</tr>
<tr>
<td>Distribute SDSs to purchasers</td>
<td>Ensure that appropriate SDSs are readily available to workers</td>
<td>Follow SDS instructions for chemical use and storage</td>
</tr>
</tbody>
</table>
The information in the Fire-fighting measures section of an SDS is only useful to firefighters.

a. True  
b. False

Correct answer: B

Feedback for A: Incorrect. This information is for all users of the material. 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. This information is for all users of the material. 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 safety data sheets.

Remember:
- The manufacturer of any hazardous chemical must research, develop, and distribute an SDS.
- Your employer must acquire and maintain a file of SDSs for all hazardous chemicals used in your facility. This file must be readily available to all workers.
- Employees must know where to find SDSs. You must know how to read them. You should also follow SDS instructions for chemical use and storage.
- Information in an SDS is divided into sections.
- The Identification section contains general information about the product and the manufacturer.
- The Hazards Identification section lists the hazard class and category of the product.
- The Composition section details the chemical name and common name of the ingredients.
- The next section covers First Aid Measures for exposure to the chemical.
- A section covering Fire-Fighting Measures is required. This section provides information about flammability and lists how to fight fires involving the material. **Follow all instructions provided in this section.**
- The Accidental Release Measures section discusses spills and leaks.
- Section 7 discusses safe Handling and Storage procedures.
<table>
<thead>
<tr>
<th>Remember:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• The section on Exposure Controls and Personal Protection covers exposure limits and personal protective equipment.</td>
<td></td>
</tr>
<tr>
<td>• The Physical and Chemical Properties section lists physical properties of the product.</td>
<td></td>
</tr>
<tr>
<td>• The section on Stability and Reactivity gives information about the product's stability and compatibility. <strong>Follow these instructions carefully.</strong></td>
<td></td>
</tr>
<tr>
<td>• Section 11 reviews Toxicological information related to the product.</td>
<td></td>
</tr>
<tr>
<td>• Sections 12 through 15 are non-mandatory, but cover ecological, disposal, transport, and regulatory concerns.</td>
<td></td>
</tr>
<tr>
<td>• The final section shows the date of preparation or revision of the Safety Data Sheet.</td>
<td></td>
</tr>
</tbody>
</table>
Welcome to the lesson on labeling of hazardous chemicals.

This lesson will review:
- Who is responsible for labeling hazardous chemicals
- The proper contents of a container label
OSHA standards require chemical manufacturers and importers to label all containers of hazardous materials.

Labels must be written in English.

A label must include the following information:
- Product identifier
- Signal word
- Hazard statement(s)
- Pictogram(s)
- Precautionary statement(s)
- Name, address, and telephone number of the manufacturer

Reference 12
4003
Container Labels: Product Identifier

The Product Identifier on the label should match that used on the SDS.

Reference 13
The signal word indicates the relative level of the hazard. “Danger” is used for more severe hazard categories and “Warning” for less severe.

Reference 13
<table>
<thead>
<tr>
<th>Container Labels: Hazard Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard statements are assigned to a hazard class and category to describe the nature and degree of the hazard.</td>
</tr>
<tr>
<td>Examples include:</td>
</tr>
<tr>
<td>- Fatal if swallowed</td>
</tr>
<tr>
<td>- Toxic if swallowed</td>
</tr>
<tr>
<td>- Harmful if swallowed</td>
</tr>
<tr>
<td>- May be harmful if swallowed</td>
</tr>
</tbody>
</table>

Reference 14
Nine pictograms are in use. Some are used for more than one class of hazard.

A label may contain more than one pictogram.

Reference 14

<table>
<thead>
<tr>
<th>Oxi/iers</th>
<th>Flammables</th>
<th>Explosives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pyrophoric</td>
<td>Self-reactive</td>
</tr>
<tr>
<td></td>
<td>Self-heating</td>
<td>Organic Peroxides</td>
</tr>
<tr>
<td></td>
<td>Emits Flammable Gas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Organic Peroxides</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acute toxicity (severe)</th>
<th>Corrosives</th>
<th>Gases Under Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Carcinogens</th>
<th>Respiratory Sensitizers</th>
<th>Reproductive Toxicity</th>
<th>Target Organ Toxicity</th>
<th>Mutagens</th>
<th>Aspiration Toxicity</th>
<th>Environmental Toxicity</th>
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<thead>
<tr>
<th>Irritant</th>
<th>Skin Sensitizer</th>
<th>Acute Toxicity (harmful)</th>
<th>Neurotoxic Effects</th>
<th>Respiratory Toxicity</th>
<th>Respiratory Toxicity (hazardous to ozone layer)</th>
</tr>
</thead>
</table>
Pictograms

The “Flame Over Circle” picture is used to identify an oxidizing agent (glossary).

Reference 14
The “Flame” representation is used to identify:

- Flammables
- Pyrophorics (glossary)
- Self-Heating
- Emits Flammable Gas
- Self Reactive (glossary) chemicals
- Organic Peroxides (glossary)

Reference 14
The “Exploding Bomb” pictogram is used to indicate:

- Explosives
- Self Reactives
- Organic Peroxides

Reference 14
<table>
<thead>
<tr>
<th>4010</th>
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<tbody>
<tr>
<td>Pictograms</td>
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<tr>
<td>The “Skull and Crossbones” identifies products with the potential for severe, acute toxicity.</td>
</tr>
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</table>

Reference 14
Corrosives (glossary) are identified by the "Corrosion" pictogram.

Reference 14
<table>
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<tr>
<th>4012</th>
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<tbody>
<tr>
<td>Pictograms</td>
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</table>

The “Gas Cylinder” picture is used to label gases under pressure.

Reference 14
<table>
<thead>
<tr>
<th>Pictograms</th>
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</table>

This picture is titled “Health Hazard” and is used to label the following products:
- Carcinogens
- Mutagens
- Reproductive Toxins
- Respiratory Sensitizers
- Products with target organ toxicity
- Products with aspiration toxicity

Reference 14
The “Exclamation Mark” is used for these properties:
- Irritant
- Skin Sensitizer
- Acute Toxicity (harmful)
- Narcotic effects
- Respiratory Tract Irritation
- Hazardous to Ozone Layer.

Reference 14
The “Environment” pictogram indicates environmental or aquatic toxicity. Since environmental concerns are outside the scope of OSHA, this pictogram is not mandatory.

Reference 14
Select the answer that best fits the question.

Hazard labels must include which of the following:
   a. Product identifier
   b. Signal word
   c. Hazard statement(s), Pictogram(s), and precautionary statement(s)
   d. Name, address, and telephone number of the manufacturer
   e. All of the above

**MULTIPLE CHOICE INTERACTION**

Correct answer: E

Response for A: Not quite. All of these items must be included.

Response for B: Not quite. All of these items must be included.

Response for C: Not quite. All of these items must be included.

Response for D: Not quite. All of these items must be included.

Response for E: Correct!
Select the answer that best fits the question.

You are creating a label for a new product that is flammable. Which pictogram is most appropriate?

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>A. Flame over circle</td>
<td>MULTIPLE CHOICE INTERACTION</td>
</tr>
<tr>
<td>B. Flame</td>
<td>Correct answer: B</td>
</tr>
<tr>
<td>C. Exploding bomb</td>
<td>Response for A: Incorrect. The right answer is B, the flame pictogram.</td>
</tr>
<tr>
<td>D. Skull and crossbones</td>
<td>Response for B: Correct.</td>
</tr>
<tr>
<td>E. Corrosion</td>
<td>Response for C: Incorrect. The right answer is B, the flame pictogram.</td>
</tr>
<tr>
<td></td>
<td>Response for D: Incorrect. The right answer is B, the flame pictogram.</td>
</tr>
<tr>
<td></td>
<td>Response for E: Incorrect. The right answer is B, the flame pictogram.</td>
</tr>
</tbody>
</table>
Summary

You have completed the lesson on chemical container labeling.

Remember:
- The manufacturer must label all containers in English. The label must contain the product identifier, signal word, hazard statement(s), pictogram(s), precautionary statement(s), and contact information for the manufacturer.
- Your employer must make sure that all chemical containers are labeled properly. Incoming chemicals should be inspected to verify proper labeling. If a chemical is transferred to a new container, the new container must be labeled appropriately.
- Employees must read product labels carefully. Follow all instructions. Heed all warnings.
- The 8 mandatory and 1 optional pictograms are used to identify the class of the hazard.
Welcome to the lesson on personal protective equipment (PPE).

We will discuss the responsibilities of employers and employees, with regard to PPE and the various types of PPE that may be required.
The purpose of PPE is to shield workers from physical and health workplace hazards. These hazards include:
- Chemical
- Radiological
- Physical
- Electrical
- Mechanical
- Other

Reference 15
Your employer is responsible for selecting the types of PPE. It must provide appropriate PPE for all hazards in your work area.

Your employer must train all workers required to use PPE. Training should educate employees about:

- 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
- Understanding the limitations of PPE

Reference 15
Trained employees are responsible for following facility procedures for PPE.

Reusable PPE should be decontaminated, cleaned, and stored after each use.

Single-use PPE should be disposed of according to facility protocol. This is also true for heavily contaminated reusable PPE.

Reference 16
Types of PPE may include:
- Protective clothing
- Respiratory equipment
- Eye protection

Reference 16
<table>
<thead>
<tr>
<th>Types of PPE: Protective Clothing</th>
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<table>
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<tr>
<th>Protective clothing may include:</th>
</tr>
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<tbody>
<tr>
<td>• Gloves</td>
</tr>
<tr>
<td>• Suits/gowns</td>
</tr>
<tr>
<td>• Coveralls</td>
</tr>
<tr>
<td>• Hoods</td>
</tr>
<tr>
<td>• Boots</td>
</tr>
</tbody>
</table>

Choose a glove material appropriate for the chemical. Latex gloves are permeable to many chemicals. They do not provide adequate protection.

Gowns, coveralls, and other protective clothing should be worn if hazardous chemicals might splash or spill on your clothes.

Choose protective clothing appropriate for the chemical. Some chemicals require impermeable gowns for adequate protection.

Reference 16
Respirators cover the mouth and nose. They prevent 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 properly.
- The respirator is properly maintained.

Reference 17
Types of PPE: Eye Protection

Goggles protect the eyes from hazardous chemical splashes.

Face shields protect the entire face.

**Prescription glasses are not a substitute for goggles. Glasses may break. They also do not shield the eyes from all angles.**

Reference 16

Employee wearing goggles as protective equipment.
Select the answer that best fits the question.

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. Do not select too much PPE. Excess PPE can create hazards such as physical and mental stress and impaired vision, mobility, and/or communication.

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

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

Feedback for D: Incorrect. B, C, and D all are true. The correct answer is A. Do not select too much PPE. Excess PPE can create hazards such as physical and mental stress and impaired vision, mobility, and/or communication.
<table>
<thead>
<tr>
<th>You have completed the lesson on PPE.</th>
</tr>
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<tbody>
<tr>
<td>Remember:</td>
</tr>
<tr>
<td>• Employers must select and provide appropriate PPE for all hazards in the work environment.</td>
</tr>
<tr>
<td>• Employers must train workers in the safe and effective use of PPE.</td>
</tr>
<tr>
<td>• Trained employees must follow facility procedures and protocols for the selection, use, storage, maintenance, and disposal of PPE.</td>
</tr>
<tr>
<td>• Choose protective clothing appropriate for the chemical.</td>
</tr>
<tr>
<td>• Use respirators appropriately.</td>
</tr>
<tr>
<td>• Use goggles or a face shield when there is a risk of splash or splatter from a hazardous chemical.</td>
</tr>
</tbody>
</table>
REFERENCES

15. Occupational Safety & Health Administration. OSHA Fact Sheet Personal Protective Equipment. April 2006.
<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 to which most people can be exposed without experiencing harmful effects</td>
</tr>
<tr>
<td>2</td>
<td>CAS number</td>
<td>A unique number assigned to every chemical by the Chemical Abstracts Service</td>
</tr>
<tr>
<td>3</td>
<td>flammability</td>
<td>the measure of a material's ability to burn</td>
</tr>
<tr>
<td>4</td>
<td>decomposition</td>
<td>chemical separation of a substance into two or more products; the products may differ from each other and from the original substance</td>
</tr>
<tr>
<td>5</td>
<td>oxidizing agent</td>
<td>chemical that can act as an electron acceptor; often a very reactive chemical; may form unstable mixtures that create a risk of fire or explosion when in contact with combustible material</td>
</tr>
<tr>
<td>6</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>
<tr>
<td>7</td>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
</tr>
<tr>
<td>8</td>
<td>Flash Point</td>
<td>The lowest temperature at which a liquid can vaporize and become an ignitable mixture.</td>
</tr>
<tr>
<td>9</td>
<td>Partition coefficient</td>
<td>A measure of a chemicals solubility</td>
</tr>
<tr>
<td>10</td>
<td>Pyrophoric</td>
<td>A substance that will ignite spontaneously in air</td>
</tr>
<tr>
<td>11</td>
<td>Self Reactive</td>
<td>A material that may spontaneously decompose and produce heat or an explosion</td>
</tr>
<tr>
<td>12</td>
<td>Organic Peroxide</td>
<td>A carbon containing compound containing 2 joined oxygen atoms. They can be severe fire and explosion hazards.</td>
</tr>
<tr>
<td>13</td>
<td>Corrosive</td>
<td>A substance that will destroy or damage another substance it comes in contact with.</td>
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</tbody>
</table>
ASSESSMENT

1. Which of the following chemical(s) present(s) a physical hazard?
   a. Chemical A: This chemical is used to clean heat-sensitive equipment such as endoscopes.
   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: E
Rationale: Physical hazards explode, ignite, or react violently with other substances. All of the chemicals listed are health hazards. Chemical A is Glutaraldehyde.

2. 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 cannot enter the bloodstream through the lungs.
   d. Strong acids can burn the eyes, but strong alkalines (bases) cannot.
   e. None of these is true.

Correct answer: E
Rationale: Inhaled chemicals can irritate the nose or throat, damage the lungs, and/or enter the bloodstream through the lungs. Skin is not impermeable. You should never smoke around hazardous chemicals.

3. Solids in the form of dust, fume, or fibers are rarely hazardous.
   a. True
   b. False

Correct answer: B
Rationale: Solids are not usually hazardous. Most 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 SDS-related provisions of OSHA’s HCS. You interview administrative personnel at the facility. You learn that the facility has compiled a list of all hazardous chemicals to which workers in the facility might be exposed. An SDS 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 SDS file.
   b. Ensure that the SDS file is readily available to all workers in their work areas, at all times.
c. Review the SDS file, in order to compile a list of manufacturer emergency phone numbers.
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 not responsible for verifying the accuracy of SDS information, or compiling a list of emergency numbers.

5. 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 SDS should you consult, in order to confirm your suspicion?
   a. Hazards identification
   b. Physical and chemical properties
   c. Fire-fighting measures
   d. Stability and reactivity

Correct answer: D
Rationale: The Stability and Reactivity section of an SDS 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 Incompatible materials in this section. Relevant information may also be found in the Handling and Storage section.

6. You are preparing a chemical hazard label for a new product. You know that the product is flammable, carcinogenic, and may irritate the respiratory tract. What pictogram(s) should be on the label?
   a. Exploding bomb
   b. Flame, Health Hazard, and Exclamation Mark
   c. Exploding bomb and Skull and Crossbones
   d. Skull and Crossbones

Correct answer: B
Rationale: This answer choice indicates flammability, carcinogenic health hazard, and respiratory tract irritation.

7. 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 corrosion pictogram on the 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 corrosion pictogram indicates that the chemical is corrosive. A corrosive chemical is able to destroy living tissue upon short- or long-term contact. Select PPE to protect the eyes and all exposed skin. You need goggles for the eyes. Remember that prescription glasses are not a substitute for goggles. You will also need gloves for the skin of the hands. You should wear a lab coat to protect the skin of your arms.

8. Regarding the local and systemic effects of toxic chemicals, all of the following are true EXCEPT:
   a. A chemical burn on the skin is an example of a local effect.
   b. Brain damage from ingested lead is an example of a systemic effect.
   c. All toxic chemicals have both local and systemic effects.
   d. The liver and the heart are two of the organs most commonly harmed by chemicals with systemic effects.
   e. All of these are true.

Correct: C
Answer rationale: Toxic chemicals may have local effects only, systemic effects only, or both local and systemic effects.

9. You can never use too much PPE when working with a hazardous chemical that has adverse health effects.
   a. True
   b. False

Correct answer: B
Answer rationale: Excess PPE can create hazards such as heat stress. Excess PPE can also impair vision, mobility, and communication.

10. Under the Hazard Communication Act, all of the following are true of container labeling EXCEPT:
    a. The NFPA 704 symbol is required.
    b. Labels must include appropriate hazard statements.
    c. Labels must include the name of the product, as it appears on the SDS.
    d. Manufacturers of hazardous chemicals must label their products in English.
    e. All of the above are true of container labeling.

Correct answer: A
Answer rationale: Chemical manufacturers and importers must provide a label that includes a signal word, pictogram, and hazard statement for each hazard class and category. Precautionary statements, product identifier, and supplier information must also be provided. The NFPA 704 symbol is not required.

11. OSHA requires all employers to develop written hazard communication programs.
    a. True
    b. False

Correct answer: A
Answer rationale: Under the Hazard Communication Standard, all employers are required to develop written hazard communication programs.

12. All of the following chemicals are physical hazards EXCEPT:
    a. Trinitrotoluene
    b. Compressed gas in a cylinder
c. Alcohol
d. Glutaraldehyde
e. Only B is a physical hazard

Correct answer: D
Answer rationale: TNT, compressed gas in a cylinder, and alcohols are all physical hazards. Glutaraldehyde is a health hazard.

13. Exposure to a chemical that is a health hazard can occur through all of the following EXCEPT:
   a. Eyes
   b. Skin
   c. Mouth
   d. All of these are exposure routes
   e. None of these are exposure routes

Correct answer: D
Answer Rationale: Exposure to health hazards can occur through the eyes, skin, inhalation, ingestion (mouth), or injection.

14. All gases used in industry have a distinctive odor.
   a. True
   b. False

Correct answer: B
Answer rationale: Many gases do not have a distinctive odor or color.

15. In which section of an SDS would you find information about exposure limits?
   a. Product identification
   b. Exposure controls and personal protection information
   c. Physical and chemical properties
   d. Accidental release measures

Correct answer: B
Answer rationale: The exposure limits are listed in the exposure controls and personal protection information section.

16. Under the Hazard Communication Act, employers are responsible for:
   a. Developing SDSs for all hazardous chemicals used in their facilities
   b. Verifying the accuracy of SDS received with hazardous chemical shipments
   c. Maintaining a file of SDSs for all hazardous chemicals used in their facilities
   d. All of these
   e. None of these

Correct answer: C
Answer rationale: Employers are not responsible for creating SDSs or verifying their accuracy. The manufacturer of each hazardous chemical is responsible for creating a corresponding SDSs and providing accurate information.

17. A product labeled with the Skull and Crossbones pictogram:
a. Will cause damage to the environment  
b. Has the potential for severe, acute toxicity  
c. Could readily undergo a violent chemical reaction, but will not detonate.  
d. Is acidic.  
Correct answer: B  
Answer rationale: The Skull and Crossbones pictogram indicates the potential for severe, acute toxicity.

18. The chemical hazard label indicates the class of hazard. It uses three major color-coded categories: Health (yellow), Flammability (red), and Instability (blue).  
a. True  
b. False  
Correct answer: B  
Answer rationale: The label uses one of 9 pictograms to identify the hazard class.

19. If a product is an oxidizing agent, a ____ pictogram will appear on the label.  
a. Flame Over Circle  
b. Exclamation Point  
c. Skull and Crossbones  
d. Health Hazard  
Correct answer: A  
Answer rationale: An oxidizer is identified with the Flame Over Circle pictogram.

20. Latex gloves should always be used as PPE when handling chemicals in the healthcare environment.  
a. True  
b. False  
Correct answer: False  
Answer rationale: Latex gloves are permeable to many types of chemicals. They do not always provide adequate protection.