

# HAZARDOUS MATERIALS II



**Carcinogen**



**Biohazard**



**Corrosive**



**Poison**

# Unit Overview

Hazardous Materials II covers the characteristics of chemicals that are health hazards. It also covers how chemicals can enter the body and what one can do to prevent toxic exposure. This information is needed to safely work with and around hazardous materials used in MEMS fabrication and other manufacturing facilities. This unit should precede all activities in which one is required to handle, work with or around chemicals.

Allow 20 minutes to cover this material.

# Objectives

- ❖ State and describe at least five characteristics of chemicals that are considered health hazards.
- ❖ Describe the three routes of exposure
- ❖ Define toxicity and how toxicity levels are determined

# Health Hazards

Hazardous chemicals pose a wide range of health hazards.

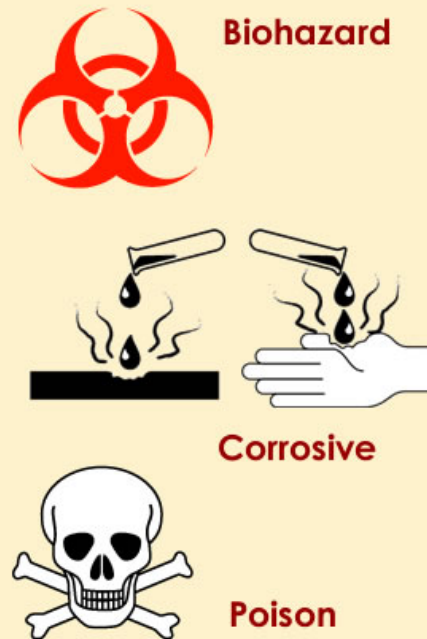
Health Hazards are associated with any chemical that may produce acute or chronic health effects to humans through exposure.

What is meant by “acute”?

What is meant by “chronic”?

# Chemical Health Hazards

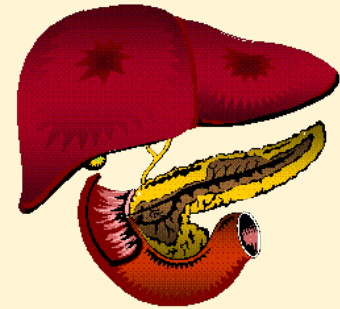
- ❖ [Asphyxiant](#)
- ❖ [BioHazard](#)
- ❖ [Carcinogen](#)
- ❖ [Corrosive](#)
- ❖ [Irritant](#)
- ❖ [Poison](#)
- ❖ [Sensitizer](#)



# Additional Health Hazards

Chemicals that can damage specific organs or a fetus.

- ❖ [Hepatotoxin](#)
- ❖ [Mutagen](#)
- ❖ [Nephrotoxin](#)
- ❖ [Neurotoxin](#)
- ❖ [Teratogen](#)



*Human Organ (The Liver)*

# Review Questions

- ❖ What type of chemical can cause mutation in an organism?
- ❖ What type of chemical can cause an allergic reaction?
- ❖ What type of chemical causes a reaction with oxygen?

# Review Questions

- ❖ What type of chemical can cause mutation in an organism?
  - ❑ *Answer: Mutagen*
  
- ❖ What type of chemical can cause an allergic reaction?
  - ❑ *Answer: Sensitizer*
  
- ❖ What type of chemical causes a reaction with oxygen?
  - ❑ *Answer: Oxidizer*



# Warning Symbols



**Carcinogen**



**Biohazard**



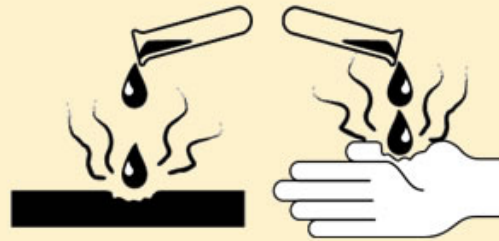
**Corrosive**



**Poison**

Universal symbols are used to quickly warn of potential health hazards. These symbols can be found on chemical labels, compressed gas bottles, chemical storage units, and on any object that contains a hazardous material.

# Review Question



What health hazard warning does each symbol represent?

# Review Question



What health hazard warning does each symbol represent?

*Answer:*

- ☐ *Biohazard*
- ☐ *Corrosive*

# Routes of Chemical Exposure

- ❖ **Inhalation** - breathing through mouth or nose
- ❖ **Ingestion** - eating, swallowing
- ❖ **Absorption** - absorbing through the skin

# Types of Chemical Exposure

- ❖ **Acute** - one time exposure, immediate or delayed effects
- ❖ **Chronic** - frequent exposures over a period of time

# Review Questions

- ❖ What is an example of acute exposure to a chemical?
- ❖ What is an example of chronic exposure to a chemical?

# Review Questions

- ❖ What is an example of acute exposure to a chemical?
  - ❑ *Being splashed with a corrosive*
- ❖ What is an example of chronic exposure to a chemical?
  - ❑ *Working in a coal mine*

# Health Effects of Flammables

- ❖ Dry the skin by removing body oils
- ❖ Irritate the eyes
- ❖ If inhaled in relatively high concentration, can cause headaches, dizziness, nausea, and unconsciousness

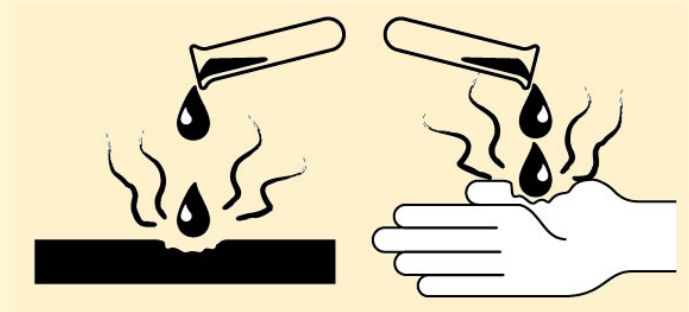


*Symbol for Flammables*



# Health Effects of Corrosives

- ❖ Can cause severe and painful skin burns
- ❖ Burn the eyes and can cause blindness
- ❖ If inhaled, can burn the nose and lungs



*Symbol for Corrosives*

# Health Effects of Oxidizers

- ❖ Can cause severe and painful skin burns
- ❖ Burn the eyes and can cause blindness
- ❖ If inhaled, can burn the nose and lungs



*Symbol for Oxidizers*

# Health Effects of Poisons

- ❖ Can be absorbed into the body through contact with the skin
- ❖ Very irritating to the eyes
- ❖ If inhaled in relatively large amounts, can cause internal damage or even death



*Symbol for Poisons*

# Chemical Toxicity

**Toxicity** is the effect a chemical has on one's health under certain concentrations and exposure times. A chemical's toxicity level depends on

- ❖ the duration of exposure and
- ❖ the chemical's concentration.

# Chemical Toxicity - Dose

**Dose** is the amount of material to which an organism is exposed.

The differentiation between a toxic substance or poison and any non-toxic substance is the dose.

Chemicals that are considered to be toxins or poisons produce harmful effects at relatively low dosages.

# Variables that Effect Toxicity

- ❖ Race
- ❖ Variations among people of the same race
- ❖ Gender
- ❖ Age
- ❖ State of health
- ❖ Medication, drugs, alcohol
- ❖ Heredity
- ❖ Synergistic effect
- ❖ Physical state of the chemical

# Review Questions

- ❖ What is an example of "different dosages" of the same chemical having "different effects" on the body?
- ❖ What is an example that you have experienced in which two people had different effects from the same chemical and exposure?

# Measuring Toxicity

## **Permissible Exposure Limits (PEL)**

The maximum permissible concentration of a particular chemical to which one should be exposed without adverse effects.

## **Threshold Limit Value (TLV)**

The airborne concentration of a substance that represents conditions under which nearly all workers may be exposed day after day with no adverse effect.



# Review Questions

What is a measurement of the effect a chemical has on one's health under certain concentrations and exposure times?

What is PEL?

# Review Questions

What is a measurement of the effect a chemical has on one's health under certain concentrations and exposure times?

❑ *Answer: Toxicity*

What is PEL?

❑ *Answer: Permissible Exposure Limits, the maximum permissible exposure concentration of a chemical without adverse effects*

# Review Question

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Look at the other people in the room.

What factors will cause each of you to be affected differently if exposed to the same chemical?

# Review Question

Look at the other people in the room.

What factors will cause each of you to be affected differently if exposed to the same chemical?

- ☐ *Race*
- ☐ *Variations among people of the same race*
- ☐ *Gender and age*
- ☐ *Physiological conditioning*
- ☐ *Synergistic effects*
- ☐ *Heredity*

# Personal Protective Equipment (PPE)

Protects the worker from chemical, physical and biological.

## Types of PPE

- ❖ Respirators
- ❖ Gloves
- ❖ Safety glasses, goggles, face shields
- ❖ Steel toes shoes
- ❖ Aprons, smocks



*PPE for Working with Acids*

# Review Question

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What type of PPE protects the throat and lungs?

# Review Question

What type of PPE protects the throat and lungs?

❑ *Answer: Respirators*

# Summary

In order to understand the information presented in MSDS's and on chemical labels, one must know and understand the terminology associated with hazardous materials.

Chemicals exhibit a variety of characteristics that are considered health hazards: corrosive, carcinogens, sensitizers.

The toxicity of a chemical is based on its concentration and exposure duration.



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