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| **Introduction**  Comment: |

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|  | **Learning Objectives**  Comment: |
|  | Copy:  After completing this program the user will be able to:   * List the label elements required on hazardous chemicals * Identify the 9 GHS pictograms for health and physical hazards * State the two GHS signal words * Differentiate between a Precautionary Statement and Hazard Statement * Describe the purpose of a Safety Data Sheet * List the 16 sections of a Safety Data Sheet, including the type of information found in each section |
|  | Image: lo collage |

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|  | **GHS & Hazard Communication**  Comment: |
|  | Copy:  The Occupational Safety and Health Administration (OSHA) regulates workplace safety. These federal regulations are primarily found in the Code of Federal Regulations 29 CFR 1910 and cover many aspects of safety in the workplace.   This module covers the information found in the **Hazard Communication Standard** (29 CFR 1910.1200) – also known as **"HCS”** or the **“HazCom Standard”**.   The HazCom Standard was updated in 2012 to align with the **United Nations Globally Harmonized System of Classification and Labeling of Chemicals**, otherwise known as **GHS**.   The intent of the GHS update was to provide an internationally consistent approach to classifying and communicating chemical hazard information.   Significant changes were made to the following:   * Chemical **Hazard Classification** definitions * **Label** elements * **Safety Data Sheet** format (formerly known as MSDS) |
|  | Image: |

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|  | **Timeline**  Comment: |
|  | Copy:The **Timeline** to Implement the 2012 HazCom Standard changes:   * Employers must train employees about the new label requirements and SDS format by **December 2013** (some states have extended deadlines for training). * Manufactures have until June 2015 to make the changes to labels and SDS format. * All chemicals shipped must have updated labels as of December 2015. * Employers have until June 2016 to complete the update of their hazard communication program and perform employee training regarding newly identified physical or health hazards. |
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| **HazCom Standard**  Comment: |

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|  | **Responsibilities**  Comment: |
|  | Copy:The **HazCom Standard** applies both to chemical manufacturers/importers and employers with hazardous chemicals in the workplace.   **Manufacturers** are required to:   * **Classify** the hazards of their chemicals according to the standards outlined in the regulations * Prepare **Labels** and **Safety Data Sheets (SDS)** using standardized formats and verbiage * Ensure the hazard information is provided to users of the chemicals   **Employers** with employees that may be exposed to hazardous chemicals under normal conditions (or in foreseeable emergencies) are required to:   * Have a written hazard communication program, including lists of chemicals present * Ensure appropriate labels are present on containers of chemicals * Ensure Safety Data Sheets (SDS) are available to employees any time they are working with a hazardous chemical * Implement an employee training program regarding chemical hazards and protective measures |

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| **Hazard Classifications**  Comment: |

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|  | **Overview**  Comment: |
|  | Copy: The updated HazCom Standard defines **hazard classifications** for the health hazards and physical hazards of chemicals (refer to image). The GHS has specific criteria for each hazard, and instructions for classifications for chemicals and mixtures of chemicals.   Many classifications are divided into **categories**, based on the degree of hazard.   In GHS, a Category 1 is the highest level of hazard; Category 2 is somewhat less hazardous, and so on.  Some Physical Hazard categories have a different rating system, denoted by Type A, Type B, etc., or Division 1.1, 1.2, 1.3, etc.   In addition, some Health Hazard categories are further divided into **sub-categories**. These sub-categories are denoted as Category 1A, Category 1B, etc.   Hazard Classifications and Categories will be reviewed in more detail later in the module. |
|  | Image: can we fit a full list of hazard classes? Can be just the class names, not categories… |

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| **Hazards Labeling**  Comment: |

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|  | **Overview**  Comment: |
|  | Copy:  The GHS also defines **labeling standards** for chemicals that are shipped or transported.   In addition to the chemical name or identifier and manufacturer’s name and contact information, labels must contain the following elements for each hazard class associated with that chemical:   * **Pictogram** – a symbol to give a visual clue of the hazard class * **Signal Word** (either ‘Danger’ or ‘Warning’) * Specific **Hazard Statement(s)** * Specific **Precautionary Statement(s)**   GHS label elements are standardized and assigned to specific hazard categories and classes, as appropriate.   Chemicals or reagents created in the laboratory are also required to be labeled, but these ‘secondary’ or ‘workplace’ labels may use other systems of warning (such as HMIS or NFPA labels) to convey hazard information.   Employees must be familiar with the GHS labeling system as well as any other hazard labeling systems used for workplace labeling.   All labels must be legible, and labels on incoming chemical containers should not be removed or defaced unless immediately replaced with another appropriate label. |
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|  | **Label Elements**  Comment: |

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|  | **Pictograms**  Comment: |
|  | Copy:**Pictograms** are symbols that convey health, physical and environmental hazard information.   To the left are the nine GHS pictograms which will be used to visually convey hazard warnings:   * Flame (flammable or reactives) * Flame over circle (oxidizers) * Corrosion (corrosive to skin, eyes or metal) * Gas Cylinder (pressurized gas) * Exploding bomb (explosives) * Exclamation Mark (health warnings) * Skull & Crossbones (acutely toxic) * Health Hazard (serious health hazards) * Environment (environmental toxicity – not mandatory)   The pictograms on chemical containers must be a red diamond with a black GHS symbol inside. If the chemical has more than one hazard, multiple pictograms will be used. |
|  | Image: manufacturer label with corrsive, caution, toxic, or carcinogen label |

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|  | **Signal Words**  Comment: |
|  | Copy:In the GHS, two **signal words** are used to emphasize hazards and indicate the relative level of severity of the hazard.   **"Danger"** is used for more severe hazards.   **"Warning"** is used for less severe hazards.   Only one signal word that corresponds to the most severe hazard class should be used on the label.   Signal words are standardized and not subject to variation. |

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|  | **Hazard Statements**  Comment: |
|  | Copy:**Hazard Statements** are standard phrases that describe the nature of the physical, health, or environmental hazard. Hazard statements are also standardized and not subject to variation.   Examples include “Fatal in contact with skin” or “Heating may cause a fire or explosion”.   For products with more than one hazard class, a GHS hazard statement for each hazard class must be included on the product label and SDS.   On some SDS you may see the hazard statement preceded by a code that starts with the letter H and is followed by three digits (such as H225). If multiple hazard statements are applicable, a "+" sign is used between codes. These codes are for reference purposes only – the English translation will also be provided. |

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|  | **Precautionary Statements**  Comment: |
|  | Copy:**Precautionary statements** are a set of standardized phrases that give advice on the correct handing of the chemical product.   Precautionary statements address prevention, response, storage, and/or disposal precautions. Examples include “Wash thoroughly after handling”, “If eye irritation persists, get medical attention” or “Store in a well ventilated place”.   Similar to hazard statements, each precautionary statement has a designated code which may be included on labels. Each precautionary code begins with the letter P followed by three digits. |
|  | Image: manufacturer label with corrsive, caution, toxic, or carcinogen label |

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|  | **Secondary Labeling**  Comment: |
|  | Copy:  When portions of chemicals are removed from the original bottles, or if new solutions are created in the laboratory, these containers must be labeled with **secondary labels**, or "workplace" labels.  Secondary labels do not have to be GHS labels, but must include the full name and concentration of the chemical, an indication of the physical and health hazards, and recommended protective equipment or protocols. |
|  | Image: secondary labels |
|  | Label: A secondary label |

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|  | **HMIS**  Comment: |
|  | Copy:  **Hazards Material Identification System (HMIS)** labels are an example of a non-GHS hazard warning system that may continue to be employed for ‘secondary’ or ‘workplace’ labeling.  HMIS labels are divided into four color-coded sections:   * **Blue**: Health Hazard * **Red**: Flammability * **Yellow or Orange**: Reactivity or Physical Hazards * **White**: Personal Protection   In the HMIS system, the first three sections are rated from 0 to 4, with zero indicating minimal hazard and 4 indicating severe hazard.   Note that the HMIS rating system is opposite the GHS standard rating system. In GHS, lower numbers indicate higher hazard.   The white HMIS section usually indicates the recommended personal protection methods, although target organ effect is sometimes specified as well. |
|  | Image: HMIS label |
|  | Label: HMIS label for ethyl ether |

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| **Health Hazard Classifications**  Comment: |

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|  | **Overview**  Comment: |
|  | Copy:  The upcoming section will review **Health Hazard Classification** as outlined in the 2012 HazCom Standard.   Manufacturers are not required to perform testing to establish the hazard classification of their chemicals, but are expected to review existing evidence and apply expert judgment where necessary for accurate classification. OSHA also supplies guidance on how to classify mixtures of chemicals.   Many health classifications are divided into **Categories**, based on the degree of hazard, and some categories are further divided into **sub-categories**.   To the left is a chart of the Health Hazard Classes, along with the possible Hazard Categories and Subcategories in each class. |
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|  | **Acute Toxicity**  Comment: |
|  | Copy: **Acute toxins** are poisonous chemicals that usually cause harm after a single exposure. Exposure may occur when the chemical is inhaled, eaten (oral), or comes in contact with the skin (dermal).   The amount of toxicity is often expressed as the **Lethal Dose 50 (LD50)**, or the amount of chemical required to kill 50% of the animals tested. The lower the LD50, the more toxic the chemical. For example, the Oral Rat LD50 for table salt is 3000 mg/kg, and for cyanide is 5 mg/kg.   In the GHS classification system, Acute Toxicity is separated into four categories based on toxicity data for oral, dermal or inhalation of gas, vapor or dust exposure (see chart at left).   Chemicals classified as Categories 1 through 3 will be indicated with a Skull and Crossbones pictogram on the label. Category 4 is considered harmful and will have an Exclamation Mark. |
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|  | **Carcinogen**  Comment: |
|  | Copy:  **Carcinogens** are substances or mixtures of substances known to cause cancer or to increase its incidence.   About 25 substances are specifically regulated as carcinogens, but many more are suspected carcinogens. Formaldehyde is a carcinogen, as are benzene, vinyl chloride and asbestos.   In the GHS classification system, carcinogens are indicated by the Health Hazard pictogram, and warning statements such as “May cause cancer” or “Suspected of causing cancer”.   Carcinogens will also be labeled with precautionary statements regarding special handling instructions and protective equipment.   See the chart to the left describing the categories and subcategories defined in this hazard class. |
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|  | **Reproductive Hazard**  Comment: |
|  | Copy:  **Reproductive hazards** are chemicals that cause harm to some aspect of human reproduction.   In the GHS classification system, chemicals that pose reproductive hazards are generally indicated by the Health Hazard pictogram, and warning statements similar to “May damage fertility or the unborn child”.   Reproductive hazards are separated into the following three classifications:   * **Germ Cell Mutagenicity**: Ability to cause mutations in human germ cells (eggs or sperm) that can be transmitted to progeny. See chart on the left for Category information. * **Reproductive Toxicity**: Causes adverse effects on sexual function or fertility in adults, or adverse effects on development in offspring either before or after birth (i.e. birth defects not caused by germ cell mutations). * **Effects On or Via Lactation**: This classification singles out chemicals that if absorbed by a woman may either interfere with lactation or could have a harmful effect on breastfed babies. There is no pictogram or signal word for this category, but the hazard statement “May cause harm to breast-fed children” will be present. |

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|  | **Sensitizer**  Comment: |
|  | Copy:  **Sensitizers** cause allergic reactions. Once sensitized, a tiny amount of chemical can cause severe reactions, ranging from itching to asthma. Formaldehyde is a common sensitizer.   In the GHS classification system, chemicals are separated into:   * **Respiratory Sensitizer**: Chemical inhalation can cause hypersensitivity of the airways. Respiratory sensitizers are indicated by the Health Hazard pictogram, and danger statements such as “May cause allergy or asthma symptoms or breathing difficulties if inhaled”. * **Skin Sensitizer**: Skin contact can cause an allergic response (such as contact dermatitis). Skin sensitizers are indicated by the Exclamation Mark pictogram, and warning statements such as “May cause an allergic skin reaction”.   See the chart to the left describing this hazard class. |
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|  | **Corrosion/Irritant**  Comment: |
|  | Copy:  **Corrosives** cause blistering and burns on skin and eyes, and fumes can damage respiratory passages. Common corrosives are sulfuric and hydrochloric acid.   **Irritants** cause reversible pain or reddening at area of contact and may cause headache, itching, dryness or coughing. Common irritants are solvents, acetic acid and ammonia.   In the GHS classification system, chemicals are graded as corrosive (highly damaging) or irritants (less damaging), and separated by skin vs. eye impact as shown in the chart to the left.   Category 1 skin or eye corrosives will be labeled with a Corrosion pictogram, and a hazard statement such as “Causes severe skin burns and eye damage”.   Category 2 skin irritants and 2A eye irritants will be labeled with the Exclamation Mark and a warning statement such as “Causes serious eye irritation”. Category 2B eye irritants do not require a pictogram, but will have the warning statement “Causes eye irritation”. |
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|  | **Aspiration**  Comment: |
|  | Copy:  The **Aspiration Toxicity** classification applies to chemicals that are extremely hazardous in the trachea or lower respiratory system (may cause fatal pulmonary injury or severe chemical pneumonia). This may occur directly from breathing the chemical, or indirectly from aspirating vomit following ingestion.   Examples of chemical in this classification include turpentine, pine oil and certain hydrocarbons.   Chemicals that are aspiration hazards are labeled with a Health Hazard pictogram, and the hazard statement “May be fatal if swallowed and enters airways”. |
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|  | **Specific Target Organ**  Comment: |
|  | Copy:The GHS has hazard categories for chemicals that are known to cause damage to a specific organ, and separates them into the following:   * Specific Target Organ Toxicity – Single Exposure  (STOT-SE) * Specific Target Organ Toxicity – Repeated Exposure (STOT-RE)   These categories apply if specific toxicity can occur to the biochemistry or hematology of the body, and is separated into whether the effect occurs after a single exposure or after multiple or prolonged exposures, or both.   Category 1 and 2 for both classes will be labeled with a Health Hazard pictogram, and a hazard statement such as “Causes damage to (specific) organs through prolonged or repeated exposure”.   Category 3 STOT-SE will be labeled with the Exclamation Mark and a warning statement such as “May cause drowsiness or dizziness”.   The primary target organ or system will be identified on the label, or if this is not possible the substance will be labeled as a general toxicant. |
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|  | **Simple Asphyxiants**  Comment: |
|  | Copy:  The final health hazard classification is **Simple Asphyxiants**. These are substances or mixtures that displace oxygen, and can thus cause oxygen deprivation, unconsciousness and death.   There is no pictogram for this category, but the hazard statement “May displace oxygen and cause rapid suffocation” will be present. |
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| **Physical Hazard Classifications**  Comment: |

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|  | **Overview**  Comment: |
|  | Copy:  **Physical Hazards** classifications are listed in the box to the left.   Similar to health hazards, most of the Physical Hazard Classifications are divided into Categories 1 through 4. However, two classes (Self-Reactive Chemicals and Organic Peroxides) are categorized using Type A through Type G, and Explosives are categorized using yet another scale.   The next few pages will review these physical hazards in more detail. |
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|  | **Flammables**  Comment: |
|  | Copy:  In the GHS, flammables are divided into:   * Flammable liquids * Flammable solids * Flammable gases * Flammable aerosols * Chemicals which emit flammable gas when exposed to water   **Flammable Liquids** are divided into Categories 1 though 4 (see list at left), based on the chemical’s **Flash Point** (temperature at which chemical gives off sufficient vapor to form an ignitable mixture). Category 1-3 will be labeled with the Flame pictogram and a hazard statement such as “Highly flammable liquid and vapor”. Category 4 does not require a pictogram, and will have the warning statement “Combustible Liquid”.   **Flammable Solids, Gases and Aerosols** are classified as either Category 1 or 2, based on the degree of hazard. **Chemicals which emit flammable gases when in contact with water** are classified as Category 1 through 3, depending on how vigorously the chemical reacts. Most of the above will be labeled with the Flame pictogram and hazard statements such as “Flammable aerosol” or “In contact with water releases flammable gas”. |
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|  | **Explosive**  Comment: |
|  | Copy:  In the GHS, **explosives** are rated on a different scale. The most hazardous is classified as an Unstable Explosive. From there, the rating scale starts with Division 1.1 through 1.6 (see list at left).   Unstable Explosives are defined as substances too sensitive for normal handling, transport or use. If an explosive doesn't meet that definition, then it's classified into Divisions based on expected hazards, including mass explosion hazard (explosion which affects almost the entire quantity almost instantaneously) or projection hazard (projection of fragments of appreciable size or range).   Most categories will be labeled with the Exploding Bomb pictogram and a hazard statement such as “Explosive, severe projection hazard” or “Fire or projection hazard”. |
|  | Image: |

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|  | **Self Reactive & Organic Peroxide**  Comment: |
|  | Copy:  **Self Reactive** chemicals are unstable chemicals that tend to explode even in the absence of air.   **Organic Peroxides** are thermally unstable chemicals which can explode by impact or friction, usually burn rapidly and react dangerously to other substances.   Both hazard classes use the Type A through Type G rating scale and have the same labeling standards.   * **Type A**: labeled with Exploding Bomb pictogram and hazard statement "Heating may cause fire or explosion" * **Type B**: labeled with both Exploding Bomb and Flame pictograms and hazard statement "Heating may cause fire or explosion" * **Types C through G**: labeled with Flame pictogram and the warning "Heating may cause fire" |
|  | Image: |

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|  | **Oxidizer**  Comment: |
|  | Copy:  **Oxidizers** are chemicals which, although not combustible themselves, may contribute to or cause the combustion of other materials, generally through the generation of oxygen.   In GHS, Oxidizers have been divided into the following classifications:   * Oxidizing Liquids * Oxidizing Solids * Oxidizing Gases   **Oxidizing Liquids and Solids** are divided into Categories 1 though 3.   **Oxidizing Gases** are classified only as Category 1.   Each of the above Categories will be labeled with the Flame over Circle pictogram and a hazard statement such as “May intensify fire; oxidizer”. |
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|  | **Other Physical Hazards**  Comment: |
|  | Copy:  **Gases Under Pressure:** This category is for gases which are contained in a receptacle at a pressure of 200 kPa (29 psi) or more. Labels will contain the Gas Cylinder pictogram and a hazard statement such as “Contains gas under pressure; may explode if heated”.   **Corrosive to Metals:** This category is for substances that will damage or destroy metals by chemical action. Labels will contain the Corrosion pictogram and a warning statement such as “May be corrosive to metals”.   **Pyrophoric Solids, Liquids or Gas:** These categories are for chemicals which catch fire when exposed to air. Labels will contain the Flame pictogram and a hazard statement such as “Catches fire spontaneously if exposed to air”.   **Self-Heating Chemicals:** These chemicals are liable to self-heat when in contact with air. These differ from Pyrophoric chemicals in that they ignite only when in large quantities and after long periods of time (hours to days). They are separated into Category 1 & 2, and both will be labeled with the Flame pictogram, and contain hazard statements such as “Self-heating; may catch fire”.   **Combustible Dusts:** There is no pictogram or signal word for this category, but the hazard warning “May form combustible dust concentrations in air” will be present. |
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| **Safety Data Sheets**  Comment: |

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|  | **Overview**  Comment: |
|  | Copy: **Safety Data Sheets (SDS)**, formerly called Material Safety Data Sheets (MSDS), are safety documents which provide detailed information about the physical and health hazards of chemicals. SDS's are in use globally and have a standardized format.   Although the content requirements are similar, the 2012 HazCom Standard now requires SDS’s to comply with a standard 16-section format (see section list). Manufacturers have until June 2015 to comply with this change.   Manufacturers must create a SDS for each hazardous chemical, and provide a copy to users upon initial shipment of the chemical and with the first shipment after a SDS is updated. Copies of SDS must also be available upon request.   Employers will ensure that SDS’s for each hazardous chemical are readily available to employees during their work shifts. Electronic versions are acceptable, provided rapid access is still available in a power outage or other emergency.   The following pages will review the required sections of SDS's. |

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|  | **SDS Contents**  Comment: |

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|  | **1. Product Identification**  Comment: |
|  | Copy:**Section 1**   The first section of the SDS contains the following:   * Chemical or product name or identifiers * Manufacturer's or supplier's contact information * Emergency phone number * Recommedation or restrictions for product use   The product name on the SDS is required to be exactly the same as the name on the product's label. |
|  | Image: |
|  | Label: SDS Section 1 Example, Methanol |

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|  | **2. Hazards Identification**  Comment: |
|  | Copy:**Section 2**   This section of the SDS must contain the following :   * GHS hazard classification(s) * Signal word, pictogram(s), hazard statement(s) and precautionary statements(s) * Description of other unclassified hazards   The manufacturer may choose to add other information, such as HMIS or NFPA hazard levels to this section. |
|  | Image: |
|  | Label: SDS Section 2 Example, Methanol |

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|  | **3. Composition/Information on Ingredients**  Comment: |
|  | Copy:**Section 3**   This SDS section includes:   * Chemical name * Common name & synonyms * CAS number(s) * If a mixture, the chemical names & percentages of all ingredients classified as a health hazard   Exact percentages of each ingredient must be specified unless the SDS is used for a group of substantially similar mixtures. Occasionally ingredient information is withheld by the manufacturer and listed a Trade Secret.   Carcinogens must be identified if present in the mixture at levels of 0.1% or more. |
|  | Image: |
|  | Label: SDS Section 3 Example, Methanol |

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|  | **4. First Aid Measures**  Comment: |
|  | Copy:**Section 4**   This section describes:   * First Aid measures to take for each route of exposure (i.e. inhalation, skin and eye contact or ingestion) * Symptoms and effects of exposure, both acute and delayed * When immediate medical attention and special treatment is needed |
|  | Image: |
|  | Label: SDS Section 4 Example, Methanol |

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|  | **5. Fire Fighting Measures**  Comment: |
|  | Copy:**Section 5**   **Fire Fighting Measures** describes the following:   * Suitable extinguishing media * Unsuitable extinguishing media * Specific hazards arising from the combustion of the chemical * Special protective equipment and precautions for firefighters |
|  | Image: |
|  | Label: SDS Section 5 Example, Methanol |

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|  | **6. Accidental Release Measures**  Comment: |
|  | Copy:**Section 6**   The **Accidental Release Measures** section indicates actions to take in the event of chemical spills or leaks, including:   * Personal precautions * Protective equipment * Emergency procedures * Environmental precautions * Methods and materials for containment and clean up   This section may distinguish clean-up methods for small vs. large spills when the spill volume has impact on the hazard. |
|  | Image: |
|  | Label: SDS Section 6 Example, Methanol |

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|  | **7. Handling and Storage**  Comment: |
|  | Copy:**Section 7**   The **Handling and Storage** section discusses:   * Precautions for safe handling * Conditions for safe storage * Any chemical incompatibilities |
|  | Label: SDS Section 7 Example, Methanol |

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|  | **8. Exposure Controls and PPE**  Comment: |
|  | Copy:**Section 8**   This section provides information about **Exposure Controls and Personal Protection** including:   * Exposure limits, such as the OSHA Permissible Exposure Limit (PEL) or the Threshold Limit Value (TLV) * Appropriate engineering controls * Individual protection measures, such as personal protective equipment (PPE) |
|  | Image: section 8 |
|  | Label: SDS Section 8 Example, Methanol |

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|  | **9. Physical and Chemical Properties**  Comment: |
|  | Copy:**Section 9**  This section lists the **Physical and Chemical Properties** of the product (see example on the left).  **Vapor density** is a helpful piece of information. If the vapor density is less than 1 (less than the density of air), then vapors from the chemical will rise and usually dissipate. If the vapor density is greater than 1 (heavier than air), vapors will tend to collect on surfaces, which is a hazard when the vapors are flammable.  **Flash point** is the minimum temperature at which the chemical gives off enough vapor to ignite.  The **autoignition temperature** is the point at which a material will burst into flames without an ignition source |
|  | Image: |
|  | Label: SDS Section 9 Example, Methanol |

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|  | **10. Stability and Reactivity**  Comment: |
|  | Copy:**Section 10**  The **Stability and Reactivity** section indicates chemical stability and the possibility of hazardous reactions, including:   * Reactivity * Stability during storage & handling * Stabilizers needed * Physical appearance indicating a safety issue * Hazardous decomposition of products * Conditions to avoid (e.g. static discharge, shock, or vibration) * Incompatible materials |
|  | Image: |
|  | Label: SDS Section 10 Example, Methanol |

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|  | **11. Toxological Information**  Comment: |
|  | Copy:**Section 11**  The **Toxicological Information** section describes various health effects including:   * Likely routes of exposure * Symptoms of exposure * Delayed and immediate effects, or chronic effects from short- or long-term exposure * Measures of toxicity * Whether chemical has been classified as a carcinogen |
|  | Image: |
|  | Label: SDS Section 11 Example, Methanol |

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|  | **12. Ecological Information**  Comment: |
|  | Copy:**Section 12**  The **Ecological Information** section lists the adverse effects the chemical has on the environment, including acquatic and terrestrial ecotoxicity, persistence and degradability of the chemical, bioaccumulative potential, and mobility in soil.   **NOTE**: Sections 12 through 15, while required to be indicated on the SDS, are non-mandatory as to content because OSHA does not regulate these areas. |
|  | Image: |
|  | Label: SDS Section 12 Example, Methanol |

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|  | **13. Disposal Considerations**  Comment: |
|  | Copy:**Section 13**   The **Disposal Considerations** section describes waste residues of chemicals and information about the safe handling and disposal methods of chemical waste, including contaminated packaging. |
|  | Image: |
|  | Label: SDS Section 13 Example, Methanol |

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|  | **14. Transport Information**  Comment: |
|  | Copy:**Section 14**   The **Transport Information** section lists the information necessary (such as UN number and proper shipping name) to properly package, transport and/or ship the chemical according to DOT and other regulations. |
|  | Image: |
|  | Label: SDS Section 14 Example, Methanol |

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|  | **15. Regulatory Information**  Comment: |
|  | Copy:**Section 15**   This section lists other safety, health, and environmental regulations that may apply to the product. |
|  | Image: |
|  | Label: SDS Section 15 Example, Methanol |

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|  | **16. Other Information**  Comment: |
|  | Copy:**Section 16**   The last section of the SDS is required by OSHA, and contains any other information, including date the SDS was prepared or revised.   You have reached the end of this program. Click the Take Test button for a ten question multiple choice test. |
|  | Image: |
|  | Label: SDS Section 16 Example, Methanol |

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| **Final Exam**  Comment: |
| Copy: <p> Which of the following is required by the Hazard Communication Standard? </p> |
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| Image: |
| Label: A secondary label |
| Label: Hazard Classification, Methanol |
| Answer Choice: Labels and Safety Data Sheets must be prepared in a standardized format |
| Answer Choice: Employers must have a written hazard communication program |
| Answer Choice: Employers must implement an employee training program regarding chemical hazards and protective measures |
| Answer Choice: All of the above |
| Answer Choice: Toxic and Danger |
| Answer Choice: Warning and Danger |
| Answer Choice: Caution and Toxic |
| Answer Choice: Danger and Caution |
| Answer Choice: Flammable, Corrosive, Explosive |
| Answer Choice: Gas Under Pressure, Corrosive, Irritant |
| Answer Choice: Flammable, Health Hazard, Irritant |
| Answer Choice: Oxidizer, Health Hazard, Irritant |
| Answer Choice: Name of manufacturer |
| Answer Choice: Permissible Exposure Limits (PEL) |
| Answer Choice: Full name and concentration of chemical |
| Answer Choice: Emergency phone number |
| Answer Choice: Category 1 |
| Answer Choice: Category 4 |
| Answer Choice: Category 5 |
| Answer Choice: None of the above |
| Answer Choice: Sensitizer |
| Answer Choice: Irritant |
| Answer Choice: Corrosive |
| Answer Choice: Mutagen |
| Answer Choice: No PPE required |
| Answer Choice: Eye, skin, and clothing protection |
| Answer Choice: Steel-toed shoes and leather gloves |
| Answer Choice: Mouthguard and a rubber apron |
| Answer Choice: The format of an SDS is determined by the manufacturer |
| Answer Choice: The lab director is the only employee who needs access to the SDS |
| Answer Choice: The SDS must comply with a standard 16-section format |
| Answer Choice: If the laboratory is short on space, the SDS may be kept in an off-site storage location |
| Answer Choice: A (Skull & Crossbones) |
| Answer Choice: B (Exploding Bomb) |
| Answer Choice: C (Health Hazard) |
| Answer Choice: D (Flame Over Circle) |
| Answer Choice: True |
| Answer Choice: False |

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|  | **Exam 1**  Comment: |

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|  | **Question 1**  Comment: |

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|  | **Question**  Comment: |
|  | Copy:  Which of the following is required by the Hazard Communication Standard? |
|  | Image: |
|  | Answer Choice: Labels and Safety Data Sheets must be prepared in a standardized format |
|  | Answer Choice: Employers must have a written hazard communication program |
|  | Answer Choice: Employers must implement an employee training program regarding chemical hazards and protective measures |
|  | Answer Choice: All of the above |

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|  | **Explanation**  Comment: |
|  | Copy:  The Hazard Communication Standard (HCS) applies to employers with hazardous chemicals in the workplace and to chemical manufacturers and chemical importers.  The HCS includes the following requirements:   * Labels and Safety Data Sheets must be prepared in a standardized format * Employers must have a written hazard communication program * Employers must implement an employee training program regarding chemical hazards and protective measures |
|  | Image: |

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|  | **Question 2**  Comment: |

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|  | **Question**  Comment: |
|  | Copy:The two GHS signal words are |
|  | Answer Choice: Toxic and Danger |
|  | Answer Choice: Warning and Danger |
|  | Answer Choice: Caution and Toxic |
|  | Answer Choice: Danger and Caution |

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|  | **Explanation**  Comment: |
|  | Copy:In the GHS, the two signal words **"Danger"** and **"Warning"** are used to emphasize hazards and indicate the relative level of severity of the hazard. |
|  | Image: |

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|  | **Question 3**  Comment: |

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|  | **Question**  Comment: |
|  | Copy:  According to this portion of the SDS label, which hazard classes apply to this chemical? |
|  | Image: |
|  | Answer Choice: Flammable, Corrosive, Explosive |
|  | Answer Choice: Gas Under Pressure, Corrosive, Irritant |
|  | Answer Choice: Flammable, Health Hazard, Irritant |
|  | Answer Choice: Oxidizer, Health Hazard, Irritant |

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|  | **Explanation**  Comment: |
|  | Copy:The Hazard Classifications that apply to Toluene are Flammable, Health Hazard, and Irritant. |
|  | Image: |

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|  | **Question 4**  Comment: |

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|  | **Question**  Comment: |
|  | Copy:  Which one of the following is information required on a Secondary Label? |
|  | Image: |
|  | Answer Choice: Name of manufacturer |
|  | Answer Choice: Permissible Exposure Limits (PEL) |
|  | Answer Choice: Full name and concentration of chemical |
|  | Answer Choice: Emergency phone number |

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|  | **Explanation**  Comment: |
|  | Copy:  Secondary labels must include the full name and concentration of the chemical, as well as an indication of the physical and health hazards and recommended protective equipment or protocols. |
|  | Image: |
|  | Label: A secondary label |

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|  | **Question 5**  Comment: |

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|  | **Question**  Comment: |
|  | Copy:  In GHS Hazard Classification, which of the following categories is the **highest** level of hazard? |
|  | Image: |
|  | Answer Choice: Category 1 |
|  | Answer Choice: Category 4 |
|  | Answer Choice: Category 5 |
|  | Answer Choice: None of the above |

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|  | **Explanation**  Comment: |
|  | Copy:In GHS, Hazard Classification is divided into four categories based on the degree of hazard. Category 1 is the highest level of hazard. Category 2 is somewhat less hazardous, and so on.   As a reminder,in the HMIS and NFPA systems, category 4 is the highest level of hazard and category 1 is the least hazardous. |
|  | Image: |
|  | Label: Hazard Classification, Methanol |

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|  | **Question 6**  Comment: |

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|  | **Question**  Comment: |
|  | Copy:  A chemical that can cause allergic reactions is called a(n): |
|  | Image: |
|  | Answer Choice: Sensitizer |
|  | Answer Choice: Irritant |
|  | Answer Choice: Corrosive |
|  | Answer Choice: Mutagen |

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|  | **Explanation**  Comment: |
|  | Copy:Sensitizers are chemicals that cause allergic reactions.   As an example shown on the left, latex products contain chemicals that may cause allergic reactions. |
|  | Image: |

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|  | **Question 7**  Comment: |

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|  | **Question**  Comment: |
|  | Copy:  Based on this SDS section for sodium hypochlorite (bleach), what personal protective equipment (PPE) should be worn when working with this chemical? |
|  | Image: |
|  | Answer Choice: No PPE required |
|  | Answer Choice: Eye, skin, and clothing protection |
|  | Answer Choice: Steel-toed shoes and leather gloves |
|  | Answer Choice: Mouthguard and a rubber apron |

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|  | **Explanation**  Comment: |
|  | Copy:  According to this SDS, use suitable personal protective equipment to prevent the skin, eyes, and clothing from contact with bleach. |

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|  | **Question 8**  Comment: |

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|  | **Question**  Comment: |
|  | Copy: Which of the following is **TRUE** about Safety Data Sheets (SDS)? |
|  | Image: |
|  | Answer Choice: The format of an SDS is determined by the manufacturer |
|  | Answer Choice: The lab director is the only employee who needs access to the SDS |
|  | Answer Choice: The SDS must comply with a standard 16-section format |
|  | Answer Choice: If the laboratory is short on space, the SDS may be kept in an off-site storage location |

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|  | **Explanation**  Comment: |
|  | Copy:The 2012 HazCom Standard requires SDS's to comply with a standard 16-section format. Employers will ensure that SDS's for each hazardous chemical are readily available to employees during their work shifts. |
|  | Image: |

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|  | **Question 9**  Comment: |

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|  | **Question**  Comment: |
|  | Copy:Which of the following pictograms indicates fatal or toxic **Acute Toxicity**? |
|  | Image: |
|  | Answer Choice: A (Skull & Crossbones) |
|  | Answer Choice: B (Exploding Bomb) |
|  | Answer Choice: C (Health Hazard) |
|  | Answer Choice: D (Flame Over Circle) |

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|  | **Explanation**  Comment: |
|  | Copy:Fatal or toxic **Acute Toxicity** is indicated by the Skull and Crossbones pictogram. |
|  | Image: |

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|  | **Question 10**  Comment: |

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|  | **Question**  Comment: |
|  | Copy:True or False: Hazard Statements and Codes are standardized and not subject to variation. |
|  | Image: |
|  | Answer Choice: True |
|  | Answer Choice: False |

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|  | **Explanation**  Comment: |
|  | Copy:  In the GHS, Hazard Statements and Codes are standardized and not subject to variation.  Since hazard statements are specific to the hazard classification categories, users should always see the same statement for the same hazard, no matter what the chemical is or who manufactures it. |
|  | Image: |