Handout 1A: Legal Rights and Responsibilities:

Directions: Use pages from Chapter 1: Legal Rights and Responsibilities and/or the OSHA 29 CFR 1926.65 and 29 CFR 1910.1200 standards to answer and discuss your assigned questions.

Example: The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) created the Superfund program to help manage and pay for cleanup at hazardous waste sites.

☐ True

☐ False

Section/Page cited: _____

1. The government agency responsible for worker safety and health at hazardous waste sites is:

   ☐ OSHA (Occupational Safety and Health Administration)

   ☐ NIOSH (National Institute of Occupational Safety and Health)

   ☐ EPA (Environmental Protection Agency)

   ☐ NIEHS (National Institute of Environmental Health Sciences)

   Section/Page cited: _____

2. If a worker is disciplined or fired for filing an OSHA complaint, she or he has no recourse under the OSH Act.

   ☐ True

   ☐ False

   Section/Page cited: _____

3. Which of the following are rights that workers have under the OSH Act: (Select all that apply)

- [ ] File a safety complaint with OSHA
  Section/Page cited: _____
- [ ] Request a workplace inspection
  Section/Page cited: _____
- [ ] Talk to the OSHA inspector in private
  Section/Page cited: _____
- [ ] Set the amount of fine for any employer violation
  Section/Page cited: _____

4. The OSHA general duty clause requires employers to:

- [ ] All of the below
- [ ] Provide a safe and healthful workplace
  Section/Page cited: _____
- [ ] Establish a joint labor-management safety and health committee
  Section/Page cited: _____
- [ ] Have an industrial hygienist at each site
  Section/Page cited: _____

5. The government agency that is responsible for protecting the air, land, and water from pollution is:

- [ ] OSHA (Occupational Safety and Health Administration)
- [ ] NIOSH (National Institute of Occupational Safety and Health)
- [ ] EPA (Environmental Protection Agency)
- [ ] NIEHS (National Institute of Environmental Health Sciences)

Section/Page cited: _____

6. The Hazardous Waste Standard 29 CFR 1926.65 protects workers at: (Check all that apply)

- [ ] Chemical plants
- [ ] Hazardous waste sites
- [ ] Refineries
- [ ] Emergency response to chemical spills

Section/Page cited: _____

7. A “qualified person” and a “site safety and health officer/supervisor” are always the same person.

- [ ] True
- [ ] False

Section/Page cited: _____

8. Identifying hazards, degree of hazards, and initial Personal Protective Equipment (PPE) requirements before work begins is called Site Characterization.

- [ ] True
- [ ] False

Section/Page cited: _____

9. Supervisors at Hazardous Waste sites must have 40 hours of offsite training, 3 days of field experience, and 8 hours of additional training.

- [ ] True
- [ ] False

Section/Page cited: _____

10. All hazardous waste workers are required to have:

- [ ] 16 hours of refresher training annually
- [ ] 3 days of supervised field training annually
- [ ] 8 hours of refresher training annually
- [ ] Passed a written and practical exam annually

Section/Page cited: _____

11. A site control program required by 29 CFR 1926.65; Paragraph (d) includes:

- [ ] All of the below
- [ ] Use of the Buddy System
- [ ] Standard Operating Procedures
- [ ] Location of Medical Assistance

Section/Page cited: _____

12. On a hazardous waste site:

- [ ] All of the below are true
- [ ] Decontamination must be performed in an area that minimizes exposure to contaminated employees and equipment
- [ ] All employees leaving contaminated areas must decontaminated
- [ ] All equipment and solvents used for decon must be decontaminated and disposed of properly

Section/Page cited: _____

13. Medical Surveillance must be provided if a worker is required to wear a respirator for more than 30 days per year as required in the respiratory standard (29 CFR 1910.134).

- [ ] True
- [ ] False

Section/Page cited: _____

14. On a hazardous waste site, the site-specific Safety and Health Plan must include:

- [ ] All of the below
- [ ] The decontamination process
  Section/Page cited: _____
- [ ] The type of personal protective equipment used by employees on site
  Section/Page cited: _____
- [ ] The type and frequency of air monitoring
  Section/Page cited: _____

15. Employers must provide hazardous waste workers with a medical examination:

- [ ] All of the below are true
- [ ] If the worker wants to start a family
- [ ] If the worker wants to get married
- [ ] Prior to their assignment to a hazardous waste site

Section/Page cited: _____

16. In the hierarchy of controls Administrative Controls, are more effective than Engineering Controls.

- [ ] True
- [ ] False

Section/Page cited: _____

17. On a hazardous waste site, each employer must develop and maintain a plan for handling drums to prevent injuries.

- [ ] True
- [ ] False

Section/Page cited: _____

18. For refineries, chemical plants, shippers, or any other company that has the potential for a hazard release, the employer must have an _____ as stated in 29 CFR 1926.65 Paragraph (l).

- [ ] Reactionary Plan
- [ ] HAZMAT Response Plan
- [ ] Disaster Prevention Program
- [ ] Emergency Response Plan

Section/Page cited: _____

19. The Hazard Communication Standard (29 CFR 1910.1200) states that labeling does not apply to hazardous waste.

- [ ] True
- [ ] False

Section/Page cited: _____

20. How long do workers medical records need to be maintained by employers?

- [ ] 20 years past their last date of employment
- [ ] 30 years past their last date of employment
- [ ] 50 years past their last date of employment
- [ ] 75 years past their last date of employment

Section/Page cited: _____

Handout 1B: Legal Rights and Responsibilities: DOE

Directions: Use pages from Chapter 1: Legal Rights and Responsibilities and/or the OSHA 29 CFR 1926.65 and 29 CFR 1910.1200 standards to answer and discuss your assigned questions.

Example: The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) created the Superfund program to help manage and pay for cleanup at hazardous waste sites.

☐ True

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- [ ] True
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20. How long do workers medical records need to be maintained at Department of Energy sites?

- [ ] 20 years past their last date of employment
- [ ] 30 years past their last date of employment
- [ ] 50 years past their last date of employment
- [ ] 75 years past their last date of employment

Section/Page cited: _____

Handout 2: Health Hazards and Routes of Exposure

Directions: Answer the following questions as you follow along with the instructor's presentation.

1. **What are some examples of the toxicological effects of exposure to chemicals?**

2. **In your own words, what is a chemical reaction and what would you want to know before mixing chemicals?**

3. **What would happen if you mixed bleach and ammonia?**

4. **What are examples of biological hazards?**

5. **What are some examples of physical hazards found on hazardous waste sites?**

6. **What are some examples of chemical hazards found on hazardous waste sites?**

7. **What is an example of an acute health effect and how long does it take for you to be affected?**

8. **What types of chemical hazards can cause a chronic health effect?**

9. **We can be exposed to chemicals in different ways. What are examples of the 5 exposure routes?**

10. **What are the 3 different types of Occupational Exposure Levels and what agency is responsible for each one?**

Handout 3: Health Effects

Directions: With your group, answer the questions assigned to your group, using your Participant Manual.

1. **What three defense systems does the body have to help get rid of contaminants?**

2. **The body's sensitivity can cause a person to _____, which can get rid of _____ from the body and not let them get _____.**

3. **What are cilia and how do they work to protect you?**

4. **What does smoking do to cilia?**

5. **_____ are part of the body's immune system and are a type of _____ that surrounds and kills microorganisms, removes dead cells, and stimulates the action of other immune system cells.**

6. **What is an example of when macrophages are not effective?**

7. **The resulting health effects from chemical and physical hazards include injuries and illnesses, _____, temporary health effects and _____ minor symptoms to life-threatening conditions, and death.**

8. **Explain how the following parts of the body are affected by the effects of chemical, physical, and biological hazards:**
   - **Head (nervous system):**
   - **Liver and Kidneys:**
   - **Ears:**
   - **Teeth and gums:**
   - **Eyes:**
   - **Nose and Throat:**
   - **Chest and Lungs:**
   - **Muscle, Tendons, and Joints:**
   - **Reproductive system:**
   - **Stomach and Intestines (gastrointestinal tract):**
   - **Skin:**

9. **What are some of the factors that affect an individuals' response to a toxic chemical?**

10. **What are the three ways the body processes chemicals? Briefly explain each.**

11. **_____ are chemicals that interfere with getting _____ to body tissues and can cause _____.**

12. **What are simple asphyxiants? Give at least two examples.**

13. **At what percentage of oxygen would cause a rapid loss of consciousness, and death in minutes?**

14. **An atmosphere with less than _____ by volume is considered oxygen deficient and immediately dangerous to life and health.**

15. **_____ reduce your body's ability to provide oxygen to its tissues, even when there is plenty of oxygen in the air.**

16. **What can chemical asphyxiants interfere with?**

17. **An _____ causes inflammation by _____ with the skin, eyes, nose, mouth, or respiratory system. Irritants can also be _____.**

18. **What are two types of irritants?**

19. **A _____ is a chemical that can cause an _____ in the body. After repeated exposures to chemicals known as _____, some people become allergic and develop a reaction to even small exposures of those chemicals.**

20. **A _____ is a substance that can be _____ or cause health effects. Any chemical can be toxic or harmful _____.**

21. **What is a systemic toxin? Give an example.**

22. **_____ toxins damage blood cells or interfere with blood cell formation by damaging our bone marrow.**

23. **_____ damage the central nervous system (brain) or peripheral nervous system.**

24. **_____ toxins cause damage and produce symptoms including jaundice and liver enlargement.**

25. **_____ toxins damage the kidneys.**

26. **_____ toxins damage the reproductive cells (egg and sperm) or interfere with their formation.**

27. **_____ cause cancer and must be listed on an _____ equal or greater than .01 percent of the product. Cancer is the uncontrolled growth of _____ (harmful) cells at any site in the body.**

28. **_____ cause birth defects in the developing fetus. Many teratogens can affect the fetus even before the woman knows she is pregnant. _____ cause a change (mutation) in your genetic material. Mutation of the reproductive cells may cause birth defects in future children.**

Handout 4: Group Presentations

Directions: With your group, create a short presentation about your assigned topic. Use your Participant Manual or the internet as a resource. You can use posters, handouts, photos, etc. to assist in creating it.

Group 1: Heat Stress

Be sure introduce the topic of heat stress and to cover the signs and symptoms of the four stages of heat stress. The four stages of heat stress are:

- Heat Rash
- Heat Cramps
- Heat Exhaustion
- Heat Stroke

Group 2: Cold Stress

Be sure to cover the following topics under cold stress. Include the signs and symptoms of the different types of cold stress. They include:

- Hypothermia (mild, moderate, and severe)
- Frostbite
- Trench Foot
- Chilblains

Group 3: Noise

Be sure to include information about the decibels that can cause hearing damage, tinnitus, and exposure to certain chemicals. Also, include the signs of hearing loss.

Group 4: Ergonomics

Be sure to include musculoskeletal disorders, such as back problems, carpal tunnel syndrome, and tendonitis. Back injury stats should also be included. Lastly, be sure to include the solutions to reduce ergonomic issues.

Handout 5: NIOSH Pocket Guide App Use (Option 1)

Directions: With your group, answer the following questions using the NIOSH Pocket Guide App (NPG).

1. What chemical has CAS number 64-19-7?

2. What concentration percentage of this chemical can be found in vinegar?

3. What is the PEL for this chemical? What is the NIOSH STEL for this chemical?

4. Is there an IDLH limit for this chemical? If yes, what is it?

5. What is the molecular weight of this chemical? Is it lighter or heavier than air?

6. What is this chemical's flashpoint?

7. What are the lower explosive and upper explosive levels for this chemical?

8. What respirator should be worn when concentrations are greater than 50 ppm of this chemical?

9. Is this chemical corrosive?

10. What are the target organs for this chemical?

Handout 6: NIOSH Pocket Guide Use (Option 2)

Directions: With your group, answer the following questions using the NIOSH Pocket Guide (NPG).

Part 1

1. On what page of the NPG can I find the contents of the guide?

2. In the introduction section of the participant manual, how many chemicals are in the NPG?

3. Under the 'How to Use This Pocket Guide' section of the NPG, where can I find the chemical name on each chemical table?

4. Under the 'How to Use This Pocket Guide' section of the NPG, what does the acronym CAS stand for? What does the acronym RTECS stand for?

   CAS:

   RTECS:

5. In the IDLH field of the 'How to Use This Pocket Guide' part of the NPG, what does the notation 'ca' stand for?

6. In the IDLH field of the 'How to Use This Pocket Guide' part of the NPG, what two exposure limits are contained in the NPG?

7. What Table in the NPG contains the Symbols, Code Components, and Codes Used for Respirator Selection?

8. In Table 3, what does the Code ‘CcrFOv100’ stand for?

9. In Table 3, what APF can be obtained when using the Code ScbaF:Pd,Pp?

10. What does Table 4 of the NPG represent?

11. In Table 5 of the NPG, what does the Code ‘CNS’ stand for?

12. What does Table 6 of the NPG represent?

13. In what Appendix of the NPG can I find NIOSH 13 OSHA-Regulated Carcinogens?

14. According to Appendix B of the NPG, how are exposures to workers to these 13 chemicals be controlled?

15. Using the information on page 375 of the NPG or by using the NPG App, what chemical has CAS number 92-93-3?

Part 2

1. What chemical has CAS number 64-19-7?

2. What concentration percentage of this chemical can be found in vinegar?

3. What is the PEL for this chemical? What is the NIOSH STEL for this chemical?

   PEL:

   NIOSH STEL:

4. Is there an IDLH limit for this chemical? If yes, what is it?

5. What is the molecular weight of this chemical? Is it lighter or heavier than air?

6. What is this chemical's flashpoint?

7. What are the lower explosive and upper explosive levels for this chemical?

8. What respirator should be worn when concentrations are greater than 50ppm of this chemical?

9. Is this chemical corrosive?

10. What are the target organs for this chemical?

Handout 7: Labels

Directions: With your group, answer the following questions using your Participant Manual.

1. An employee should be told the location of what three things as it relates to HazCom?

   1.
   2.
   3.

2. OSHA's HazCom standard is written to be consistent with what? What does this ensure?

3. Explain the following terms:

   Product Identifier:

   Supplier Identification:

   Signal Words:

   Hazard Statement:

   Precautionary Statement:

   Hazard Pictogram:

4. Fill in the name and hazards/types of chemicals for each pictogram:

Pictogram Name	Pictogram	Hazards/Types of Chemicals
		
		
		
		
		
		

		
		
		

5. If you pour anything into a container, it must be _____ unless you are going to use it within the _____ and _____ it. _____can go beyond the minimum standard and require labeling for all containers.

Handout 8: Safety Data Sheets (SDS)

Directions: With your group, answer the following questions using the SDS given to you.

1. What is the name of the product? When was it created? When was it revised?
   Name:
   Date Created:
   Date Revised:

2. What is its CAS number?

3. What are the target organs of this product?

4. What is the signal word: Danger or Warning?

5. What three pictograms are included on this SDS?

   1.
   2.
   3.

6. According to the First-Aid Measures section, what should you do if this product is inhaled?

7. According to the First-Aid Measures section, what should you do if this product gets into your eyes?

8. What is the flashpoint of this product?

9. According to the NFPA, what is the flammability risk of this product?

10. According to the Accidental Release Measures, what are the personal precautions that should be taken?

11. What precautions should be taken when storing this chemical?

12. What is the PEL for this product?

13. What are the Upper and Lower Explosive Limits of this product?

    UEL:
    LEL:

14. What are the incompatible materials for this product?

15. Does any agency classify this product as a carcinogen?

SAFETY DATA SHEET

Creation Date 13-Apr-2009 **Revision Date** 24-Dec-2021 **Revision Number** 7

1. Identification

Product Name **Methyl Ethyl Ketone**

Cat No. : **M209-1, M209-20, M209-200, M209-4, M209-500, M209S-4, M209FB-19, M209FB-50, M209FB-115, M209FB-200, M209RB-115, M209RS-19, M209RS-28, M209RS-50, M209RS-200, M209SS-28, M209SS-50, M209SS-115, M209SS-200**

CAS No 78-93-3
Synonyms 2-Butanone; MEK; Ethyl methyl ketone

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver.	

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor
Causes serious eye irritation
May cause drowsiness or dizziness
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Wear protective gloves/protective clothing/eye protection/face protection
Keep cool
Response
Get medical attention/advice if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store in a well-ventilated place. Keep container tightly closed
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Repeated exposure may cause skin dryness or cracking
Other hazards
Contains a known or suspected endocrine disruptor.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Methyl ethyl ketone	78-93-3	>95

4. First-aid measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Get medical attention if symptoms occur.
Inhalation	Remove to fresh air. Get medical attention if symptoms occur. If not breathing, give artificial respiration.
Ingestion	Do NOT induce vomiting. Get medical attention.
Most important symptoms and effects	Difficulty in breathing. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting: Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	CO_2, dry chemical, dry sand, alcohol-resistant foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	Water may be ineffective
Flash Point	-7 °C / 19.4 °F
Method -	CC (closed cup)
Autoignition Temperature	404 °C / 759.2 °F
Explosion Limits	
Upper	11.4 vol %
Lower	1.4 vol %
Oxidizing Properties	Not oxidising
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2).
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	3	1	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin, eyes or clothing. Ensure adequate ventilation.
Environmental Precautions	Avoid release to the environment. See Section 12 for additional Ecological Information.
Methods for Containment and Clean	Remove all sources of ignition. Soak up with inert absorbent material. Keep in suitable,

Up closed containers for disposal. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Ensure adequate ventilation. Use spark-proof tools and explosion-proof equipment. Avoid contact with skin, eyes or clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Flammables area. Incompatible Materials. Strong oxidizing agents. Strong acids. Strong bases. Strong reducing agents. Ammonia. copper. Amines.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Methyl ethyl ketone	TWA: 200 ppm STEL: 300 ppm	(Vacated) TWA: 200 ppm (Vacated) TWA: 590 mg/m³ (Vacated) STEL: 300 ppm (Vacated) STEL: 885 mg/m³ TWA: 200 ppm TWA: 590 mg/m³	IDLH: 3000 ppm TWA: 200 ppm TWA: 590 mg/m³ STEL: 300 ppm STEL: 885 mg/m³	TWA: 200 ppm STEL: 300 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Characteristic - sweet
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-87 °C / -124.6 °F
Boiling Point/Range	80 °C / 176 °F
Flash Point	-7 °C / 19.4 °F

Method -	CC (closed cup)
Evaporation Rate	3.7
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	11.4 vol %
Lower	1.4 vol %
Vapor Pressure	105 mbar @ 20 °C
Vapor Density	2.41
Specific Gravity	0.806
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	404 °C / 759.2 °F
Decomposition Temperature	No information available
Viscosity	0.42 mPa.s @ 15°C
Molecular Formula	C4 H8 O
Molecular Weight	72.11

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Hygroscopic.

Conditions to Avoid Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition. Exposure to moist air or water.

Incompatible Materials Strong oxidizing agents, Strong acids, Strong bases, Strong reducing agents, Ammonia, copper, Amines

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Methyl ethyl ketone	LD50 = 2483 mg/kg (Rat)	LD50 = 5000 mg/kg (Rabbit)	LC50 = 11700 ppm (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Methyl ethyl ketone	78-93-3	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)
STOT - repeated exposure Kidney Liver

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting: Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

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Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Methyl ethyl ketone	Not listed	Lepomis macrochirus: LC50=3,22 g/L 96 h	EC50 = 3403 mg/L 30 min EC50 = 3426 mg/L 5 min	EC50: = 5091 mg/L, 48h (Daphnia magna) EC50: 4025 - 6440 mg/L, 48h Static (Daphnia magna) EC50: > 520 mg/L, 48h (Daphnia magna)

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Methyl ethyl ketone	0.29

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Methyl ethyl ketone - 78-93-3	U159	-

14. Transport information

DOT

UN-No UN1193
Proper Shipping Name Ethyl methyl ketone
Hazard Class 3
Packing Group II

TDG

UN-No UN1193
Proper Shipping Name ETHYL METHYL KETONE
Hazard Class 3
Packing Group II

IATA

UN-No UN1193
Proper Shipping Name Methyl ethyl ketone

Hazard Class 3
Packing Group II

IMDG/IMO

UN-No UN1193
Proper Shipping Name Ethyl methyl ketone (Methyl ethyl ketone)
Hazard Class 3
Packing Group II

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Methyl ethyl ketone	78-93-3	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Methyl ethyl ketone	78-93-3	X	-	201-159-0	X	X	X	X	X	KE-24094

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Methyl ethyl ketone	5000 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Methyl ethyl ketone	X	X	X	X	X

U.S. Department of Transportation
Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Serious risk, Grade 3

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Methyl ethyl ketone	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Methyl ethyl ketone	78-93-3	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Methyl ethyl ketone	78-93-3	Not applicable	Not applicable	Not applicable	Annex I - Y42

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

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Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

Handout 9: Monitoring and Sampling

Directions: Use Chapter 4: Monitoring and Sampling to answer and discuss your assigned questions.

1. What is the difference between monitoring and sampling?

2. What questions can we answer with monitoring and sampling?

3. Monitoring and sampling are very important because they:

4. What is the worker's responsibility for wearing a sampling device?

5. Who is included in the monitoring program?

6. Why is personal sampling used?

7. How are personal samples collected?

8. What is area monitoring used for?

9. What happens if you use the wrong monitoring?

10. What can real-time monitoring be used to measure?

11. In what order must real-time measurements be taken when used for confined spaces?

12. What are the advantages of real-time monitoring?

13. What monitor can be used to detect flammables or explosives?

14. What is a colorimetric tube?

15. By how much can colorimetric tubes be off?

16. What can an instrument that measures velocity be used for?

17. What are the disadvantages of real-time monitoring?

18. What are some of the most common types of measurements that your monitoring results will be listed as?

19. What are photoionization detectors (PID) used to measure?

20. How long does an employer have to post the monitoring results after they have been returned from the analyzing laboratory?

Handout 10: Sensor Simulator

Directions: Use these pages to record your findings from the Sensor Simulator App and use the NIOSH Pocket Guide App to find the chemical information.

O_2: Oxygen
CO: Carbon Monoxide
H_2S: Hydrogen Sulfide
SO_2: Sulfur Dioxide
NO_2: Nitrogen Dioxide
Cl_2: Chlorine Gas
ClO_2: Chlorine Dioxide
PID: Photo Ionizing Detector
LEL: Lower Explosive Limit

CO_2: Carbon Dioxide
PH_3: Phosphine Gas
NH_3: Ammonia
HCN: Hydrogen Cyanide
NO: Nitric Oxide
HCl: Hydrogen Chloride
H_2: Hydrogen Gas
CH_4: Methane Gas

1. **Chemical Name:**

IDLH	
Oxygen %	
PEL	
REL	
LEL / UEL	
Vapor Density	
Specific Gravity	
Respirators	
Target Organs	
First Aid	
Gas	
Liquid	

2. **Chemical Name:**

IDLH	
Oxygen %	
PEL	
REL	
LEL / UEL	
Vapor Density	
Specific Gravity	
Respirators	
Target Organs	
First Aid	
Gas	
Liquid	

3. **Chemical Name:**

IDLH	
Oxygen %	
PEL	
REL	
LEL / UEL	
Vapor Density	
Specific Gravity	
Respirators	
Target Organs	
First Aid	
Gas	
Liquid	

4. **Chemical Name:**

IDLH	
Oxygen %	
PEL	
REL	
LEL / UEL	
Vapor Density	
Specific Gravity	
Respirators	
Target Organs	
First Aid	
Gas	
Liquid	

Handout 11: Filters and Cartridges

Directions: Use your Participant Manual to answer the following questions.

1. **What are particulate filters used for?**

2. **How many filter classes does NIOSH have for APRs? What are they based on?**

3. **What is meant by the following:**

- **N-Series Filter:**
- **R-Series Filter:**
- **P-Series Filter:**

4. **How long can an R-series filter be used in an environment containing oil?**

5. **What are the three efficiency levels of filters?**

6. **When does a filter need to be changed?**

7. **What does a chemical cartridge remove from the air?**

8. **What does a chemical cartridge use to remove contaminant-specific gases and vapors?**

9. **What materials are used as sorbents?**

10. **What happens when the sorbent material becomes more saturated? What can it lead to and what does this mean?**

11. **What does a worker have to rely on if breakthrough occurs? Is this a reliable or safe way of knowing that the cartridge is used up?**

12. **What is an ESLI and how does it work?**

13. **Why are chemical cartridges color-coded?**

14. **What are white, blue, and yellow cartridges used for?**

Handout 12: Fit Testing

Directions: Use the Respirator Fit and Fit Testing sections in your Participant Manual to find the answers to the following questions.

1. **Respirators must _____, be_____, _____, _____, and _____ to provide the level of respiratory protection indicated by the assigned protection factor.**

2. **Why is respirator fit important?**

3. **Who requires that fit tests be done? Which standard requires this?**

4. **What is the purpose of fit testing?**

5. **Which respirators are considered tight-fitting?**

6. **How often should workers be fit tested?**

7. **What are the two types of fit tests?**

8. **What are the four test agents that are approved for a QLFT?**

9. **What is the highest protection factor that can be given to a respirator if a QLFT is the only test given?**

10. **What are the disadvantages of performing a QLFT?**

11. **What are the activities that must be performed while conducting a QLFT or QNFT?**

12. **How long must each activity be conducted for when doing a QLFT?**

Handout 13: CPC Use and Inspection

Directions: Use your Participant Manual to find the answers to the following questions.

1. **What does CPC's ability to protect us depend on?**

2. **What is meant by the 'penetration?'**

3. **What is the deterioration of the protective material called?**

4. **What can contribute to the degradation of CPC?**

5. **What are some of the signs of degradation?**

6. **What is meant by the term 'permeation?'**

7. **What is meant by the term 'breakthrough time' as it relates to permeation?**

8. **What is the breakthrough time for a Level 4 performance level?**

9. **_____ used to make most PPE and suits do not _____, causing rapid heat and moisture build-up inside the PPE. Wearing PPE makes it difficult for the body to cool itself and adds to _____.**

10. **How should the safety and health plan address the prevention of heat-related illnesses?**

11. **When should CPC be inspected?**

12. **What should a CPC inspection checklist consider?**

13. **What can prolong the life of CPC?**

14. **Where should proper storage procedures for CPC be located?**

15. **What can you check to see if the CPC being used has a shelf life?**

Performance Checklist 1:
Respirator Inspection, Donning, and Doffing

Name: _____ **Date:** _____

Type of Exercise: ___ Individual ___ Group

Task	Rating (Yes or No)
1. Examine the face piece for: • Excessive dirt. • Cracks, tears, holes, or distortion from improper storage. • Inflexibility (stretch and massage to restore flexibility). • Cracked or broken air-purifying element holder(s), badly worn threads, or missing gaskets.	☐ Yes ☐ No
2. Examine the head straps or head harness for: • Breaks. • Loss of elasticity and twists. • Broken or malfunctioning buckles and attachments.	☐ Yes ☐ No
3. Remove exhalation valve cover and examine for: • Foreign material, such as detergent, residue, dust particles, or human hair under the valve seat. • Cracks, tears, or distortion in the valve material. • Improper insertion of the valve body in the facepiece. • Cracks, breaks, or chips in the valve body, particularly in the sealing surface. • Missing or defective valve cover. • Improper installation of the valve in the valve body.	☐ Yes ☐ No
4. Examine the air-purifying elements for: • Correct cartridge, canister, or filter. • Correct/incorrect installation, loose connections, missing or worn gaskets, or cross-threading in holder. • Expired shelf-life date on cartridge or canister. • Cracks or dents in outside case of filter, cartridge, or canister. • Evidence of prior use of sorbent cartridge or canister, indicated by absence of sealing material, tape, foil, etc., over inlet.	☐ Yes ☐ No
5. Place chin in chin cup and pull crown straps of head harness across head.	☐ Yes ☐ No

6. Adjust straps to fit.	☐ Yes ☐ No
7. Perform positive pressure user seal check by placing palm of hand over exhalation valve cover and exhaling slightly for 10 seconds. Notice any leaks.	☐ Yes ☐ No
8. Perform negative pressure user seal check by placing palms of hands over filter intakes and inhaling slightly for 10 seconds. Notice any leaks.	☐ Yes ☐ No
9. Readjust straps, if necessary.	☐ Yes ☐ No
10. Repeat steps 8 and 9 if readjustment occurs.	☐ Yes ☐ No
11. Check for good breathing.	☐ Yes ☐ No
12. Loosen straps from top to bottom. Be gentle so as not to damage elasticity of straps.	☐ Yes ☐ No
13. Grasp respirator on bottom and remove upward over top of head.	☐ Yes ☐ No
14. Remove cartridges and dispose of properly.	☐ Yes ☐ No

Handout 14: Work Practice and Site Control

Directions: Use Chapter 6: Work Practice and Site Control in the Participant Manual to answer and discuss your assigned chapter topics.

1. What is involved with Site Characterization?

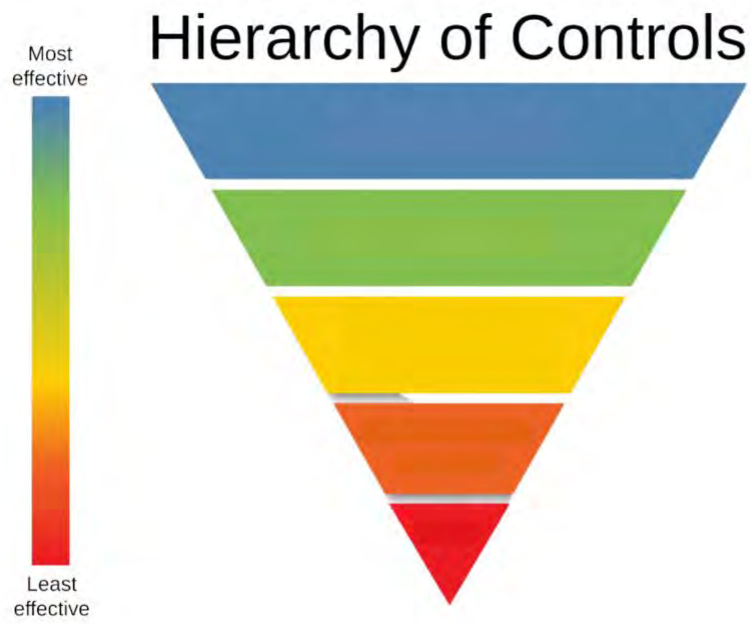
2. What are the different types of work zones?

3. What are the required sections of a site-specific Safety and Health Plan?

4. How is medical surveillance administered?

Handout 15: Hierarchy of Controls

Directions: List the Hierarchy of Controls from most effective to least effective and give one example of each control.



Control	Example

Handout 16: Standard Operating Procedures Definitions

Direction: Match the words in the left column to the correct definition in the right column.

	Hazard Control
	Hierarchy of Controls
	Engineering Controls
	Over Packing
	Hot Work Permit
	Ground Fault Circuit Interrupter (GFCI)
	Shoring
	Hyperthermia
	Hypothermia
	Confined Space
	Permit Required Confined Space
	LEL
	Oxygen Deficiency
	Oxygen Enriched
	Intrinsically Safe
	Probes
	Staging Areas
	PPE
	Patching
	Falls

A	Placing a leaking drum into a compatible larger drum to contain the contents.
B	A space that has an environment that contains more than 23.5% oxygen.
C	Rubber, mud, or tape materials applied over a leaking area.
D	Device used to detect buried drums.
E	A space where a heavier gas has displaced the oxygen in the air.
F	Store only compatible substances on the same or adjacent location.
G	Non-sparking tools used in flammable environments.
H	A device used in conjunction with temporary power and wet locations that protects workers from electricity.
I	The last resort and must be used to reduce worker exposure.
J	The lowest percentage at which a flammable gas or vapor can be ignited.
K	Leading cause of unintentional injury and deaths nationwide.
L	Body core temperature is less than the normal 98.6° F.
M	A method of identifying and ranking safeguards to protect workers from hazards.
N	Contains a hazardous atmosphere, or material that could engulf a person, or a shape that could trap or asphyxiate someone, or any other recognized serious safety or health hazard.
O	A mechanical means to prevent hazards from reaching a worker, the most reliable way to control hazards that cannot be eliminated.
P	A way of introducing new methods, effective technologies, and safety equipment to improve worker protection.
Q	Almost all work with cutting, grinding, and welding that creates heat and could be the source of ignition of flammables/combustible environments.
R	Large enough so a worker can enter, limited means for entry and exit, and not designed for continuous worker occupancy.
S	Method used to protect workers in trenches that are 5 feet deep or greater.
T	Body core temperature is greater than the normal 98.6° F.

Handout 17: Decontamination Zones

Directions: Use your Participant Manual to answer the following questions.

1. **When must the decontamination line be set up?**

2. **What is the Exclusion Zone also known as?**

3. **When must decontamination occur?**

4. **Which of the following refers to the 'Warm Zone'?**

   a) **Exclusion Zone**
   b) **Support Zone**
   c) **Work Area**
   d) **Contamination Reduction Zone**

5. **The decontamination line is made up of a series of _____ that reduce _____. The stations are arranged in order of decreasing contamination, preferably in a _____.**

6. **Where do most decontamination activities take place?**

7. **What activities take place in the Hot Zone?**

8. **What is the Hot Line?**

9. **What besides PPE must be decontaminated in the Warm Zone?**

10. **What is the Cold Zone also known as?**

11. **Workers in _____ and _____ may be assigned to the decon line to scrub and rinse personal protective equipment and help you take it off.**

12. **What should be decontaminated and removed first when going through the decon line?**

13. **What are two examples of less contaminated items?**

14. **When must you go through the decon?**

15. **The number of _____, their _____ and the _____ at each station is site-specific and will vary with the nature (type of chemicals) and extent (amount or concentration) of the _____.**

16. **The process of decontamination uses one or more methods to _____ or _____ hazardous substances. The decon methods must be _____.**

17. **Contaminated wash and rinse solutions must be _____and _____ to prevent pollution and the spread of contamination.**

18. **Describe the steps of Level A decontamination.**

19. **Describe the steps of Level B decontamination.**

20. **Describe the steps of Level C decontamination.**

Instructor Tool 1: Building the Decontamination Line

Materials to be supplied by the training center:

- (6) - 2” x 4” x 16’ or equivalent for decon perimeter
- (3) - 2” x 4” x 10’ for decon tubs
- (3) chairs or (1) 8’ bench
- (3) 6’ tables or equivalent for glove and respirator wash, and respirator drying

Materials supplied by CPWR (grant sponsored training only):

- (1) Roll plastic 20’ x 100’ for decon line, decon tubs, and covering tables.
- All required tape, warning tape, brushes and “spray nozzles” needed for decontamination procedures, glove and respirator wash tubs, sanitizer/cleaner, paper towels, and respirator storage bags.

Complete the following steps:

(1) Arrange a 2” x 4” x 16’ perimeter as shown above.
(2) Unroll and cut plastic extending the length of the decon line, allowing approximately 2’ past each end. (36’ total)
(3) Open the plastic, removing as many wrinkles as possible.
(4) Beginning on one long side, position both 2” x 4”s on the plastic equal distance from the ends and roll the plastic and 2” x 4”s two times towards the center.
(5) Repeat with the other long side. Make sure that the 2” x 4”s are the same distance from the ends of the plastic. All 2” x 4”s must be lying flat.
(6) Check the width using one of the 2” x 4” x 16’ on the ends. If needed, continue wrapping plastic until the decon is 16’ wide.
(7) Place the 2” x 4” x 16’ on each end of the plastic and wrap the 2” x 4” until meeting the side 2”x 4”s. Tape the corners as needed.

Take the class to the proposed location of the decontamination line the participants are to construct. Direct the participants to complete the following:

(1) Lay out the poly decontamination floor.
(2) Construct the decontamination perimeter barriers using 2” x 4s”, caution, danger, and Polyken© Tape.
(3) Section the decontamination line into Level B and Level C decontamination work zones.
(4) Place the three decontamination ponds, glove drops, three sprayers and brushes, and
(5) hip-air (SAR) air lines in the Level B zone.
(6) Place two benches, two wash tables with seven tubs, respirator rack, and glove drops in the Level B zone.
(7) Establish the Hot Zone for Level As using danger tape.

Building the Decon Tub (Instructor Note: Tubs can be larger if desired. Material requirements will change if sizes are increased):

(1) Using the 2” x 4” x 10’s, cut 4 pieces from each measuring 30” long.

(2) Using screws or nails and (4) 30” 2” x 4”s, assemble 3 squares (the completed squares will be 31” by 3” high).
(3) From the roll of plastic, cut 3 pieces approximately 50” square.
(4) Wrap the frames in the plastic and secure with tape, creating 3 “tubs.”

Decon Line Walk Through:

When the decontamination line is completed, at least two instructors will demonstrate a “walk through” of the decontamination process, starting with a Level A worker leaving the Hot Zone, entering the front of the decontamination line, and ending with the Level C decontamination workers exiting.

Handout 18: Emergency Response Cards

Directions: Arrange the cards in the order that you would prioritize each task in an emergency scenario.

3 OR 6	EVACUATE	Refers to the evacuation of all **"NON-Essential"** personnel.
6 OR 5	CONTROL THE HAZARD	Refers to either any offensive or defensive actions that you would take to control the spread of the **HAZARD.**
4 OR 3	RESCUE THE INJURED	Refers to the rescue of involved personnel who were injured in the initial incident/release of the **HAZARD**.
2 OR 1	ALERT OTHERS	Refers to notifying other workers on the jobsite.
7	NOTIFY EPA/OSHA	Refers to notifying the appropriate governmental or state agencies.
1 OR 2	SIZE UP THE SITUATION	Refers to gaining an understanding as to what is happening and going on.
8	EVALUATE HOW YOU RESPONDED	Refers to examining and evaluating the response actions and making any necessary changes.
5 OR 4	DECONTAMINATE THE INJURED	Refers to the physical removal of contaminants from workers injured in the initial incident/exposure.

Handout 18: Emergency Response Cards

Directions: Arrange the cards in the order that you would prioritize each task in an emergency scenario.

	EVACUATE	Refers to the evacuation of all **"NON-Essential"** personnel.
	CONTROL THE HAZARD	Refers to either any offensive or defensive actions that you would take to control the spread of the **HAZARD.**
	RESCUE THE INJURED	Refers to the rescue of involved personnel that were injured in the initial incident/release of the **HAZARD**.
	ALERT OTHERS	Refers to notifying other workers on the jobsite.
	NOTIFY EPA/OSHA	Refers to notifying the appropriate governmental or state agencies.
	SIZE UP THE SITUATION	Refers to gaining an understanding as to what is happening and going on.
	EVALUATE HOW YOU RESPONDED	Refers to examining and evaluating the response actions and making any necessary changes.
	DECONTAMINATE THE INJURED	Refers to the physical removal of contaminants from workers injured in the initial incident/exposure.

Handout 19: Emergency Response Plans

Directions: Use your Participant Manual to answer the following questions.

1. In accordance with _____, employers must develop and implement an emergency response plan (ERP) as part of the site-specific safety and health program.

2. The ERP must be designed to handle _____and be put in place prior to the start of clean-up work.

3. The emergency response plan must be consistent with the disaster, fire, and/ or other emergency response plans of_____ .

4. The emergency response plan shall be a separate section of the _____ .

5. Employers who evacuate their workers from the danger area and prohibit them from assisting in an emergency are not required to have an ERP.
   ☐ True ☐ False

6. How often must the ERP be reviewed? _____

7. How often must the ERP plan be rehearsed? _____

8. First aid training is required in the 40-hour Hazardous Waste Site Worker training mandated by 1926.65?
   ☐ True ☐ False

9. The emergency response plan must be available to _____.

10. Employers must provide an emergency action plan that meets the requirements of _____.