STUDENT WORKBOOK
HAZMAT OPERATIONS

PRESENTATION:

000000001. General

a. Without reference identify general principles of the First Responder Operations Level with at least 80% accuracy. **(3-1)**

(1) Introduction **(3-1.1)**

(a) _____certification is a prerequisite

(b) Meets the requirements for;

1 Occupational Safety and Health Administration (OSHA)

2 Air Force Occupational Safety and Health (AFOSH)

3 U. S. Environmental Protection Agency (EPA)

(2)00 Definition **(3-1.2)**

(a) National Fire Protection Association (NFPA) definition

(b) Member of an emergency response service or organization

(c) **NOT** a hazardous materials response team

1 Not trained in specialized protective clothing

2 Not trained in specialized control equipment

(d)0 **Defensive** control measures to protect;

1 People

2 _____

3 _____

(3)00 Goal **(3-1.3)**

(a) Analyze a_____ to determine the magnitude of the problem in terms of outcomes by completing the following tasks:

1 Survey the hazardous materials

a Identify_____.

b Identify the name, four-digit I.D. number, or placard

c Note any leaks, smells,_____

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d Assess conditions at the site of the incident

20 Collect hazard and response info from material safety data sheets(MSDS), CHEMTREC/CANUTEC, shipper/manufacturer contacts

3 Predict_____

4 Estimate_____

(b)0 Plan an initial response within the capabilities and competencies of available personnel, personal protective equipment, and control equipment by completing the following tasks:

1 Describe the response objectives for hazardous materials incidents

2 Describe_____

_____

3 Determine_____
_____
_____

4 Identify the emergency decontamination procedures.

(c)0 Implement the planned response to favorably change the outcomes consistent with the local emergency response plan and the organization's standard operating procedures by completing the following tasks:

1 Establish and enforce _____procedures including control zones, emergency decontamination, and communications

2 Initiate the _____for hazardous materials incidents

3 Don, work in, and doff personal protective equipment

4 Perform defensive control functions identified in the_____.

(d)0 Evaluate the progress of the actions taken to ensure that the response objectives are being met safely, effectively, and efficiently by completing the following tasks:

1 Evaluate_____
_____

2 Communicate_____
_____

100000002. **Analyzing the Incident (3-2)**

a. Given scenarios of both facility and transportation situations involving hazardous

materials, survey the hazardous materials incident to identify the containers and materials involved, whether hazardous materials have been released, and the surrounding conditions with at least 80% accuracy. **(3-2.1)**

(1) Given examples of various hazardous materials containers, identify the general shapes of containers for liquids, gases, and solids. **(3-2.1.1)**

(a) Nonbulk Shipping Containers**(49 CFR part 173 subpart A & B; part 178 subpart L)**

1 Liquids with an internal volume less than _____(450 liters)

2 Solids with a capacity less than _____(400 kilograms)

3 Compressed Gas with a water capacity less than 1000 pounds (453.6 kilograms)

4 Bags

a _____

b Folded and Glued

c _____

50 Bottles

a Protected

b _____

c Glass

60 Boxes

a Fiberboard

b _____

c Divided Fiberboard

70 Multicell packaging

8 Carboys

a _____

b Wooden Box

90 Cylinders

a _____

b Uninsulated

c _____

100 Drums

a 5-gal (pail, bucket, or can) up to ____ gal

b Metal open head

c Tight or closed head metal

d Open head plastic

e Tight or closed plastic

f Fiberboard

g Plywood

110 Jerricans

12 Wooden barrels

(b)0 Bulk Shipping Containers**(49 CFR part 173 subpart F; part 178**

subpart L)

1 Anything Larger than capacities listed in (a)1-3

2 Bulk Bags

a _____

b Bottom outlet

c _____

30 Bulk Boxes

4 Palletized Non-bulk Packages

a Loose bags

b _____

c 5 gallon pails

50 Portable Tanks and Bins**(49 CFR part 173 subpart F; part 178 subpart H)**

a Intermodal Tank Containers **(3-2.1.1.2)**

1 Plastic

2 Metal

3 _____ gallon capacity

4 Metal Frame _____

5 Can transport a gas, liquid, or solid

b0 Portable Bins

1 Portable bins used to transport solids

2 L4' x W4' x H6'

3 Contains up to _____

4 Loaded from _____ unloaded at _____

c0 Types of Portable Tanks/Bins

1 Non-pressure

a Liquids and Solids

b Internal pressures up to ____ psi

20 Pressure

a Compressed liquids and gases

b 6' x 20'

c Protected fittings

d Up to _____ gallon capacity

e 100 to _____ psi

30 Specialized

a Cryogenic - tank within a tank

b Tube module

6000 Ton Containers (multi-unit tank cars (DOT))

a Rigid packaging that transport _____ and _____

b Called "ton containers" because it will transport one ton of chlorine (most common use)

c Cylindrical pressure tanks approximately 3' in diameter, 8' long with convex or concave heads

70 Protective Overpacks

a Radioactive Materials

1 Type A packaging - _____
_____

2 Type B packaging - _____
_____

b0 Cylindrical overpacks

1 Laminated or solid wood -_____
_____

2 Up to _____pounds when loaded

c0 Box-like overpack

1 Two nested _____ enclosed in a solid wooden box reinforced with steel bars

2 Coated with protective paint that swells and forms a char when exposed to fire.

3 Up to _____ pounds when loaded

800 Casks

a Radioactive Materials

b Rigid metal packaging

c Up to ___ diameter and ___ long

d May have reinforced rings and cooling fins

(c)00 Vessels

1 Any watercraft used for transportation

2 Intermodals and freight containers

(d)0 Facility Containers

1 Piping

2 Open Piles

3 Reactors

4 Storage Bins

(e)0 Tank Cars by rail **(3-2.1.1.1)**

1 General - Safety features

a Double shelf couplers

b 1/2 inch steel head shields

c Thermal protection- designed to keep tank metal temperatures below 800° F under direct flame impingement for 30 minutes

1 Spray on thermal coating called "_____"

2 A layer of insulation enclosed by an outer steel jacket called "_____"

3 Insulation substantially reduced the fire induced violent ruptures

200 Nonpressure tank cars with and without expansion domes

a Also known as _____ or low-pressure tank cars

b Capacities range from _____ gallons and carry flammable/combustible liquids, flammable solids, oxidizers, organic peroxides, corrosives, poisons, molten solids, and some flammable and nonflammable gases

c With Expansion Dome

1 Dome with visible fittings on top

2 Older cars

d0 Without expansion domes

1 No dome, visible fittings on top

2 Newer cars

300 Pressure Tank Cars

a _____

b Poison Gases

1 Hydrogen Cyanide

a EXTREMELY _____

b Body color_____

c Two_____ vertical bands

d One _____ horizontal

20 Pressures range from ___ to ___psi

3 Capacities from_____ to _____ gallons

400 Cryogenic Liquid Tank Cars

a Low-pressure liquids (____ psig or lower)

b Refrigerated (_____ and below)

(f)00 Intermodal Tank Containers **(3-2.1.1.2)**

1 Bulk containers from one mode of transportation, placed on

another mode such as rail, truck, or ship

2 Economical

3 Non-pressure intermodal tank containers

a Liquids and solids

b Pressures up to ____ psi

40 Pressure intermodal tank containers

a Gases liquified _____

b ____ to ____ psig

(g)00 Cargo Tanks **(3-2.1.1.3)**

1 Also called_____

2 Used to transport

a Flammable/Combustible Liquids

b _____

c Flammable/nonflammable compressed gases

30 MC-306/DOT-406 cargo tanks

a Large _____ ends

b Underbelly outlets

c _____ rail runs entire length

d Maximum allowable working pressure (MAWP) no lower than 2.65 psig and not above 40 psig

e Used to transport:

1 _____

2 Gasoline

3 _____

4 Flammable/Combustible liquids

5 Class B Poisons

6 _____

7 Vapor pressures under _____ (21 kpa)

400 MC-307/DOT-407 cargo tanks

a _____ shape

b Single work platform

c MAWP - at least____ psig

d Used to transport:

1 _____

2 Corrosives

3 _____

500 MC-312/DOT-412 cargo tanks

a Small round or_____

b Single work platform

c High integrity _____

d MAWP - at least__ psig and up to ___psig

e Used to transport_____ liquids

60 MC-331 cargo tanks

- a Hemispherical or ellipsoidal ends or heads
- b Service pressures from_____ to _____ psig
- c Capacities up to _____ gallons
- d Used to transport:
  - Liquified gases, compressed

70 MC-338 cargo tanks, _____

- a Tank within a tank
  - 1 Tank = inner vessel
  - 2 Jacket = outer shell (insulation)
- b0 Design pressure of at least_____ psig but not more than ____ psig
- c Capacity ____ to _____ gallons
- d Ends are "_____"
- e Valving found in compartment on the back or on the side just forward the trailer wheels.
- f Used to transport cryogenic materials

80 Dry bulk cargo tanks

- a Also known as _____.
- b Pneumatically unloaded transport bulk solids
- c One or more cone shaped bins
- d Capacities up to_____ cu. ft..Fertilizers such as ammonium nitrate, cement, dry caustic soda, grains,

oxidizers, plastic products

(h)00 Facility tanks **(3-2.1.1.4)**

1 General

a Installed locations

1 Above ground

2 Below ground

3 Inside or on top of buildings

200 Nonpressure facility tanks (Atmospheric) - 0 to .5 psig

a Ordinary Cone Roof

b _____

c Lifter Roof

d _____

e Horizontal atmospheric

30 Pressure facility tanks

a Low-pressure __ to __ psig

1 Atmospheric, Horizontal Tank

2 Spheroid

3 Noded Spheroid

b0 Pressure vessels 15 psig and above

1 _____

2 Horizontal, pressure vessel

(2)0000 Facility and transportation container markings that differentiate one container from another. **(3-2.1.2)**

(a) National Fire Protection Association (NFPA) Standard 704 markings for fixed facilities

(b) Department of Transportation (DOT) placards, labels and identification numbers of vehicles, containers, and packages

(c) Pre-emergency planning documents

(3)0 Transport vehicle's shipping papers will list identification numbers that correspond to the tank or container identification markings **(3-2.1.2.1)**

(a) Rail cars

1 Names and numbers used to identify the shipper and contents of the car (i.e., GATX 7759) are usually on _____

2 Placards will be on all rail cars carrying hazardous materials

(b)0 Box cars, hopper cars, and flat cars are owned by the individual railroad- marked on both sides and ends with serial numbers

(c) Tank cars

1 _____ or owned by the shipper

2 Three letter abbreviation for the owner, followed by an "X" and numbers

(d)0 Intermodal equipment including tank containers

1 Metal Certification Plate with serial number

2 _____

3 Placards or labels

(e)0 Highway transport vehicles including cargo tanks

1 Metal Certification Plate with serial number

2 Shippers identification number (trailer #)

3 _____

(4)00 Facility containers, identify the markings indicating container size, product contained, and/or site identification numbers **(3-2.1.2.2)**

(a) Container/Tank size

(b) Product name on tank

(c) NFPA Std 704 Symbol

(d) Tank identification number/site identification numbers

1 Site pre-plan

2 _____

(5)00 Facility and transportation situations involving hazardous materials, identify the name(s) of the hazardous material(s) in each situation **(3-2.1.3)**

- State and federal legislation on hazard communication, right-to-know, and mandatory local notification on hazard.

(a) Identify the following information on a pipeline marker **(3-2.1.3.1)**

1 _____

2 Owner

3 _____

(b)0 Pesticide label, identify each of the following pieces of information; then match the piece of information to its significance

in surveying the hazardous materials incident: **(3-2.1.3.2)**

1 Name of Pesticide

- a Complete product name
- b Correct Spelling
- c Ensures positive identification

20 Signal Word

- a **Caution**- _____
- b **Warning**- _____
- c **Poison/Danger** (_____)
- d Indicates relative hazard of product

30 Pest Control Product Number, (PCP) number (Canada), used to acquire additional information regarding a specific product.

- a EPA Registration number (U.S.)
  - 1 Two or three section number
  - 2 12345 - 6789 - 11
    a b c
    - a _____
    - b Specific product
    - c _____

b00 Like the product name, ensures positive identification

40 Precautionary statement

a "_____"

b "Restricted use pesticide"

50 Hazard Statement

a Physical and _____hazards

b On side panel

c Lists any special flammability, explosion, or chemical hazards

60 Ingredient statement

a _____ - MUST be listed by chemical name

b Inert ingredients- usually are not named

(6)000 List the surrounding conditions that should be noted when surveying hazardous materials incidents **(3-2.1.4)**

(a) Topography

(b) _____

(c) Accessibility

(d) _____

(e) Bodies of Water

(f) Public Exposure Potential

(g) _____

(h) Storm and Sewer Drains

(i) _____

(j) Adjacent Land Use

1 Rail lines

2 _____

3 Airports

(k)0 Nature and extent of injuries

(l) Building information if applicable

1 _____

2 Ventilation ducts

3 _____

(7)00 Give examples of ways to verify information obtained from the survey of a hazardous materials incident **(3-2.1.5)**

(a) _____

(b) Contact CHEMTREC/CANUTEC to verify information found in response guides, plans, and instructions

(c) Contact_____ to verify shipping paper information

(d) Consult additional references to obtain cross-reference and confirmation of information already received

1 Shipper/owner

2 _____

3 Other references

b.000 Given known hazardous materials, collect hazard and response information using material safety data sheets (MSDS), CHEMTREC/CANUTEC, and contacts with the shipper/manufacturer with at least 80% accuracy. **(3-2.2)**

(1) Responders can use a MSDS to

(a) Obtain information on the material's hazards

(b) Identify material's behavior characteristics

(c) Determine _____ or _____ damage

(d) Predict_____

(e) Groups of information to be collected

1 Material identification

2 _____

3 Chemical properties

4 _____

5 Health hazards

6 _____

(f)0 Use information to determine _____ options

(2)0 Match the definitions associated with the DOT hazard classes and divisions of hazardous materials, including refrigerated liquified gases and cryogenic liquids, with the class or division. **(3-2.2.1)**

(a) An important feature of the DOT regulations is the system of hazardous materials identification.

(b) Hazardous materials are classified according to their primary danger and assigned standardized symbols to identify the classes/divisions.

(c) Class 1 (_____)

1 Major Hazard: _____

2 Definition- Explosive means any substance or article, including a device, that is designed to function by explosion (i.e. an extremely rapid release of gas and heat) or that, by chemical reaction within itself, is able to function by explosion.

3 Divisions

a 1.1 Explosives that have a mass explosion hazard. A mass explosion is one that affects almost the entire load instantaneously.

- Black powder, dynamite, T-N-T, blasting caps, nitroglycerine

b 1.2 Explosives that have a projection hazard but not a mass explosion hazard.

- Aerial flares, detonation cord, and power device cartridges

c 1.3 Explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard, or both, but not a mass explosion hazard

- Liquid-fueled rocket motors, propellant explosives

d 1.4 Explosive devices that present a minor explosion hazard. No device in the division may contain more than 25 grams (0.9 oz) of a detonating material. The explosive effects are largely confined to the package and no projection of fragments of appreciable size or range are expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.

- Practice ammunition, signal cartridges

e 1.5 Very insensitive explosives. This division is comprised of substances that have a mass explosion hazard but are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.

- Prilled ammonium nitrate fertilizer, (blasting agents).

f 1.6 Extremely insensitive articles that do not have a mass explosive hazard. This division is comprised of articles that contain only extremely insensitive detonating substances and that demonstrate a negligible probability of accidental initiation or propagation.

40 Placard - Orange, Bursting Ball with word "Explosives" or "Blasting Agents"-(1.5)

(d)0 Class 2 (_____)

1 Major Hazards: _____

2 Compressed gases might also be flammable, oxidizers, Poisonous, and cryogenic

3 Divisions

a 2.1 (Flammable gas) means any material that is a gas at 20° C (68° F) or less and 101.3 kPa (14.7 psi) of pressure, a material that has a boiling point of 20° C (68° F) or less at 101.3 kPa (14.7 psi) and that:

1 Is ignitable at 101.3 kPa (14.7 psi) when in a mixture of 13% or less by volume with air; **or**

2 Has a flammable range at 101.3 kPa (14.7 psi) with air of at least 12% regardless of the lower limit

- Inhibited butadienes, methyl chloride, propane, .methane and hydrogen

b0 2.2 (Nonflammable, Nonpoisonous Compressed Gas, Including Compressed Gas, Liquefied Gas, Pressurized Cryogenic Gas, and Compressed Gas in solution) A nonflammable, nonpoisonous compressed gas means any material (or mixture) that exerts in the packaging an absolute pressure of 280 kPa (41 psia) at 20° C (68° F).

1 A cryogenic liquid means a refrigerated, liquefied gas having a boiling point colder than -90° C (-130° F) at 101.3 kPa (14.7 psi) absolute.

- Anhydrous ammonia, cryogenic argon, carbon dioxide, compressed nitrogen, neon, and helium.

c0 2.3 (Poisonous Gas) means gases that vaporize easily, that are very dangerous to life, even in small amounts. A material that is a gas at 20° C (68° F) or less and a pressure of 101.3 kPa (14.7 psi or 1 atm), a material that has a boiling point of 20° C (68° F) or less at 101.3 kPa (14.7 psi), and that:

1 Is known to be so toxic to humans as to pose a hazard to health during transportation; **or**

2 In the absence of adequate data on human toxicity, it is presumed to be toxic to humans because, when tested on laboratory animals, it has an LC50 value of not more than 5,000 ppm.

- Anhydrous hydrogen fluoride, arsine, chlorine, methyl bromide, cyanide gas, hydrocyanic acid, and diphosgene.

3 Hazard Zones of poisonous gases

a Hazard Zone A - LC50 less than or equal to 200 ppm.

b Hazard Zone B - LC50 greater than 200 ppm and less than or equal to 1000 ppm.

c Hazard Zone C - LC50 greater than 1000 ppm and less than or equal to 3000 ppm.

d Hazard Zone D - LC50 greater than 3000 ppm and less than or equal to 5000 ppm.

4000 Placards

a Flammable = Red background, White Flame

b Non-Flammable = Green background, White Cylinder

c Oxidizer = Yellow background, Flaming "O"

d Poison Gas = White background, Skull & Crossbones

(e)00 Class 3

1. Flammable Liquid

a Major Hazard: _____

b Definition - Flammable liquid means any liquid having a flash point of not more than 60.5° C (141° F).

1 Division 3.1-Flash point < 0°F

2 Division 3.2-Flash point 0°F to <73°F

3 Division 3.3-Flash point 73°F to <141°F

c0 Hazard Zones of Flammable Liquids

1 Hazard Zone A - LC50 less than or equal to 200 ppm.

2 Hazard Zone B - LC50 greater than 200 ppm and less than or equal to 1000 ppm.

- Acetone, amyl acetate, gasoline, methyl alcohol, and toluene.

100 Combustible Liquid

a Definition - Combustible liquid means any liquid that does not meet the definition of any other hazard class and has a flash point above 60°C (140°F) and below 93°C (200°F).

b Combustible liquids flash point 141°F

c Flammable liquids with a flash point above 38° C (100° F) may be reclassified as a combustible liquid.

- Mineral oil, peanut oil, No. 6 fuel oil, pine oil, and plastic solvents.

20 Placards

a Flammable = Red background, White Flame w/ the word Flammable

b Combustible = Red background, White Flame w/ the word Combustible

(f)00 Class 4 (_____)

1 Major Hazard: _____
_____

2 Divisions

a 4.1 (Flammable Solid) means any of the following

three types of materials:

1 Wetted explosives - explosives wetted with sufficient water, alcohol, or plasticizer to suppress explosive properties.

2 Self-reactive materials - materials that are liable to undergo, at normal or elevated temperatures, a strongly exothermic decomposition caused by excessively high transport temperatures or by contamination.

3 Readily combustible solids - solids that may cause a fire through friction and any metal powders that can be ignited.

- Magnesium (pellets, turnings, or ribbons), nitrocellulose, safety matches, and sulfur.

b0 4.2 (Spontaneously Combustible Material) means any of the following materials:

1 Pyrophoric material - a liquid or solid that, even in small quantities and without an external ignition source, can ignite within 5 minutes after coming in contact with air.

2 Self-heating material - a material that, when in contact with air and without an energy supply, is liable to self-heat.

- Aluminum alkyls, charcoal briquettes, magnesium alkyls, and phosphorus.

c0 4.3 (Dangerous When Wet Materials) means a material that, by contact with water, is liable to become spontaneously flammable or to give off flammable or toxic gas at a rate greater than 1 L/kg of the material, per hour.

- Calcium carbide, magnesium powder, potassium metal alloys, and sodium hydride.

30 Placards

a Division 4.1 Red and White Vertical Stripe, Black Flame and the words Flammable Solid

b Division 4.2 White Top, Red Bottom, Black Flame with word Spontaneously Combustible

c Division 4.3 Blue background White flame word "Dangerous when Wet"

(g)00 Class 5 _____

1 Major Hazards 5.1; _____

2 Major Hazards 5.2; _____

3 Divisions

a 5.1 (Oxidizer) means a material that may, generally by yielding oxygen, cause or enhance the combustion of other materials.

- Ammonium nitrate, bromine trifluoride, calcium hypochlorite, chlorate, and permanganate.

b Division 5.2 (Organic Peroxide) means any organic compound containing oxygen (O) in the bivalent [-O-O-] structure that may be considered a derivative of hydrogen peroxide, where one or more of the hydrogen atoms have been replaced by organic radicals.

1 Division 5.2 (Organic Peroxide) materials are assigned to one of seven types:

a Type A - organic peroxide that can detonate or deflagrate rapidly as packaged for transport. Transportation of type A organic peroxides is forbidden.

b Type B - organic peroxide that neither detonates nor deflagrates rapidly, but that can undergo a thermal explosion.

c Type C - organic peroxide that neither detonates nor deflagrates rapidly and cannot undergo thermal explosion.

d Type D - organic peroxide that detonates only partially or deflagrates slowly, with medium to no effect when heated under confinement.

e Type E - organic peroxide that neither detonates nor deflagrates and shows low, or no, effect when heated under confinement.

f Type F - organic peroxide that will not detonate, does not deflagrate, shows only a low, or no, effect if heated when confined, and has low or no explosive power.

g Type G - organic peroxide that will not detonate, does not deflagrate, shows no effect if heated when confined, and has no explosive power, is thermally stable, and is desensitized.

- Dibenzoyl peroxide, methyl ethyl ketone peroxide, and peroxyacetic acid.

20 Placards

a 5.1, Yellow background, Black Flaming "O" with word "Oxidizer"

b 5.2 Yellow background, Black flaming "O" with words "Organic Peroxide"

(h)0000 Class 6 (_____)

1 Major Hazards: _____ Gases are class 2 division 3

2 Major Hazard: _____

3 Divisions

a 6.1 (Poisonous Materials) means a material, other than a gas, that is either known to be so toxic to humans as to afford a hazard to health during transport, **OR** in the absence of adequate data on human toxicity, is presumed to be toxic to humans, including irritating materials that cause irritation.

- Parathion, Potassium arsenate, tear gas candles, xylol bromide.

b 6.2 (Infectious Substance) means a viable microorganism, or its toxin, that causes or may cause disease in humans or animals. Infectious substance and etiologic agent are synonymous.

- Anthrax, botulism, rabies, tetanus, and polio virus.

c If a package addressed to the *Centers for Disease Control* in Atlanta, Georgia is involved in an incident, the contact phone number is (404) 633-5313.

d Packaging Groups

1 PG I or II, other than PG I inhalation hazard

2 PG III

400 Placard - White background, Skull & Crossbones

(i)0 Class 7 (_____)

1 Major Hazard: radioactive poisonous burns

2 Definition - Radioactive material having a specific activity greater than 0.002 microcurie per gram (:Ci/g)

3 Transport Groups

a Fissile Class I - White I - has a radiation level of < 0.5 millirem per hour (mrem/h)

- Chromium 51

b Fissile Class II - Yellow II - 0.5 mrem/h # Radiation level # 50 mrem/h

- Iodine 131

c Fissile Class III - Yellow III - radiation level is > 50 mrem/h

- Plutonium, Cobalt 60, Uranium, Hexafluoride, Strontium 90.

40 Placard - Yellow top, White bottom, Black "Propeller"

(j)0 Class 8 (_____)

1 Major Hazards: _____
_____

2 Definition - a liquid or solid that causes visible destruction or irreversible alterations in human skin tissue at the site of contact, or a liquid that has a severe corrosion rate on steel or aluminum

- Nitric Acid, Phosphorus Trichloride, Sodium Hydroxide, Sulfuric Acid, and ammonium hydroxide.

3 Placard - White Top, Black bottom, two test tubes, hand, and steel bar

(k)0 Class 9 (_____)

1 Definition - a material that presents a hazard during transport, but that is not included in another hazard class.

a Any material that has an anesthetic, noxious, or other similar property that could cause extreme annoyance or discomfort to a flight crew member so as to prevent the correct performance of assigned duties.

b Any material that is not included in any other hazard class, but is subject to the DOT requirements (a hazardous substance or a hazardous waste).

- Adipic Acid, hazardous substances such as; PCBs and Molten Sulfur. Hazardous Waste

20 Placard - Black and white vertical stripes on top, white bottom

(l)0 Other Regulated Material (ORM-D)

1 Definition - a material that presents a limited hazard during transportation due to its form, quantity, and packaging.

- Consumer commodities, small arms ammunition, and furniture polish.

2 No placard

(m)0 Forbidden - means prohibited from being offered or accepted for transportation. Does not apply if the materials are diluted, stabilized, or incorporated in devices. There is no placard for these they aren't transported.

(3)0 Identify two ways to obtain a material safety data sheet (MSDS) in an emergency. **(3-2.2.2)**

(a) Hazard Communication Program

1 All hazardous materials received by Base Supply will be accompanied by a MSDS.

2 _____ will maintain MSDS's for products located in their buildings (on-site).

3 _____ may maintain MSDS's for high quantity, high use items.

(b)0 Location of MSDS's in the civilian sector

1 May be obtained from the _____ by FAX (manufacturer).

2 Available from _____ by FAX or through the Hazardous Information Transmission System (HITS) by computer modem hook-up.

3 May accompany the shipment either with the product itself or with the person in charge of shipping papers.

(4)00 Using a material safety data sheet (MSDS) for a specified material, identify the following hazard and response information: **(3-2.2.3)**

(a) Physical and chemical characteristics

1 _____

2 Boiling point

3 _____

4 Water solubility

5 pH

6 _____

(b)0 Physical hazards of the material

1 Fire and explosion hazards

a _____

b Autoignition temperature

c _____

20 Extinguishing agents

3 Reactivity

(c)0 Health hazards of the material

1 _____ (TLV)

2 Material's effects

(d)0 Signs and symptoms of exposure

(e) Routes of entry/exposure

(f) Permissible exposure limits

(g) Responsible party contact

1 Material manufacturer

2 Distributors

3 Emergency

(h)0 Precautions for safe handling (including hygiene practices, protective measures, procedures for cleanup of spills or leaks)

(i) Applicable control measures including personal protective equipment

1 Respiratory protection

2 Eye protection

3 Protective gloves

4 Storage

5 Incompatible materials

(j)0 Emergency and first aid procedures

(5)0 _____ (CHEMTREC) and Canadian Transport Emergency Center (CANUTEC) **(3-2.2.4)**

(a) The type of assistance provided by CHEMTREC/CANUTEC

1 Public service of Chemical Manufacturers Association (CMA)

2 Objective- Help emergency service personnel responding to emergencies involving unfamiliar hazardous materials

3 Responding personnel need information that's

a Always _____

b Brief and to the point

c Easily understood

d Readily accessible

e From a recognized source

40 Operates _____

(b)0 How to contact CHEMTREC/CANUTEC

1 Emergency telephone numbers

a CHEMTREC - 1-800-_____

b CANUTEC - 1-613-996-6666 collect (Emergency only)

20 Business - CHEMTREC 1-202-887-1255, 9-4 EST

(c)0 The information to be furnished to CHEMTREC/CANUTEC

1 _____

2 Guide number being used

3 _____

4 _____

5 The carrier's and consignee's name

6 Local conditions

(d)0 Standard procedure used by CHEMTREC/CANUTEC

1 They confirm that a chemical emergency exists

2 Details recorded in writing and on tape

3 Provides immediate technical assistance to the caller

a Prewritten information provided by the manufacturer

b Will not give any additional information that is not prewritten

40 Contacts the shipper of the material or other experts

5 Shipper/manufacturer is given name and call back number of the person who made the call to CHEMTREC/CANUTEC

6 Shipper/manufacturer deals directly with the party involved

(e)0 Other Resources, utilized by CHEMTREC

1 _____

2 Department of Defense

3 Vinyl Chloride Monomer Emergency Response Program

4 _____

5 National Agricultural Chemical Association

6 Department of Energy

7 Pesticide Safety Team Network (PSTN) of the National Agricultural Chemicals Association (NACA)

(6)00 Two methods of contacting the manufacturer or shipper to obtain hazard and response information **(3-2.2.5)**

(a) _____

(b) Use information found on the MSDS such as telephone numbers, FAX's, or emergency contact procedures.

(c) _____

c.00 Given scenarios of facility and transportation hazardous materials incidents involving a single hazardous material, predict the likely behavior of the material and its container in each incident with at least 80% accuracy. **(3-2.3)**

(1) Interpret the hazard and response information obtained from the current edition of the Emergency Response Guidebook, material safety data sheet (MSDS), CHEMTREC/CANUTEC, and shipper/manufacturer contacts. **(3-2.3.1)**

(a) Know where to find information

(b) Recognize that different emergency response publication and information sources may provide conflicting data or speak from their expertise only.

(2)0 Match the following chemical and physical properties with their significance and impact on the behavior of the container and/or it contents: **(3-2.3.1.1)**

(a) Corrosivity (pH) pH value range is 1 thru 14

1 ACID - _____

a Litmus dye's turns _____

b Dissolves metals

c Reacts with bases

d Strong acids have a pH equal to or less than 2.0

20 Neutral - pH value equal __ (pure water)

3 BASE - pH value above ___

a Litmus dye's turns _____

b Reacts with acids

c Strong bases have a pH value equal to or greater than ___

d Also known as _____

(b)00 Flammable (explosive) range

1 Range is the difference between the _____ and _____ flammable limits.

a Values given in concentration percentages of product vapor to air

b Use combustible gas indicators to measure limits

20 Lower explosive limit (LEL)- is the minimum concentration of vapor to air below which a flame will not propagate in the presence of an ignition source. Also known as "Too_____ to burn"

3 Upper explosive limit (UEL)- is the maximum vapor to air concentration above which a flame will not propagate. Also known as "Too _____ to burn".

4 Any measurements taken of a product that fall within the published LEL and UEL are subject to burn and/or explode.

5 Concentrations will vary depending upon other characteristics of the product such as; vapor

density, wind direction and speed, and ambient temperature

- Gasoline, LEL = 1.4, UEL = 7.6
- Hydrazine (100%), LEL = 2.9, UEL = 98

(c)0 _____ -Temperature at which a liquid will give off sufficient vapors that will ignite readily given an ignition source. Fire does not have to continue to burn.

(d) Form (solid, liquid, gas)

1 Solid

a Melting point

b Solubility or insolubility in liquids

c Hardness

d Color

e Odor

f Density

20 Liquid

a Boiling point

b Viscosity

c Color

d Odor

e Density

30 Gas

a Solubility in water

b Liquefaction

c Color

d Odor

e Density

40 States of Change

a _____- going from the liquid to the gaseous state or going from the solid to the gaseous state

b Condensation - _____
_____

c Distillation - going from the liquid to gaseous to the liquid state

d _____ - going from the liquid to the solid state

e Melting - going from the solid to the liquid state

f Sublimation - going from the solid to the gaseous to the solid state

50 Different forms of hazardous materials present different hazards

(e)0 Ignition (auto-ignition) temperature - _____
_____
_____

(f) _____ - the ability of a material to release energy either by itself or in combination with other materials

(g) _____

1 Ratio of the weight of a liquid or solid as compared to an equal amount of water

2 Water is given a value of 1.0

a Solids or liquids with values less than 1.0 are considered _____ than water and will _____ when in water.

b Solids or liquids with values greater than 1.0 are considered heavier than water and thus will sink when in water.

(h)00 Toxic products of combustion

1 Combustion may alter the original products

2 May be less harmful

3 May be more harmful

4 Smoke, Steam and Runoff from fire and fire fighting operations may contaminate a larger area

(i)0 _____ Density

1 Ratio of the weight of a _____ as compared to an equal amount of air

2 Air is given a value of _____

a Vapors with values less than 1.0 are considered lighter than air and thus will rise and dissipate when released in air.

b Vapors with values greater than 1.0 are considered heavier than air and thus will seek low lying areas when released.

(j)00 _____ - the ability of a material to blend uniformly (solubility) with another

1 Types of solubility

a Solid in liquid

b Liquid in liquid

c Gas in liquid

d Gas in Gas

20 Common terminology for solubility

a Yes - is soluble

b No - not soluble

c Slight - partly soluble or will easily saturate the substance

d May be described in percentages

e Solubility may vary depending upon the material it is in.

f Solubility may be referred to as "Miscible", usually used with liquids and gases.

(3)000 Exposure, hazard, and contamination differences **(3-2.3.1.2)**

(a) Exposure and hazard

1 Exposure

a Large quantities of hazardous material in concentrations that are not a hazard

b Small amounts of a hazardous material that is a very high hazard

(b)00 Exposure and contamination

1 People exposed to a hazardous material are not necessarily always contaminated by it

2 People contaminated obviously must have been exposed to the hazardous material

(c)0 Contamination and secondary contamination

1 Contamination

a Occurs from direct contact with the material usually as a result of a release - victims
b During the control phase - responders

20 Secondary contamination

a Usually a result of coming in contact with others, equipment, property that was originally contaminated

b High risk, secondary contaminants

1 Solids and liquids

- Asbestos, mercaptan, pesticides, and PCBs.

c0 Low risk materials

- carbon monoxide, weak acids, and gasoline

d Decontaminate adequately

(4)000 Identify three types of stress that could cause a container system to release its contents **(3-2.3.2)**

(a) Stress - "_____
_____

(b) Types of stress

1 _____- as a result from radiated, convected, conducted or direct heat exposure

2 Mechanical - as a result from some dominant physical force

3 _____ - as a result of a reaction or interaction between a chemical(s) coming in contact with the container or its

contents, it may also be a result of a change in the contents alone.

(5)00 Identify five ways in which containers can breach **(3-2.3.3)**.

(a) Types of Breach

1 _____ - container material fails due to rust, corrosion or other form of disintegration.

2 _____ cracking

3 Closures opening up

4 _____

5 _____/Tears

(b)0 Stress causes breaches

1 Container may be stressed

a Internally from material

b Externally from any number of things

20 Contents may be stressed

a _____ may cause changes to material

b Chemical reaction or breakdown of material

30 Either form of stress may cause release of contents

a Type of breach is typically dependant upon _____ and _____ of stress

b Type of breach and size of breach will ultimately determine amount and speed of content's release

(6)000 Identify four ways in which containers can release their contents. **(3-2.3.4)**

(a) _____ - Explosion of contents

1 Release time of less than 1/100th of a second

2 **NO** time to react

a Blast impulse

b Overpressure

1 High explosive => 3200 ft./sec.

2 Low explosive < 3200 ft./sec.

(b)000 Violent rupture - NOT an explosion

1 _____ of the container

2 Rapid-acceleration polymerization

a Polymerization - chemical reaction in which a catalyst such as light or heat, typically under pressure, cause simple molecules to combine to form long chain molecules

b Rapid-acceleration - run-away polymerization (not under control in a process) that causes the material to expand at a rate uncontainable by the container or without the addition of an inhibitor.

30 Oxidizing hazardous materials reactions

a Burst containers abruptly

b Oxidizers

c Organic Peroxides - contain inhibitor to prevent such occurrences

(c)00 Rapid Relief

1 _____

a Over pressurization

b Pressure as a result of external stress or heat

20 Safety Valve or Relief valve operation/failure

(d)0 Spills and Leaks

1 Gradual flow through openings

2 _____ and splits

3 Punctures

(7)00 Identify at least four dispersion patterns that can be created upon release of a hazardous material **(3-2.3.5)**

(a) Factors influencing dispersion patterns

1 _____

2 Form of material (liquid, solid or gas)

3 _____

4 Topography

5 Type of container breach

6 _____

(b)0 Types of patterns

1 _____ - vapor release that initially rises spreads outward symmetrically and falls equally in all directions (usually occurs when there is no wind)

2 Cloud - complete vapor release in the form of a single cloud

3 _____ - continuous vapor release with product drifting with wind

4 Cone - a liquid material spill that flows with the topography and widens at the furthest point from the release site

5 Stream - liquid material flowing with the topography, but remaining generally consistent in width for the length of the spill

6 Pool - _____
_____

7 Irregular - liquid product is not following any specific flow

(8)00 Three general time frames for predicting the length of time that exposures may be in contact with hazardous materials in an endangered area. **(3-2.3.6)**

(a) Factors influencing the length of time

1 _____

2 Method of dispersion

3 _____

(b)0 Time Frames

1 Short-term (_____)

a Low hazards

b Small (short) releases

c Quick control

20 Medium-term (_____)

a Moderate to high hazards

b Exposure contamination occurred

c Decontamination lengthy or difficult

d Moderate clean-up required

30 Long-term (_____)

a hazards

b Heavy contamination

c Decontamination lengthy and difficult

d Extensive clean-up required

- Example - Love Canal, N.Y.
- Chernobal

(9)000 Health and physical hazards that could cause harm. **(3-2.3.7)**

(a) Definition of harm - injury or damage caused by being exposed to the hazards of the material

(b) Factors influencing harm

1 _____

2 Duration of contact

3 _____

4 Protective clothing

(c)0 Types of hazards causing harm

1 _____

2 Mechanical

3 _____

4 Corrosive

5 _____

6 Radiation

7 _____

(10)00 Health hazards associated with the following terms: **(3-2.3.7.1)**

(a) _____ - material which is not necessarily toxic, but can cause unconsciousness and death by displacing or depriving oxygen

(b) _____ - material that is not necessarily corrosive, but may cause a reaction or inflammation at the point of contact. People react differently

(c) _____ - Material that causes visible destruction to human skin tissue or a severe corrosion rate on steel

(d) _____ - material that causes some people to have an allergic reaction after repeated exposure to the material. The number and length of exposures will vary the speed and degree of reaction amongst people.

(e) _____ - material that through inhalation, ingestion, or skin absorption causes an allergic reaction

(f) Convulsant - material that causes convulsions

(g) Chronic health hazard

1 Carcinogen - any material that causes cancerous growths in living tissue

a A material is considered a carcinogen if the International Agency for research on Cancer (IARC) has determined the material to be a carcinogen or potential carcinogen

b A material is a carcinogen or potential carcinogen if listed in the Annual Report on Carcinogens

published by the National Toxicology Program (NTP) latest edition.

c A material is a carcinogen if it is regulated by federal Occupational Safety and Health Association as a carcinogen.

20 Mutagen - Causes mutations in DNA and living cells

3 _____ - any substance that causes growth abnormalities in embryos or genetic modifications in cells

(h)0 Highly Toxic - A chemical falling within any of the following categories:

1 A chemical that has a median lethal dose (LD_{50}) of 50 mg or less per kg of body weight when administered orally to albino rats weighing between 200 and 300 g each.

2 A chemical that has a median lethal dose (LD_{50}) of 200 mg or less per kg of body weight when administered by continuous contact for 24 hr (or less if death occurs within 24 hr) with the bare skin of albino rabbits weighing between 2 and 3 kg each.

3 A chemical that has a median lethal concentration (LC_{50}) in air of 200 parts per million by volume or less of gas or vapor, or 2 mg per L or less of mist, fume, or dust, when administered by continuous inhalation for 1 hr (or less if death occurs within 1 hr) to albino rats weighing between 200 and 300 g each.

(i)0 Toxic - A chemical falling within any of the following categories:

1 A chemical that has a median lethal dose (LD_{50}) or more than 50 mg per kg but not more than 500 mg per kg of body weight when administered orally to albino rats weighing between 200 and 300 g each.

2 A chemical that has a median lethal dose (LD_{50}) of more than 200 mg per kg but not more than 1,000 mg per kg of body weight when administered by continuous contact for 24 hr (or less if death occurs within 24 hr) with the bare

skin of albino rabbits weighing between 2 and 3 kg each.

3 A chemical that has a median lethal concentration (LC_{50}) in air of more than 200 parts per million but not more than 3,000 parts per million by volume of gas or vapor, or more than 2 mg per L but not more than 200 mg per L of mist, fume, or dust, when administered by continuous inhalation for 1 hr or less if death occurs within 1 hr) to albino rats weighing between 200 and 300 g each.

(j)0 Target organ effects:

1 _____ - Chemicals that produce liver damage. Signs and Symptoms: Jaundice; liver enlargement.

- Chemicals: Carbontetrachloride; nitorsamines.

2 Nephroxtoxins - _____.

- Sign and Symptoms: Edema; protein urea.
- Chemicals: Halogenated hydrocarbons; uranium.

3 _____ - Chemicals that produce their primary toxic effects on the nervous system.

a Central Nervous System Hazards - Chemicals that cause depression or stimulation of consciousness or otherwise injure the brain

b Peripheral Nervous System - Chemicals that cause damage to the nerves that transmit messages to and from the brain and the rest of the body. Signs and Symptoms: Numbness, tingling, decreased sensation, change in reflexes; decreased motor strength

- Examples: Arsenic, lead, touene, styrene

40 Agents that decrease hemoglobin in the blood function;

deprive the hematopolatic body tissues of oxygen system. Signs and Symptoms: Cyanosis; loss of consciousness. Chemicals: carbon monoxide; benzene

5 Agents that irritate the lung or damage the pulmonary tissue. Signs and Symptoms: Cough; tightness in chest; shortness of breath. Chemicals; Silica; Asbestos; HCL.

d.000 Given scenarios of hazardous materials incidents, identify potential harm within the endangered area of the incident with at least 80% accuracy. **(3-2.4)**

(1) Resources for determining the size of an endangered area of a hazardous materials incident **(3-2.4.1)**

(a) U.S. DOT Emergency Response Guidebook

1 Table of _____ and _____ Distances

a Color coded _____ Pages

b Contains chemicals with poisonous vapor hazards

20 _____ guide pages may contain initial distances

(b)0 CHEMTREC/CANUTEC may provide distances for evacuation

(2)0 Estimate the number and type of exposures within that endangered area. **(3-2.4.2)**

(a) Must have the size of the endangered area

(b) Must know surrounding conditions

1 Size of _____

2 Size of_____

3 Wind direction and speed

(c)0 Exposures

1 _____

2 Environment

3 _____

(d)0 Factors influencing determining numbers and types of exposures

1 Time of day

2 _____

3 Location of release

(3)00 Resources available for determining the concentrations of a released hazardous material within an endangered area. **(3-2.4.3)**

(a) Not typically an operations level responsibility

(b) Operations level personnel should know where to get such help

(c) Technical Assistance

1 Hazardous Materials handling companies/Hazardous Materials Team

2 _____

3 Adjacent Fire Departments

4 _____

5 Environmental Agencies

6 _____

7 Local & State Resources

(d)0 List these resources in the Emergency Response Plan

(4)0 Factors for determining the extent of physical, health, and safety hazards within the endangered area of a hazardous materials incident given the concentrations of the released material. **(3-2.4.4)**

(a) Used in determining need to intervene or not

(b) Ask yourself the following questions

1 What are_____?

2 How many exposures (people)?

3 Is the material a _____ or _____?

4 How far away are the exposures from the source/Degree of Hazard?

5 How fast is the release/behavior of the Hazardous Material and its container?

PRESENTATION:

200000003. Competencies - **Planning the Response**

a. Given simulated facility and transportation hazardous materials scenarios, describe the first responder's response objectives with at least 80% accuracy. **(3-3.1)**

(1) Steps for determining the number of exposures that could be saved by the first responder **(3-3.1.1)**

(a) Based on defensive procedures

(b) Use resources available at the time

(c) Use information gathered during analysis of the incident

(d) Perform steps in order:

1 _____

2 Decide how many exposures are already lost.

3 Estimate action options available and their effectiveness.

a _____

b _____

(2)000 Steps for determining defensive response objectives **(3-3.1.2)**

(a) Use information obtained in analyzing the incident

(b) This is also known as determining "_____ _____"

(c) Focus on the following;

1 Changing the actions of the stressors

a Examples are cooling, extinguishing, or closing valves

b Must be defensive in nature

20 The containment system

a Capacity

b _____

c Size of Breach

30 The hazardous materials

a Type of hazard

b _____

b.0000 Given simulated facility and transportation hazardous materials scenarios, identify the defensive options for each response objective with at least 80% accuracy. **(3-3.2)**

(1) Defensive options to accomplish a given response objective. **(3-3.2.1)**

(a) Actions are expected to be _____

(b) Containment

(c) Confinement

1 _____

2 Dilution with water

3 _____

4 Dikes

5 Diversions

6 _____

7 Wetting

(d)0 The first responder at the operations level is expected to take actions without actually _____.

(2)0 Identify the purpose for, and the procedures, equipment, and safety precautions used with, each of the following control techniques **(3-3.2.2)**

(a) _____

1 Definition - the ability of some elements to pick up or capture another element

a Do not confuse with _____, the ability

of a material to adhere to the outside of another

b Commonly used with liquids

c Compatibility must always be considered

20 A**b**sorption methods or materials

a _____ is the most common material

b Commercial a**b**sorbents

1 _____

2 Kitty litter

3 Product Specific Absorbents

4 _____

c0 The a**b**sorbent and hazardous material must be handled as a_____ and disposed of properly.

(b)00 Dike, (Dam), Diversion, Retention

1 _____)- use of a barrier which prevents passage of the material to an area which is not yet damaged

a Constructed by forming an embankment to detain liquids & solids

b When constructing begin far enough from the spill so the dike will be completed before substance reaches the dike area

1 When confining_____ moving or heavy materials construct a _____ shaped dike

2 If the product is _____ moving construct a "V" shaped dike

c0 _____- controlled movement of the material to an area where the effects will produce less harm

- A flowing land based spill can be quickly diverted to another location by placing a barrier in advance of the spill and should be made well in advance

d The diversion wall should be constructed with the _____ and _____ of the oncoming product in mind

e The greater the speed of the product the greater the distance and angle required to slow it down. For fast moving spills, angles of _____ degrees or more should be used for intercepting the spill

20 _____- temporary containment of the material in an area where it can be absorbed, neutralized, diluted or picked up

a Should be accomplished as soon as possible. Until the spill is retained damage may continue to occur and the area will grow larger making recovery more difficult

b Before constructing a retaining structure some thought should be given to the people and equipment required to build below grade pits or ponds

c Most effective of the three actions

(c)00 Dilution

1 Operations level will typically use _____

2 Usually upon information obtained from a reliable source

3 Reactivity should be a primary concern

4 Potential to increase contaminated area exists

5 Makes clean up _____

6 May not eliminate hazard, only reduce or weaken the original product.

7 Product must be water _____

(d)0 Vapor dispersion

1 _____ or _____ works well

2 Mechanical blowers or other means not feasible with flammables

3 Usually needed with_____ materials to remove them from enclosed places and low lying areas

4 Gas concentrations can be reduced below the lower flammable limits.

(e)0 Vapor Suppression

1 Effective with flammable liquids

2 Use foams such as AFFF

3 Use compatible foam with alcohols

c.000 Given the name of the hazardous material involved and the anticipated type of exposure, determine whether available personal protective equipment is appropriate for implementing a defensive option with at least 80% accuracy.

(1) Determine the appropriateness of Personal Protective Equipment **(3-3.3)**

(a) Must know product(s) involved

(b) Anticipate type of exposure (_____)

(c) Is available protective clothing adequate?

1 First Responders at the operations level

a **Are/ Are not** expected to use specialized chemical protective clothing

b Wear what "authority having jurisdiction" has provided

1 Fire fighters - full protective clothing and a minimum - positive pressure SCBA

2 Industry - varies depending upon process

200 Level of protective clothing available is important when determining the type of defensive actions to be undertaken

(d)0 Appropriate respiratory protection required for a given defensive option. **(3-3.3.1)**

1 Wear SCBA until a lower level is approved by the _____

2 Once concentration has been determined

a Lower levels compatible with the product

b Must not result in a hazardous exposure to the responder

c Decision made by incident commander should be made after consulting _____

30 Three types of respiratory protection **(3-3.3.1.1)**

a _____ filter mask

1 Advantages

a Greater Mobility

b Light weight

20 Limitations

a Cannot be used in oxygen deficient atmospheres

b _____

c Selected for specific products

d _____ and _____ monitoring must take place simultaneously with use

e Only usable against gas and vapor concentrations

b00 Supplied-Air Respirator (SAR)

1 Advantages

a _____

b _____

c Protects against airborne contaminants

20 Limitations

a SCBA must be worn as an emergency backup thus negating light weight theory

b _____

c Tendency to _____

responders

c00 Self-Contained Breathing Apparatus (SCBA) (Positive Pressure)

1 Advantages

a Highest level of protection

b Good mobility

20 Limitations

a _____

b Heavy equipment

c Difficult movement in confined spaces

4000 No one system better than the other

a Firefighters trained primarily with SCBA's

b Select the best for the particular task, ensure user is trained in its proper use.

(e)00 Physical capabilities and limitations of personnel working in positive pressure self-contained breathing apparatus. **(3-3.3.1.2)**

1 Physical Capabilities

a Physical exertion is increased with the weight of SCBA

b _____

c _____

d Good physical condition maximizes work performed and stretches air supply.

20 Limitations

3 Criteria For:

a OSHA requires wearers to be_____

b NFPA 1500 requires wearers to be _____certified annually **(NFPA 1500, 8-1.3) (NFPA 1500, 8-2.1, thru 8-2.3)**

c NFPA 1500 requires wearers of SCBA to be _____, _____, and certified **(NFPA 1500, 5-3.2)**

(f)00 Appropriate personal protective equipment required for a given defensive option. **(3-3.3.2)**

1 Minimum Protective Equipment

a _____

b Work clothing

c Protective equipment provided by the "Authority having jurisdiction"

1 Must meet all other established criteria

2 Must be trained, tested, and certified in its use

200 Compatibility

a Must know the hazardous material/determine the name of the material and type of exposure.

b NFPA Standards

1 Standard _____, Vapor-protective

Clothing for Hazardous Chemical Emergencies (1994)

2 Standard _____, Liquid Splash-protective Suits for Hazardous Chemical Emergencies (1994)

3 Standard _____, Support Function Protective Garments for Hazardous Materials Chemical Operations (1994)

c0 Manufacturers Guidance

d Utilize other references or resources

1 Cross reference to verify

2 Use a pre-plan to list other resources

(g)000 Skin contact hazards encountered at hazardous materials incidents. **(3-3.3.2.1)**

1 Skin contact hazards

a Burns

b Rashes

c Absorption

20 Methods of Exposure

a _____ with material

b Improper wear or selection of personal protective equipment

c Permeation, _____, or degradation of protective equipment

d Flawed or incomplete decontamination process

(h)00 Purpose, advantages, and limitations of the following levels of protective clothing at a hazardous materials incidents: **(3-3.2.2.2)**

1 Structural fire fighting clothing **(NFPA 1971/AFOSH STANDARD 48-1,)**

a Purpose

1 Primarily firefighting

2 _____ protective clothing for response

3 Includes Positive-pressure SCBA

b0 Advantages

1 Most familiar to responders

2 _____
_____

3 Can be donned, and doffed by the user without assistance

c0 Limitations

1 Not widely available outside of fire departments

2 Limited_____ protection, absorbs liquids

3 Besides SCBA, no _____protection

4 Relatively bulky and heavy

200 High temperature-protective clothing

a Purpose

1 Proximity (up to 2000E F/_____)

2 Fire Entry (2000E F/_____ exposure to radiant heat)

b0 Advantages

1 Extremely effective against high temperatures

2 May serve as _____protection

c0 Limitations

1 No usage other than high temperatures and flash protection

2 When worn over other protective clothing as flash protection total clothing becomes heavy and extremely bulky

300 Chemical-protective clothing

a Vapor protective clothing **(NFPA Std _____)**

1 Purpose - protects wearer from chemical vapors, gases, and liquids

2 Advantages

a Tested for_____ specific chemicals

b _____ package provided with each suit will show breakthrough times for each chemical the suit is certified against.

30 Limitations

a Cannot use with chemicals for which

the manufacturer has not certified the suit against

b _____

c _____, and _____ are limited. Usually simple tasks become extremely difficult

d Requires assistance for donning, doffing, as well as _____ and _____ to wear

b00 Liquid splash-protective clothing **(NFPA Std 1992)**

1 Purpose - protects against chemical liquid _____, and **NOT** against chemical _____ or _____.

2 Advantages

a Tested for ___specific chemicals

b Technical data package provided with each suit will show _____ times for each chemical the suit is certified against.

30 Limitations

a Cannot use with chemicals for which the manufacturer has not certified the suit against

b SCBA may be located on the exterior of the suit, COMPATIBILITY!

c Range of motion, communication and usually simple tasks become extremely difficult

d Requires assistance for donning, doffing, as well as training and certification to wear

d.000000 Without reference, identify emergency decontamination procedures with at least 80% accuracy.

(1) Emergency Decontamination Procedures **(3-3.4)**

(a) Ways that personnel, personal protective equipment, apparatus, and tools and equipment become contaminated. **(3-3.4.1)**

1 _____ with hazardous substances in the hot zone

2 _____ from other personnel, equipment, or downwind conditions

3 During the _____ process

(b)0 The potential for secondary contamination determines the need for emergency decontamination procedures. **(3-3.4.2)**

1 Operations level personnel should be performing _____ tactics only!

a Often utilizes protective clothing below the level used during entry for direct contact with product

b Reduces the potential for secondary contamination

20 Accidents and circumstances may cause personnel to become contaminated

a Procedures must be _____ to protect personnel if this occurs

b Without procedures others will ultimately become contaminated

30 Victims and bystanders may need decontamination

a Victims typically do not have protective clothing

b Emergency medical service personnel that come in contact with contaminated victims

(c)00 Purpose of emergency decontamination procedures at hazardous materials incidents. **(3-3.4.3)**

1 Immediately reduce the threat to life through _____ decontamination

2 Reduce the potential for _____ contamination

(d)0 Advantages and limitations of emergency decontamination procedures. **(3-3.4.4)**

1 Advantages

a Requires _____

b Quickly reduces contamination

c Does not require the establishment of a formal contamination _____ or _____ process

20 Limitations

a Not always total decontamination

b Creates_____

PRESENTATION:

400000005. Competencies - **Implementing the Planned Response**

a. Given scenarios for facility and/or transportation hazardous materials incidents, identify how to establish and enforce scene control including control zones, emergency decontamination, and communications with at least 80% accuracy. **(3-4.1)**

(1) Procedures for establishing scene control through control zones. **(3-4.1.1)**

(a) The _____ is responsible for monitoring the condition of personnel, the compliance of safety procedures, and the use of protective equipment during a hazardous materials incident.

(b) Establish zones as soon as possible

1 Limit the number of exposures

2 Begin victim/personnel_____

3 Incident Command Procedures

4 Standard Operating Procedures

5 _____

(c)0 Size is based on the degree of hazard

1 Requires _____ of product(s) involved

2 Utilize multiple resources and references

(d)0 Establish defined boundaries of each zone

1 Initial and continuous monitoring must be accomplished

2 Weather (wind) conditions must be considered

3 Clearly mark the zones

a Geographically

b Barriers, tape, cones, etc.

(e)00 Control Zones

1 Hot\Red\Restricted\Exclusion

a Area immediately around the release

b Protective clothing selected specifically for the released product in this area

c Persons necessary to control the incident only

d _____ must be maintained for accountability

20 Warm\Yellow\limited\decontamination\contamination reduction

a Begins where the_____ ends

b Appropriate protective clothing required

c _____ process takes place in this zone

d Control points into and out of this zone must be established and marked

30 Cold\green\clean\support

a Begins where the _____ ends

b Normal work clothing may be worn

c _____ located in this section

d Support functions are numerous;

1 Site security

2 _____

3 Reserve equipment

4 _____

e0 Control points into and out of this zone must be established and marked

1 No by-standers in this zone

2 Everyone in this zone must have credentials and a need to be there

(f)000 Control and direct operations within zones

1 Limit personnel in each zone to those authorized

2 Establish _____ (ECP)

a Accountability for people within the zone must be accomplished

b Prevents _____ across zones

(g)00 Adjust zones as needed

1 Changes as weather changes

2 _____

3 Continued use of monitoring

(2)00 Determining the locations of control zones. **(3-4.1.1.1)**

(a) Initial

1 _____

2 Chemtrec/Canutec

3 Observations and assessments

(b)0 Follow-on

1 _____

2 Evaluations of extent of contamination

3 _____

4 Plume models and dispersion models

(3)00 Identify the basic techniques for the following protective actions **(3-4.1.2)**

(a) _____- is a prolonged precautionary, stay away from the affected location

1 Incidents which may require building evacuation involve:

a Leaks of unknown gases from _____ _____containers

b Explosives or large quantities of materials which could _____ or_____

c Leaks that can not be controlled

d The Incident Commander determines that the leak can not be controlled by Emergency Response Personnel (ERP) and civilians are at risk. Whenever the decisions made to evacuate, four critical steps must be established:

1 _____- tell occupant where to go

2 _____- move occupant to safe location Do not allow evacuees to congregate on the perimeter of the control zones.

3 _____- keep occupant housed, fed, and informed

4 _____- keep occupants informed on your progress, and notify concerned citizens of the situation

(b)000 Protection in place

1 Can be very effective if ERP give all occupants specific directions. The directions should include

a Shut down_____

b Closing doors and windows

c Should be given by a _____to_____ visit

20 Announcements through megaphones

3 Notifications by the _____

4 Protection in place is an available option when

a The Hazardous Material is a_____ to _____ health hazard

b Manpower is limited

c The Hazardous Material has been totally released from the container

d The Hazardous Material is migrating a toxic vapor cloud, and the citizens are safer inside

e Short duration_____ or _____leaks are present

f Vapor cloud disperses quickly

g Leaks can be controlled rapidly

(4)000 Considerations associated with locating emergency decontamination areas.
(3-4.1.3)

(a) Site selection and management

1 Selection based on access to incident from hard surface roads,_____, and proximity to environmentally sensitive areas, such as streams or ponds.

2 Keep close to the incident to limit the spread of contaminants. Generally an _____, _____ level area that is open, should be set in the warm zone

(b)0 Decontaminating away from the incident site, complicates the situation

1 May be impractical at one location, several sites may be required

2 Considerations for _____control must be made

(c)0 Weather

(d) _____

(e) _____

(f) Surface Material and Porosity

(g) _____

(h) Availability of Power and Lighting

(i) Proximity of the Incident

(j) _____

(k) Containment of Wash-down water

(l) Security and Control

b.00 Given all necessary equipment, as a team demonstrate the ability to perform emergency decontamination, within 10 minutes with 11 out of 11 evaluation elements identified correctly.

(1) Demonstrate the ability to perform emergency decontamination. **(3-4.1.4)**

(a) Act in the most expedient manner appropriate without worsening the situation

(b) _____ is only important where a _____ is involved

(c) Even victims should be decontaminated as thoroughly as practicable

(d) By performing emergency decontamination you reduce the risk of contaminating the hospital and ambulance staff.

(e) Procedure **(NFPA 472, Supplement 8)**

1 _____

2 While in the decontamination area provide a supply of uncontaminated air or oxygen

3 _____

4 Immediately wash with flooding quantities of water, any exposed body parts

5 _____
_____

6 Remove all contaminated clothing (cut if necessary) Continue to wash the victim during clothing removal.

7 _____

8 Render necessary first aid (do not apply direct mouth-to mouth)

9 Send victim for medical treatment as soon as decontamination is complete

10 _____
_____

(2)00 Items to be considered in a safety briefing prior to allowing personnel to work on a hazardous materials incident. **(3-4.1.5)**

(a) Must be accomplished at _____ incidents

(b) Level and depth of coverage will vary at each response

(c) May be given verbally, but must be_____ and _____ at the completion of the incident and file maintained with all other records from the response

(d) Key Elements

1 Preliminary evaluation (analysis of the hazard and risk)

a _____

b What is happening

c _____

d Basically narrate the initial size-up

20 Hazard Identification

a Methods used to identify

b List all hazards associated with incident

1 _____

2 Respiratory

3 _____

300 Description of the site

a Topographical

b _____

c Site map or sketch

40 Site work (control) zones

5 _____

6 Site Communications

7 _____

8 SOP's & Safe work practices

9 Medical Assistance & Triage

10 Task(s) to be performed

a Identify everyone's role

b List all tasks to be performed

110 Length of time for tasks(s)

a Varies depending upon task and response

b Usually kept to about_____ minutes per task

120 Required personal protective clothing

a Entry, backup and rescue teams

b Decontamination and warm zone

130 Monitoring requirements (Hazard Monitoring Plan)

a Establishing and maintaining zones

b Identification/ verification

c Decontamination process

140 Notification of identified risks

a Brief up front what the risks are.

b Provide each member of team with written data on risks (post response)

c Should be in all entry team medical surveillance records

150 Other relevant information

c.000 Given a simulated facility and/or transportation hazardous materials incidents, know the steps to initiate the incident management system (IMS) specified in the local emergency response plan and the organization's standard operating procedure with at least 80% accuracy.

(1) Initiating the Incident Management System **(3-4.2) (3-4.2.3)**

(a) Guidance provided in _____

(b) Can provide work sheets and plan formats

(c) Developed locally

(d) Should be specific in identifying roles and responsibilities during various specific and general responses

(e) Common elements:

1 Terminology

2 _____

3 Integrated Communications

4 Unified Command Structure

5 Consolidated action plans

6 _____

(f)0 NFPA 1561

(g) National Interagency Incident Management System (NIIMS)

(h) All these documents are a result of FEMA's NRT-1 guidance

(2)0 Role of the first responder at the operational level during hazardous materials incidents as specified in the local emergency response plan and the organization's standard operating procedures. **(3-4.2.1)**

(a) Primary roles included in plan;

1 _____ to the emergency

2 _____ the nature of the incident

3 Implementing initial defensive actions

4 _____

5 Asking for _____ when needed

(3)00 Levels of hazardous materials incidents as defined in the local emergency response plan. **(3-4.2.2)**

(a) Levels of hazmat incidents **(NFPA 471, TABLE 3-1)**

1 Response level I

a Description - An incident which can be controlled, cleaned-up and disposed of by the using organization. The incident is confined to a small area. Only evacuation of the immediate area is required.

b Contacts

1 Fire Department

2 Environmental

200 Response Level II

a Description - An incident beyond the using organization's capabilities involving a greater hazard or larger area which could be a potential threat to life or property and which may require limited evacuation of the surrounding area.

b Contacts

1 Fire Department

2 Emergency Medical Service

3 Security Police

4 Hazmat Response Team

5 Cleanup Team

6 Bioenvironmental Management

7 Disaster Preparedness

c0 As needed

1 CHEMTREC/CANUTEC

2 National Response Center

3 HAZMAT Program Manager

4 Local Emergency Planning Committee

300 Response level III

a Description - An incident involving a_____ hazard or large area which poses an extreme threat to life and property and will probably require a large scale evacuation; or an incident requiring the expertise or resources of county, state, Federal, or private agencies and organizations

b Contact

1 All level II agencies

2 Disaster Control Group

c0 As needed

1 Mutual Aid, Fire, Police, EMS

2 Appropriate local, state, and Federal Agencies

(4)0000 Considerations for determining the location of the command post **(3-4.2.4)**

(a) Initial - may be first responding unit

(b) Designated command post

1 May be specially designed vehicle

2 _____

3 Access controlled

4 _____

5 _____, uphill, large area

6 More complex response may need the establishment of a emergency operation center

(5)00 Procedures for requesting additional resources at a hazardous materials incident. **(3-4.2.5)**

(a) Be familiar with resources available

(b) Establish and maintain a resource listing

(c) Procedures - part of your pre-planning (Local Emergency Plan)

(6)0 Responsibilities of the safety officer. **(3-4.2.6)**

(a) Should meet all requirements of the _____ being performed

(b) Directs safety of operations within the ____ and _____ zones

(c) _____ be designated specifically at ALL hazardous materials incidents**(29 CFR 1910.120)**

(d) Responsibilities

1 Obtains briefing from the IC or Incident Safety officer and Hazard Group Supervisor

2 Participates in; preparation, monitoring, and implementation of incident safety plan

3 _____
_____

4 Advise Incident Commander or Hazard Group Supervisor of incident safety plan or of dangerous situations

5 _____ ANY activity judged to be unsafe

d.000 Without reference, identify basic principles associated with the wearing of

personal protective clothing with at least 80% accuracy. **(3-4.3)**

(1) The importance of the buddy system in implementing the planned defensive options. **(3-4.3.1)**

(a) Helps to keep account of everyone **(NFPA 1500, 6-3.4)**

(b) _____is the minimum, may be three or more depending on the incident

(c) Visibility and dexterity are poor in level A & B suits. Tasks are easier with two or more

(2)0 The importance of the back-up personnel in implementing the planned defensive options. **(3-4.3.2)**

(a) _____ in the event of an emergency

(b) Equipped to the_____ of protective clothing as primary team.

(c) If placed into action they must have _____ in place prior to entry.

(d) Back-up teams must be available for immediate deployment

1 Dressed to the point of only needing to connect to their _____

2 Located in the _____ zone just up wind of the decontamination process

3 May be connected with thru-the-suit systems to a fixed air source while waiting

(3)00 Safety precautions to be observed when approaching and working at

hazardous materials incidents. **(3-4.3.3)**

(a) Use of monitoring equipment will:

1 Assess the hazard

2 _____

(b)0 Approach

1 _____,_____

2 Calculated and _____

a Study topography prior to entry

b Binoculars may assist in determining

1 Material identification

2 Tools needed

3 Obstacles to approach

(c)000 Working at the incident

1 Be aware of what is happening

2 What is the current and expected _____?

3 Is there a sufficient supply of each type of protective clothing to allow for back up teams and a third rescue team if needed?

4 Is the suit completely sealed protecting all areas of the body from the hazards?

5 Will the SCBA be protected from the hazardous substance involved?

6 What areas of the suit are going to be the most affected parts of the suit?

7 What areas of the suit are going to be the least affected parts of the suit?

8 _____

9 How long will the individuals be allowed to work before beginning decon and protective clothing removal? (usually _____ within an encapsulated suit is the maximum working time)

(4)00 Identify the symptoms of heat and cold stress. **(3-4.3.4)**

(a) Heat Stress

1 Heat rashes

2 Heat cramps

3 Heat exhaustion

a Fatigue

b Headache

c Nausea

d Dizziness

e Paler (complexion)

f Profuse sweating

40 Heat stroke - "_____"

a Hot, dry skin

b Confused

c Impaired judgment

(b)00 NIOSH Guidelines to Heat Stress and Control and Monitoring

1 The heart rate should be measured for_____ seconds as early as possible in the resting period. The initial heart rate should not exceed_____. If the heart rate is higher, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period remains the same.

2 Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature should not exceed _____. If it does, the next work period should be shortened by 10 minutes (or 33 %), while the length of the rest period remains the same. Monitoring of the oral temperature should continue, and the work and rest periods adjusted accordingly until the temperature drops below 99° F. Individuals should not be permitted to wear semipermeable or impermeable protective clothing if their oral temperature exceeds 100.6°

(c)0 Cold Temperature Exposures

1 _____ - a dangerous condition that occurs when a low ambient temperature is combined with an active air flow.

2 _____ - the body heat lost through conduction. Wet clothing extracts heat from the body up to 240 times faster than dry clothing.

3 Hypothermia - condition in which the body temperature falls below 95° F. This is a _____.

4 Degrees of Frostbite

a _____ - a condition usually resulting from direct contact with a cold object, cold

temperature, the combination of cold temp. and the wind chill, and the combined effect of cold temps. and contact with moisture.

b Superficial Frostbite - the second stage of frostbite. The affected part will appear white and waxy and the local area will feel frozen. The tissue below will feel soft and still have "bounce" or rebound.

c _____ - the third stage which involves the layers of skin tissue and deeper structures including muscles, tendons and bones. The affected body part will become a blotchy gray or blue and the skin will feel frozen, with no rebound to the touch.

(5)000 Physical capabilities required for and the limitations of personnel working in the personal protective equipment as provided by the authority having jurisdiction. **(3-4.3.5)**

(a) Respiratory physical and medical requirements were covered in section 2a(5)(e).

(b) Increased physical stamina required to wear the protective clothing

(c) Physical stamina to utilize equipment under work strenuous conditions

1 Physiological stress

2 Psychological stress

3 Personnel Limitations such as claustrophobia

(d)0 Realistic training exercises test true abilities

(6)0 Match the function of the operational components of the positive pressure self-contained breathing apparatus provided the hazardous materials responder to the name of the component. **(3-4.3.6)**

(a) Cylinder - contains breathable air (60 min supply)

(b) Cylinder valve and gauge - controls flow of air from cylinder to regulator indicates psi of cylinder

(c) Harness and carrier - holds cylinder and allows for wear of unit

(d) Regulator unit - takes high pressure breathable air (4500 psi) and lowers it to _____psi

(e) Breathing valve - takes the 110 psi and brings it down to a slight positive pressure within the face mask (4-6 PSI)

(f) Face mask - Provides a breathable, visual atmosphere

(g) Warning whistle - begins to operate when the primary air supply has dropped to approximately _____%

(h) By-pass valve - allows wearer to override the normal function of the pressure demand (breathing valve) valve

(7)0 Procedures for cleaning, sanitizing, and inspecting respiratory protective equipment. **(3-4.3.7)**

(a) Inspection of Interspiro

1 Cylinder pressure

2 Harness Straps - fully open in good condition

3 Head Harness - fully open in good condition

4 Facemask - scratched lens, dry rot, deformities, speech assembly

5 Close Positive Pressure Lever

6 Open Cylinder Valve, **FULLY**

7 Read Pressure on Manifold Block gauge (should be the same as cylinder)

8 Close Cylinder valve

9 Slowly Open By-pass valve, Check alarm whistle

10 Close By-pass

11 Open Positive pressure lever

(b)0 Clean the entire unit (MSA and Interspiro is referred to as the carrier and harness assembly)

1 Use mild soap and water

2 Do NOT get water into the regulator assembly openings

(c)0 Disinfect the mask

1 Scott

a Hypochlorite solution, two tablespoons chlorine bleach per gallon of water

b Aqueous solution of Iodine, one teaspoon of tincture of Iodine per gallon of water

c MSA cleaner-sanitizer is compatible

20 MSA-Follow directions for MSA Cleaner-Sanitizer

3 Interspiro

a Simple green solution

b MSA Cleaner Sanitizer

(d)00 Recharge the air cylinder

e.00 Given all necessary equipment demonstrate the ability to don, work in, and doff the personal protective equipment provided within 20 minutes with 6 out of 6 evaluation elements identified correctly **(3-4.3.8) (3-4.3.9)**

(1) Procedures for donning, working in, and doffing positive pressure self contained breathing apparatus.

(a) Donning

1 Regular Coat Method

2 Cross-armed Coat Method

3 Over-the-head Method

4 Donning form seat, rear, or compartment mount

(b)0 Working in

1 Section 3(b) of this unit covers the majority of working in positive pressure SCBA

2 Monitor facemask seal and air pressure

3 Control breathing

4 Be familiar with emergency procedures

5 If not worn properly it will not protect as designed

(c)0 Doffing

1 Ensure that sufficient decontamination has taken place prior to removal of SCBA

2 Follow procedures given for the specific method of decontamination being utilized

3 Normal doffing procedures apply otherwise

(2)00 Always perform preventive maintenance, post use inspection, and repair after use of protective equipment

f.0 Given a plan of action for a hazardous materials incident within his or her capabilities, identify the procedures for performing defensive control actions set out in the plan with at least 80% accuracy. **(3-4.4)**

(1) Proper application of firefighting foams or other vapor suppressing

agent

(a) Characteristics and applicability of the following foams: **(3-4.4.1.1)**

1 Protein

a Produces _____

b High Stability

c _____

d Good resistance to burnback

e Poor resistance to breakdown from fuel saturation

f Non-toxic and biodegradable after dilution

20 Fluoroprotein

a Highly effective with _____

b Fuel Shedding properties

c Used in _____ systems

d Good vapor suppressing capabilities

e Good burnback resistance

f Good compatibility with dry chemical agents

g Nontoxic and biodegradable after dilution

30 Special purpose

a Polar solvent alcohol resistant concentrates

1 Resistant to breakdown from;

a Water-soluble or water-miscible

b Polar solvents - alcohols, lacquer and enamel thinners, acetone

20 Produce a _____ for foam buildup

b0 Hazardous Materials concentrates

1 _____resistant foam

2 Medium expansion foams specially designed for acidic or alkaline hazards

3 Applied by _____

c0 Aqueous film-forming foam (AFFF)

1 _____

2 Low viscosity, fast spreading and leveling characteristics

3 Self-healing after disruption

4 Effectiveness reduced on hot metal or

aromatic hydrocarbons

5 Non-toxic and biodegradable

d0 High Expansion

1 Used on Class___ and ___ fires

2 Good for total flooding of confined spaces

3 Outdoor use is limited

(b)000 Manufacturers information as to compatibility and use should be followed

(2)0 Methods of application

(a) Hose and _____

(b) Vehicle systems

(c) _____ system

(d) Portable system

g.00 Given the necessary equipment, as a team, demonstrate the proper application of the fire fighting foam or vapor suppressing agent on a spill or fire involving hazardous materials within 15 minutes with 13 out of 13 evaluation elements identified correctly. **(3-4.4.1)**

(1) NOTE: Vapor suppression techniques can be used offensively to mitigate the evolution of flammable, corrosive, or toxic vapors and to reduce the surface area to the exposed atmosphere.

(2) The intent is to_____ by covering with foam

(3) This may extinguish a fire, prevent a fire, or control release of toxins

(4) General application tactics for R9 Refueler training fire:

(a) Deploy two 1 1/2 AFFF attack lines

(b) Deploy one AFFF backup line

(c) Cool metal with two attack lines

(d) Extinguish pressure fires with chemical nozzle application

1 Must extinguish pressure fires first

2 Dry chemical - best agent

(e)0 Cool surface metal while NOT mixing agents

1 Cool metal with 1 line

2 Avoid washing away dry chemical

(f)0 Approach top fires with attack lines

(g) Extinguish top fires with attack lines

(h) Approach any open cell fire

(i) Extinguish open cell fire by playing pattern off back of open cell

(j) Cool exposed metal surfaces

(k) Back out safely

h.00 Given necessary equipment, as a team, demonstrate proper vapor dispersion techniques during a live LPG tank fire, within 10 minutes with 13 out of 13 evaluation elements identified correctly.

(1) The intent is not to _____ the fire with water streams, but to _____ control the fire by shutting off valves.

(2) Fire streams will be used to protect approaching responders by dispersing vapors away from them.

(3) General approach tactics:

(a) Determine proper approach considerations

1 _____

2 Can you maintain _____ gpm on each point of flame impingement

(b)0 Establish defensive control

(c) Establish water delivery techniques

1 Handlines

2 Un-manned monitor nozzles

(d)0 Apply_____ stream to impinged LPG tanks

(e) Maintain straight stream on impinged LPG tanks

1 Handlines used for protection

2 Un-manned monitor nozzles used to maintain 500 gpm at points of impingement

(f)0 Advance toward LPG tanks with handlines making adjustments to stream on approach

1 Solid stream to begin

2 Fog pattern when close to tank

(g)0 Direct stream at impingement or hot area without extinguishing fire

(h) Maintain protective pattern with fog streams

1 Water fog will create barrier

2 Responders will use fog barrier to reach valves

(i)0 Attempt to control the leak by _____

(j) Safely back out of immediate area with streams maintained

i.00 Given necessary tools and equipment, as a team, perform basic defensive control activities for various simulated hazardous materials releases within 20 minutes with 13 out of 13 evaluation elements identified correctly. **(3-4.4.2)**

(1) Control Procedures

(a) By far, the best method of control is to_____. This may be accomplished as easily as shutting off a valve but requires Technician level training

(b) Your objective in control is to capture, contain or minimize the hazard with the smallest exposure to people, property, and the environment from a defensive posture

(2)0 _____

(a) The use of booms (pigs)

(b) Absorbents (pads, diatomaceous earth, fillers, earth)

(3)0 Dike, (dam), diversion, and retention

(a) _____ use of a barrier which prevents passage of the material to an area which is not yet damaged.

1 Constructed by forming an embankment to retain liquids & solids on the ground

2 When constructing begin far enough from the spill so the dike will be completed before substance reaches the area

a When confining slow moving or heavy materials construct a_____ dike

b If the product is fast moving construct a _____ shaped dike

(b)00 _____- controlled movement of the material to an area where the effects will produce less harm

1 A flowing land based spill can be quickly diverted to another location by placing a barrier in advance of the spill and should be made well in advance

2 The diversion wall should be constructed with the _____and _____ of the oncoming product in mind

3 The greater the speed of the product the greater the distance and angle required to slow it down.

4 For fast moving spills, angles of____ degrees or more should be used for intercepting the spill

(c)0 _____- temporary containment of the material in an area where it can be absorbed, neutralized, diluted or picked up (most effective procedure of the three)

1 Should be accomplished as soon as possible. Until the spill is retained damage may continue to occur and the area may expand making recovery more difficult

2 Before constructing a retaining structure some thought should be given to the people and equipment required to build below grade pits or ponds

(d)0 Dilution - application of water to water soluble or water miscible materials

1 Goal is to achieve a _____ of the product to a

point at which the product becomes relatively harmless

2 Does not change the chemical make up of the material

3 _____

4 Caution should be used as this method is not advisable on a material that is water reactive

(e)0 Vapor dispersion - _____

1 Rapidly mixing vapors with air through the use of a water fog can lower the concentration of material below a hazardous level

2 Works well with materials that are _____ air

(f)0 Vapor suppression - (blanketing) reduction or elimination of vapors given off of a spilled liquid or solid

1 Material used to blanket spill varies depending upon characteristics of spilled product

2 Objective (g) on foam application covers most common agents and techniques

(4)00 Location and use of the mechanical, hydraulic, and air emergency remote shutoff devices as found on MC-306/DOT-406 and MC-331 cargo tanks. **(3-4.4.3)**

(a) Types of emergency shutoffs

1 _____

a Corrosion resistant cables and handles

b Closes all internal valves within _____ of activation

c May be fusible link style

20 _____

a Closes all internal valves as a result of_____ of hydraulic pressure

b Usually part of the tractor systems connect via "pig tail" hoses from cab to trailer

c May be fusible plugs

30 _____

a Closes all internal valves as a result of LOSS of pneumatic pressure

b Usually part of the tractor systems connect via "pig tail" hoses from cab to trailer

c May be fusible plugs

(b)00 Location of emergency shutoffs

1 MC306/DOT406 - _____

2 MC331/DOT331 - two remote method of closure, _____ and _____, one at front and one on rear.

(5)00 Objectives and dangers of search and rescue missions at hazardous materials incidents.
(3-4.4.4)

(a) Varied in nature and complexity

(b) Different at each incident

(c) Complete_____ is essential

(d) Rescuers must not subject themselves to unnecessary dangers

(e) Non-intervention and deciding _____ are viable choices

PRESENTATION:

7. Competencies - **Evaluating Progress (3-5)**

50000000a. Given a simulated facility and/or transportation hazardous materials incidents, identify the status of the defensive actions taken in accomplishing the response objectives with at least 80% accuracy.**(3-5.1)**

(1) Considerations for evaluating whether defensive options are effective in accomplishing the objectives. **(3-5.1.1)**

(a) Ask the questions

1 Is the incident _____?

2 Is the incident _____?

(b)0 Make adjustments to improve the situation based on the answers to these questions

(2)0 Circumstances under which it would be prudent to pull back from a hazardous materials incident. **(3-5.1.2)**

(a) Nothing can be done to mitigate the incident

(b) The situation may be about to deteriorate

(c) Examples

1 Flame impinging directly on a closed container and there is no water supply in the area - BLEVE

2 A leak of Hydrogen Cyanide requiring level A, fully

encapsulated suits

b.000 Given simulated hazardous materials incidents, identify the proper methods of communicating the incident status to the Incident Commander with at least 80% accuracy.

(1) Communicating the Status of the Planned Response. **(3-5.2)**

(a) Methods for communicating the status of the planned response to the incident commander through the normal chain of command. **(3-5.2.1)**

1 Pre-plans establish the chain of command

2 Block IV, ICS will fully explain

(b)0 Methods for immediate notification of the incident commander and other response personnel about critical emergency conditions at the incident. **(3-5.2.2)**

1 Pre-established emergency radio message or tone

2 _____

3 Emergency procedures should be spelled out in pre-plans and used in training

(2)00 Under true emergencies do not delay the message by trying to run the _____