

CHAPTER 2 -- Chemical Hazards

A. Examination Questions

1. Why are the genital region and armpits highly susceptible to exposure to several chemical agents:
 - a. presence of many nerve endings
 - b. cell membranes are not fat-based but water-based
 - c. low number of sebaceous glands**
 - d. low lacrimation rate
 - e. all of the above

2. Chemical agents can enter the body by all of the following routes EXCEPT:
 - a. consumed through food
 - b. inhaled
 - c. absorbed through skin/wounds/abrasions
 - d. absorbed through eyes
 - e. none of the above**

3. Sulfur mustard is a known:
 - a. mutagen
 - b. carcinogen**
 - c. allergen
 - d. cholinesterase inhibitor
 - e. all of the above

Refer to the table below.

4. In the event of a release, which of the chemical weapons listed is most likely to rise to the ceiling of a room?
 - a. sarin
 - b. VX
 - c. cyanogen chloride
 - d. potassium cyanide**
 - e. mustard gas

	Vapor Pressure	Vapor Density	Volatility	Specific Gravity
	mm Hg	(Air = 1)	mg/m ³	
Sarin	1.48	1.10	22,000	1.09
VX	0.00063	1.01	0.00009	1.01
Cyanogen chloride	1230	N/A	N/A	1.19
Potassium cyanide	618.7	0.94	N/A	1.20
Mustard gas	0.11	5.4	600	1.27

5. Which of the agents in the table would be most effective in trench-style warfare (i.e., will not readily disperse)?
 - a. sarin
 - b. VX
 - c. cyanogen chloride
 - d. potassium cyanide**
 - e. mustard gas**

6. Which of the agents will sink if in contact with a body of water?
a. sarin b. cyanogen chloride c. potassium cyanide
e. mustard gas e. all of the above
7. Chemical weapons stockpiles in the US had existed in eight states; however, these stockpiles have been destroyed since 2003 using both incineration and chemical neutralization technologies. (**False – many of the stockpiles are still in existence.**)
8. The G-series chemical warfare agents are based on the chemical properties of common pesticides. (**True**)
9. Nerve agents (cholinesterase inhibitors) interfere with oxygen transfer to red blood cells, thus causing cell asphyxiation. (**False**)
10. The V agents are non-persistent, whereas the G agents are persistent. (**False**)
11. Dose rate of a nerve agent is not very critical with regard to the body's response. (**False**)
12. Daily exposure to small doses of a nerve agent can be cumulative, resulting in symptoms after several days. (**True**)
13. Regular clothing will not allow the penetration of nerve agents, whether they occur in a liquid or vapor form. (**False**)
14. Agent AC was originally H that had been purified through washing and vacuum distillation to reduce metallic impurities. (**False. Correct answer: HD is the distilled form of H; distillation removes sulfur impurities.**)
15. Non-persistent blister agents dissipate or vaporize rapidly after release, and therefore are a short-duration hazard. (**True**)
16. A blister agent that is term 'persistent' is one that cannot be readily decomposed by microorganisms or via reactions with oxygen or other chemicals. (**True**)
17. Persistence of a blister agent increases in hilly, wooded terrain rather than open terrain. (**True**)
18. Cyanide liquid can be absorbed directly through the skin. (**True**)
19. Young troops have better survival rates in a chemical agent attack than older civilians. (**True**)
20. No effective medical care exists for persons with mustard agent exposure and lesions, other than relieving symptoms. (**True**)
21. Response to a chlorine or phosgene exposure involves rapid administration of an anti-toxin such as atropine. (**False**)
22. Hydrogen cyanide prevents transfer of oxygen to tissue. (**True**)
23. Phosgene is a corrosive and highly toxic gas that leads to "dry land drowning". (**True**)

Mark which of the following are commercially available:
(Available = a; Not available = b)

- 24. Phosgene **(a)**
- 25. Chlorine **(a)**
- 26. VX **(b)**
- 27. H **(b)**

Match

Chemical Weapons

- | | |
|---------------------|------------------------------|
| 1. Tabun (d) | a. venomous |
| 2. Sarin (b) | b. GB |
| 3. Soman (h) | c. blood agent |
| 4. VX (a) | d. GA |
| 5. AC (c) | e. IDLH |
| 6. HD (g) | f. L |
| | g. sulfur impurities removed |
| | h. GD |
| | i. GQ |

CW Symptoms

- | | |
|---------------------------|--|
| 1. Miosis (c) | a. excessive tearing of the eyes |
| 2. Emesis (e) | b. fluid-filled lesions |
| 3. Edema (b) | c. constriction of pupil |
| 4. Lacrimation (a) | d. necrosis of tissue |
| 5. Wheal (g) | e. vomiting |
| | f. deformation of a substance, e.g., metal |
| | g. an evanescent area of edema of the skin |

Short Answer

1. By what routes can chemical agents enter the body? Which route is most effective for VX? For sarin?
2. Define the following terms: LD₅₀; edema; cytotoxic; vesicant; photolysis.
3. Define and explain an 'area denial weapon'.