

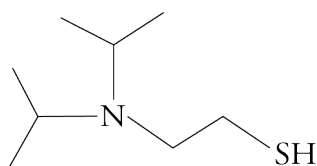
Name _____

Chemistry Module Quiz for Science and Technology NPTS

1. Write the term in the blank that corresponds to the following definitions. (2 points each)

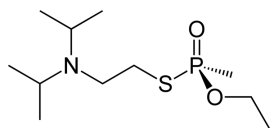
- a. _____ Implementing body of the CWC...given the mandate to achieve the object and purpose of the Convention, to ensure the implementation of its provisions, including those for international verification of compliance with it, and to provide a forum for consultation and cooperation among States Parties.
- b. _____ Protocol on the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare
- c. _____ Any chemical reactant that takes part at any stage in the production by whatever method of a toxic chemical.
- d. _____ The reaction in which water, H_2O , divides into H , which combines with one part of a molecule, and OH , which combines with another part of the molecule, splitting the molecule into two parts.

3. When inspectors are trying to determine whether chemical weapons have been used, they try to detect the chemical weapon itself, but they also try to detect chemical weapon precursors and the substances that form when chemical weapons breakdown. The following line drawing represents one of the hydrolysis products for the breakdown of VX, so if inspectors find this chemical, it suggests the use of the nerve agent VX. Draw a Lewis structure that corresponds to the line drawing below. (6 points)



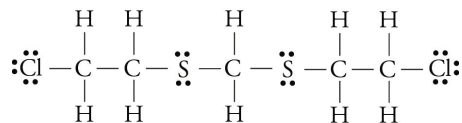
4. Although it has some legitimate small-scale uses (such as the production of pen inks, plastics, pesticides, dyes, and photographic developing solutions), thiodiglycol can be used to make the Schedule 1 chemical weapon sulfur mustard. Thiodiglycol is also a hydrolysis product formed in the chemical neutralization of sulfur mustard. It is one of the organic substances that is destroyed by either supercritical water treatment or biotreatment that follow the hydrolysis step in the destruction of sulfur mustard.
- Draw a Lewis structure for thiodiglycol, $\text{HOCH}_2\text{CH}_2\text{SCH}_2\text{CH}_2\text{OH}$, including all the lone pairs. (6 Points)
 - On which schedule for the Chemical Weapons Convention would you expect thiodiglycol to appear? Why? (3 Points)
 - Would it have been on part A or part B? Why? (3 Points)

5. Identify each of the following structures as chlorine, phosgene, sulfur mustard, hydrogen cyanide, sarin, VX, BZ, or ricin. (2 points each)

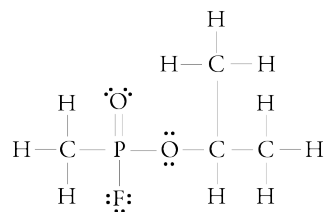


a.

b. $\text{H}-\text{C}\equiv\text{N}:$



c.



d.

6. Write a description of the effects of nerve agents on the body and explain why atropine and 2-PAM act as antidotes. (Your description should include mention of nerve cells, muscle cells, neurotransmitters, acetylcholine, receptor sites, acetylcholinesterase, the on-off mechanism of nerve and muscle cells, and competition for receptor sites.) (11 Points)

9. Pretend that you are part of a well-financed terrorist group that is planning a chemical attack on the New York subway. Within your group, you don't have the expertise, the facilities, or the equipment to make your own chemicals, but a member of your group works in the chemical industry, so you think you can steal commonly used chemicals that are stockpiled in industrial facilities. You want a fairly stable substance that is easily transported and dispersed as a gas. You want to create panic, so you want the chemical agent to have fairly fast-acting effects. You don't want chemical to be noticed until the concentrations have risen to high enough levels to be damaging. The chemical can have an odor, but you don't want it to be too distinct. You don't want the chemical to be irritating to the eyes or lungs. You want some fatalities in order to create maximum fear among the American public and to get the most media coverage. Which of the chemical weapons we have discussed would you use? *Explain why.* (10 Points)