Quiz Topics for Science and Technology

1. Glossary terms

   You will be given the definition and asked for the term.

   http://institutebishop.org/Glossary_Science.pdf (for the quiz)

   http://institutebishop.org/Glossary_Science_final.pdf (for the final exam)

2. Draw Lewis structures from chemical formulas for phosgene, $COCl_2$, and hydrogen cyanide, HCN. (*An Introduction to Chemistry - Atoms First* - pages195-197)

3. Convert between Lewis structures and line drawings for sulfur mustard, sarin, and VX. (*An Introduction to Chemistry - Atoms First* – page 636)

4. Convert between the condensed formula and Lewis structure for sulfur mustard, $ClCH_2CH_2SCH_2CH_2Cl$.

5. For the chemical weapons chlorine, phosgene, sulfur mustard, hydrogen cyanide, sarin, VX, Novichok, fentanyl, BZ, and ricin, be able to describe each of the following.

   http://institutebishop.org/chemical_weapons_1.pdf

   http://institutebishop.org/chemical_weapons_2.pdf

   a. Identify the chemical structure from a line drawing or Lewis structure (For example, I may give you a structure and ask you which of the chemical agents listed above it represents.)
   b. List examples of its use as a chemical weapon, if any.
   c. Identify whether it's more likely to be lethal or incapacitating.
   d. How it can be obtained and the relative difficulty in obtaining it compared to the other chemical weapons
   e. Whether or not it has uses other than as a chemical weapon.
   f. Which CWC schedule it's listed on (if any)
   g. Its physiological effects and the symptoms that arise from them
   h. Its relative persistence on the ground
   i. Necessary protective gear
   j. Treatment for exposure
   k. How it can be destroyed

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, neurotransmitters, acetylcholine, receptor sites, acetylcholinesterase, the on-off mechanism of nerve cells, and competition for receptor sites.) (see slides 90-98 of http://institutebishop.org/chemical_weapons_1.pdf)

7. Describe the pros and cons of using either sarin or VX as a nerve agent. (see slide 116 of http://institutebishop.org/chemical_weapons_1.pdf)
8. Describe at least five differences between toxins and chemical weapons. (see slide 16 of http://institutebishop.org/chemical_weapons_2.pdf)
9. Describe the criteria for choosing a chemical weapon for military use. (see slide 17 of http://institutebishop.org/chemical_weapons_2.pdf)
10. For the Chemical Weapons Convention, CWC, describe each of the following. (see http://institutebishop.org/chemical_weapons_2.pdf)
    a. General purpose (slide 22)
    b. General Obligations (slides 23 and 24)
    c. Level of international cooperation (slide 25)
11. Describe the CWC Schedules 1, 2, and 3, parts A and B.

    (see http://institutebishop.org/chemical_weapons_2.pdf slides 30, 38, 40, and 41)
12. Describe the purpose of the Organisation for the Prohibition of Chemical Weapons (OPCW)

    (see http://institutebishop.org/chemical_weapons_2.pdf slides 42 and 43)
13. Describe the goals of the Australia Group and describe some of the difficulties in achieving these goals. (see slides 47-51 of http://institutebishop.org/chemical_weapons_2.pdf)
14. Describe the steps that the OPCW goes through to determine whether chemical weapons have been used. (see slides 58-62 of http://institutebishop.org/chemical_weapons_2.pdf)
15. Given the Lewis structure of sarin, sketch the Lewis structures for the products of its hydrolysis.

    (see http://institutebishop.org/chemical_weapons_2.pdf slide 63)
16. One of the ways to discover whether sarin was used in a chemical attack is to test for the presence of isopropyl methylphosphonic acid (IMPA). List two reasons why IMPA is more likely to be found after a sarin attack than the sarin itself, and explain why the detection of IMPA is an indication that sarin was present where the IMPA was found. (see http://institutebishop.org/chemical_weapons_2.pdf slide 64)
17. Describe how a GC/MS (gas chromatograph/mass spectrometer) can be used to detect chemical weapons, and use this to explain why it is important that small quantities of chemicals that might be used as chemical weapons are synthesized and analyzed before detection is attempted. (see http://institutebishop.org/chemical_weapons_2.pdf slides 68-74)