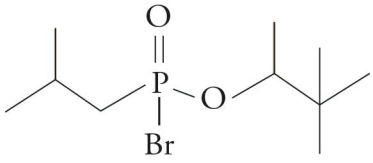
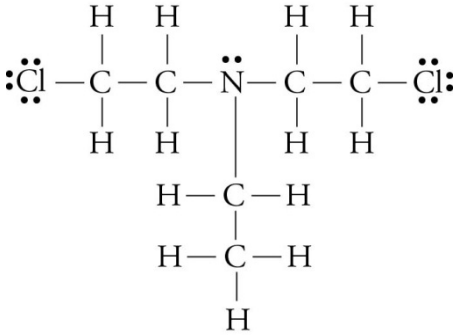
Quiz Topics for Science and Technology

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 molecular structures seen in lecture or structures that are very similar (*An Introduction to Chemistry - Atoms First* - pages195-197)
   e.g. One of the techniques used by chemists for the development of new chemicals is to make substances similar to chemicals with the desired properties and then test the new chemicals for these desired properties. For example, we know that phosgene, $COCl_2$, can be used as a chemical weapon, so a chemist might synthesize COF_2, which substitutes the halogen fluorine for the halogen chlorine, and then test it to see if it is toxic as well. Draw a reasonable Lewis structure for COF_2.
3. Convert between Lewis structures and line drawings for organic compounds that we have seen or that are similar to those we've seen.
   (*An Introduction to Chemistry - Atoms First* – page 636)
   e.g. The following structure is similar to the structure for the nerve gases. Draw a Lewis structure that corresponds to the following line drawing. (Notice that the phosphorus atom with five bonds and no lone pairs does not have its most common bonding pattern.)



   e.g. Nitrogen mustards are toxic chemicals that are similar to the sulfur mustard we talked about in class. Draw a line drawing for the Lewis structure of the following nitrogen mustard.



4. For the chemical weapons chlorine, phosgene, sulfur mustard, hydrogen cyanide, sarin, VX, fentanyl, BZ, and ricin, be able to describe each of the following.
   http://institutebishop.org/chemical_weapons_S&T.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. Relative difficulty in obtaining it compared to the other chemical weapons (Issues related to (1) its production, including cost, safety precautions, storage issues, and availability of its precursors, and the necessary equipment and (2) ability to obtain it from the chemical industry)
   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
   h. Its relative persistence on the ground
   i. Necessary protective gear
   j. Treatment for exposure
   k. How it can be destroyed
5. 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 79-86 of http://institutebishop.org/chemical_weapons_S&T.pdf and http://preparatorychemistry.com/nerve_agent_sarin.html)
6. Describe the pros and cons of using either sarin or VX as a nerve agent. (see slide 103 of http://institutebishop.org/chemical_weapons_S&T.pdf)
7. Describe at least five differences between toxin and chemical weapons. (see slide 129 of http://institutebishop.org/chemical_weapons_S&T.pdf)
8. Describe the criteria for choosing a chemical weapon for military use. (see slide 130 of http://institutebishop.org/chemical_weapons_S&T.pdf)
9. For the Chemical Weapons Convention, CWC, describe each of the following.
   (see http://institutebishop.org/chemical_weapons_S&T.pdf)
   a. General purpose (slide 135)
   b. General Obligations (slides 136 and 137)
   c. Level of international cooperation (slide 138)

10. Explain why the OPCW is concerned by unintended by-products and captive intermediates in the production of legitimate chemicals.
    (see slides 144-150 and 152 of http://institutebishop.org/chemical_weapons_S&T.pdf)
11. Describe the CWC Schedules 1, 2, and 3, parts A and B.
    (see http://institutebishop.org/chemical_weapons_S&T.pdf slides 143, 151, 153, and 154)
12. Describe the purpose of the Organisation for the Prohibition of Chemical Weapons (OPCW)
    (see http://institutebishop.org/chemical_weapons_S&T.pdf slide 155 and 156)
13. Describe the goals of the Australia Group and describe some of the difficulties in achieving these goals. (see slides 160-165 of http://institutebishop.org/chemical_weapons_S&T.pdf)
14. Describe the steps that the OPCW goes through to determine whether chemical weapons have been used.
    (see slides 171-175 of http://institutebishop.org/chemical_weapons_S&T.pdf)
15. Given the Lewis structure of sarin, sketch the Lewis structures for the products of its hydrolysis.
    (see http://institutebishop.org/chemical_weapons_S&T.pdf slide 176)
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). Explain why the detection of IMPA is an indication that sarin was present where the IMPA was found. (slide 177)