**Final Exam Practice Problems**

1. What is the significance of the following set of reactions? Where are they important? What is their net effect? Describe any particular characteristics of this system of reactions that contributes to its environmental significance.

   $CF_2Cl_2 + h\nu \rightarrow CF_2Cl + Cl$

   $Cl + O_3 \rightarrow ClO + O_2$

   $ClO + O_3 \rightarrow Cl + 2O_2$

2. Methyl bromide ($CH_3Br$) is produced naturally by fungi. It has also been used in agriculture as a fumigant, but this use is being phased out because the compound has been linked to ozone depletion in the stratosphere. Draw the Lewis structure for $CH_3Br$. Use arrows to show the bond dipoles and overall molecular dipole for $CH_3Br$ (You may treat the molecule as though it is planar). Is the molecule polar? Is $CH_3Br$ likely to have a higher or lower boiling point than $CH_4$? Explain your reasoning.

3. In some aquatic ecosystems, nitrate ($NO_3$-) is converted to nitrite ($NO_2$-), which then decomposes to nitrogen and water. As an example of this second reaction, consider the decomposition of ammonium nitrite: $NH_4NO_2$ (aq) $\rightarrow$ $N_2$ (g) + 2 $H_2O$ (l). What would be the change in pressure in a sealed 10.0 L vessel due to the formation of $N_2$ gas when 32.0 g of $NH_4NO_2$ decomposes at 25 °C?

4. Balance the following chemical equation, and identify each species other than water as an acid, a base, or a salt:

   __ $H_2SO_4$ (aq) + __ $Ca(OH)_2$ (aq) $\rightarrow$ __ $CaSO_4$ (s) + __ $H_2O$ (l)

   Name one place in the environment where this reaction is important.

5. $NO_2$ absorbs light of wavelength 400 nm, whereas $N_2O$ absorbs light of wavelength 7000 nm. Which of these two gases is a greenhouse gas? Explain. What are the other factors, besides the wavelength of light absorbed, that affect whether a compound is an effective greenhouse gas?

6. Propylene, $C_3H_6$, is a hydrocarbon that can be used to make a polymer. Draw the Lewis structure for this compound. Draw the polymer that would result from initiating growth by reacting propylene with a radical, R•, showing at least 3 monomer subunits.

7. Assume that coal can be represented by the formula $C_{135}H_{96}O_9NS$.
   a. What is the percent of nitrogen by mass in coal?
   b. If 3 tons of coal were burned completely, what mass of nitrogen in NO would be produced? Assume that all of the nitrogen in the coal is converted to NO.
   c. Actually, more NO is produced than calculated in part b. Explain the source of the additional NO.

8. The bond energy of the $O_2$ molecule is 498 kJ/mol. What wavelength of light would be required to photolyze $O_2$? In what region of the electromagnetic spectrum does this light fall? Where in the atmosphere would this process most likely take place?

9. A large corporation controls a 100,000 $km^2$ parcel of land in a fertile, temperate climate. List 3 possible uses for the land that would benefit the global environment. Discuss the pros and cons of each option. Which strategy would you choose?