**Guided Reading Questions**



## Chapter 2
## The Chemical Basis of Life

(essay) What tree dominate the "devil's garden?" How do the trees get their name? Describe the experiment and results of Frederickson's experiment? What are some of the uses of formic acid?

(2.1) Define matter and chemical element. How many elements naturally exist and how many are essential for life? What are the four most common elements in human bodies? Define trace elements.

(2.2) Why do some organisms require iron and iodine? How do developed countries help their residents consume enough iodine?

(2.3) Define compound.

(2.4) Define atom. What are the three subatomic particles and what is the electrical charge on each. Where are the three subatomic particles located in the atom? How much of an atom is space? How do elements differ from each other? Define atomic number. How many protons are present in an atom of helium and an element of carbon? How many electrons are in an atom of helium and an atom of carbon? Define mass number. Which has the smallest mass – electron, neutron or proton? Define isotope. Define radioactive.

(2.5) Why are radioactive isotopes (a.k.a. radioisotopes) useful as biological tracers? What does a PET scanner detect? What are some dangers of radioactive isotopes?

(2.6) Which of the subatomic particles has the main effect on an atom's behavior. Define electron shells. Which electron shell determines the chemical properties? Why is hydrogen more reactive than helium? Define chemical bond.

(2.7) Define ion. How are ions formed? Define ionic bond and salt. Note that ionic compounds are electrically neutral.

(2.8) Define covalent bond and molecule. Define double bond. How many covalent bonds can an atom form? Contrast molecule and compound.

(2.9) What is the chemical formula of a water molecule? Define electronegativity, nonpolar bond, polar covalent bond and polar molecule.

(2.10) Define hydrogen bond. Which part of the water molecule is positively charged and which end is negatively charged? Are any electrons transferred in a hydrogen bond?

(2.11) Define cohesion. How do cohesion and evaporation help a tree transport water against the pull of gravity? Define surface tension.

(2.12) Why does water help moderate temperatures? Contrast heat and temperature. What happens to the hydrogen bonds when water is heated or cooled? Why are temperatures in coastal areas milder than in inland areas? How does sweat cool a person?

(2.13) Why does ice float on water? Why is it important to life that ice floats?

(2.14) Define solution, solvent, solute, and aqueous solution. When salt (sodium chloride) is added to water, what happens to the salt crystal? To what is $Na^+$ attracted? To what is $Cl^-$ attracted? What types of compounds dissolve in water? What regions of a protein allow it to dissolve in water?

(2.15) Into what two ions does water dissociate? Define acid and base. What pH represents an acid and what pH represents a base? What is the pH of pure water? What is the function of

a buffer?

(2.16) What is acid precipitation? What compounds in air form the acids when combined with water? What is a major product of fossil fuel combustion? What happens to the carbon dioxide that is released? How does $CO_2$ affect sea water?

(2.17) What properties of water benefit life? What has been discovered about water on Mars?

(2.18) What do each of the letters and numbers in the chemical equation $2H_2 + O_2 \longrightarrow 2H_2O$ represent? Which molecules are reactants and which are products? What do the coefficients (numbers in front of the molecular formulas) mean? What has happened to the number and type of atoms in a reaction? I like to define a chemical reaction as “the rearrangement of atoms in molecules.”