PROBLEMS

1. Why do water scientists contend that most of the earth’s water is saline, and what isn’t is not available? Explain:

2. How is water an agent in the geochemical subcycle? In what ways do you think processes of the hydrosphere and lithosphere are linked?

3. A first-order reaction is 40% complete after 50-minutes. Determine the rate constant, k, and the time required for 80% completion of the reaction.

4. The initial rate of a second-order reaction equation is $5 \times 10^{-7}$ moles/l. sec. Estimate $k$ if the species concentrations are all 0.2 M.

5. For the reaction below, determine the equilibrium constant, $K$. If the solution pH is 8 and the concentration of $NH_3(aq)$ is $2 \times 10^{-8}$ M and concentration of $NH_4(aq)$ is $10^{-4}$ M, is the direction of the reaction left, right, or at equilibrium?

$$NH_3(aq) + H_2O \leftrightarrow NH_4^+(aq) + OH^-$$

6. Determine the concentration of $Mg^{2+}$ in a solution of pH 10 at equilibrium.

$$Mg^{2+} + 2OH^- \leftrightarrow Mg(OH)_2(s)$$

7. In a beaker of solution in the laboratory, the concentrations of $CO_2(aq)$, $HCO_3^-$ and $H^+$ in solution are initially set at $10^{-5}$ M. Presuming that the reactions occur at 25°C, what is the direction of the reaction below as the reaction proceeds?

$$CO_2(aq) + H_2O \leftrightarrow HCO_3^- + H^+$$