MC Practice

1. A molecule or an ion is classified as a Lewis acid if it

(A) accepts a proton from water
(B) accepts a pair of electrons to form a bond
(C) donates a pair of electrons to form a bond
(D) donates a proton to water
(E) has resonance Lewis electron-dot structures

2. Which of the following occurs when excess concentrated $NH_3(aq)$ is mixed throughly with 0.1 M $Cu(NO_3)_2(aq)$?

(A) A dark red precipitate forms and settles out.
(B) Separate layers of immiscible liquids form with a blue layer on top.
(C) The color of the solution turns from light blue to dark blue.
(D) Bubbles of ammonia gas form.
(E) The pH of the solution decreases.

3. A yellow precipitate forms when 0.5 M NaI(aq) is added to a 0.5 M solution of which of the following ions?

A) $Pb^{2+}(aq)$ B) $Zn^{2+}(aq)$ C) $CrO_4^{2-}(aq)$ D) $SO_4^{2-}(aq)$ E) $OH^-(aq)$

4. Which of the following compounds is NOT appreciably soluble in water but is soluble in dilute hydrochloric acid?

A) $Mg(OH)_2(s)$ B) $(NH_4)_2CO_3(s)$ C) $CuSO_4(s)$ D) $(NH_4)_2SO_4(s)$ E) $Sr(NO_3)_2(s)$

5. What is the molar solubility in water of Ag_2CrO_4? (The K_{sp} for Ag_2CrO_4 is 8×10^{-12}.)

A) 8×10^{-12} M B) 2×10^{-12} M C) $(4 \times 10^{-12}\ M)^{1/2}$ D) $(4 \times 10^{-12}\ M)^{1/3}$ E) $(2 \times 10^{-12}\ M)^{1/3}$

Write the net ionic equation for the following reactions and answer the supplementary question:

a. excess dilute nitric acid is added to a solution of tetramminecadmium(II) ion
--what is the coordination number of the complex ion?

b. pellets of aluminum metal are added to a solution containing an excess of sodium hydroxide
--which reactant acts as a Lewis acid? explain

c. an excess of ammonia gas is bubbled through a solution saturated with silver chloride
--which reactant acts as a Lewis base? explain

d. a concentrated solution of ammonia is added to a suspension of zinc hydroxide
--what visual change occurs in the reaction mixture?

e. a solution of ammonium thiocyanate is added to a solution of iron(III) chloride
--describe the color changes that occur during the reaction

Free Response Practice

1990 1) The solubility of iron(II) hydroxide, $Fe(OH)_2$, is 1.43×10^{-3} gram per liter at 25 °C.

(a) Write a balanced equation for the solubility equilibrium.

(b) Write the expression for the solubility product constant, K_{sp}, and calculate its value.

(c) Calculate the pH of the saturated solution of $Fe(OH)_2$ at 25 °C.

(d) A 50.0-milliliter sample of 3.00×10^{-3} molar $FeSO_4$ solution is added to 50.0 milliliters of 4.00×10^{-6} molar NaOH solution. Does a precipitate of $Fe(OH)_2$ form? Explain and show calculations to support your answer.

1994 1) $MgF_2(s) \text{ <===> } Mg^{2+}(aq) + 2\ F^{-}(aq)$

In a saturated solution of MgF_2 at 18° C, the concentration of Mg^{2+} is 1.21×10^{-3} molar. The equilibrium is represented by the equation above.

(a) Write the expression for the solubility-product constant, K_{sp}, and calculate its value at 18° C.

(b) Calculate the equilibrium concentration of Mg^{2+} in 1.000 liter of saturated MgF_2 solution at 18°C to which 0.100 mole of solid KF has been added. The KF dissolves completely. Assume the volume change is negligible.

(c) Predict whether a precipitate of MgF_2 will form when 100.0 milliliters of a 3.00×10^{-3} molar $Mg(NO_3)_2$ solution is mixed with 200.0 milliliters of a 2.00×10^{-3} molar NaF solution at 18°C. Calculations to support your prediction must be shown.