Self-Assessment Exam
# Aqueous Solutions

Write your answers on these pages.

State your assumptions and show calculations that support your conclusions.

RESOURCES PERMITTED: PERIODIC TABLE OF THE ELEMENTS, TABLE OF CONSTANTS, AN AID SHEET (ONE PAGE 8½" × 11"), AND A CALCULATOR.

NO BOOKS OR OTHER NOTES ALLOWED.

2009 Exam 3, Problem #3

(a) Calcium ammonium phosphate ($CaNH_4PO_4$) dissolves in water according to

$$CaNH_4PO_4(s) \ \Pi \ Ca^{2+}(aq) \ + \ NH_4^+(aq) \ + \ PO_4^{3-}(aq)$$
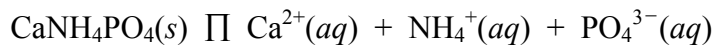
for which the value of the solubility product, K_{sp}, has been determined to be 4.4×10^{-14}. Calculate the solubility of $CaNH_4PO_4$ in water. Express your answer in units of molarity, i.e., moles of $CaNH_4PO_4$ per L of solution.

(b) Calculate the solubility of $CaNH_4PO_4$ in 2.2 M $CaBr_2(aq)$. Express your answer in units of molarity. Assume that in water $CaBr_2$ completely dissociates into Ca^{2+} cations and Br^- anions.
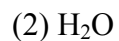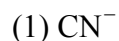
Final Exam, Problem #10

(a) You have 333 mL of alkaline solution at pH = 9.9. You wish to neutralize this by reacting it with 222 mL of acid. What must be the value of the pH of the acid?

(b) Name the conjugate base of each of the following:

(1) HPO_4^{2-}

(2) $CH_3NH_3^+$

(c) Classify each of the following as a Lewis acid or a Lewis base:

(1) CN^-

(2) H_2O

(d) Consider the effect each of the following substances has on the ionization of the weak base, ammonia ($NH_3(aq)$). For each, state whether the substance (1) suppresses ionization, (2) enhances ionization, or (3) has no effect on the ionization of ammonia. In each instance, give a reason for your choice.

(i) KOH

(ii) HCl

(iii) NH_4Cl
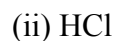
3.091SC Introduction to Solid State Chemistry

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