

# Homework #11

November 18, 2003 (to be tested 11/23 )

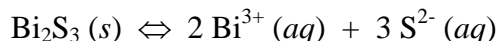
from Module Chapter 4 “Solubility Equilibria”: 4, 8, 10, 16, 26, 29

from Main Text Chapter 11 “Acids and Bases”: 5, 6, 13, 35, 50, 52, 64, 85, 89

plus the following problems.

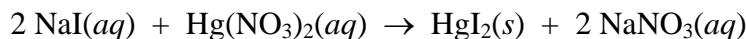
- (a) Identify the conjugate acid-base pairs in the following reactions:
  - $\text{HI} (aq) + \text{H}_2\text{O} (l) \rightarrow \text{H}_3\text{O}^+ (aq) + \text{I}^- (aq)$
  - $\text{CH}_3\text{COOH} (aq) + \text{OH}^- (aq) \rightarrow \text{CH}_3\text{COO}^- (aq) + \text{H}_2\text{O} (l)$
  - $\text{NH}_3(aq) + \text{H}_2\text{O} (l) \rightarrow \text{NH}_4^+ (aq) + \text{OH}^- (aq)$
- (b) Identify which of the following cannot be a Brønsted base and give a reason for your choices:  $\text{H}_3\text{O}^+$ ,  $\text{AlCl}_4^-$ ,  $\text{CN}^-$ ,  $\text{O}^{2-}$ ,  $\text{SiH}_4$ ,  $\text{AsH}_3$ .
- (c) Estimate the  $p\text{H}$  and  $p\text{OH}$  of a 0.03091 M solution of hydroiodic acid ( $K_a \cong 10^9$ ).

- $\text{Bi}_2\text{S}_3$  dissolves in water according to the following reaction:



for which the solubility product,  $K_{sp}$ , has the value of  $1.6 \times 10^{-72}$  at room temperature.

- At room temperature how many moles of  $\text{Bi}_2\text{S}_3$  will dissolve in  $3.091 \times 10^6$  liters of water?
  - How many  $\text{Bi}^{3+}$  ions will be found in the solution described in part (a)?
- Calculate the volume of 0.25 M NaI that would be needed to precipitate all the  $\text{Hg}^{2+}$  ion from 45 mL of a 0.10 M  $\text{Hg}(\text{NO}_3)_2$  solution according to the following reaction:



- Strontium fluoride,  $\text{SrF}_2$ , has a  $K_{sp}$  value in water of  $2.45 \times 10^{-9}$  at room temperature. Calculate the solubility of  $\text{SrF}_2$  in water. Express your answer in units of molarity.
- Calculate the solubility of  $\text{SrF}_2$  in 0.03 M NaF ( $aq$ ). Express your answer in units of molarity. Assume that NaF is completely dissociated in water.