

Chem 103

Practice problems from Weeks #1 and #2. It is a good idea to do these as preparation for the upcoming first midterm exam. Do these now and don't wait until later. NO cramming if you wish to really understand these.

Do these. Solutions will not be made available until much later.

1) Determine the molar solubility of barium fluoride, BaF_2 ($K_{\text{sp}}=1.7 \times 10^{-6}$), as well as $[\text{Ba}^{2+}]$ and $[\text{F}^{2-}]$ in the following:

a) In a pure water solvent. (7.5x10⁻³;7.5x10⁻³;1.5x10⁻²)

b) In a solution of 0.10M NaF. (1.7x10⁻⁴;1.7x10⁻⁴;1.0x10⁻¹)

2) How would you logically conclude that to dissolve gases in water is an exothermic process?

3) 15.0 grams of sodium chloride (NaCl , 58.45g/mol) is dissolved in 80.0 grams of water resulting in a 90.0 mL solution. Calculate each of the following:

a) the molarity: (2.85)

b) the molality: (3.21)

c) the % (m/v): (16.7)

d) the density: (1.06)

e) the boiling point: (103.34)

4) The by-product of the reaction of benzene and hot nitric acid has a percent composition (by mass) of 42.86% C, 2.40% H, 16.67% N and the rest O. The freezing point of the solution mixture containing 5.5 g of the by-product in 45 g of benzene was 1.76°C. Pure benzene has a freezing point of 5.45°C. The freezing point depression constant, k_f , for benzene is 5.07°C/m. Calculate the molecular weight of the by-product and determine its molecular formula.

(168;C₆H₄O₄N₂)

5) Lead chloride, PbCl_2 , has a K_{sp} of 1.7×10^{-5} . What is the osmotic pressure of an aqueous solution containing a saturated solution of this PbCl_2 at 20°C? (1.2)

6) What is the hydronium ion concentration of a 0.35 M solution of hydrofluoric acid (HF , $K_a = 7.2 \times 10^{-4}$)? What is the pH? (1.80)

7) complete the following:

if $[\text{OH}^-] = 2.86 \times 10^{-5}$, what are: $\text{pH} = \underline{\hspace{2cm}}$ $\text{pOH} = \underline{\hspace{2cm}}$

$[\text{H}^+] = \underline{\hspace{2cm}}$ (9.456;4.544;3.50x10⁻¹⁰)

8) Suppose 4.80 grams of a nonelectrolyte compound is dissolved in 200. mL solution and exerts an osmotic pressure of 2.58 atm at 15°C. What is the molecular weight of this compound?

(220.)

9) What are the K_a and $\text{p}K_a$ of a monoprotic weak acid, HA, if a 0.225 M HA solution has a **pOH** of 12.05?

(5.6x10⁻⁴;3.252)

10) 38.0% (m/m) HCl has a density of 1.189 g/mL. Determine the concentration of this aqueous solution in terms of :

a) molality (16.8)

b) molarity (12.3)