

Name: Key  
 Blk: \_\_\_\_\_ Date: 0

Chemistry 12  
 Solubility Lesson #2  
**CALCULATING SOLUBILITY AND ION CONCENTRATIONS**

**SOLUBILITY (g/L) is defined as:** the maximum amount of a substance that can dissolve in a given amount of solvent @ a given temp

**MOLAR SOLUBILITY (mol/L) is:** The equilibrium concentration of a substance in solution @ a given temp.  
*a saturated*

**Example 1:** It is determined experimentally that 1 L of saturated  $\text{AgBrO}_3$  (aq) contains 1.96 g of  $\text{AgBrO}_3$ . What is the MOLAR SOLUBILITY of  $\text{AgBrO}_3$ ?

$\text{Ag} = 107.9$   
 $\text{Br} = 79.9$   
 $3\text{O} = 48.0$   
 $\underline{\hspace{1cm}}$   
 $235.8 \text{ g}$

$$1.96 \text{ g AgBrO}_3 \times \frac{1 \text{ mol AgBrO}_3}{235.8 \text{ g}} = \boxed{\frac{8.31 \times 10^{-3} \text{ mol}}{1 \text{ L}}}$$

**Example 2:** The Molar solubility of  $\text{PbI}_2$  is  $1.37 \times 10^{-3} \text{ M}$ . Express this value in grams per Litre.

$\text{Pb} = 207.2$   
 $2 \text{ I} = 253.8$   
 $\underline{\hspace{1cm}}$   
 $461.0 \text{ g}$

$$\frac{1.37 \times 10^{-3} \text{ mol}}{\text{L}} \times \frac{461.0 \text{ g}}{1 \text{ mol}} = \boxed{0.632 \text{ g/L PbI}_2}$$

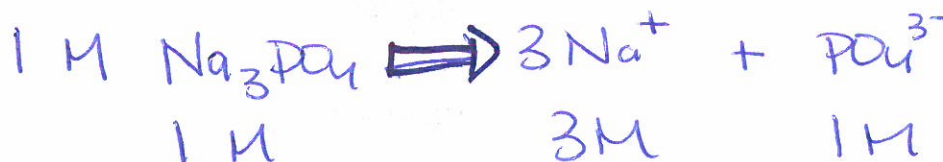
**Example 3:** Experimentally it is found that 250.0 mL of saturated  $\text{CaCl}_2$  contains 18.6 g of  $\text{CaCl}_2$  at  $20^\circ\text{C}$ . What is the molar solubility of  $\text{CaCl}_2$ ?

$\text{Ca} = 40.1$   
 $2 \text{ Cl} = 71.0$   
 $\underline{\hspace{1cm}}$   
 $111.1 \text{ g}$

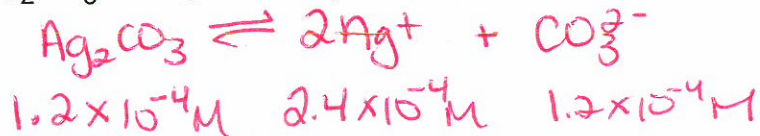
$$18.6 \text{ g} \times \frac{1 \text{ mol}}{111.1 \text{ g}} = \frac{0.167 \text{ mol}}{0.250 \text{ L}} = \boxed{6.70 \times 10^{-1} \text{ M}}$$

**CALCULATING ION CONCENTRATIONS**

**Example 1:** What are the individual ion concentrations contained in 1 M of  $\text{Na}_3\text{PO}_4$  (aq)?



**Example 2:** What is the concentration of all ions present in a saturated solution of  $\text{Ag}_2\text{CO}_3$  having a molarity of  $1.2 \times 10^{-4} \text{ M}$ ?



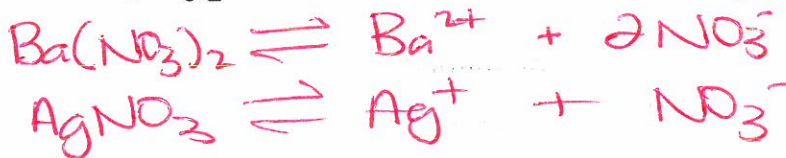
**Example 3:** If 5.0 mL of 0.020 M  $\text{Cl}^{1-}$  is added to 15.0 mL of 0.012 M  $\text{Br}^{1-}$ , what is the molarity of  $\text{Cl}^{1-}$  and  $\text{Br}^{1-}$  ions in this mixture?

**RECALL the Dilution Equation :**  $M_i V_i = M_f V_f$

$$[\text{Cl}^-]_f = \frac{0.020 \text{ M Cl}^- \times 0.0050 \text{ L}}{0.020 \text{ L}} = 5.0 \times 10^{-3} \text{ M Cl}^-$$

$$[\text{Br}^-]_f = \frac{0.012 \text{ M Br}^- \times 0.0150 \text{ L}}{0.020 \text{ L}} = 9.0 \times 10^{-3} \text{ M Br}^-$$

**Example #4:** Calculate the concentration of all ions present when 10.0 mL of 0.100 M  $\text{Ba}(\text{NO}_3)_2$  is mixed with 40.0 mL of 0.300 M  $\text{AgNO}_3$



$$M_f = \frac{0.100 \text{ M} \times 0.0100 \text{ L}}{0.0500 \text{ L}} = 0.0200 \text{ M Ba}(\text{NO}_3)_2$$

$$M_f = \frac{0.300 \text{ M} \times 0.0400 \text{ L}}{0.0500 \text{ L}} = 0.240 \text{ M AgNO}_3$$

$$[\text{Ba}^{2+}] = 0.0200 \text{ M}$$

$$[\text{Ag}^+] = 0.240 \text{ M}$$

$$[\text{NO}_3^-] = 2 \times 0.0200 \text{ M} = 0.0400 \text{ M}$$

$$+ 1 \times 0.240 \text{ M} \quad + 0.240 \text{ M}$$

$$\boxed{0.280 \text{ M}}$$

**Seat work/HOMEWORK:** 8 -14 pg 77-78, 18-20 (odd letters) pg 81

**PLO's:** G1, G2, G3, G4, G5, G6, and G8