

Name: _____
 Blk: _____ Date: _____

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 at a given temp.

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

Example 1: It is determined experimentally that 1 L of saturated AgBrO_3 (aq) contains 1.96 g of AgBrO_3 . What is the MOLAR SOLUBILITY of AgBrO_3 ?

$\text{Ag} = 107.9$
 $\text{Br} = 79.9$
 $3 \text{ O} = 48.0$
235.8 g AgBrO_3
 1 mol

$$\frac{1.96 \text{ g } \text{AgBrO}_3}{1 \text{ L}} \cdot \left(\frac{1 \text{ mol}}{235.8 \text{ g}} \right) = 8.31 \cdot 10^{-3} \text{ M } \text{AgBrO}_3$$

Example 2: The Molar solubility of PbI_2 is $1.37 \times 10^{-3} \text{ M}$. Express this value in grams per Litre. (solubility)

$1 \text{ Pb} = 207.2$
 $2 \text{ I} = 253.8$
461.0 g PbI_2
 1 mol

$$1.37 \cdot 10^{-3} \text{ mol PbI}_2 \cdot \left(\frac{461.0 \text{ g PbI}_2}{1 \text{ mol}} \right) = 0.632 \text{ g/L PbI}_2$$

Example 3: Experimentally it is found that 250.0 mL of saturated CaCl_2 contains 18.6 g of CaCl_2 at 20°C . What is the molar solubility of CaCl_2 ?

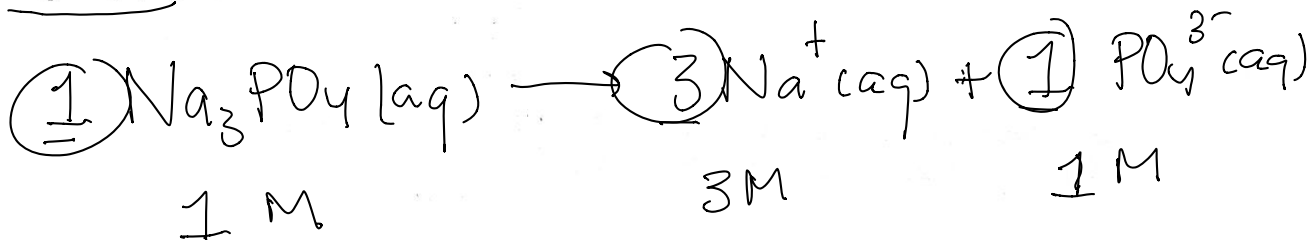
$\text{Ca} = 40.1$
 $2 \text{ Cl} = 71.0$
111.1 g
 1 mol

$$\frac{18.6 \text{ g CaCl}_2}{250.0 \text{ mL}} \cdot \left(\frac{1 \text{ mol}}{111.1 \text{ g CaCl}_2} \right) \cdot \left(\frac{1 \text{ mL}}{1 \cdot 10^{-3} \text{ L}} \right) = 6.70 \cdot 10^{-1} \text{ M CaCl}_2$$

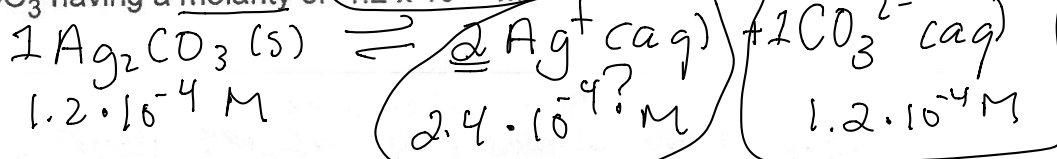
CALCULATING ION CONCENTRATIONS

OR 0.670 M

Example 1: What are the individual ion concentrations contained in 1 M of Na_3PO_4 (aq)?



Example 2: What is the concentration of all ions present in a saturated solution of Ag_2CO_3 having a molarity of $1.2 \times 10^{-4} \text{ M}$?



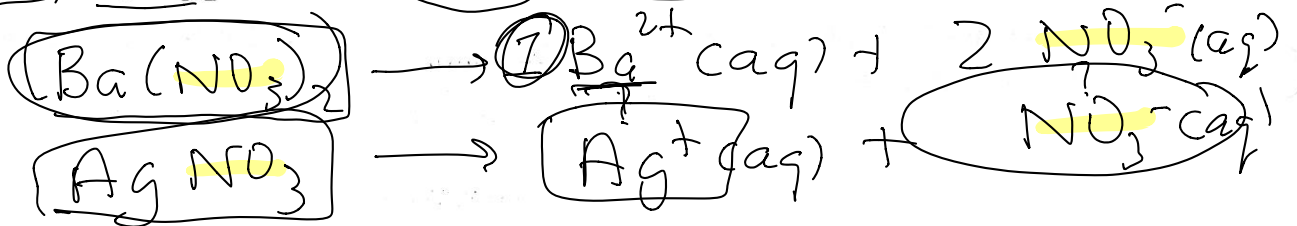
Example 3: If 5.0 mL of 0.020 M Cl^- is added to 15.0 mL of 0.012 M Br^- , what is the molarity of Cl^- and Br^- ions in this mixture?

RECALL the Dilution Equation $(M_i V_i = M_f V_f)$

$$[\text{Cl}^-]_f = \frac{0.020 \text{ M} \cdot 0.0050 \text{ L}}{0.0200 \text{ L}} = 5.0 \cdot 10^{-3} \text{ M Cl}^-$$

$$[\text{Br}^-]_f = \frac{0.012 \text{ M} \cdot 0.0150 \text{ L}}{0.0200 \text{ L}} = 9.0 \cdot 10^{-3} \text{ M Br}^-$$

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 AgNO_3



$$[\text{Ba}(\text{NO}_3)_2]_f = \frac{0.100 \text{ M} \cdot 0.0100 \text{ L}}{0.0500 \text{ L}} = 0.0200 \text{ M Ba}(\text{NO}_3)_2$$

$$\therefore \text{Ba}^{2+} (\text{aq}) = 0.0200 \text{ M Ba}^{2+}$$

$$\text{NO}_3^- = 2 (0.0200 \text{ M}) = 0.0400 \text{ M NO}_3^-$$

$$[\text{AgNO}_3]_f = \frac{0.300 \text{ M} \cdot 0.0400 \text{ L}}{0.0500 \text{ L}} = 0.240 \text{ M AgNO}_3$$

$$[\text{Ag}^+] = 0.240 \text{ M} ; \text{NO}_3^- = 0.240 \text{ M}$$

Seat work/HOMEWORK: 8, 14 pg 77-78, 18, 20 (odd letters) pg 81
 PLO's: G1, G2, G3, G4, G5, G6, and G8

$[\text{NO}_3^-]$	=	0.0400 M	
		0.240 M	
		0.280 M	NO_3^-