Name: Key
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Chemistry 12
Solubililty 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 $AgBrO_3$ (aq) contains 1.96 g of $AgBrO_3$. What is the MOLAR SOLUBILITY of $AgBrO_3$?

Ag = 107.9
Br = 79.9
3O = 48.0
235.8 g

$$1.96\,g\,AgBrO_3 \times \frac{1\,mol\,AgBrO_3}{235.8\,g} = \boxed{\frac{8.31 \times 10^{-3}\,mol}{1\,L}}$$

Example 2: The Molar solubility of PbI_2 is 1.37×10^{-3} M. Express this value in grams per Litre.

Pb = 207.2
2 I = 253.6
461.0 g

$$\frac{1.37 \times 10^{-3}\,mol}{L} \times \frac{461.0\,g}{1\,mol} = \boxed{0.632\,g/L\ PbI_2}$$

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 $CaCl_2$?

Ca = 40.1
2Cl = 71.0
111.1 g

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

CALCULATING ION CONCENTRATIONS

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

$$1\,M\ Na_3PO_4 \Longrightarrow 3\,Na^+ + PO_4^{3-}$$
$$1\,M \qquad 3\,M \qquad 1\,M$$

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

$Ag_2CO_3 \rightleftharpoons 2Ag^+ + CO_3^{2-}$

$1.2\times10^{-4}M \quad 2.4\times10^{-4}M \quad 1.2\times10^{-4}M$

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

RECALL the Dilution Equation : $M_I V_I = M_F V_F$

$[Cl^-]_F = \frac{0.020M\ Cl^- \times 0.0050L}{0.020L} = 5.0\times10^{-3}\ M\ Cl^-$

$[Br^-]_F = \frac{0.012M\ Br^- \times 0.0150L}{0.0200L} = 9.0\times10^{-3}\ M\ Br^-$

Example #4: Calculate the conentration of all ions present when 10.0 mL of 0.100 M $Ba(NO_3)_2$ is mixed with 40.0 mL of 0.300 M $AgNO_3$

$Ba(NO_3)_2 \rightleftharpoons Ba^{2+} + 2NO_3^-$

$AgNO_3 \rightleftharpoons Ag^+ + NO_3^-$

$M_F = \frac{0.100M \times 0.0100L}{0.0500L} = 0.0200M\ Ba(NO_3)_2$ $\quad M_F = \frac{0.300M \times 0.0400L}{0.0500L} = 0.240M\ AgNO_3$

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

$[Ag^+] = 0.240M$

$[NO_3^-] = 2 \times 0.0200M = 0.0400M$

$+ 1 \times 0.240M \quad +.240M$

$\boxed{0.280\ M}$

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

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