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Tutorial N° 4

Exercise 1

Calculate the solubility in pure water for the following compounds, assuming they dissociate completely in solution (neglecting interactions with H_3O^+ and OH^-):

a) **$CaSO_4$** : pKs = 4.6

b) **CaF_2** : pKs = 10.4

c) **Ag_2CrO_4** : pKs = 12.0

Exercise 2

The solubility of silver chromate, Ag_2CrO_4, in water at 25°C is 0.0027 g per 100 mL. Calculate the solubility product of silver chromate.

Given: Ag = 108; Cr = 52; O = 16 g/mol

Exercise 3

The solubility product of silver chloride (AgCl) is Ks =1.8×10^{-10} at 25°C.

1) **Calculate its solubility**

   a) In pure water.

   b) In a silver nitrate solution with a concentration of 0.2 mol/L.

   c) In a hydrochloric acid solution with a concentration of 0.5 mol/L.

2) **Compare the solubility values in the three cases**.

   a. What do you observe?

   b. What is this effect called ?

Exercise 4

The solubility equilibrium for magnesium hydroxide is:

$$Mg(OH)_2(s) \leftrightarrow Mg^{2+} + 2OH^-$$

The solubility product constant is Ks = 1.8×10^{-11}.

a) Calculate the solubility of $Mg(OH)_2$ in pure water at 25°C.

b) How does the solubility change if the pH of the solution is adjusted to 10?

Exercise 5

The solubility equilibrium of calcium fluoride (CaF_2) is:

$$CaF_2(s) \leftrightarrow Ca^{2+}(aq) + 2F^-(aq)$$

The solubility product constant is $Ks = 3.9.10^{-11}$.

1. Calculate the solubility of CAF_2 in pure water at 25°C.
2. How does the solubility change if the solution is adjusted to pH =3? (Assume that H^+ react with F^- to form HF, and the equilibrium constant for HF is $KS = 6.6 \times 10^{-4}$).