

## 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  $OH^-$ ):

- $CaSO_4$  :  $pK_s = 4.6$
- $CaF_2$  :  $pK_s = 10.4$
- $Ag_2CrO_4$  :  $pK_s = 12.0$

### Exercise 2

The solubility of silver chromate,  $Ag_2CrO_4$ , in water at  $25^\circ C$  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  $K_s = 1.8 \times 10^{-10}$  at  $25^\circ C$ .

- Calculate its solubility**
  - In pure water.
  - In a silver nitrate solution with a concentration of 0.2 mol/L.
  - In a hydrochloric acid solution with a concentration of 0.5 mol/L.
- Compare the solubility values in the three cases.**
  - What do you observe?
  - What is this effect called ?

### Exercise 4

The solubility equilibrium for magnesium hydroxide is:

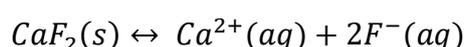


The solubility product constant is  $K_s = 1.8 \times 10^{-11}$ .

- Calculate the solubility of  $Mg(OH)_2$  in pure water at  $25^\circ C$ .
- 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:



The solubility product constant is  $K_s = 3.9 \cdot 10^{-11}$ .

1. Calculate the solubility of  $\text{CaF}_2$  in pure water at  $25^\circ\text{C}$ .
2. How does the solubility change if the solution is adjusted to  $\text{pH} = 3$ ? (Assume that  $\text{H}^+$  react with  $\text{F}^-$  to form  $\text{HF}$ , and the equilibrium constant for  $\text{HF}$  is  $K_s = 6.6 \times 10^{-4}$ ).