DIRECTED WORK N°4

Exercice 1:

Consider a solution saturated with lead chloride ($PbCl_2$). Calculate the Pb^{+2} ion concentration of the solution.

Data: $pK_S(PbCl2_{(s)}) = 4,8$.

Exercice 2:

Calculate the solubility of barium sulfate **$BaSO_4$**:

a- In pure water.

b- In a 0.1mol.L-1 sulfuric acid solution.

Data: $pK_S(BaSO_{4(s)}) = 9,97$; H_2SO_4 is considered a strong diacid.

Exercice 3:

1-What pH value is the formation of zinc hydroxide of formula $Zn(OH)_{2(S)}$ observed in a zinc nitrate solution of initial concentration

1- $C = 10^{-3}$ mol.L^{-1}.

2-Set at pH = 4.

a-What is the hydroxide ion concentration of the solution?

b-   Calculate the product $[Zn^{2+}][OH^-]^2$.

c- Compare this with the solubility product of zinc hydroxide. Is not the precipitation condition met?

Data: pK_S $(Zn(OH)_2(S))=17$; $Ke=10^{-14}$.

Exercice 4:

Name the following complexes:

a-$[Hg(CN)_4]^{2-}$.

b-$[CrCl_2(H_2O)_4]^+$.

c-$[Fe(CO)_5]$.

Exercice 5:

Give the chemical formula of the following complexes:

1- Tetraammine zinc(II)

2- ion hexa cyano ferrate (II)

3- ion hexa aqua aluminium (III)

4- penta carbonyle fer

5- ion tétra thiocyanato diammine chromate (III)

Exercice 6:

Mix 500mL **NH₃** ammonia at 0.1 mol. L^{-1} and 100 mL of copper sulfate **CuSO₄, 5H₂O** at a concentration of 0.01 mol. L^{-1}.

a- Write down the complex-forming reaction and its **progress table**.

b- Calculate the formation constant of this complex. What can we deduce about the formation reaction?

c- Determine the concentrations of all the chemical species involved in the complexation reaction in the final state.

Data: $K_d(\ Cu(NH_3)_4^{2+})$ = 2,5 10^{-13}.

Exercice 7:

In 1 liter of a 10^{-2} mol.L-1 solution of zinc (II) chloride, 1 mol of ammonia is added. The tetrammine zinc (II) complex is formed. At equilibrium, the concentration of zinc (II) ions is equal to 10^{-7} mol.L^{-1}.

-Calculate the formation constant **β4** of the tetrammine zinc (II) complex (the action of water on ammonia will be neglected, and it will be assumed that there is no change in volume).

Exercice 8:

For form the $(FeCH_3COO)^{+2}$ complex, 50 mL of 0.1 M iron III nitrate

solution and 50 mL of 0.1 M sodium acetate are mixed.

a- Name the complex formed.

b- Determine the composition of the solution at equilibrium.

c- A no complexing acid, such as nitric acid, is added without dilution. In which direction is the complexation equilibrium shifted?

d- Determine the **pH** of the solution when only **1%** of the Fe^{+3} ions are complexed.

  Data: pK_a (CH_3COOH/CH_3COO^-) = 4,8 ; pK_d = ($Fe(CH_3COO)^{2+}$) = 3,2.