Mohamed Khider University of Biskra
Faculty of Exact Sciences and Natural and Life Sciences

1st year LMD – SNV Biology **Academic year: 2024/2025**
Subject: Chemistry 2

Applied exercises series No. 3

(Solubility - Solubility product)

Exercise 1:

Magnesium hydroxide $Mg(OH)_2$ is a poorly soluble compound, with a molar mass of 58.3 g/mol and which has a solubility product Ks = 1.2 10^{-11} mol^3/l^3 at 18 °C.

1. Calculate the solubility of $Mg(OH)_2$ in grams per liter.

2. Calculate the solubility product of $Ca_3(PO_4)_2$, S = 2.50 $.10^{-3}$ g/l; M = 310 g/mol.

Exercise 2:

Bladder (urinary) stones are made up of calcium oxalate, CaC_2O_4. Calcium oxalate is an ionic solid that is poorly soluble in water.

1. Calculate the molar solubility and mass solubility of CaC_2O_4.

2. What minimum volume of pure water should be used to dissolve a 1.1 g urinary stone?

3. The water used actually contains calcium chloride at a concentration of 10^{-4} mol/l. In this case, what is the minimum volume of water necessary to dissolve the same urinary stone of 1.1 g?

We give: Ks (calcium oxalate) = $10^{-8.6}$, the molar mass (g/mol) of: Ca(40), C(12), O(16).

Exercise 3:

The solubility product of lead sulfate $PbSO_4$ is $10^{-8.6}$. Calculate its molar and mass solubility in:

1. Pure water.

2. A solution of lead nitrate $Pb(NO_3)_2$ 0.10 mol/l. calculate the new solubility S', what can we conclude?

We give: the molar mass (g/mol) of the atoms: Pb(207), S(32), O(16).

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Applied exercises series No. 4

(Oxidation-reduction reaction)

Exercise 1:

- Calculate the degrees (numbers) of oxidation of the underlined atoms:

$K\underline{Mn}O_4$, $H\underline{N}O_3$, $H_3\underline{P}O_4$, $\underline{Cr_2}O_7^{-2}$, $Na\underline{H}$, $\underline{O_2}$, $F_2\underline{O}$, I^-.

Exercise 2:

1. Equilibrium the following reaction in an acidic medium:

$$Cr_2O_7^{-2} + H_2SO_3 \longrightarrow Cr^{+3} + HSO_4^-$$

2. Equilibrium the following reaction in an basic medium:

$$NO_3^- + HS^- \longrightarrow NO_2^- + S$$

Exercise 3:

1. Express the electrode potential of the Riboflavin-Leucoriboflavin (Rb/RbH_2) system as a function of the pH of the solution at 25 °C.

2. Calculate the equilibrium constant K of the tow following equations:

$(Fe^{3+}/Fe^{2+}) \rightarrow E^0_1 = 0.771$ V.

$(Sn^{4+}/Sn^{2+}) \rightarrow E^0_2 = 0.14$ V.

Exercise 4:

- What is the e.m.f. from the following battery?

Ag/Ag^+ (10^{-1} M) // Cu^{2+} (10^{-2} M)/Cu

We give: the standard potentials of the two couples:

$E^0(Ag^+/Ag) = 0.80$ V, $E^0(Cu^{2+}/Cu) = 0.34$ V