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

1st year LMD – SNV Biology **Academic year: 2023/2024**
Subject: Chemistry 2

Applied exercises series No. 1

(Acid-base equilibrium)

Exercise 1:

1. Indicate among the following species, acids, bases and ampholytes: CH_3COOH, NH_4^+, $H_2PO_4^-$, CH_3CH_2OH, S^{2-}, Al^{3+}.

2. Name the conjugated acid/base pairs corresponding to each case.

Exercise 2:

- Knowing that the ionic product of water at 100 ºC is equal to 6.10^{-13}.

1. Calculate the pH of the following solutions at this temperature:

a) Pure H_2O, **b)** HCl at 0.1 mol/l, **c)** NaOH at 0.2 mol/l.

2. Compare these pH values with those obtained at 25 ºC.

Exercise 3:

- In an aqueous solution of formic acid HCOOH (0.2 M), the acid is dissociated to 3%.

1. Calculate the equilibrium concentrations of the species present in aqueous solution.

2. Deduce the pKa of this acid.

Exercise 4:

- Three solutions, sulfuric acid, hydrochloric acid and propanoic acid CH_3CH_2COOH (considered a weak acid) have the same pH. 15 Cm^3 of a 10^{-2} M NaOH sodium hydroxide solution are needed to neutralize 200 Cm^3 of the hydrochloric acid solution, while 40 Cm^3 of the sodium hydroxide solution is required to neutralize 10 Cm^3 of the propanoic acid solution.

Calculate:

1. The pH common to the three solutions.

2. The molarity of each solution.

3. The acid constant of propanoic acid.

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

1st year LMD – SNV Biology **Academic year: 2023/2024**
Subject: Chemistry 2

Applied exercises series No. 2

(Acid-base equilibrium)

Exercise 1:

26.75 g of ammonium chloride NH_4Cl are dissolved in 1 *l* of water.

1. Calculate the pH of NH_4Cl knowing that the Ka of the NH_4^+/NH_3 couple is equal to $5.6*10^{-10}$.

2. How many moles of NH_3 must be added to the previous solution to obtain a buffer solution of pH = 9.07?

We give: the molar mass (g/mol) of the atoms: H(1), N(14), Cl(35.5).

Exercise 2:

The pH of a saturated solution of H_2S is maintained equal to 3.7.

- What are the concentrations of SH^- and S^{2-} species in this solution, knowing that in a solution saturated with H_2S.

We have: $[H_2S] = 0.1$ mol/l

H_2S/HS^- ($Ka_1=10^{-7}$), HS^-/S^{2-} ($Ka_2= 1.2 * 10^{-13}$).

Exercise 3:

- We have the following solutions:

1. CH_3COOH at 0.5 mol/l and CH_3COONa at 0.5 mol/l (pKa=4.75)

2. How to prepare 1 liter of a buffer solution of pH = 4.9