

Tutorial N° 2

Exercise 1

- 1) What are the conjugate bases of the following acids :
 H_2O ; HSO_4^- ; H_2PO_4^- ; HBr ; NH_3 ; HCO_3^- ; $\text{Al}(\text{OH})_3$
- 2) What are the conjugate acids of the following bases :
 H_2O ; SO_4^{2-} ; H_2PO_4^- ; Cl^- ; NH_2^- ; NH_3 ; CO_3^{2-} .

Exercise 2

- 1) Calculate, at 25°C, the pH of a 0.1 M (decimolar) solution of nitric acid.
- 2) Calculate the pH of a 10^{-8} M solution of nitric acid (HNO_3) at 25°C.

Exercise 3

What is the change in the concentration of hydronium ions [H_3O^+] and hydroxide ions [OH^-] when a 0.1 M solution of HCl is diluted 10 times?

Similarly, what happens to these concentrations when a 0.1 M solution of acetic acid (CH_3COOH), with $K_a=10^{-4.75}$, is diluted 10 times?

Exercise 4

Calculate the concentration of hydronium ions [H_3O^+] and hydroxide ions [OH^-] in the following aqueous solutions:

- 1) A mixture of 50 cm³ of HCl (0.1 M) and 30 cm³ of NaOH (1/30 M).
- 2) A mixture of 75 cm³ of KOH (1/15 M) and 50 cm³ of a weak acid (0.1 M) with a dissociation constant $K_a=10^{-6}$.

Exercise 5

We have an aqueous solution of an acid AH with a concentration **C** equal to 0.05 mol/L. The concentration of hydronium ions is 3.16×10^{-4} mol/L.

1. Is this acid strong or weak?
2. What is its K_a value if it is weak ?
3. What is its degree of dissociation α ?
4. What are the concentrations of the dissolved species?

Exercise 6

A weak base B is dissolved in water to prepare a solution with a concentration of $C = 0.10$ mol/L

1. Determine the pOH of the solution.
2. From this result, calculate the corresponding pH

Given: The base dissociation constant is $pK_b = 5$

Exercise 7

Aspirin (acetylsalicylic acid) is a weak monoprotic acid denoted (AH). A 500 mg aspirin tablet (molar mass: $180 \text{ g}\cdot\text{mol}^{-1}$) is dissolved in 200 mL of water, giving a solution with a measured pH of 2.7.

1. Calculate the acid dissociation constant (K_a).
2. Deduce the pK_a of aspirin.