ANALYTICAL CHEMISTRY

FIRST LEVEL

FIRST SEMESTER

1444 - 1445

2023 - 2024

LECTURER: RAWNAQ THAMER KADEEM

EXPERIMENT (8)

Oxidation –Reduction titration

Preparation and standerazation of $KMnO_4$

INTRODUCTION:-

The oxidation and reduction (redox) reaction is represented by the transfer of electrons. The oxidation process involves the loss of electrons from the substance, while the reduction process involves the gain of electrons for the other substance, the number of lost electrons is equal to the number of gained electrons. It should be noted that the oxidizing agent will gain reduced electrons while the reducing agent will lose electrons. So,

Definition of oxidation: The element lost an electron (or an increase in the oxidation number).

Definition of oxidizing agent: It is a substance that oxidizes another substance that reacts with it, and a reduction process occurs (it gains one or more electrons).

Definition of reduction: Reduction is the acquisition of one or more electrons by an element (or a decrease in its oxidation number).

Definition of reducing agent: It is a substance that reduces another substance that reacts with it, causing it to undergo an oxidation process (losing one or more electrons).

THEORY:-

The oxidation process for permanganate takes place in an acidic, alkaline or neutral solution. Indicators are not used for calibration with permanganate because it has its own indicator. In this experiment, the medium will be acidic, and when the neutralization point is reached, the color of the solution will change from violet (the color of permanganate) to colorless, but after the end point of the reaction a drop of permanganate solution will turn the solution pale pink as in the equation below:

$$MnO_4^- + 8\,H^+ \longleftrightarrow Mn^{+2} + 4H_2O$$

Permanganate is not primary standard solution because:

- **low equivalent weight.**
- **It is difficult to obtain in pure form.**
- **It is effect in light and heat (not stable).**
- **It is released MnO_2 because it is a strong oxidizing agent.**

Permanganate is a deeply color, own indicator. There for many primary standard have been proposed for standardization of permanganate, the include [$H_2C_2O_4$], [$Na_2C_2O_4$], [As_2O_3], K_4 [Fe (CN)$_6$] etc.

The most convenient of these experiment is sodium oxalate [$Na_2C_2O_4$], why?

- **It is easy to pure by recrystallization from water.**
- **Drying in (240-250) ^{0}C.**
- **It is not hygroscopic.**
- **It does not change on keeping.**

Chemicals needed for the experiment :-

- **Sodium Oxalate (0.1 N).**
- **Potassium permanganate $KMnO_4$ (unknown concentration).**
- **Diluted Sulfuric acid H_2S0_4 .**

Procedure :-

1- Fill the burette with $KMnO_4$ solution.

2- Take (5ml) of (0.1N) $Na_2C_2O_4$ in conical flask and add to it (5ml) of diluted H_2S0_4.

3- Heat the flask to (60-70 ^{o}C).

4- Titrate with $KMnO_4$ solution until a first drop gives a pink color.

5- Write down your notes.

6- In your report calculate the normality of $KMnO_4$ solution by:

$$N_1 V_1 = N_2 V_2$$

Home work :-

Q_1- What do you know about Redox reaction?

Q_2- Is $KMnO_4$ primary or secondary stander solution? Why?