**EXPERIMENT NO.1**

**OBJECT: To determine the amount of copper sulphate in g/L in the given sample solution using sodium thiosulphate (hypo) solution as anintermediate solution. A known copper sulphate solution is provided.**

**APPARATUS REQUIRED:** Burette, Pipette, Reagent bottles, conical flask, Measuring flask etc.

**REAGENTS REQUIRED:** Known CuSO4 solution, sodium thiosulphate (Hypo), 10% KI, Starch Indicator.

**THEORY:** THEORY: It is redox iodometric titration (double titration). Analytical reactions using iodine as the oxidizing agent are called iodimetric titration while procedures using iodide ion as the reducing agent are called iodometric titration. When a measured quantity of CuSO4 is treated with KI, the Cu2+ present in the CuSO4 oxidizes the corresponding amount of KI to iodine. The liberated iodine is estimated by titrating against hypo solution, using starch as an indicator. Known CuSO4 solution is used to standardize hypo solution.

Iodine is slightly soluble in water but it soluble in solutions containing iodide ion. Iodine forms the tri iodide complex with iodide.Excess potassium iodide is added to the reaction mixture to increase the solubility of iodine and to decrease its volatility.

I2 + K I K I3

The reactions involved are as follows:

2CuSO4 + 4KI Cu2I2 + 2K2SO4 +I2

I2 + 2Na2S2O3 2NaI + Na2S4O6

Sodium tetra thionate

I2 + Starch Starch-iodo complex

(Blue Colour)

**PROCEDURE:**

1. **Standardization of Na2S2O3(hypo):**
2. Fill hypo in burette.
3. Take 10 ml CuSO4 in a clean dry conical flask with the help of pipette.
4. Add 5 ml of KI solution to the above flask, dark yellowish-brown solution is obtained.
5. Titrate this solution against hypo till the solution becomes light yellow.
6. In the above solution, add 1-2 drops of starch (Blue coloured iodo starch complex is formed.)
7. Titrate again the above solution against hypo to get milky white endpoint.
8. Repeat the above procedure to get concordant reading.

**II) Titration of unknown CuSO4with hypo :**

Repeat the above procedure with unknown CuSO4 in place of known CuSO4.

**OBSERVATION TABLES:-**

**I) Standardization of hypo:**

| S.NO. | Volume of known CuSO4 taken (ml) | Volume of hypo solution consumed (ml) (Burette reading) | | | Concordant reading(ml) |
| --- | --- | --- | --- | --- | --- |
| Initial (a) | Final (b) | Difference(b-a) |  |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |

**II) Titration of unknown CuSO4with hypo:**

| S.NO. | Volume of unknown CuSO4  taken (ml) | Volume of hypo solution consumed (ml) (Burette reading) | | | Concordant reading(ml) |
| --- | --- | --- | --- | --- | --- |
| Initial (a) | Final (b) | Difference(b-a) |  |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |

**CALCULATIONS:-**

**(I) Standardization of hypo:**

N1V1 = N2V2  Where N1 = Normality of hypo solution=?

N2 = Normality of known CuSO4 solution

V1 = Volume of hypo consumed (Burette reading)

V2 = Volume of known CuSO4 solution taken(10ml)

**(II) Calculation of normality of unknown CuSO4 solution**

N3V3 = N4V4 Where N3= Normality of hypo solution (N1 =N3)

N4 = Normality of unknown CuSO4 solution

V3 = Volume of hypo consumed (Burette reading)

V4 = Volume of unknown CuSO4 solution taken(10ml)

**(III) Strength of unknown CuSO4solution**

Strength of unknown CuSO4solution = Normality x Equivalent weight of CuSO4 solution (249.5)

=N4 x 249.5 g/L

**RESULT: -**The amount of CuSO4 in given sample solution is ………….. g/L.

**PRECAUTIONS:-**

1. Use distilled water throughout the experiment.
2. Volume of starch indicator should be same in all the titrations.
3. Indicator should be prepared freshly.
4. End point of the titrations should be carefully observed.

**DISCUSSION:-**

Cu imparts bitter taste to drinking water if its concentration is 1.0 ppm. If water containing high concentration of copper is used for heamodialysis, serious poisoning may result with red cells destruction and death. **Copper** is a mineral that is found throughout the body. It helps our body make red **blood** cells and keeps nerve cells and our immune system healthy. It is essential constituent of enzymes which are necessary for metabolic activity going on in our body, with an adult daily requirement of 2.0 mg. Percentage of copper in ores and alloys can be determined by using this technique.

.**VIVA QUESTIONS:**

1. Name the milky white precipitate formed due to the reaction of Copper sulphate with KI.
2. Why is starch added near the end point?
3. Explain the role of starch in this titration.
4. Name the Oxidizing and reducing agent in this titration.
5. Differentiate between iodimetric and iodometric.