EXPERIMENT

Objective:

To determine the hardness of given water sample by complexometric titration using EDTA as an intermediate and EBT as an indicator.

Apparatus and Chemical required:

Burette, Pipette, Conical flask, EDTA, water sample, EBT, Buffer solution (pH= 10).

Theory:

Water generally contains Ca^{2+} and Mg^{2+} salts which are responsible for the hardness of water. When we add EBT to the water sample, Ca^{2+} and Mg^{2+} salts react with EBT at pH 10 to form an unstable complex which is wine red in color.

$$Ca^{2+} + EBT \longrightarrow [Ca^{2+} - EBT]$$

$$Mg^{2+} + EBT \longrightarrow [Mg^{2+} - EBT]$$

Unstable wine- red complexes

Now, when we add EDTA solution to this, the unstable complex converted into stable complex and EBT is liberated which is sky- blue in color.

$$[Ca^{2+} - EBT] + EDTA \longrightarrow [Ca^{2+} - EDTA] + EBT$$

Stable Complex Sky blue color

- EDTA (Ethylene diamine tetra acetic acid)
- EBT (Erichrome Black-T)

Procedure:

Pipette out 10 ml of known water sample in a conical flask and 2 ml of buffer solution (pH 10) + 1 drop of EBT→ wine red color appears → Titrate with EDTA solution until the color changes to sky- blue color. Perform the above procedure for 5times.

Repeat the same procedure 5 times again by taking unknown water sample (tab water)

Observation:

S.No.	Volume of known water sample (ml)	Volume of EDTA solution used (V_1) ml	Volume of unknown water sample (ml)	Volume of EDTA solution used (V_2) ml
1.	10		10	
2.	10		10	
3.	10		10	
4.	10		10	
5.	10		10	

Calculation:

Hardness of known water sample is given = 800ppm

So, hardness of unknown water sample is = $800 \times V_2/V_1 \times 1000$ ppm

Precautions:

(1) Burette should be vertical throughout the experiment.

(2) The reaction mixture should continuously be shaken during titration.

(3) Glass ware should be washed and dried before doing the experiment.

EXPERIMENT

Objective:

To determine the iron content of a given ferrous ammonium sulphate solution by titrating it against N/50 $K_2Cr_2O_7$ solution using N- phenylanthranilic acid as an internal indicator.

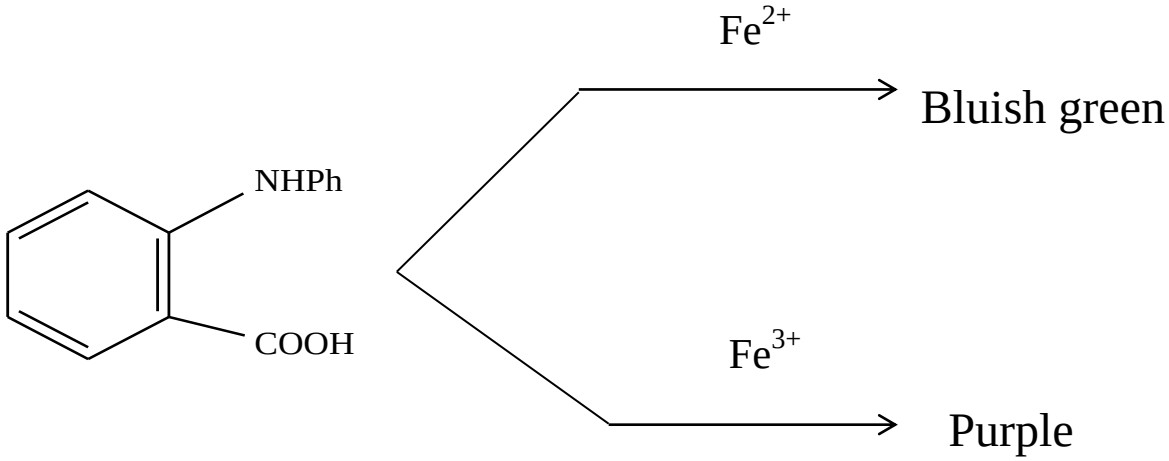
Apparatus and Chemical required:

Solution of ferrous ammonium sulphate (FAS) or Mohr's salt, $K_2Cr_2O_7$ solution, N-phenylanthranilic acid, distilled water, burette, Pipette, conical flask, diluted sulphuric acid.

Theory:

$K_2Cr_2O_7$ acts a strong oxidizing agent in presence of dil. H_2SO_4.

$$6Fe^{2+} + 14H^{+} + Cr_2O_7^{2-} \longrightarrow 6Fe^{3-} + 2Cr^{3-} + 7\ H_2O$$



Procedure:

Pipette out 10 ml FAS + 2ml of dil. H_2SO_4 + 1 drop of N- phenylanthranilic acid → Bluish green color → titrate it against $K_2Cr_2O_7$ from burette until the purple color just appears → this will be end point → repeat the same for 5 times.

Observation:

S.No.	Volume of $K_2Cr_2O_7$ used V(ml)
1.	
2.	
3.	
4.	
5.	

Calculation:

Volume of FAS taken = 10 ml.

Normality of potassium dichromate taken = 1/50 N

Volume of potassium dichromate used = V ml.

$N_{FAS} \times 10 = N/50 \times V$

Strength of FAS (S) = $N_{FAS} \times 392.16$ gm/lit.

Iron content = $S \times 56/392.16$ gm.

Result:

The strength of FAS is = …….. gm/lit.

The iron content is = …….. gm.

Precautions:

(1) Burette should be vertical throughout the experiment.

(2) The reaction mixture should continuously be shaken during titration.

(3) Glass ware should be washed and dried before doing the experiment.