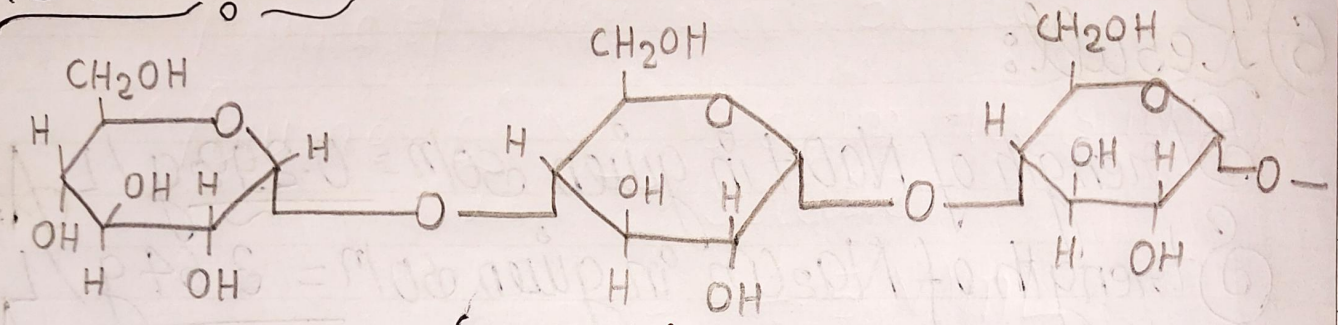
Experiment No: 4

Indicator



(Starch)

Reactions Involved

$$MnSO_4 + 2KOH \longrightarrow Mn(OH)_2 + K_2SO_4$$

$$2(Mn(OH)_2) + O_2 \longrightarrow 2MnO(OH)_2$$ (Basic manganese oxide)

$$2MnO(OH)_2 + H_2SO_4 \longrightarrow MnSO_4 + H_2O + [O]$$

$$2KI + H_2SO_4 + [O] \longrightarrow K_2SO_4 + H_2O + I_2$$

$$I_2 + Na_2S_2O_3 \longrightarrow 2NaI + Na_2S_4O_6$$

(Sodium tetrathionate)

Ionic Reactions

$$NaN_3 + H^{\oplus} \longrightarrow NH_3 + Na^{\oplus}$$

$$NH_3 + NO_2 + H^{\oplus} \longrightarrow N_2 + 2H_2O$$

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1) Aim: To determine the concentration of dissolved oxygen from the given water sample using standard N/40 $Na_2S_2O_3$ solution

2) Apparatus Required: Burette, Pipette, Measuring flask, Glass Rod.

3) Reagents Required: Potassium iodide solution (10%), N/40 Hypo solution ($Na_2S_2O_3$), starch solution (freshly prepared)

4) Theory: This experiment is based on the oxidation of potassium iodide by dissolved oxygen. The liberated iodide is against a standard solution. Since, oxygen dissolved in water remains present in molecular state; it is not capable of reacting with potassium Iodide. As oxygen carrier such as manganese hydroxide is produced insitu by the action of potassium hydroxide and manganous sulphate. Starch is used as an Indicator in Iodometric titration. It is a viable indicator in titration process because it turns deep dark blue when iodide is present in a solution when starch is added.

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heated in water, decomposition occurs and beta-amylase is produced Beta-amylase with iodine, resulting in a dark blue coloured change.

Azide modification is used to remove substances like nitrites, sulphide, etc. which liberate iodine from potassium iodide to dissolve oxygen
For eg: the interference of nitrite is overcome by adding sodium azide (NaN_3) and H_2SO_4.

5) Procedure:

- 50mL of water sample was taken in Iodometric flask avoiding as far as possible, contact with air.
- Immediately 1ml of manganese sulphate solution was added from the burette and add 1mL of alkaline iodide was added from other burette
- The stopper was inserted and solution was shaken several times

The precipitate was settled half way & was mixed again. This process was repeated at least

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Observations :→

Volume of water used = 50ml

Volume of (N/40) sodium thiosulphate solution

$V_{Hypo.} = 44.5 (V) mL$

Calculations :→

$N_{O_2} \times N_{water} = N_{Hypo} \times V_{Hypo}$

$N_{O_2} = \left(\frac{1}{40}\right) \times \left(\frac{44.5}{50}\right) = \underline{0.02225}$

Strength = N_{O_2} × 8 gm of O_2 / litre

$= N_{O_2} \times 8 \times 1000 ppm$

$= 0.02225 \times 8 \times 1000$

$= \underline{178 ppm}$ Ans

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for 3 times.

- The yellow solution was allowed to stand for 5min.
- 50mL of solution was withdrawal. It was then titrated against the standard N/40 solution sodium thiosulphate solution till the solution became faint yellow.
- At this stage few drops of starch were added. The colour turned to deep blue information of starch iodide
- Titration was continued till the solution becomes colourless.

6) Result: Amount of Dissolved Oxygen from the water using sample N/40 $Na_2S_2O_3$ solution standard

= 178 ppm. Ans

7) Precautions:

(i) The solution in the iodide flask should be shaken carefully while keeping the thumb on the lid.

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(ii) The solution be well shaken before each aliquot is withdrawn for titration

(iii) The solution in the iodine flask should not be sucked into the pipette with the mouth

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