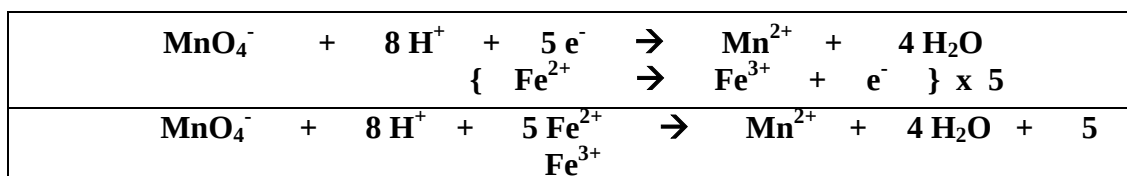


CLASS XII
CHEMISTRY PRACTICAL
PERMANGANOMETRY- (REDOX TITRATION)

Experiment Number: 01**Date: -----****ESTIMATION OF KMnO_4 USING STANDARD MOHR'S SALT SOLUTION**

Aim: - To determine the mass of potassium permanganate in one litre of the given solution using the given pure Ferrous ammonium sulphate [Mohr's salt, $(\text{NH}_4)_2\text{SO}_4 \cdot \text{FeSO}_4 \cdot 6 \text{H}_2\text{O}$] crystals of Analytical Reagent (A.R.) quality.

Principle: - The estimation is based on the reaction between KMnO_4 and Mohr's salt.



REQUIREMENTS: - Burette, Pipette, Conical flask, Weighing bottle, Ferrous ammonium sulphate (Mohr's salt) crystals (A.R. Grade), Balance, etc.

PROCEDURE: - First of all wash all the apparatus thoroughly with tap water and rinse with distilled water.

• **Preparation of Mohr's salt solution (standard 0.0500 M)**

Weigh **1.960 g** of Mohr's salt crystals (A.R. grade), accurately in a weighing bottle transfer and wash into a clean funnel placed over a **100 ml.** standard volumetric measuring flask. Add about 15ml (1 test tube) of 10% H_2SO_4 solution and then wash down the crystals carefully into the flask by a jet of distilled water. Wash the funnel also down into the flask. Dissolve the crystals completely and then make up the solution to 100 ml. mark. Shake well to make a homogeneous solution.

(Note: - Weigh **4.900 g** of Mohr's salt for a **250 ml.** flask)

Mass of Mohr's salt crystals	=	----- gms.	
Volume to which the solution is diluted	=	V_s ml. = 100 ml.	
Molarity of the Mohr's salt solution	=	$M_F = \frac{a \times 1000}{392 \times V_s}$	=
-----M		$\frac{\text{-----} \times 1000}{392 \times 100}$	

• **Estimation of Potassium permanganate solution**

Pipette out 20 ml. of Mohr's salt solution into a conical flask and add about 20 ml. (1 ½ test tubes) of Dil. Sulphuric acid to it. The solution is then titrated with KMnO_4 solution taken in the burette. The end point is indicated by the appearance of **pale pink colour** in the solution. The titration is repeated till concordant titre values are obtained.

Sl. No	Volume of F A S (ml)	Burette reading		Titre value (Volume of KMnO_4 consumed) (X – Y) ml
		Initial reading Y ml	Final reading X ml	

1	20 ml			
2	20 ml			

Calculation: -

Molarity of the Mohr's salt solution = M_F = ----- M

Volume of FAS used = V_F = 20 ml

Volume of $KMnO_4$ used up = V_K ml. = ----- ml.

By law of equivalence: - $5 M_K V_K = M_F V_F$		
M_K = Molarity of $KMnO_4$	V_K = Volume of $KMnO_4$ used up (Burette reading).	5 = Number of electrons consumed
M_F = Molarity of Mohr's salt used.	V_F = Volume of Mohr's salt (Volume of the pipette).	Only one electron is released

Molarity of the $KMnO_4$ solution = $M_K = \frac{M_F V_F}{5 V_K} = \frac{\text{.....} \times 20}{5 \times \text{-----}} = \text{-----} M$

Result: -

Molarity of the given $KMnO_4$ solution = ----- M.

N.B: - (Do not enter in your journal)

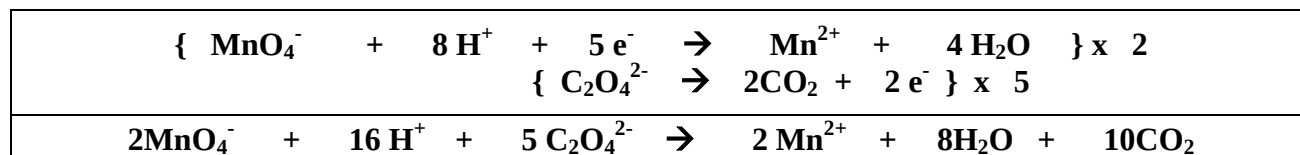
1. If during the reaction a brown precipitate of hydrated manganese dioxide is observed, insufficient sulphuric acid is indicated. More acid should then be added to the solution.
2. Since the lower meniscus cannot be seen clearly through the purple colour of the $KMnO_4$ solution, the burette readings are taken at the highest level of the liquid surface (upper meniscus).
3. A burette, which has been used for $KMnO_4$ solution, should be emptied and cleaned, immediately after use. Any brown stain due to MnO_2 should be removed by oxalic acid solution or Mohr's salt solution.

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Experiment Number: 02**Date: -----****ESTIMATION OF KMnO₄ USING STANDARD OXALIC ACID SOLUTION.**

Aim: - To determine the mass of potassium permanganate in one litre of the given solution using the given pure oxalic acid crystals of Analytical Reagent (A.R.) quality.

Principle: - The estimation is based on the reaction between KMnO₄ and Oxalic acid.



REQUIREMENTS: - Burette, Pipette, Conical flask, Weighing bottle, Oxalic acid crystals (AR grade), Balance, etc.

PROCEDURE: - First of all wash all the apparatus thoroughly with tap water and rinse with distilled water

- Preparation of oxalic acid solution (standard 0.0500 M)**

Weigh **0.6300 g** of Oxalic acid crystals (A.R. grade), accurately in a weighing bottle wash and transfer into a clean funnel placed over a **100 ml.** standard volumetric measuring flask. Wash the funnel also down into the flask. Dissolve the crystals completely and then make up the solution to 100ml. mark. Shake well to make a homogeneous solution.

(Note: - Weigh **1.575 g** of oxalic acid for a **250ml.** flask)

Mass of oxalic acid crystals = **X g**
 Volume of solution prepared = **Vs ml** = 100 ml.

Molarity of the Oxalic acid solution (**Mo**) = $\frac{X \times 1000}{126 \times Vs} = \frac{\dots \times 1000}{126 \times 100} = \dots\text{M}$

- Estimation of Potassium permanganate solution**

Pipette out 20 ml. of oxalic acid into a conical flask, about 20 ml. (1 ½ test tubes) of Dil. Sulphuric acid is added and the mixture is **heated to 60° to 70° C** (bearable warmth). The solution is then titrated with KMnO₄ solution taken in the burette. The end point is indicated by the appearance of **pale pink colour** in the solution. The titration is repeated till concordant titre values are obtained.

Sl No	Volume of Oxalic acid used (ml)	Burette reading		Titre value (Volume of KMnO ₄ consumed) (Z – Y) ml
		Initial reading Y ml	Final reading Z ml	
1	20 ml			
2	20 ml			

Calculation: -

Molarity of the Oxalic acid solution = **Mo** =M

Volume of oxalic acid used = V_o = 20 ml

Volume of $KMnO_4$ used up = V_K ml. = ml.

By law of equivalence: - $5 M_K V_K = 2 M_O V_O$		
M_K = Molarity of $KMnO_4$	V_K = Volume of $KMnO_4$ used up (Burette reading).	5 = Number of electrons consumed
M_O = Molarity of Oxalic acid used.	V_O = Volume of Oxalic acid (Volume of the pipette)	2 = Number of electrons released.

Molarity of the $KMnO_4$ solution = $M_K = \frac{2 M_O V_O}{5 V_K} = \frac{2 \times \dots \times 20}{5 \times \dots} = \dots M$

Mass of $KMnO_4$ in one litre of the given solution = $M_K \times 158 = \dots \times 158 = \dots g$.

Result: -

Molarity of the given $KMnO_4$ solution = M.

Mass of $KMnO_4$ in one litre of the given solution = g.

N.B: - (Do not enter in your journal)

1. If during the reaction a brown precipitate of hydrated manganese dioxide is observed, insufficient sulphuric acid is indicated. More acid should then be added to the solution.
2. Since the lower meniscus cannot be seen clearly through the purple colour of the $KMnO_4$ solution, the burette readings are taken at the highest level of the liquid surface (upper meniscus).
3. A burette, which has been used for $KMnO_4$ solution, should be emptied and cleaned, immediately after use. Any brown stain due to MnO_2 should be removed by oxalic acid solution or Mohr's salt solution.

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