Assay of Hydrogen Peroxide

H_2O_2

H_2O_2: Mwt.=34.02 gm/mole
Different H_2O_2 solution: 30%,27%w/w and 6%, 3%w/v

- H_2O_2 is slightly more viscous than water.
- Aqueous solution of H_2O_2 colorless and odorless. Rapidly decomposes when contact with organic matter and certain metals; Cu, Fe, Mn and if allowed to stay in alkaline solution. $2H_2O_2 \rightarrow O_2 + H_2O$

- In acidic solution Fe^{2+} is oxidized to Fe^{3+} (H_2O_2 acting as an oxidizing agent):

  $2\ Fe^{2+} + H_2O_2 + 2H^+ \rightarrow 2\ Fe^{3+} + 2H_2O$
- hydrogen peroxide acts as a reducing agent in its reaction with $KMnO_4$ *in our experiment*.

  $2MnO_4^- + 5H_2O_2 + 6H^+ \rightarrow 2Mn^{2+} + 5O_2 + 8H_2O$
- **Uses:**

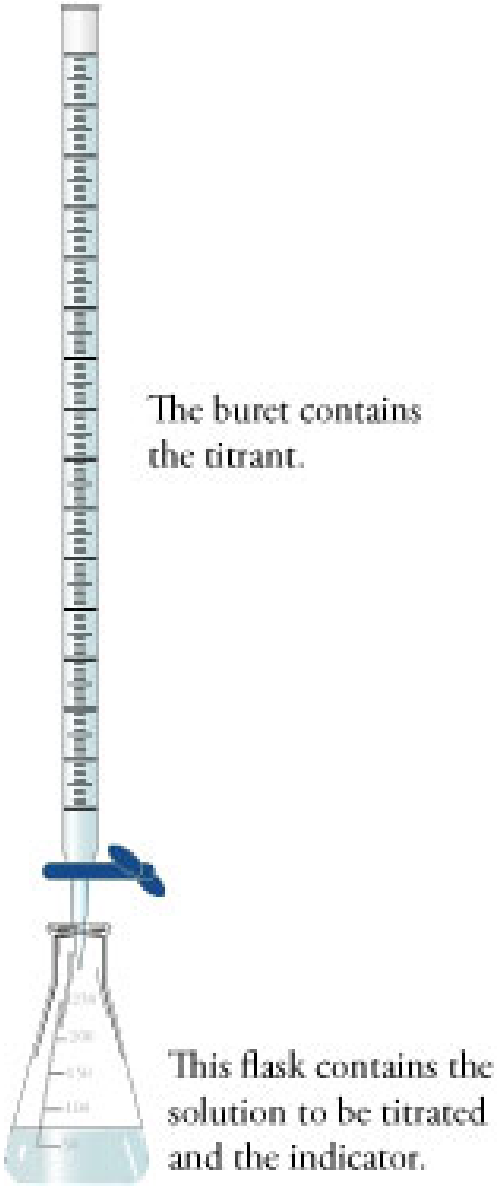
  It is a ***disinfectant*** or ***antiseptic*** for treating wounds for its antimicrobial activity.

  it is an effective ***cleaning agent*** prevents infection transmission in the hospital environment.

Procedure:

≈ 0.1N $KMnO_4$

10ml of unknown
25ml of D.W.
5ml of 50%v/v H_2SO_4



***End point**: colorless → pink*

- **Notes:**

1. We make the media acidic **<u>to;</u>**

- Prevent decomposition of H_2O_2
- Prevent reaction of $KMnO_4 \rightarrow MnO_2$
- Increase oxidizing power of $KMnO_4$

2. Titration should be done slowly

- **Chemical principle:**

$2KMnO_4 + 5H_2O_2 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 5O_2 + 8H_2O$

** You must write the oxidation and reduction equations to calculate the eqwt. for both $KMnO_4$ & H_2O_2 .*

- **Chemical factor:**

According to the chemical equation;

2Mwt of $KMnO_4$ ≡ 5Mwt of H_2O_2

then complete the derivation of the Ch. Factor.

The Chemical factor is equal to:

1ml of 0.1N $KMnO_4$ ≡ 0.001701gm of H_2O_2

- **Calculation:**
- Correct the **volume** of $KMnO_4$

  NxV = *N'xV'* (corrected)
- Multiply the corrected volume by the Ch. Factor.

  to get the **weight (wt.)** of H_2O_2
- the **%w/v** of H_2O_2 = **wt**. /10 x 100

- There is 2 methods to calculate the concentration of hydrogen peroxide in commercial products:

1. %W/V:

10ml of concentrated sol. was diluted to 200ml with D.W. ⟶ Then 20ml is taken from the dil. one and titrated with approximately 0.1N $KMnO_4$

conc.	diluted
10	200
x	20

x= 20X10/200=1ml of conc. sol. (original sol.)

Correct the volume of $KMnO_4$= ***Vol.***

Vol. x ch. Factor =wt. of H_2O_2 in 1ml.

Then calculate %w/v

2. **Volume strength of the solution:**

Decomposition occurs according to this equation:

$$2\ H_2O_2 \longrightarrow 2\ H_2O + O_2$$

Example: if the %w/v of H_2O_2 is 8.5%w/v ***i.e.*** It contains 8.5 gm of H_2O_2 in 100ml solution.

wt.	Vol.	
8.5	100ml	X= 0.085 gm of H_2O_2 in 1ml
X	1ml (from the definition)	

$$2\ H_2O_2 \longrightarrow 2\ H_2O + O_2$$

2✖34gm mwt.	22400ml	y = 28ml of O_2
0.085gm	y	

So the *volume strength* of the sample is 28.