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EXPERIMENT NO. 4

NAME OF EXPERIMENT: TO DETERMINE THE STRENGTH OF SUPPLIED H_2SO_4 BY TITRATING WITH STANDARD N/10 Na_2CO_3 SOLUTION

APPARATUS REQUIRED

- | | | |
|---------------------|------------------|------------------|
| 1. Volumetric flask | 2. Beaker | 3. Conical flask |
| 4. Burette | 5. Burette stand | 6. Funnel |
| 7. Pipette | | |

CHEMICALS REQUIRED

- | | |
|-------------------|---------------|
| 1. Methyl orange | 2. Na_2CO_3 |
| 3. Sulphuric acid | |

THEORY

Molecular weight of anhydrous $Na_2CO_3 = 106$

$$\therefore \text{Equivalent weight of } Na_2CO_3 = \frac{\text{Molecular weight}}{2} = 53$$

Now,

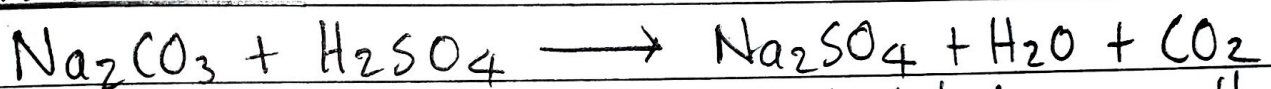
$$\text{Normality} = \frac{\text{Weight in gm}}{\text{Equivalent weight} \times \text{Volume in litre}}$$

$$\text{or, } \frac{N}{10} = \frac{\text{Weight in gm} \times 1000}{53 \times 100}$$

$$\therefore \text{Weight of } Na_2CO_3 \text{ to be taken} = 0.53 \text{ gm}$$

Titration is the technique of determining the strength of unknown solution by reacting it with the standard solution by means of volume measurement normally in presence of third chemical substance. Indicator is the third chemical substance used in titration which helps to predict the end point of titration by its colour change.

REACTION



The unknown strength is calculated using the normality equation. $N_1 V_1 = N_2 V_2$.

Where, V_1 = Volume of acid N_1 = Normality of acid
 V_2 = Volume of alkali N_2 = Normality of alkali

PROCEDURE

1. The whole apparatus was cleaned with water.
2. The burette was cleaned with distilled water and rinsed with the given acid.
3. The burette was clamped vertically to the stand so that the jet of the burette remained slightly above the mouth of the conical flask. The burette was filled with acid upto the zero mark.
4. The pipette was cleaned with distilled water.

And it was rinsed with the standard Na_2CO_3 solution.

5. 10 ml of standard alkali was added into a clean conical flask with pipette. 2-3 drops of methyl orange was added and shaken gently.
6. The first reading was taken by running out 1 ml of the acid at a time from the burette into the alkali taken in the conical flask. The flask was shaken during each addition giving the rotatory motion to the solution into the flask.
7. Slight permanent pink colour was appeared in the solution that indicated the solution has acquired the end point of the titration. The volume of the acid in the burette was noted.
8. The conical flask was washed with distilled water. Pipette was used to put 10 ml of the alkali into the conical flask.
9. The alkali was titrated against H_2SO_4 solution as before.
10. During the process of titration, a state will come when you cannot say definitely whether the solution in the conical flask is colourless or very faint yellow.
11. If the solution has already attained the end point, the solution turns slightly pink by the

addition of one drop of the acid.

12. The procedure was repeated and some more readings were taken.

OBSERVATION TABLE

No. of Obs.	Vol. of alkali Na_2CO_3	Burette readings ml			Concurrent Vol. of alkali
		Initial	Final	Difference	
1.	10ml	0	6	6	
2.	10ml	6	12	6	6
3.	10ml	12	17.9	5.9	

CALCULATION

Vol. of Na_2CO_3 (V_1) = 10ml

Strength of Na_2CO_3 (N_1) = 0.1N

Vol. of H_2SO_4 (V_2) = 6ml

Strength of H_2SO_4 (N_2) = ?

We have,

$$N_1 V_1 = N_2 V_2$$

$$\text{or, } 0.1 \times 10 = N_2 \times 6$$

$$\therefore N_2 = 0.17 \text{ N}$$

Now, Normality = Molarity $\times n$

$$\text{or, } 0.17 = \text{Molarity} \times 2$$

$$\therefore \text{Molarity} = 0.09 \text{ M}$$

Again,

$$\begin{aligned}\text{Gram/litre} &= \text{Normality} \times \text{Equivalent weight} \\ &= 0.17 \times 49 \\ &= 8.33\end{aligned}$$

Again,

$$\begin{aligned}\text{Purity percentage (\%)} &= \frac{8/1}{10} = \frac{8.33}{10} \\ &= 0.83 \%\end{aligned}$$

RESULT

Hence, the strength, ~~normality~~ molarity, g/ltr and % purity are 0.17 N, 0.09 M, 8.33 and 0.83 % respectively.

PRECAUTIONS

1. All the glasswares should be handled with care.
2. Conical flask should never be ~~raised~~ rinsed with chemical.
3. Lower meniscus of the solution should be observed while taking the readings.
4. Excess of indicator should not be used.

