leCampion College

5th Form Laboratory   **Skill: A/I   /10**

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Topic: Volumetric Analysis

Aim: To determine the amount of sodium carbonate needed to standardize hydrochloric acid.

Title: **Standardizing HCl using 0.1M Na₂CO₃ with methyl orange indicator**

Apparatus and materials: burette, pipette, methyl orange, hydrochloric acid, sodium carbonate, conical flask,

Method:

1. The burette was conditioned and filled with HCl.
2. The pipette was conditioned with sodium carbonate
3. Using the pipette, 20 cm^3 of 0.1M sodium carbonate was transferred to a conical flask.
4. Three drops of methyl orange were added to the conical flask.
5. Hydrochloric acid was added to the conical flask until one drop changed the colour from yellow to red.
6. The final volume of hydrochloric acid on the burette was recorded
7. The titration was repeated until the values were within 0.1cm^3 of each other.

Results:

	Trial 1	Trial 2	Trial 3
Final Burette reading/cm^3	25.55	27.50	28.10
Initial Burette Reading/cm^3	3.25	6.55	7.25
Volume of HCl used /cm^3	22.30	20.95	20.85

Discussion

1. Write the chemical equation for the reaction   [2]
   2HCl(aq) + Na₂CO₃(aq) → 2NaCl(aq)+ H₂O(l)+ CO₂(g)

2. Calculate the average volume of HCl

(20.95+20.85)/2

                =20.90cm^3 [1]

3. Calculate the moles of Na₂CO₃ in the pipetted volume
   Concentration = moles/volume
   Moles = concentration * volume
   Moles = .1mol/dm3 * .02dm3
   =.002 moles
                                                [2]
4. Use the mole ratio to determine the moles of HCl in the average volume   [1]

Mol ratio $HCl:Na_2CO_3$ = 2:1

X: .002

X = 2*.002

X=.004 moles HCl

5. Calculate the molar concentration of HCl

Concentration = #moles/volume

Concentration = $0.004mol/.0209dm^3$

Concentration = $0.191mol/dm^3$

[2

6. Calculate the mass concentration of HCl

Mass concentration = molar concentration * molar mass

Mass concentration = $.191mol/dm * 36.46g/mol$

Mass concentration = $6.96g/dm^3$ [2]

Conclusion: An average of $20.90cm^3$ of HCl was needed to neutralize $20cm^3$ of sodium carbonate of concentration 0.1M. There were .002 moles of sodium carbonate, and .004 moles of hydrochloric acid, which had a molar concentration of $.191mol/dm^3$ and a mass concentration of $6.96g/dm^3$.