N1. DETERMINATION OF HYDROGEN CARBONATE IN BAKING POWDER

PURPOSE: To determine the concentration of hydrogen carbonate in baking powder

PREWORK
- Write the balanced equation for the reaction between sodium hydrogen carbonate and hydrochloric acid.
- A standardised 0.05M NaHCO₃ solution will be available for use in evaluating an appropriate indicator for the baking powder analysis. Calculate the volume of standardised 0.1 M HCl that would be required to neutralise 25 mL of the NaHCO₃ solution.
- What are the colours in acid and alkaline solutions of phenolphthalein, bromothymol blue, methyl orange and screened methyl orange.
- Calculate the mass of baking powder (about 20% NaHCO₃) which would make 250 mL of about 0.05 M NaHCO₃

PROCEDURE
Evaluation of an Appropriate Indicator
1. Titrate 25 mL aliquots of the standardised NaHCO₃ solution with your standardised HCl solution using the following indicators
   a. phenolphthalein
   b. bromothymol blue
   c. methyl orange
   d. screened methyl orange

II. Analysis
2. Weigh accurately about the mass of baking powder calculated in Prework part 3. Quantitatively transfer to a 250 mL volumetric flask. Add about 150 mL purified water to dissolve the active ingredient, make up to the mark, cap and shake well.
3. Filter about 100 mL of this solution by gravity through a fluted #54 filter paper.
4. In triplicate pipette 25 mL aliquots of the filtrate into clean 250 mL conical flasks. Add 2-3 drops of the appropriate indicator (from Part I) and titrate with your standardised HCl to endpoint.

CALCULATIONS
1. Calculate the number of moles of HCl used in the titration and then determine the number of moles of NaHCO₃ involved in the titration
2. Calculate the molarity and then the g/L of NaHCO₃ in the solution
3. Calculate the mass of NaHCO₃ in the original 250 mL of solution
4. Calculate the percentage of NaHCO₃ in the baking powder

DISCUSSION
- Explain the volume differences obtained for the titrations with the different indicators
- Explain why it was necessary to filter the sample solution prior to taking the aliquot
QUESTIONS
1. What advantage does screened methyl orange have over ordinary methyl orange? How is screened methyl orange prepared?
2. Name another indicator that would be suitable for this analysis
3. What purpose does sodium hydrogen carbonate serve in baking powder? How does it work? What other components are found in baking powder?