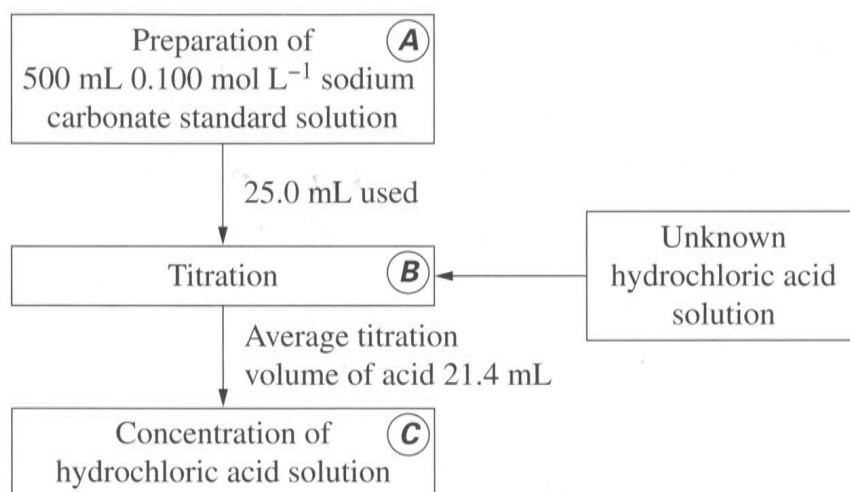


**Question 28** (8 marks)

The flowchart shown outlines the sequence of steps used to determine the concentration of an unknown hydrochloric acid solution. 8



Describe steps **A**, **B** and **C** including correct techniques, equipment and appropriate calculations. Determine the concentration of the hydrochloric acid.

**A** to prepare 0.1 M, 500 mL solution of  $\text{Na}_2\text{CO}_3$ ,  
0.05 moles of  $\text{Na}_2\text{CO}_3$  are needed,  $0.05 \times (2 \times 22.99 + 12.01 + 48)$   
= 5.2995g.

1) Accurately measure 5.2995g of  $\text{Na}_2\text{CO}_3$  using an electronic balance

2) then use 50 mL of distilled water to dissolve it, before transferring it to a volumetric flask.

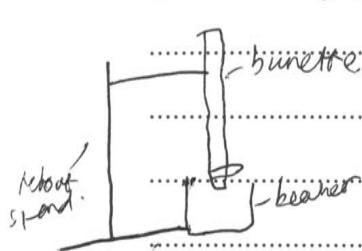
3) use distilled water to make up the rest of the solution, taking care to use a dropper to add the last few drops, ensuring the bottom

of the meniscus is below the mark at the neck.

Question 28 continues on page 18

Question 28 (continued)

B) ~~MAA~~ Set up ~~the~~ equipment as shown:

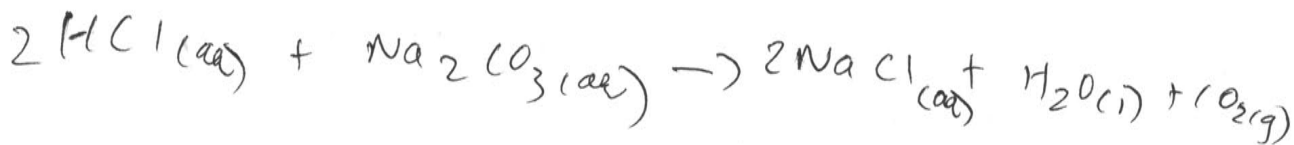


- 1) Clean burette with HCl solution to be used, before filling burette to mark
- 2) Use ~~an~~ pipette to transfer 25.0 mL of  $\text{Na}_2\text{CO}_3$  solution to beaker.
- 3) Add ~~with~~ few drops of ~~strong~~ bromothymol blue indicator
- 4) ~~ADD~~ Using ~~tap~~ <sup>of burette</sup>, add few drops of acid at a time ~~in~~ to beaker, swirling beaker constantly. As soon as solution begins to change colour record the amount of HCl used.
- 5) Empty beaker and burette and repeat steps 1-4

b) Record all results

c) Average **End of Question 28** results.

C) Calculations



$$C_a V_a = \frac{1}{2} C_b V_b \times 2$$

$$C_a = \frac{2 \times 0.025 \times 0.1}{0.0214}$$

$$= 0.2336 \text{ mol L}^{-1}$$