Aim:

To determine the concentration of the given hydrochloric acid (HCl) solution by titrating it against a standard sodium carbonate (Na2CO3) solution.

Apparatus and Chemicals Required:

Apparatus:

- Burette
- Pipette (10 mL)
- Conical flask
- Beaker
- Funnel
- Stand with clamp
- White tile (optional)

Chemicals:

- Sodium carbonate (Na2CO3) solution
- Hydrochloric acid (HCl) solution
- Methyl orange indicator
- Distilled water

Procedure:

1. **Preparation of Sodium Carbonate Solution:**
    - Weigh a known mass of anhydrous sodium carbonate (Na2CO3) and dissolve it in distilled water.
    - Transfer the solution to a volumetric flask and make up the volume to a known mark.
2. **Filling the Burette:**
    - Rinse the burette with distilled water and then with hydrochloric acid.
    - Fill the burette with hydrochloric acid and record the initial reading.
3. **Pipetting the Sodium Carbonate Solution:**
    - Rinse the pipette with distilled water and then with sodium carbonate solution.
    - Use a pipette to transfer 10 mL of sodium carbonate solution into a conical flask.
    - Add 2-3 drops of methyl orange indicator (solution turns yellow).
4. **Performing the Titration:**

- Slowly add hydrochloric acid from the burette to the conical flask while swirling it continuously.
- Near the endpoint, add acid dropwise until the color changes from yellow to orange-pink.
- Record the final burette reading.

5. **Repeating the Experiment:**
   - Perform at least three titrations and take the average volume of hydrochloric acid used.

Result:

The concentration of the given hydrochloric acid solution is determined using the titration data.

Balanced Chemical Equation:

$Na2CO3+2HCl \rightarrow 2NaCl+CO2+H2O$