Acids, Bases, Salts

Section B: Descriptive Type Questions - Answers

1. **Explain why an aqueous solution of an acid conducts electricity.**
    - **Answer:** An aqueous solution of an acid conducts electricity because acids dissociate in water to produce hydrogen ions (H^+) and anions (such as Cl^- in hydrochloric acid). These ions are charged particles that move freely in the solution and carry electric current. The movement of these ions allows the solution to conduct electricity.

2. **What happens when an acid reacts with a metal? Write a balanced chemical equation for the reaction between hydrochloric acid and zinc.**
    - **Answer:** When an acid reacts with a metal, hydrogen gas is evolved and a salt is formed. This is a typical displacement reaction where the metal displaces hydrogen from the acid. For example, the reaction between hydrochloric acid and zinc can be represented by the following balanced chemical equation:

      $$\mathrm{Zn + 2HCl \rightarrow ZnCl_2 + H_2}$$

      In this reaction, zinc reacts with hydrochloric acid to produce zinc chloride and hydrogen gas.

3. **How is the concentration of hydronium ions (H_3O^+) affected when a solution of an acid is diluted?**
    - **Answer:** When a solution of an acid is diluted, the concentration of hydronium ions (H_3O^+) decreases. Dilution involves adding more water to the solution, which increases the volume of the solution but keeps the amount of the acid the same. As a result, the number of hydronium ions per unit volume decreases, leading to a reduction in the acidity of the solution.

4. **Describe an activity to prove that compounds such as alcohol and glucose are not acids.**
    - **Answer:** To prove that alcohol and glucose are not acids, you can perform a simple conductivity test:
        - Take solutions of glucose and alcohol.
        - Fix two nails on a cork and place the cork in a 100 mL beaker.
        - Connect the nails to the two terminals of a 6-volt battery through a bulb and a switch.
        - Pour the glucose solution into the beaker and switch on the current.
        - Observe if the bulb glows. Repeat the experiment with the alcohol solution.
        - Result: The bulb will not glow in either case, indicating that glucose and alcohol do not ionize in water to produce ions, and hence, they do not conduct electricity. This demonstrates that they are not acids, as acids would dissociate to produce ions and conduct electricity.

5. **Why do acids not show acidic behavior in the absence of water?**

- **Answer:** Acids do not show acidic behavior in the absence of water because they need water to dissociate and produce hydrogen ions (H^+). The hydrogen ions are responsible for the acidic properties of the solution. In the absence of water, the acid molecules cannot dissociate to form H^+ ions, and therefore, they do not exhibit acidic behavior. For example, dry hydrogen chloride gas does not change the color of dry litmus paper, but when dissolved in water to form hydrochloric acid, it dissociates to release H^+ ions and exhibits acidic properties.