Carboxylic Acids & Esters — Instructor Answer Key

Worked solutions and reasoning • For instructor review before publication

1. **Ethanoic acid + methanol (H^+ catalyst) forms which ester?**

   Answer: Methyl ethanoate

   Reasoning: Methyl derives from methanol; ethanoate comes from ethanoic acid.

2. **Fischer esterification is:**

   Answer: Generally reversible

   Reasoning: Acid-catalyzed esterification is an equilibrium process.

3. **The characteristic carboxylic acid group is:**

   Answer: R–COOH

   Reasoning: Carboxylic acids contain carbonyl and hydroxyl at the same carbon.

4. **Why is the acetate ion stabilized?**

   Answer: Charge delocalization between two O atoms

   Reasoning: Carboxylate charge is delocalized across two oxygens.

5. **Which can shift Fischer esterification toward product?**

   Answer: Removing water

   Reasoning: Water removal shifts equilibrium toward ester.

6. **Ethanol + benzoic acid with acid catalysis gives:**

   Answer: Ethyl benzoate

   Reasoning: Alcohol contributes ethyl and acid contributes benzoate.

7. **Dilute acid and excess water generally promote ester:**

   Answer: Hydrolysis

   Reasoning: Hydrolysis is reverse of acid-catalyzed esterification.

8. **Comparing ordinary alcohols and carboxylic acids, which is generally more acidic?**

   Answer: Ethanoic acid

   Reasoning: Carboxylate anion is resonance-stabilized, unlike simple alkoxide.

9. **Why is acetate relatively stable?**

   Answer: The negative charge is delocalized across the two oxygen atoms in resonance contributors.

   Reasoning: The negative charge is delocalized across the two oxygen atoms in resonance contributors.

10. **What product forms from methanoic acid and ethanol with acid catalyst?**

    Answer: Ethyl methanoate and water, in a reversible equilibrium.

    Reasoning: Ethyl methanoate and water, in a reversible equilibrium.