Acyl Substitution — Instructor Answer Key

Worked solutions and reasoning • For instructor review before publication

1. **Acetyl chloride + ethanol gives mainly:**

   Answer: Ethyl ethanoate

   Reasoning: Alcohol substitutes for chloride to give ethyl ethanoate (plus HCl).

2. **Nucleophilic acyl substitution typically involves:**

   Answer: Tetrahedral intermediate then leaving-group loss

   Reasoning: Addition to C=O is followed by collapse of a tetrahedral intermediate.

3. **Which is usually more reactive toward acyl substitution?**

   Answer: Acetyl chloride

   Reasoning: Acyl chlorides have a good leaving group and comparatively high electrophilicity.

4. **Ester aminolysis with NH_3 under suitable conditions forms:**

   Answer: An amide

   Reasoning: Substitution of OR with NH_2 yields an amide.

5. **Why are amides relatively unreactive compared with acyl chlorides?**

   Answer: Strong C–N resonance stabilization and poor leaving group

   Reasoning: The N lone pair delocalizes into carbonyl and NR_2 is a poor leaving group.

6. **What bond reforms as tetrahedral acyl intermediate collapses?**

   Answer: C=O

   Reasoning: Oxygen electrons reform the carbonyl π bond while the leaving group departs.

7. **An ester has which acyl substituent?**

   Answer: –OR

   Reasoning: Esters have R–C(=O)–OR′.

8. **Reaction of an acid chloride with excess water generally produces:**

   Answer: Carboxylic acid

   Reasoning: Hydrolysis of acyl chloride yields carboxylic acid and HCl.

9. **What happens after attack on an acyl derivative?**

   Answer: The tetrahedral intermediate collapses, restoring C=O and expelling an appropriate leaving group.

   Reasoning: The tetrahedral intermediate collapses, restoring C=O and expelling an appropriate leaving group.

10. **Which is generally more reactive to substitution, acetyl chloride or acetamide?**

    Answer: Acetyl chloride, which has a better leaving group and less amide-type resonance stabilization.

    Reasoning: Acetyl chloride, which has a better leaving group and less amide-type resonance stabilization.