

Making and reacting esters and acyl chlorides

Chemistry grades 11-12 (A Level · IB · Class 11-12) · Test

Name: _____ Date: _____ Class: _____ Mark: ____ / 20

This 45 minute test is worth 20 points. It covers naming esters, esterification equilibrium, hydrolysis, acyl chlorides and a mechanism. Write balanced equations, use the reversible arrow where it applies and show each step of a calculation.

Level: Chemistry grades 11-12 (A Level · IB · Class 11-12) · **Curriculum:** A Level 3.3.9

Time: 45 minutes · 8 questions · Total: 20 marks · Calculator allowed

Question 1 Naming an ester (2 marks)

The ester $\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_3$ is heated with aqueous acid.

- Name the ester. (1 mark)
- Name the two organic products. (1 mark)

Question 2 Esterification (2 marks)

Ethanoic acid reacts with propan-1-ol.

- Write the equation using $\rightleftharpoons$. (1 mark)
- Name the catalyst. (1 mark)

Question 3 Alkaline hydrolysis (2 marks)

Methyl ethanoate is heated under reflux with aqueous sodium hydroxide.

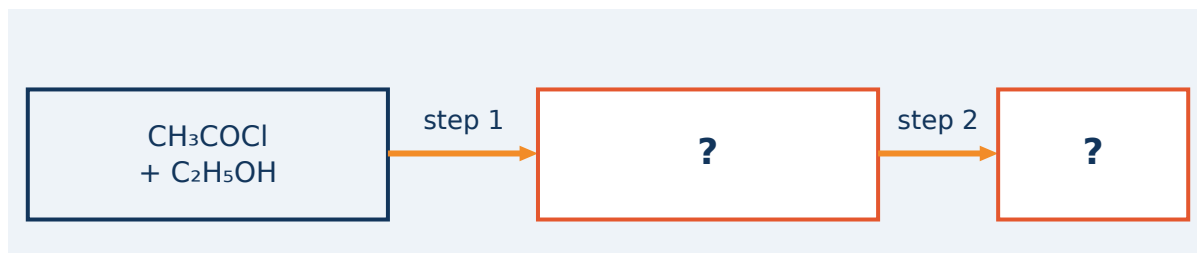
- Write the equation. (1 mark)
- Explain why the reaction goes to completion. (1 mark)

Question 4 Making an acyl chloride (2 marks)

- Name a reagent that converts ethanoic acid to ethanoyl chloride. (1 mark)
- State the two other products. (1 mark)

Question 5 Addition-elimination (3 marks)

Ethanoyl chloride reacts with ethanol.



Mechanism for the question: name the intermediate and give the products.

- Name the mechanism. (1 mark)
- Describe the intermediate. (1 mark)
- Give the formulae of the products. (1 mark)

Question 6 Equilibrium amounts (3 marks)

0.800 mol of ethanoic acid and 0.800 mol of ethanol are heated with a catalyst until equilibrium is reached ($K_c = 4.0$).

- Write the expression for K_c . (1 mark)
- Calculate the amount of ester at equilibrium. (2 marks)

Question 7 Identify an ester (3 marks)

An ester of formula $C_5H_{10}O_2$ is hydrolysed. Acid A has $M = 60.0$ and effervesces with sodium carbonate. Alcohol B, on oxidation, gives a product that forms an orange precipitate with 2,4-DNPH but gives no silver mirror.

- Identify A and B. (2 marks)
- Name the ester. (1 mark)

Question 8 Reactivity of acyl chlorides (3 marks)

- Explain why ethanoyl chloride reacts faster with ethanol than ethanoic acid does. (2 marks)
- State one practical advantage and one disadvantage of using the acyl chloride. (1 mark)