

11.7 Carboxylic acids

Name: _____ Class: _____ Date: _____

Total: 7 marks

KEY WORDS ester 酯 • carboxylic acids 羧酸 • ethanoic acid 乙酸 • oxidation 氧化 • salt 盐

Objective

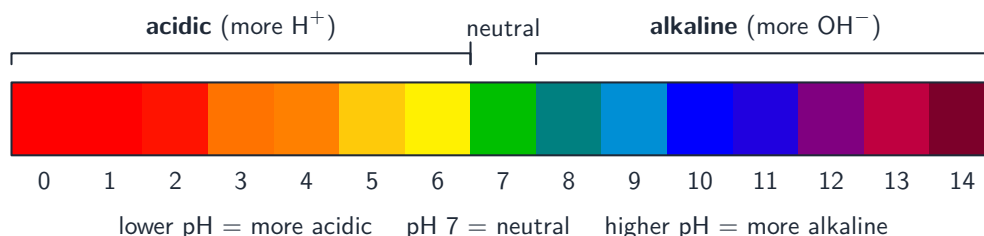
Build the skills to answer exam questions on **carboxylic acids** 羧酸 — the -COOH group, the reactions of **ethanoic acid** 乙酸, making it by **oxidation** 氧化 of ethanol, and **esters** 酯.

You must be able to:

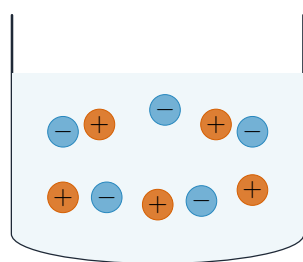
- give the reactions of carboxylic acids (with metals, bases, carbonates)
- describe making ethanoic acid by oxidising ethanol
- describe the formation of an ester

1 Worked examples

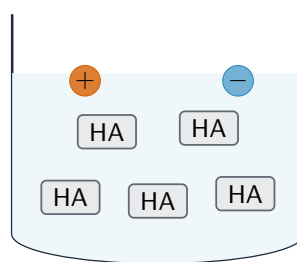
■ Reactions of ethanoic acid



Carboxylic acids contain -COOH and behave as (weak) acids



strong acid
fully split into ions (e.g. HCl)



weak acid
mostly molecules, few
ions (e.g. ethanoic acid)

Carboxylic acids are weak acids

- – metal $\rightarrow$ ethanoate salt + hydrogen.
- – base $\rightarrow$ salt + water; + carbonate $\rightarrow$ salt + water + CO_2 .
- **made by:** oxidising ethanol (acidified KMnO_4 , or bacteria $\rightarrow$ vinegar).
- – alcohol (acid catalyst) $\rightarrow$ an **ester**.

2 Practice

2.1 State the functional group in a carboxylic acid.

[1]

2.2 Name the type of compound formed when a carboxylic acid reacts with an alcohol.[1]

3 Exam-style questions

3.1 Ethanoic acid reacts with a carbonate to give a salt, water and: [1]

- **A** hydrogen
 - **B** oxygen
 - **C** carbon dioxide
 - **D** chlorine
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3.2 Ethanoic acid can be made by oxidising ethanol.

(a) Name a reagent that oxidises ethanol to ethanoic acid. [1]

(b) Name the everyday product made when ethanol is oxidised by bacteria. [1]

3.3 Magnesium reacts with ethanoic acid. Name the two products. [2]

Solutions

2.1 -COOH (the carboxyl group).

2.2 an ester.

3.1 C. Acid + carbonate $\rightarrow$ salt + water + carbon dioxide.

3.2 (a) acidified potassium manganate(VII).
(b) vinegar.

3.3 magnesium ethanoate; hydrogen.