



Carboxylic acids: knowledge check

1.1 The image shows a molecular model of a carboxylic acid molecule.

Draw a circle around the carboxylic acid functional group and use the words provided to label the parts of the molecule.

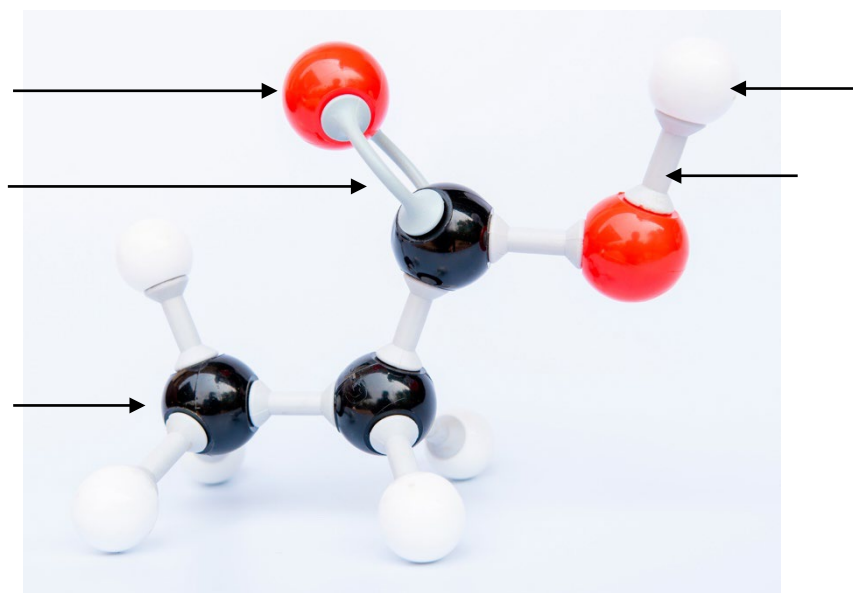
oxygen atom

carbon atom

double covalent bond

single covalent bond

hydrogen atom





- 1.2 The table includes images of molecular models of the first four carboxylic acids. Use some of the names and molecular formulas provided to complete the table.

propanoic acid

methanoic acid

butanoic acid

ethanoic acid

pentanoic acid

 C_3H_7COOH $HCOOH$ CH_3COOH C_4H_9COOH C_2H_5COOH

Molecular model	Name	Molecular formula



1.3 Decide whether each of the following statements is true or false and tick the box.

(a) Carboxylic acid molecules fully ionise in water. True False

(b) Carboxylic acids are strong acids. True False

(c) Solutions of carboxylic acids in water have a pH below 7. True False

(d) The functional group of carboxylic acids is $-\text{COO}$. True False

(e) The general formula for carboxylic acids is $\text{C}_n\text{H}_{2n+1}\text{COOH}$. True False

Use the space provided to write out the correct version of any statements you think are false.

**1.4** Carboxylic acids have typical acid properties.

Use some of the terms provided to complete the sentences describing the typical chemical reactions of carboxylic acids. The terms may be used once, more than once or not at all.

hydrogen fully a salt higher
water carbon dioxide oxygen
partially lower a base

Hydrochloric acid is a strong acid and _____ ionises in water.

Ethanoic acid is a weak acid and _____ ionises in water.

A solution of ethanoic acid has a _____ pH than a solution of hydrochloric acid with the same concentration.

Carboxylic acids react with:

- metals to form _____ and _____ gas
- bases to form _____ and _____
- carbonates to form _____,
_____ and _____ gas.



Acids and bases: test myself

2.1 Which **two** molecular formulas represent carboxylic acids? Circle your choices.



2.2 Draw the displayed formula for ethanoic acid.

Hint: Remember to check the number of carbon atoms and functional group.

2.3 What type of ions are produced by all carboxylic acids when they ionise?

Hint: These ions are responsible for acidic properties.

2.4 Complete the word equations representing the reactions of ethanoic acid.

*Hint: Remember how salts are named and think about the typical reactions of acids from **question 1.4**.*

(a) ethanoic acid + _____ → magnesium ethanoate + _____

(b) ethanoic acid + magnesium oxide → _____ + _____

(c) ethanoic acid + magnesium _____ → _____ +
_____ + carbon dioxide

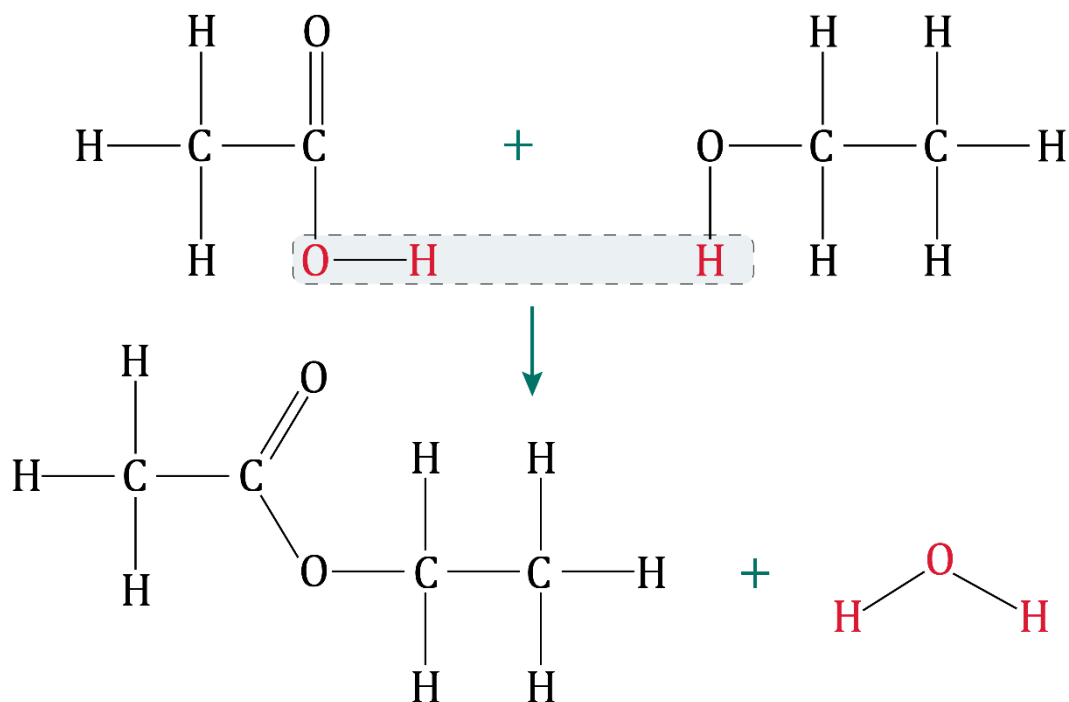
2.5 Complete the general equation for the reaction between a carboxylic acid and an alcohol.

carboxylic acid + alcohol → _____ + _____



2.6 Esters are a homologous series. What is their functional group?

2.7 The image shows the reaction between ethanoic acid and ethanol to form an ester:

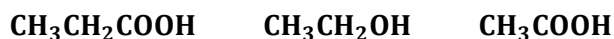


Name the ester formed.

Hint: Remember, the name of the ester is influenced by the carboxylic acid and alcohol used.

2.8 Ethanol, $\text{CH}_3\text{CH}_2\text{OH}$, reacts with an oxidising agent to produce ethanoic acid and a second product.

Use some of the numbers and formulas provided to complete the balanced symbol equation representing this reaction.

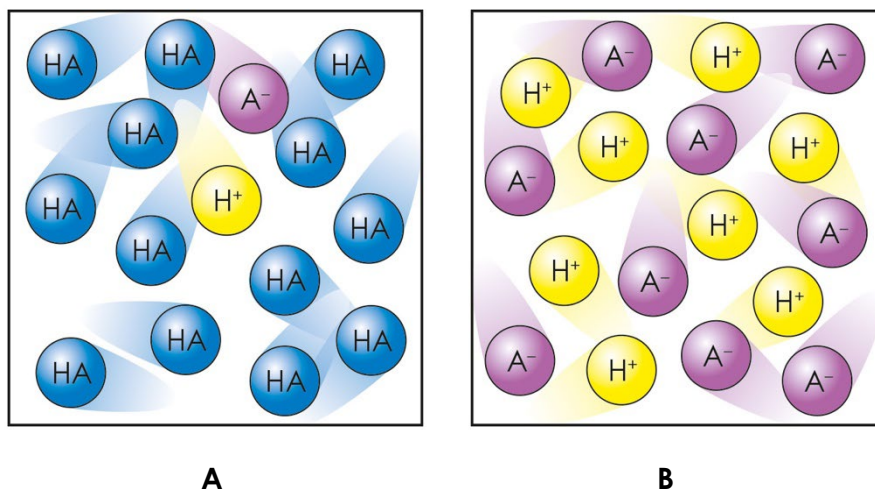




Carboxylic acids: feeling confident?

3.1 Diagrams **A** and **B** represent two different acids.

The formula HA is used to represent the acid molecule in diagram **A**.



(a) What does the H⁺ in each diagram represent?

(b) Which diagram represents the acid that would react the fastest with magnesium ribbon?

(c) Which diagram represents ethanoic acid and which represents hydrochloric acid?

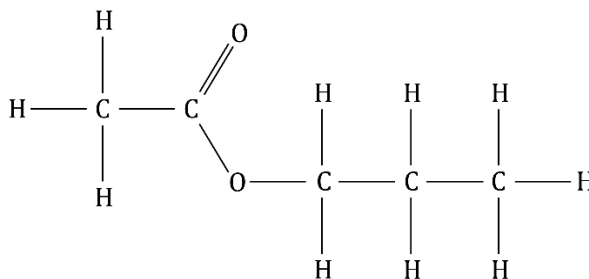


- (d) Explain how you worked out your answer to **question (c)**.
Hint: Think about the amount of ionisation and how this is linked to the strength of the acid.

3.2 The diagram shows the displayed formula of an ester.

Use this image to answer the questions.

Hint: The name of the alcohol always comes first and ends in '-yl'. The name of the acid comes last and ends in '-oate'.



- (a) Name the carboxylic acid used to make this ester.

- (b) Name the alcohol used to form this ester.

- (c) Name the ester shown.



Carboxylic acids: what do I understand?

Think about your answers and confidence level for each mini-topic. Decide whether you understand it well, are unsure or need more help. Tick the appropriate column.

Mini-topic	I understand this well	I think I understand this	I need more help
I can identify the functional group and general formula of carboxylic acids.			
I can write the molecular formulae and draw the displayed formulae of the first four carboxylic acids.			
I know that carboxylic acids are weak acids.			
I can describe the reactions of carboxylic acids with metals, bases and carbonates.			
I can describe the reactions of carboxylic acids with alcohols to produce esters and identify the functional group of an ester.			
I can name an ester and identify the displayed formula of ethyl ethanoate.			
I can write an equation for the reaction between ethanol and an oxidising agent			
Feeling confident? topics	I understand this well	I think I understand this	I need more help
I can describe the difference between strong and weak acids.			
I can name esters.			