Taking it Further: Esters

Answer the questions below.

1. Name the functional group found in carboxylic acids.
   Carboxyl group
2. State the chemical formula of methanoic acid.
   COOH
3. Name the homologous series that contain a C=C double bond.
   Alkenes
4. Name the alcohol that contains two carbon atoms.
   Ethanol
5. Give a use of ethanol.
   In alcoholic drinks, as a fuel or a solvent

Do Now

Taking it Further: Esters

Do Now:

1. Name the functional group found in carboxylic acids.
2. State the chemical formula of methanoic acid.
3. Name the homologous series that contain a C=C double bond.
4. Name the alcohol that contains two carbon atoms.
5. Give a use of ethanol.

Drill:

1. Draw the structural formula of ethene.
2. Draw the structural formula of ethanol.
3. Draw the structural formula of ethanoic acid.

Do Now

Taking it Further: Esters

Read Now:

If you look on the ingredients lists on many scented cleaning products or fragrances, you may see compounds with names like methyl butanoate. Esters are organic compounds that usually have fruity smells and can be used as solvents, making them useful in scented products. Esters are formed through the chemical reaction between alcohols and carboxylic acids. In any chemical reaction, the properties of the new substance or compound formed is different to the substances or compounds it is formed from. We can use the names of the alcohols and the carboxylic acids that react to determine the name of the ester and the number of carbon atoms that would be found in a molecule.

1. Explain why esters are useful in scented products.
2. Describe how an ester is formed.
3. Compare the properties of the product of a chemical reaction with the properties of the reactants.
4. Describe how we can determine the name of an ester.

Do Now

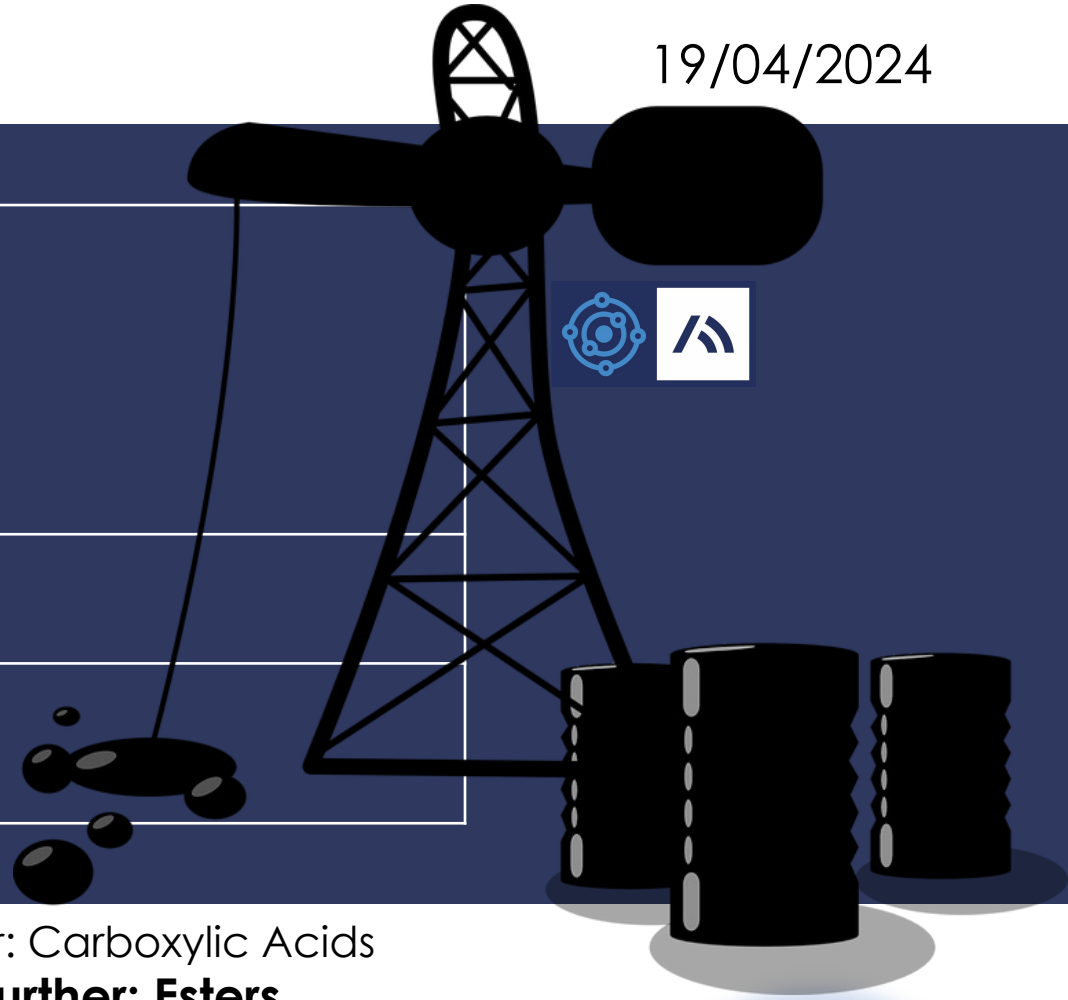
ArkCurriculum+

19/04/2024

Taking it Further: Esters

C5.1.11

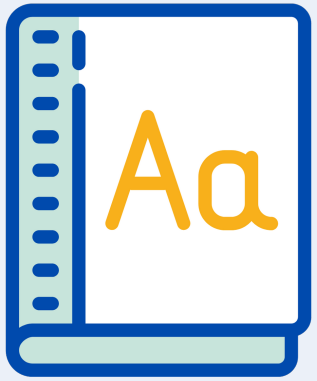
Science
Mastery



Following this lesson, students will be able to:

- Describe how esters are formed
- State the general equation for the formation of esters
- Describe uses of esters

Key Words:



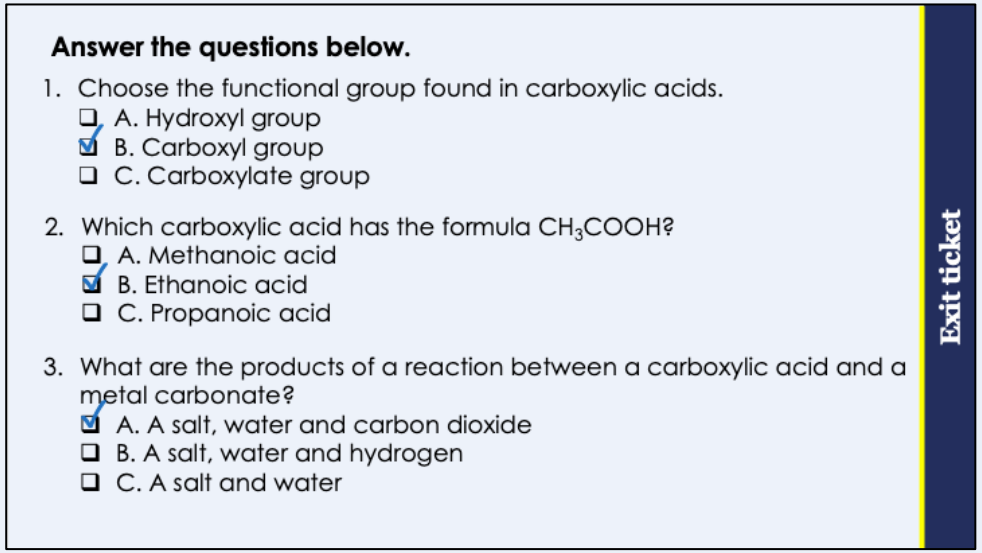
carboxylic acid	alcohol	ester
solvent	ethyl ethanoate	

Lesson Objectives

This is the fix-it portion of the lesson

The **fix-it** is an opportunity to respond to gaps in knowledge, especially those identified by the **pre-unit quiz**.

- The teacher should customise this slide as needed, to facilitate
  - **reteach**, **explanation, demonstration** or **modelling** of ideas and concepts that students have not yet grasped or have misunderstood.
  - **practise** answering specific questions or of key skills.
  - **redrafting** or **improving** previous work.



Answer the questions below.

1. Choose the functional group found in carboxylic acids.
   - ☐ A. Hydroxyl group
   - ☑ B. Carboxyl group
   - ☐ C. Carboxylate group

2. Which carboxylic acid has the formula CH_3COOH?
   - ☐ A. Methanoic acid
   - ☑ B. Ethanoic acid
   - ☐ C. Propanoic acid

3. What are the products of a reaction between a carboxylic acid and a metal carbonate?
   - ☑ A. A salt, water and carbon dioxide
   - ☐ B. A salt, water and hydrogen
   - ☐ C. A salt and water

Exit ticket

Fix-it

Esters

Carboxylic acids can react with **alcohols** to form **esters**.

Esters have **fruity smells** and can be used as **solvents**.

The general equation for the formation of esters is:

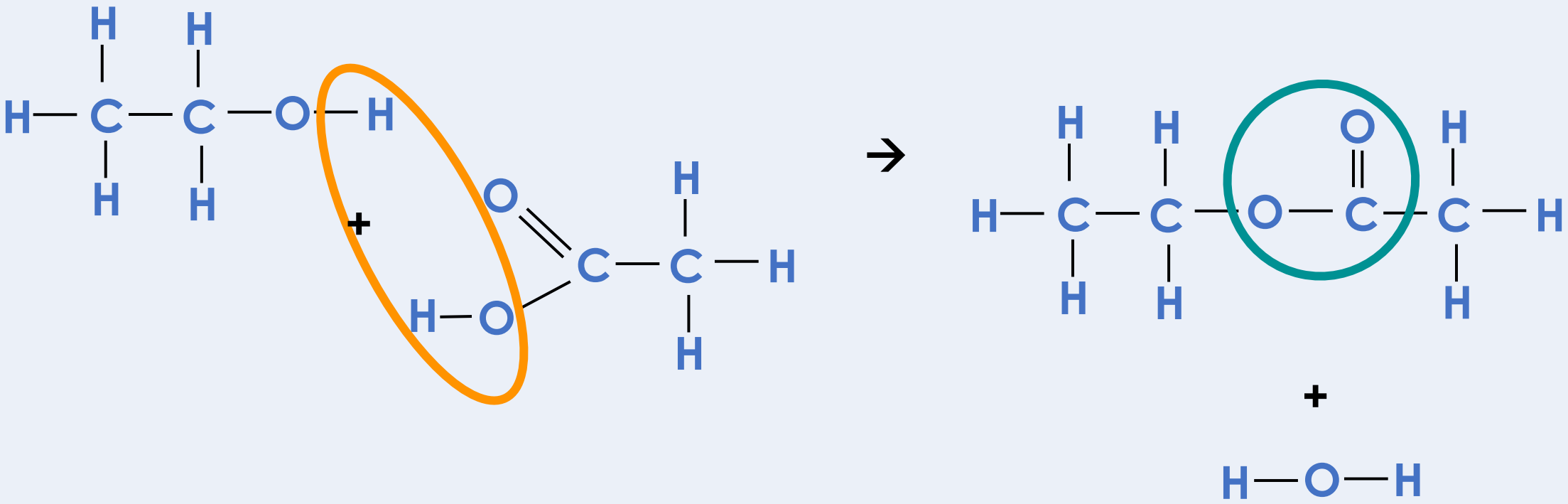
Alcohol + carboxylic acid → ester + water

For example:

Ethanol + ethanoic acid → ethyl ethanoate + water

Formation of Esters

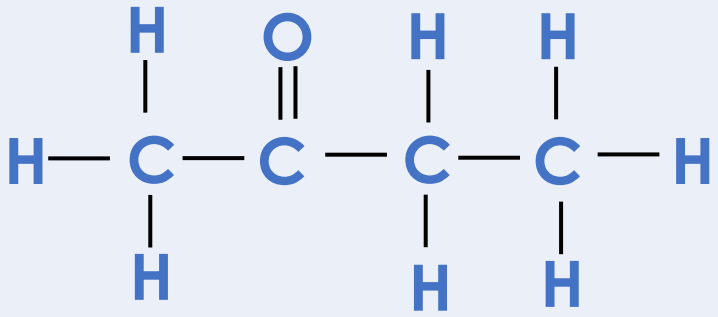
Ethanol + ethanoic acid → ethyl ethanoate + water



Talk Task

Which is the correct displayed formula of ethyl ethanoate?

A



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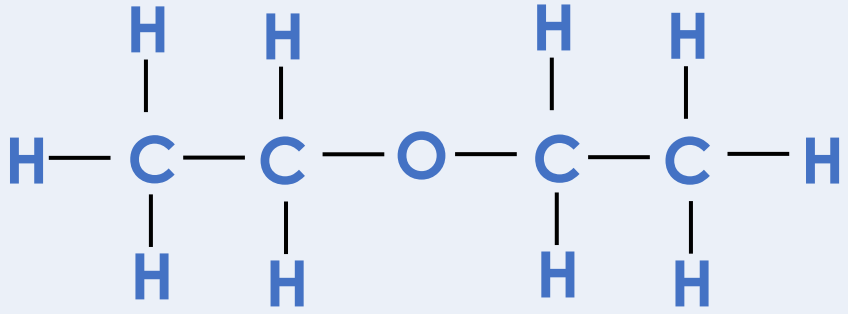

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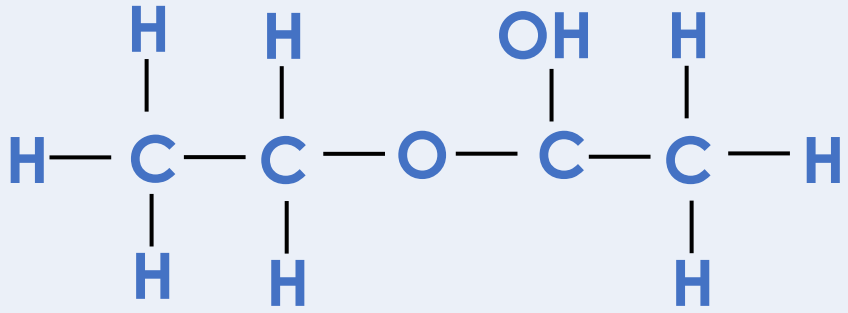
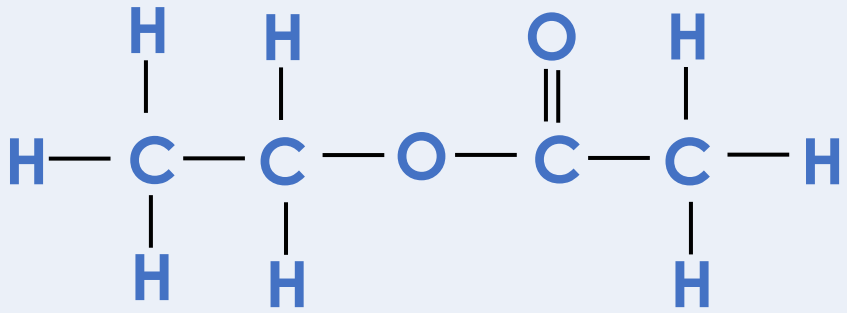


D



How many carbon atoms are present in each of these esters?

Stretch: what reactants were used to make these esters?

1. Methyl butanoate
   1 4
   5 carbons total
   Methanol + butanoic acid

2. Propyl ethanoate
   3 2
   5 carbons total
   Propanol + ethanoic acid

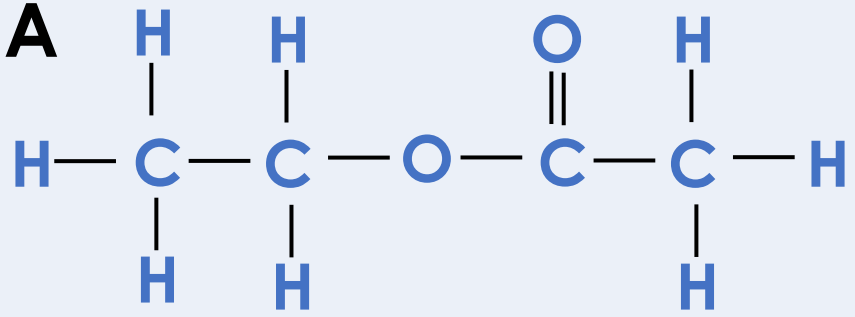
3. Ethyl methanoate
   2 1
   2 carbons total
   Ethanol + methanoic acid

4. Butyl propanoate
   4 3
   7 carbons total
   Butanol + propanoic acid

Talk Task

Name each compound and the homologous series it belongs to

A



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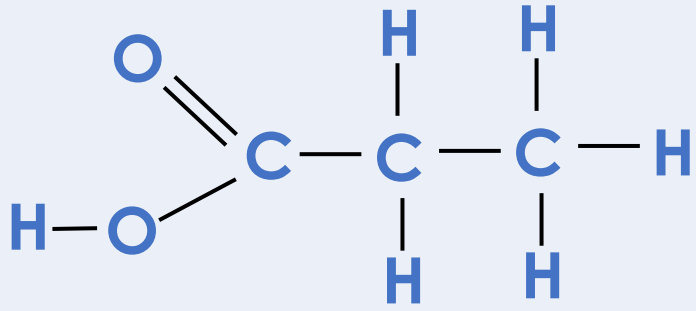

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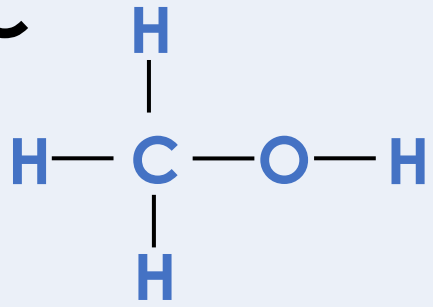
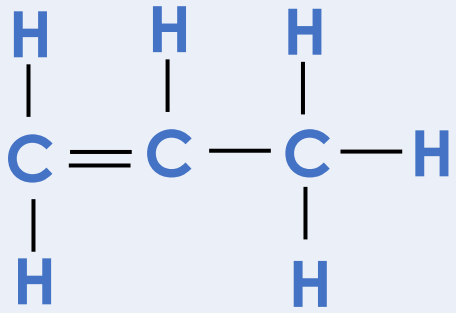
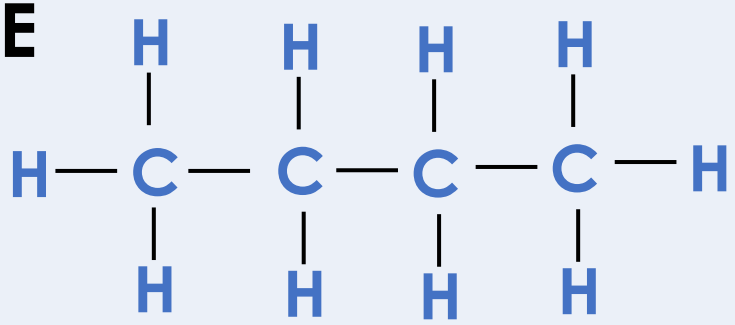


D



E



Check for understanding

Drill

1. State the function group found in esters.
2. Give a use of esters.
3. Name the type of reactants needed to form an ester.
4. Explain why the formation of an ester is a condensation reaction.
5. State the general equation for the formation of an ester.
6. Name the ester made from ethanol and ethanoic acid.

Check for understanding

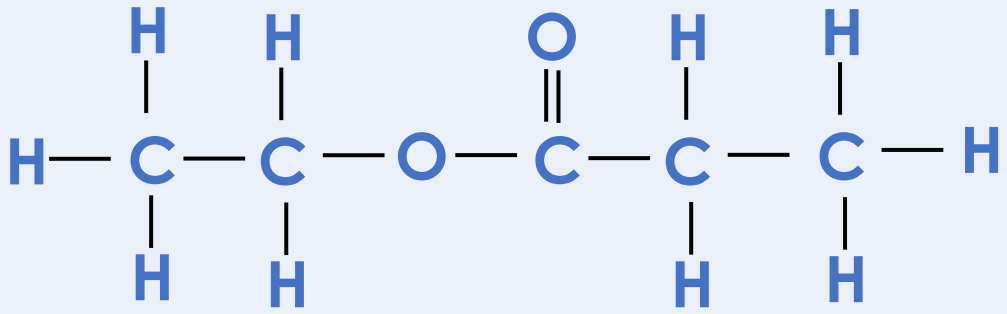
Drill answers

1. COO
2. In scented products or as a solvent
3. An alcohol and a carboxylic acid
4. It produces water
5. Alcohol + carboxylic acid → ester + water
6. Ethyl ethanoate

Check for understanding

I: Reactions of organic compounds

The displayed formula below shows an organic compound.



Stretch: suggest the name of this compound.

Ethyl propanoate

Identify the homologous series this compound belongs to.

Esters

Identify the functional group of this compound.

COO

Name the two types of organic compound that would have been used to make this compound.

Alcohol and carboxylic acid

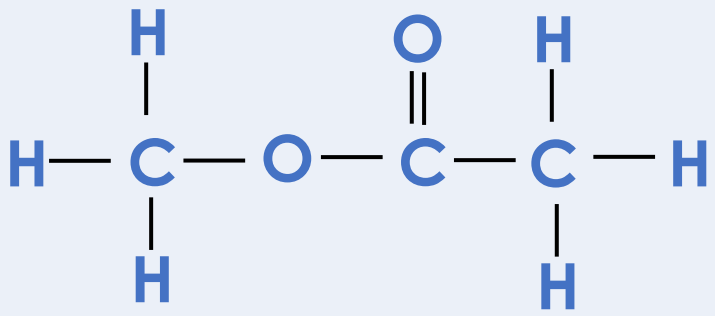
Stretch: suggest the names of the reactants used to make this compound.

Ethanol and propanoic acid

Apply

We: Reactions of organic compounds

The displayed formula below shows an organic compound.



Stretch: suggest the name of this compound.

Methyl ethanoate

Identify the homologous series this compound belongs to.

Esters

Identify the functional group of this compound.

COO

Name the two types of organic compound that would have been used to make this compound.

Alcohol and carboxylic acid

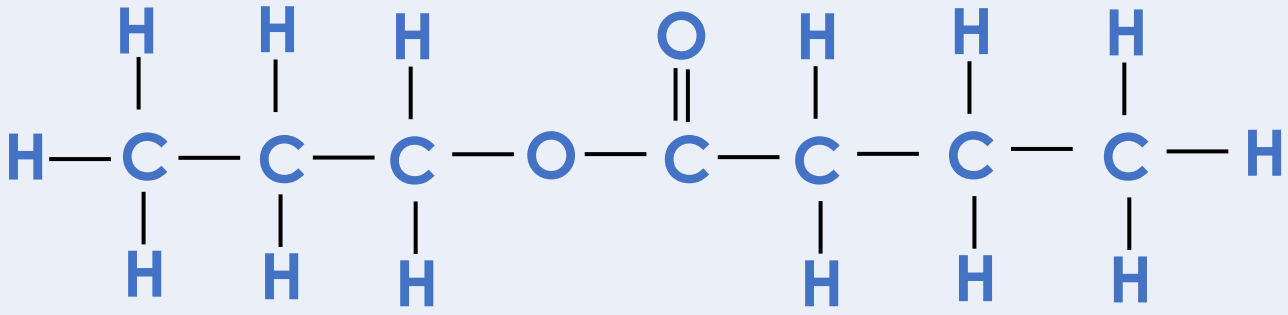
Stretch: suggest the names of the reactants used to make this compound.

Methanol and ethanoic acid

Apply

You: Reactions of organic compounds

The displayed formula below shows an organic compound.



Stretch: suggest the name of this compound.

Propyl butanoate

Identify the homologous series this compound belongs to.

Esters

Identify the functional group of this compound.

COO

Name the two types of organic compound that would have been used to make this compound.

Alcohol and carboxylic acid

Stretch: suggest the names of the reactants used to make this compound.

Propanol and butanoic acid

Apply

Answer the questions below.

1. What are the reactants needed to make an ester?
   - ❑ A. An alcohol and an alkene
   - ❑ B. A carboxylic acid and an alkene
   - ☑ C. An alcohol and a carboxylic acid

2. What is the name of the ester formed from ethanol and ethanoic acid?
   - ❑ A. Ethanol ethanoate
   - ☑ B. Ethyl ethanoate
   - ❑ C. Ethyl ethanoic

3. What is a use of esters?
   - ❑ A. As a fuel
   - ❑ B. In alcoholic drinks
   - ☑ C. In scented products

Exit ticket

Feedback

Lesson C5.1.11	
What was good about this lesson?	What can we do to improve this lesson?

Send us your feedback by clicking this link
or by emailing sciencemastery@arkonline.org
Thank you!