

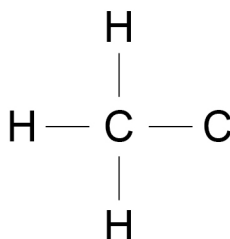
1.1

Figure 2 shows part of the displayed formula for ethanol.

Complete **Figure 2**.

[1 mark]

Figure 2



1.2

Name the gas produced when sodium is added to ethanol.

[1 mark]

1.3

Methanol is used to produce methanoic acid.

What type of substance reacts with methanol to produce methanoic acid?

[1 mark]

[This question is about polymers.

[2.1 Polyesters are produced when monomers join together and lose a small molecule.

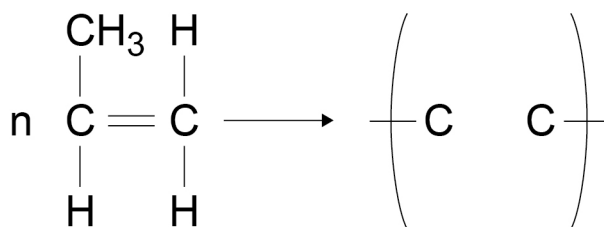
Name the small molecule lost.

[1 mark]

[2.2 Poly(propene) is produced from propene.

Complete the structure of poly(propene) in the equation.

[3 marks]



3.1

Figure 6 shows the displayed structural formula of poly(styrene).

Figure 6

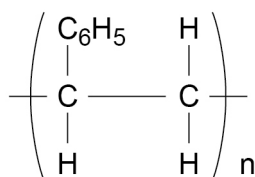
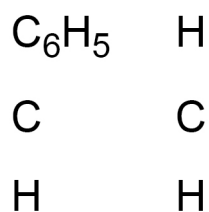


Figure 7 shows an incomplete displayed structural formula of the monomer styrene.

Complete **Figure 7**.

[2 marks]

Figure 7



The outer skin of surfboards contains a polyester.

Two monomers, **A** and **B**, are needed to make the polyester.

Figure 8 shows how these two monomers are represented.

Figure 8



Monomer **A**



Monomer **B**

[3.2

Name the functional group in monomer **B**.

[1 mark]

[3.3

Monomers **A** and **B** join together to produce a polyester and a small molecule.

Name the small molecule.

[1 mark]

This question is about hydrocarbons.

Hexane and hexene are hydrocarbons containing six carbon atoms in each molecule.

Hexane is an alkane and hexene is an alkene.

4.1

Draw **one** line from each hydrocarbon to the formula of that hydrocarbon.

[2 marks]

Hydrocarbon	Formula
	C₆H₈
Hexane	C₆H₁₀
	C₆H₁₂
Hexene	C₆H₁₄
	C₆H₁₆

4.2

Bromine water is added to hexane and to hexene.

What would be observed when bromine water is added to hexane and to hexene?

[2 marks]

Hexane _____

Hexene _____

This question is about carboxylic acids.

Carboxylic acids belong to a homologous series.

Table 3 shows information about the first three carboxylic acids in this homologous series.

Table 3

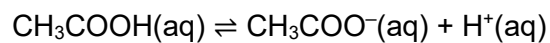
Name	Formula	pH of a 0.01 mol/dm ³ solution
Methanoic acid		2.91
Ethanoic acid	CH ₃ COOH	3.39
	CH ₃ CH ₂ COOH	3.44

Complete **Table 3**.

[2 marks]

Ethanoic acid ionises in water.

The equation for the reaction is:



Explain how the equation shows that ethanoic acid is a weak acid.

[2 marks]

[5.3

A student adds a solution of ethanoic acid to zinc carbonate in an open flask on a balance.

Explain what happens to the mass of the flask and its contents during the reaction.

[3 marks]

Ethanoic acid reacts with ethanol to produce an ester.

[5.4

Give the name of the ester produced when ethanoic acid reacts with ethanol.

[1 mark]

[5.5

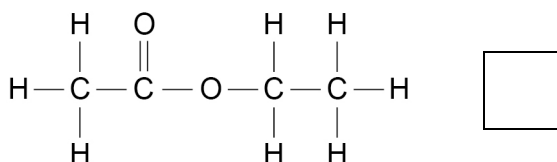
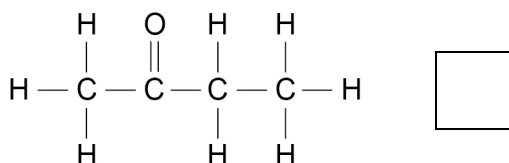
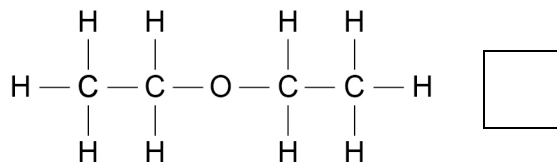
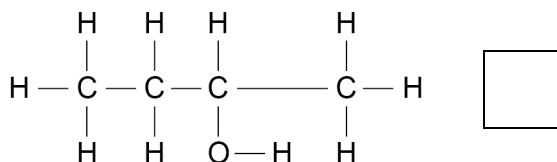
Hexanedioic acid and ethanediol join together to produce a polyester.

Ethanoic acid and ethanol join together in the same way to produce an ester.

Which is the displayed structural formula of the ester produced when ethanoic acid reacts with ethanol?

[1 mark]

Tick (✓) **one** box.



[6.1

Glucose is produced when algae photosynthesise.

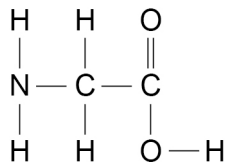
Name **two** naturally occurring polymers produced from glucose.

[2 marks]

_____ and _____

Figure 6 shows the displayed structural formula of an amino acid called glycine.

Figure 6



[6.2

How many functional groups are there in the molecule in **Figure 6**?

[1 mark]

Tick (✓) **one** box.

1

☐

2

☐

3

☐

4

☐

[6.3

Glycine reacts by condensation polymerisation to produce a polypeptide and one other substance.

Name the other substance produced.

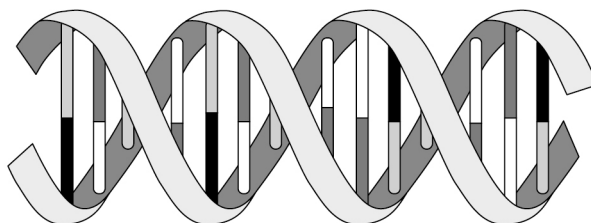
[1 mark]

[6.4

The development and function of algae are controlled by a naturally occurring polymer.

Figure 7 represents the shape and structure of this polymer.

Figure 7



Describe the shape and structure of this polymer.

[3 marks]

This question is about poly(ethene) and polyesters.

7.1 Poly(ethene) is produced from ethene.

Figure 3 shows part of the displayed structural formula equation for the reaction.

Complete **Figure 3**.

[2 marks]

Figure 3

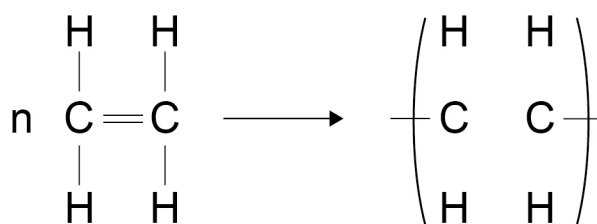
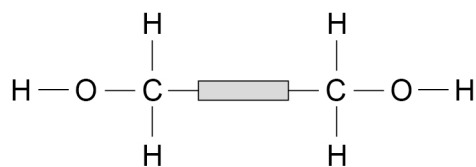


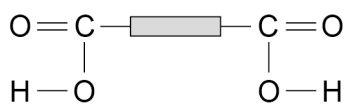
Figure 5 shows three monomers, **A**, **B** and **C**.

Monomer **A** can react with monomer **B** and with monomer **C** to produce polyesters.

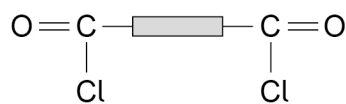
Figure 5



Monomer **A**



Monomer **B**



Monomer **C**

7.2

Draw a circle on **Figure 5** around an alcohol functional group.

[1 mark]

[This question is about cycloalkenes.

Cycloalkenes are ring-shaped hydrocarbon molecules containing a double carbon-carbon bond.

Cycloalkenes react in a similar way to alkenes.

[8.1 Describe a test for the double carbon-carbon bond in cycloalkene molecules.

Give the result of the test.

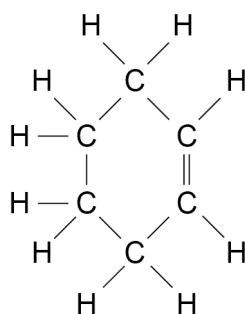
[2 marks]

Test _____

Result _____

Figure 6 shows the displayed structural formula of cyclohexene, C_6H_{10}

Figure 6



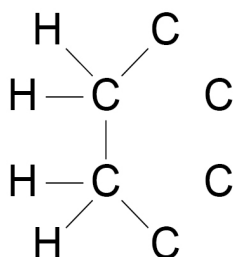
Chlorine reacts with cyclohexene to produce a compound with the formula $C_6H_{10}Cl_2$

8.2

Complete **Figure 7** to show the displayed structural formula of $C_6H_{10}Cl_2$

[2 marks]

Figure 7



Ethanol and butanol can be used as fuels for cars.

[9.1

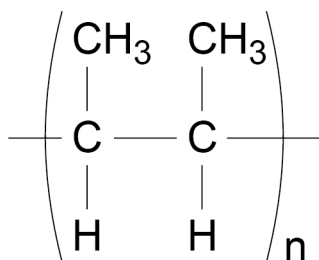
When butanol is burned in a car engine, complete combustion takes place.

Write a balanced equation for the complete combustion of butanol.

You do **not** need to include state symbols.

[2 marks]

- 10.1 The addition polymer poly(butene) has the displayed structural formula:

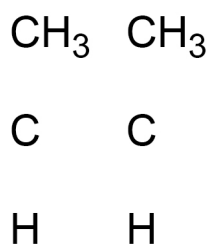


Poly(butene) is produced from the monomer butene.

Complete **Figure 2** to show the displayed structural formula of butene.

[2 marks]

Figure 2



11.1

Hydrocarbon molecules containing seven and eight carbon atoms can be produced when heavy fuel oil is processed.

Which pair of hydrocarbon molecules would **both** turn bromine water colourless?

[1 mark]

Tick (✓) **one** box.

C_7H_{14} and C_8H_{16}

☐

C_7H_{14} and C_8H_{18}

☐

C_7H_{16} and C_8H_{16}

☐

C_7H_{16} and C_8H_{18}

☐

[This question is about acids and alkalis.

[12.1 Ethanoic acid is a weak acid.

What is meant by 'weak acid'?

Answer in terms of ionisation.

[1 mark]

Ethanoic acid can be produced from ethanol.

[13.1 What is reacted with ethanol to produce ethanoic acid?

[1 mark]

Tick (✓) **one** box.

A halogen

☐

An alkali metal

☐

An oxidising agent

☐

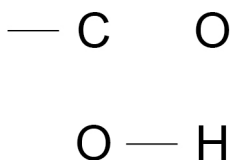
Water

☐

[13.2 Ethanoic acid contains the functional group -COOH

Complete the displayed structural formula of this functional group.

[1 mark]



13.3 Ethanoic acid reacts with different compounds.

Draw **one** line from each compound to a product of the reaction of the compound with ethanoic acid.

[2 marks]

Compound

**Product of the reaction
with ethanoic acid**

Ethanol

Sodium carbonate

Carbon dioxide

Ethene

Ethyl ethanoate

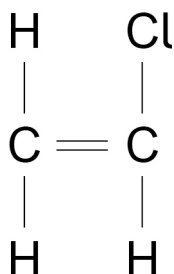
Hydrogen

Poly(ethene)

This question is about polymers.

Chloroethene can be used to produce an addition polymer called poly(chloroethene).

The displayed structural formula of chloroethene is



14.1

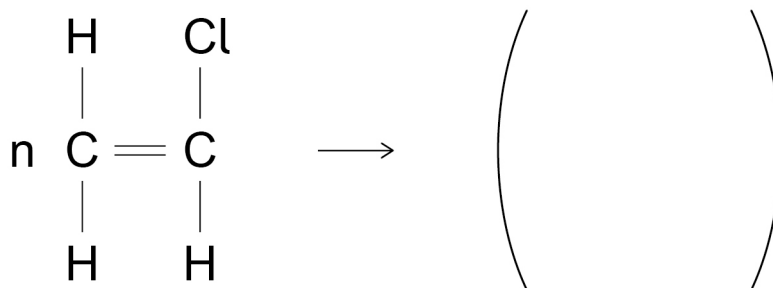
Draw a circle around the functional group on the displayed structural formula that allows chloroethene to produce an addition polymer.

[1 mark]

14.2

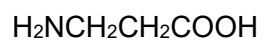
Complete the equation for the production of poly(chloroethene) from chloroethene.

[3 marks]



[14.3

The amino acid beta-alanine has the formula



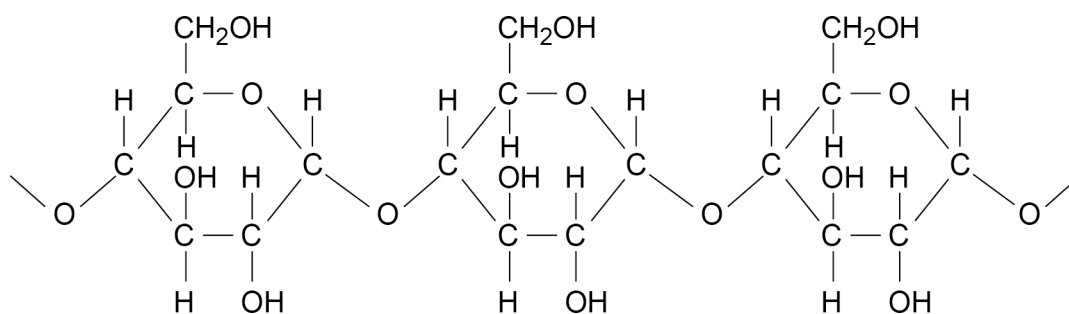
Beta-alanine polymerises to produce a polypeptide and a small molecule.

Name the small molecule produced when beta-alanine polymerises.

[1 mark]

Figure 6 represents part of a naturally occurring polymer molecule produced from glucose.

Figure 6



- [14.4 Draw a circle around the repeating unit in the polymer in **Figure 6**.

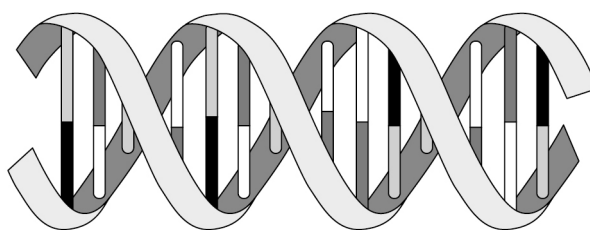
[1 mark]

- [14.5 Suggest the identity of this polymer.

[1 mark]

Figure 7 represents the structure of a naturally occurring polymer.

Figure 7



- [14.6 Give the general name for the four different monomers which make up the structure shown in **Figure 7**.

[1 mark]

- [14.7 Name the **shape** of the structure shown in **Figure 7**.

[1 mark]