Condensation polymerisation: knowledge check

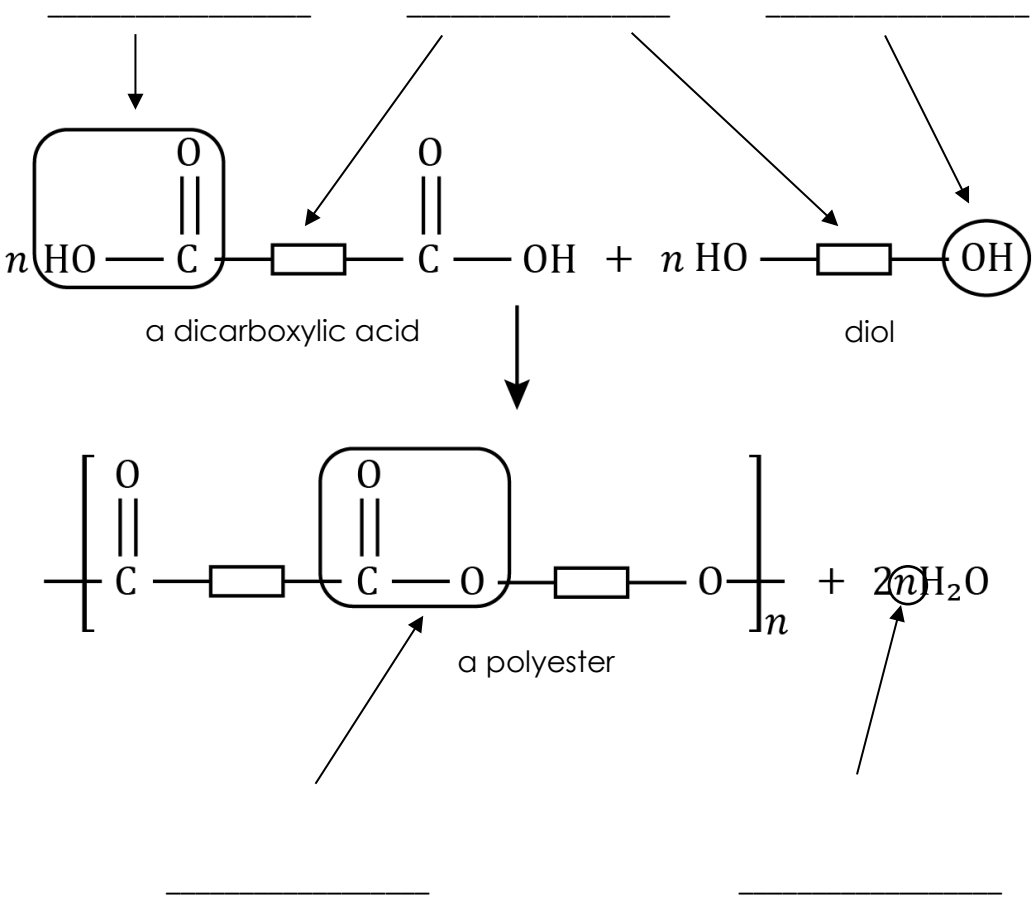
1.1 The diagram shows a dicarboxylic acid reacting with a diol in a condensation polymerisation reaction to produce a polyester and water.

Use some of the words provided to label the parts identified on the diagram. Some words will not be used at all.

carboxylic acid functional group **alcohol functional group**

alkene functional group **ester functional group**

amide functional group **a large number** **the rest of the molecule**



1.2 Addition polymerisation and condensation polymerisation are two different types of polymerisation.

Place ticks in the correct column of the table to indicate whether each statement is describing addition polymerisation, condensation polymerisation or both.

	Addition polymerisation	Condensation polymerisation	Both
The monomers contain carbon-carbon double (covalent) bonds.			
The monomers used are small covalent molecules.			
The monomers only contain one functional group.			
The monomers contain two functional groups.			
Only one product is formed in the polymerisation process.			
Two products are formed in the polymerisation process.			
The polymers formed are large covalent molecules.			

1.3 Select the correct answer from those provided to match each of the descriptions in the table describing condensation polymerisation. Not all of the words provided will need to be used.

polyester **oxygen** **diol** **dicarboxylic acid**

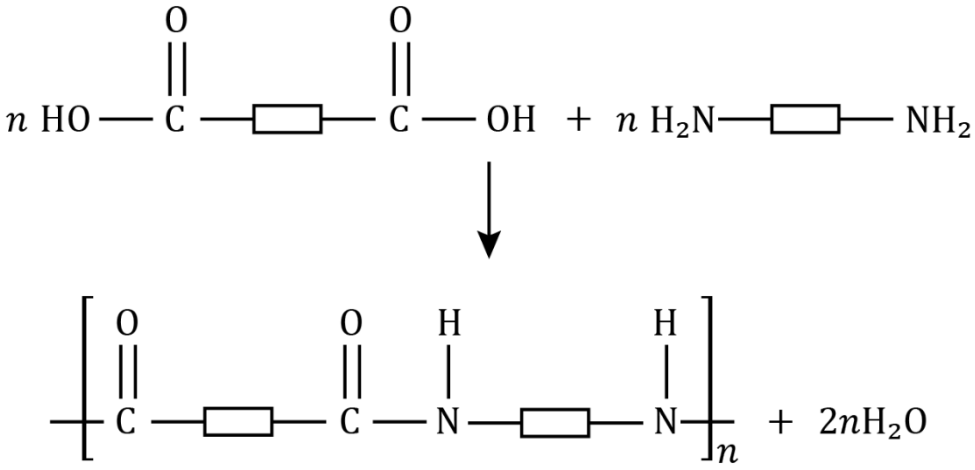
diamine **polyalkene** HOOC–□–COOH

HO–□–OH **water** **ester functional group**

alkene functional group

Description	Answer
Type of polymer produced from $HOOC-CH_2-CH_2-COOH$ and $HO-CH_2-CH_2-OH$.	
The small molecule produced as well as the polymer.	
Type of monomer including two carboxylic acid functional groups.	
Type of monomer including two alcohol groups.	
The short-form representation of $HOOC-CH_2-CH_2-COOH$.	
The short-form representation of $HO-CH_2-CH_2-OH$.	
Link formed between the two monomers.	

1.4 The diagram shows the condensation polymerisation reaction between a dicarboxylic acid and a diamine to produce the polyamide, nylon.



Use some of the words and formulas provided to complete the sentences describing this condensation polymerisation reaction.

NH_2	–CONH–	COOH	C=C	–OH
dicarboxylic acid	**diamine**	**polyamide**	**diol**	

The first monomer is a _____ containing two

_____ functional groups.

The second monomer is a _____ containing two

_____ functional groups.

The polymer formed is a _____, which contains the functional

group _____.

Condensation polymerisation: test myself

2.1 Which statement describing the polymers formed in condensation polymerisation is true? Circle the correct answer.

A Polymers are small covalent molecules.

B Polymers are very long chain-like covalent molecules.

C Polymers are long chain-like ionic structures.

D Polymers are small ionic substances.

2.2 Identify each of the following polymers as addition polymers or condensation polymers. Sort them into the table below.

poly(ethene) **poly(chloroethene)** **polyester**

poly(tetrafluoroethene) **polyamide** **poly(propene)**

Addition polymers	Condensation polymers

2.3 Which of the following monomers could join up to make a condensation polymer? Circle all that apply.
Hint: Think about the functional groups needed.

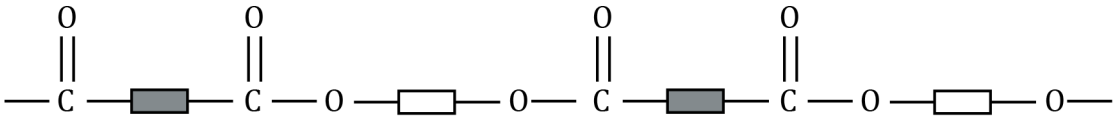
$CH_2 - CH_2 - COOH$ $CH_3CH_2 - OH$ $HO - CH_2 - COOH$

$HO - CH_2 - CH_2 - OH$ $HOOC - CH_2 - COOH$

2.4 What property of monomers makes them suitable to use to make condensation polymers?

2.5 What is the correct definition of a dicarboxylic acid?
Hint: Think about the number and type of functional group(s) present.

2.6 The diagram shows a short section of a condensation polymer. What is the name of this polymer?



Hint: Identify the type of functional group shown.

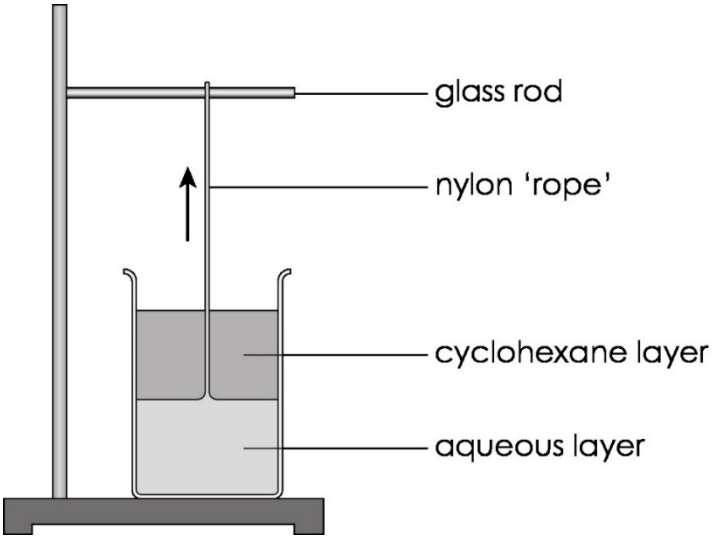
2.7 Polypeptides are examples of condensation polymers. What monomers are used to produce polypeptides?
Hint: Remember that the functional group of polypeptides is –CONH–.

Condensation polymers: feeling confident?

3.1 This apparatus is used to make nylon in the lab.

The instructions for this process are given below but they are in the incorrect order.

Complete the table to put the instructions in the correct order.



A Pour about 10 cm^3 of monomer X solution into a beaker.

B Wind the nylon rope around the glass rod and continue to gently lift it out of the beaker.

C Dissolve monomer X in deionised water.

D Use tweezers to gently lift the layer of nylon that forms at the interface.

E Dissolve monomer Y in cyclohexane.

F Carefully pour about 10 cm^3 of monomer Y solution into the beaker so that it forms a layer on top of the aqueous layer.

Step	Instruction
1	
2	
3	
4	
5	
6	

3.2 The polyamide, Nylon 6,6 is made from the two monomers, $HOOC(CH_2)_4COOH$ and $H_2N(CH_2)_6NH_2$.

Choose the correct formulas to complete the equation representing this reaction. Make sure your equation shows the repeating unit.

$\mathbf{2H_2O}$ $\mathbf{2NH_3}$ $\mathbf{[CO(CH_2)_4CONH(CH_2)_6NH]_n}$

$\mathbf{[COO(CH_2)_4CONH(CH_2)_6NH_2]_n}$ $\mathbf{CO(CH_2)_4CONH(CH_2)_6NH}$

$n HOOC(CH_2)_4COOH + n H_2N(CH_2)_6NH_2 \rightarrow$ _____ + _____

Condensation polymerisation: 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 describe the characteristics of a polymer and an example of condensation polymerisation.			
I can describe the differences between addition polymerisation and condensation polymerisation.			
I can describe the monomers used to make condensation polymers and identify their functional groups.			
I understand the equation for the reaction to produce polyester, using block diagrams.			
I understand the equation for the reaction to produce nylon, using block diagrams.			
Feeling confident? topics	**I understand this well**	**I think I understand this**	**I need more help**
I can describe a process to make nylon in the laboratory.			
I can complete equations representing the reaction to produce nylon.			