

Chapter 11: Polymers

Knowledge organiser

Polymers

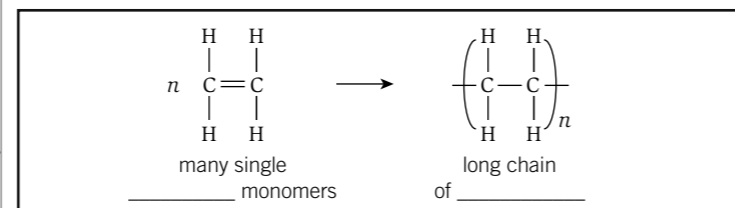
Polymers are very _____ molecules made up of lots of smaller molecules joined together in a _____ pattern. The smaller molecules are called _____. The process of turning many monomers into a polymer is called _____.

There are two main types of polymerisation.

Type of polymerisation	Monomers	Products of polymerisation
_____ polymerisation	molecules with C=C bonds, such as _____	just the polymer
_____ polymerisation	diols, dicarboxylic acids, or diamines	polymer and _____

Addition polymerisation

Addition polymerisation starts with molecules with a _____ (e.g., alkenes) as the monomer. The carbon-carbon double bond breaks in each molecule, and the carbon atoms then link together.



The n refers to _____. The rounded brackets and the bonds sticking out of them represent where the next molecule in the chain goes.

The inside of the brackets is known as the _____ - the section that repeats over and over again many thousands of times in the polymer.

Addition polymers are named after the monomer used to create them.

- An addition polymer made of ethene is called _____.
- An addition polymer made of _____ is called poly(propene).

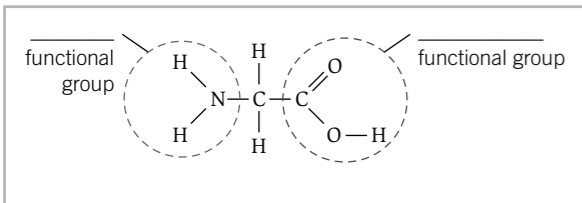
Natural polymers

Amino acids and proteins (HT only)

_____ reactions can also happen with just one monomer molecule, so long as the molecule has _____ different functional groups.

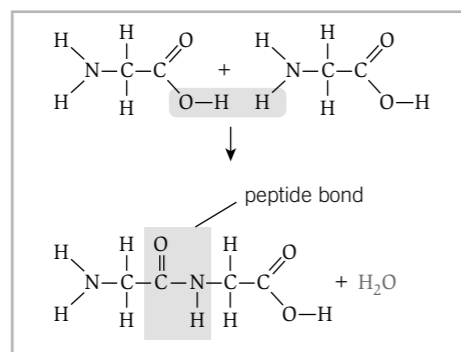
Amino acids have an _____ functional group and a _____ functional group. The amine functional group has a _____ bonded to a carbon and two hydrogens.

_____ is the simplest amino acid.



When many molecules of glycine react together they form a _____.

There are many different types of amino acids. They can react together to form many different polypeptides. When lots of polypeptides come together they form something called a _____.

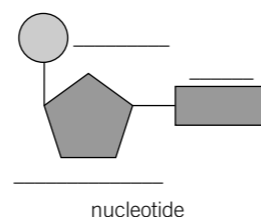


DNA

All genetic information is stored in _____. Genetic information contains the instructions for the functioning and development of _____.

DNA is made of _____.

The polymers are made of four different monomers called _____.



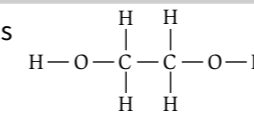
Starch and cellulose

Starch and cellulose are another two **natural polymers**. Both of these are made from _____ molecules joined together. Whether the resulting polymer is starch or cellulose depends on how the glucose molecules form _____ with each other.

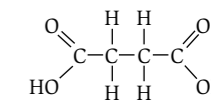
Condensation polymerisation (HT only)

Condensation polymerisation can involve two different monomers, each has *two* functional groups.

Molecule **A** is a _____. It has two _____ groups: one at either end.



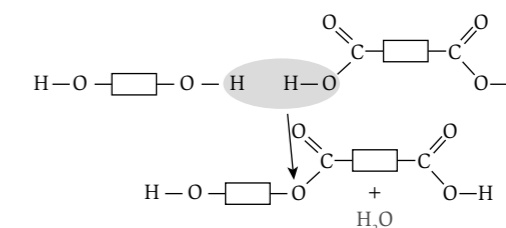
Molecule **B** is a _____. It has a _____ group at either end.



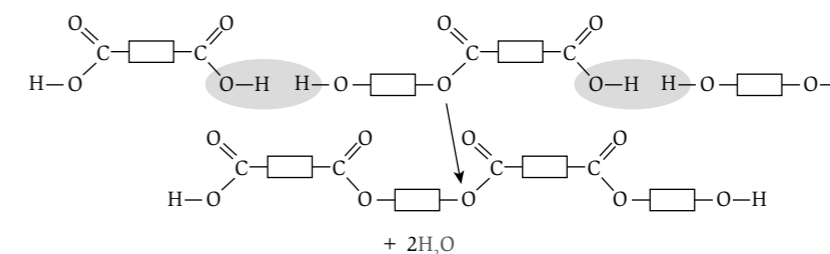
To simplify the diagrams, a rectangle is used to represent $\begin{array}{c} \text{H} \quad \text{H} \\ | \quad | \\ \text{---C---C---} \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$. Draw molecules A and B.



When molecule **A** and molecule **B** react together, the _____ group from the _____ and a hydrogen atom from the -OH group on the _____ join together to form _____.

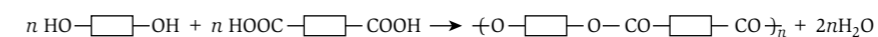


Another molecule _____ and another molecule _____ can now react with either side of the molecule that has been formed.



You could keep adding more molecules in the pattern ABABABABA. Every time a molecule is added, a _____ molecule is produced. This type of reaction is called a _____ reaction.

If you keep adding molecules, a condensation polymer is produced. This is represented by:



When diols (compounds with two -OH groups) and dicarboxylic acids react together, they form _____.

Key terms

Make sure you can write a definition for these key terms.

addition polymerisation amine amino acid condensation polymerisation DNA
monomer natural polymer nucleotide polymer polypeptide protein repeating unit

Chapter 11: Polymers

Retrieval questions

Answer the following questions using the information from the knowledge organiser.

C11 questions

Answers

1 What are monomers?

2 What is a polymer?

3 What is a repeating unit?

4 What is polymerisation?

5 What are the two types of polymerisation?

6 What kind of monomers are involved in addition polymerisation?

7 What kind of monomers are involved in condensation polymerisation?

8 What other products are made in condensation polymerisation?

9 What does n represent in an equation showing polymerisation?

10 What is a natural polymer?

11 Give four examples of natural polymers.

12 What are amino acids?

13 What is a polypeptide?

14 What is a protein?

15 Which monomer makes up starch and cellulose?

16 What is DNA?

17 Which monomers are DNA made of?

18 How is DNA arranged?