

In context

Subject area: Organic chemistry

Level: 14–16 years (Higher)

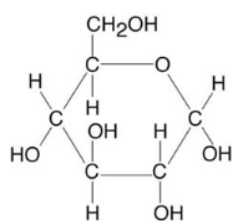
Topic: Natural polymers

Source: rsc.li/3iF4Lvm

1. All of these foods contain starch.

Starch is a polymer.

Below is the molecular structure of a molecule that can make starch.



Molecule 1



Source: Envato Elements

a) What is a polymer?

Answer: A very long chain molecule made of many smaller molecules (monomers) chemically bonded.

b) Name molecule 1 above.

Answer: Glucose.

c) What is the molecular formula of molecule 1?

Answer: C₆H₁₂O₆

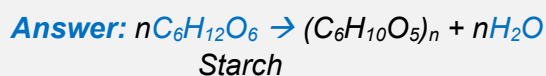
Molecule 1 reacts with many other identical molecules to make starch.
Water is also formed in the process.

d) What is the name given to molecules like molecule 1 that chemically bond together to form a polymer?

Answer: Monomers.

e) In the equation below, n is a whole number.

Complete the equation:

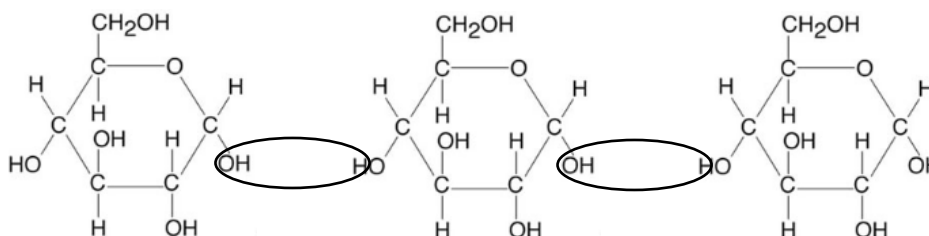


f) What type of polymerisation is taking place when starch is formed?

Give a reason for this name.

Answer: Condensation polymerisation, as a small molecule like water is formed.

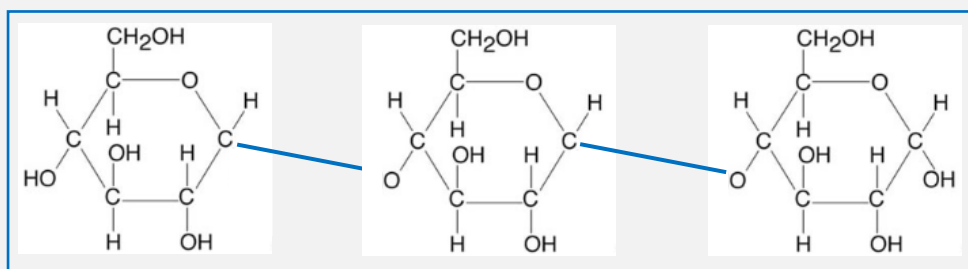
The diagram below shows how three molecule 1s react together:



g) Explain what the rings show in the diagram.

Answer: The OH group from one glucose molecule combines with the H group from another, to form water.

h) Draw a chemical bond between the three molecules to show how they chemically bond, after water has been removed.

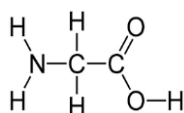


2. This question is about amino acids forming a polymer.

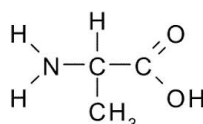
a) What class of polymer is formed from amino acids?

Answer: Proteins.

The molecular structures of two different amino acids are shown below.



Glycine



Alanine

b) Name the functional groups present in each amino acid.

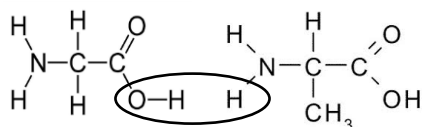
Answer: Amine group and carboxylic acid.

c) Explain why these molecules are placed in the same homologous series.

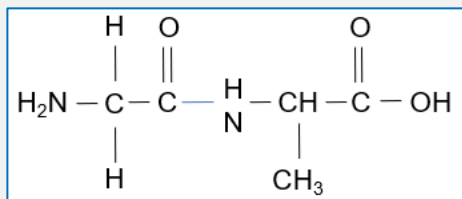
Answer: They have the same functional groups, and differ by a CH₂ unit.

One functional group is acidic and the other is basic.
They react together to form water.

The diagram shows this taking place.



- d) Draw the structure of the molecule formed when glycine and alanine react according to the diagram.



- e) What is the name of the link that bonds together amino acids in this way?

Answer: A peptide link.