1. Which statements about biological molecules are true and which are false?

Tick (✓) **one** box in each row.

Statement	True	False
Breaking one ester bond in a triglyceride produces glycerol and three fatty acids.		
Ribose is a hexose monosaccharide.		
In an alpha glucose molecule, the hydroxyl (OH) group is positioned below carbon 1.		

[2]

2(a). The table lists some biological molecules

Complete the table by putting a tick (✓) in the appropriate box or boxes on each line to show whether the corresponding feature is present.

The first line has been completed for you.

Biological molecule	Is a monomer	Is a polymer	Contains glycosidic bond(s)
Amino acid	✓		
Amylopectin			
Glucose			
Sucrose			

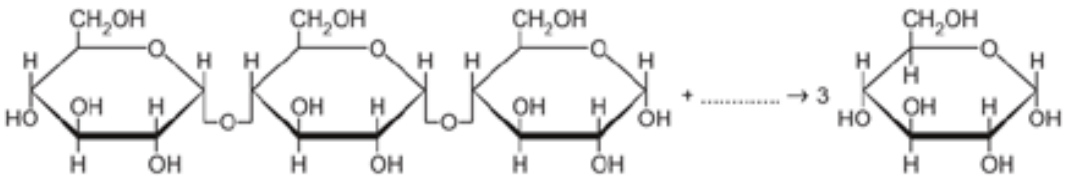
[3]

(b). Describe the bond between the two glucose monomers in maltose.

[2]

(c). Maltotriose is a trisaccharide formed during the breakdown of starch by amylase. It can be broken down further to produce glucose.

i. Complete the equation for the conversion of maltotriose to glucose.



[2]

ii. The enzyme maltase converts maltose to glucose during the final stages of starch digestion in the small intestine.

Suggest why maltotriose can also be converted to glucose by maltase.

_____

_____

[1]

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3. Lactose is a carbohydrate.

Which feature describes the structure of lactose?

A Lactose contains glycosidic bonds that are broken by a condensation reaction
B Lactose is made up of fructose and glucose
C The molecular formula of lactose is $C_{12}H_{22}O_{11}$
D The molecular formula of lactose is $C_{12}H_{24}O_{12}$

Your answer ☐ **[1]**

4. Starch and glycogen are polysaccharides. Starch is present in plant cells, and glycogen is present in animal cells. Glucose is a monosaccharide present in both types of cell.

Outline how the different properties of glucose, starch and glycogen relate to their functions in cells.

[4]

5. Which statement is a correct description of polymers?

A A polymer is broken down by condensation reactions.
B A polymer is formed when two monomers bond together.
C All polymers are classified as either a carbohydrate or a protein.
D Some polymers are composed of several monomers that are similar in structure but **not** identical.

Your answer ☐ **[1]**

6. Which description of the structure of a glucose molecule is correct?

A It contains 5 OH groups and has a C:O ratio of 1:1.
B It contains 6 OH groups and has a C:H ratio of 1:2.
C It contains 6 oxygen atoms and has a C:H ratio of 1:1.
D It contains 12 hydrogen atoms and has a C:O ratio of 1:2.

Your answer ☐ **[1]**

7. Which description of the structure of cellulose is correct?

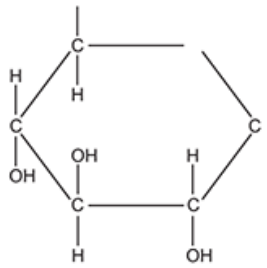
A Alternate α-glucose monomers rotate 180°
B Branched polymer forms from β-glucose monomers
C Hydrogen bonds form between coiled polymer chains
D Straight chains contain 1,4-glycosidic bonds

Your answer ☐ **[1]**

8. The element nitrogen is recycled within ecosystems.

Rhizobium forms nodules on the roots of certain plants. The *Rhizobium* receives a supply of glucose from the plant which the bacterium is able to use.

The diagram below shows an incomplete diagram of the structure of alpha glucose.



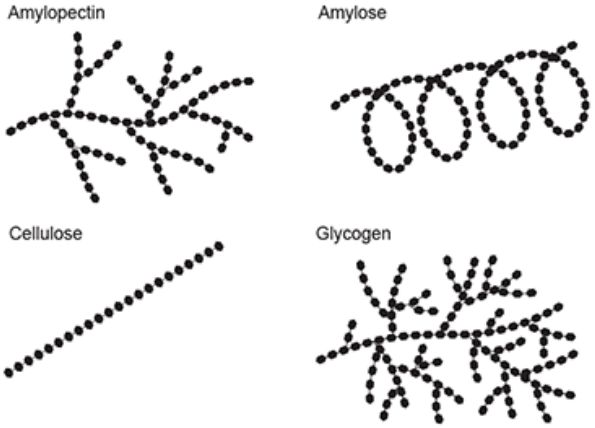
i. Write **on the diagram** to show the complete structure of alpha glucose.

[3]

ii. Explain how the structure of glucose allows it to move from the plant to the bacterium.

[2]

9. The image below shows representations of the structures of four polysaccharides.

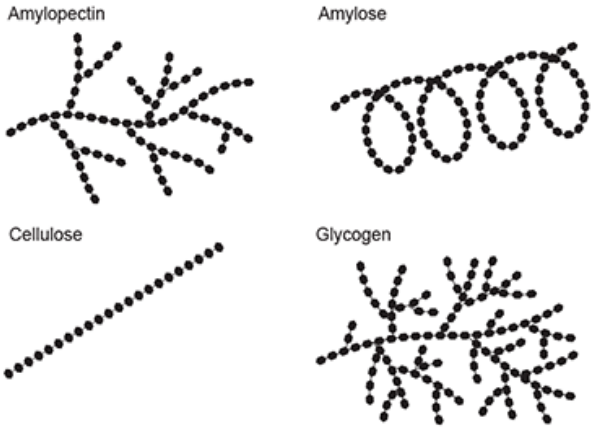


Which of the molecules contains the highest proportion of 1-6 glycosidic bonds?

A Amylopectin
B Amylose
C Cellulose
D Glycogen

Your answer ☐ **[1]**

10. The image below shows representations of the structures of four polysaccharides.



Which of the molecules is **not** used for energy storage?

A Amylopectin
B Amylose
C Cellulose
D Glycogen

Your answer ☐ **[1]**

11. Which description of biological molecules is correct??

A DNA and RNA are both polymers of nucleotides.

B Hydrolysis of sucrose produces fructose and β-glucose.

C Proteins are polymers of amino acids and are broken down in condensation reactions.

D Starch is a polymer of the monosaccharide maltose.

Your answer ☐ **[1]**

12. Congenital lactose intolerance is where a person is born without the enzyme lactase needed to digest lactose in milk. The use of enzyme technology has allowed lactose free milk to be widely available in shops and supermarkets.

Fig. 3.1 shows a technique used to produce lactose free milk.

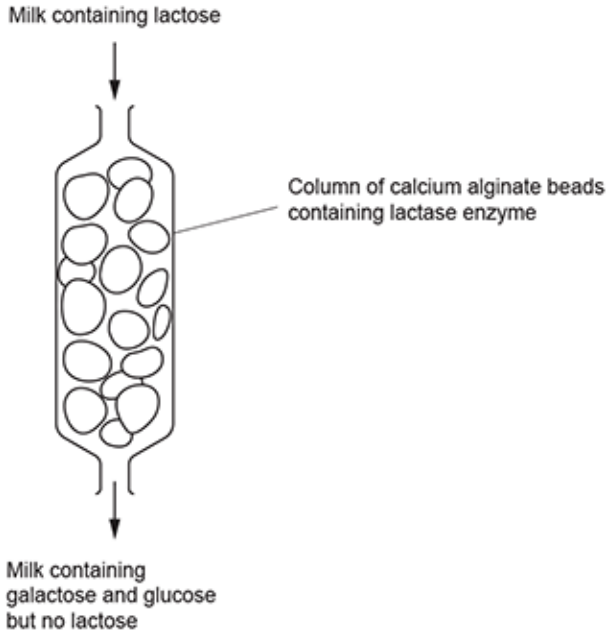


Fig. 3.1

i. Name the type of bond broken by the enzyme lactase **and** describe what happens when this bond is broken.

[2]

ii. A common symptom of lactose intolerance in adults is the creation of extra fluid in the large intestine.

Suggest why this occurs.

[2]

13. Cellulose is the main component of plant cell walls.

Which option is **not** a property of cellulose?

A High tensile strength
B Inflexible
C Insoluble in water
D Resistant to digestion by enzymes

Your answer ☐ **[1]**

14. Glycogen is a large polysaccharide.

Which option describes the structure and function of glycogen?

A 1–6 glycosidic bonds are more accessible to enzymes than 1–4 glycosidic bonds so energy can be released more quickly.
B Bonds between β-glucose residues are easily broken by enzymes.
C Exposed OH groups mean glycogen is soluble.
D Short branches allow more energy storage in a small space.

Your answer ☐ **[1]**

END OF QUESTION PAPER