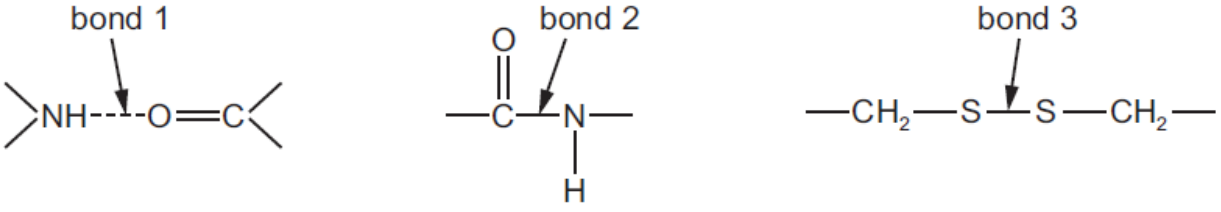
1. June/2023/Paper_9700/11/No.9

The diagrams show three examples of different bonds.



Which bonds hold the secondary structure of proteins together?

A 1, 2 and 3 **B** 1 and 3 only **C** 1 only **D** 2 and 3 only

2. June/2023/Paper_9700/11/No.8

The table shows some steps that can be made in carrying out the Benedict's test.

Which combination of steps is required to carry out a semi-quantitative test on a reducing sugar solution?

	standardise volume of Benedict's solution and volume of test solution	boil with hydrochloric acid and then neutralise with alkali	standardise boiling time with Benedict's solution and compare final colour with numbered colour standards
A	✓	✗	✗
B	✗	✓	✗
C	✓	✗	✓
D	✗	✗	✓

key

✓ = step made

✗ = step not made

3. June/2023/Paper_9700/11/No.10

Insulin is a globular protein involved in cell signalling. It is transported in the blood plasma from the cells that synthesise it to its target cells. A molecule of insulin contains six sulfur-containing amino acids and has two polypeptide chains.

Which statements about insulin are correct?

1 An insulin molecule has a quaternary structure.

2 Insulin polypeptides are held together by six disulfide bonds.

3 Amino acids with hydrophobic R groups would be found in the centre of an insulin molecule.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

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4. June/2023/Paper_9700/12/No.6

Which polymers are present in all viruses **and** all prokaryotes?

1 polynucleotides

2 polypeptides

3 polysaccharides

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

PapaCambridge

5. June/2023/Paper_9700/12/No.7

Which set of steps is the best method for conducting the emulsion test for lipids?

A Add 2 cm^3 of water to the sample.
Pour the water into a test-tube containing 2 cm^3 of ethanol.
Lipids are present if the mixture becomes cloudy.

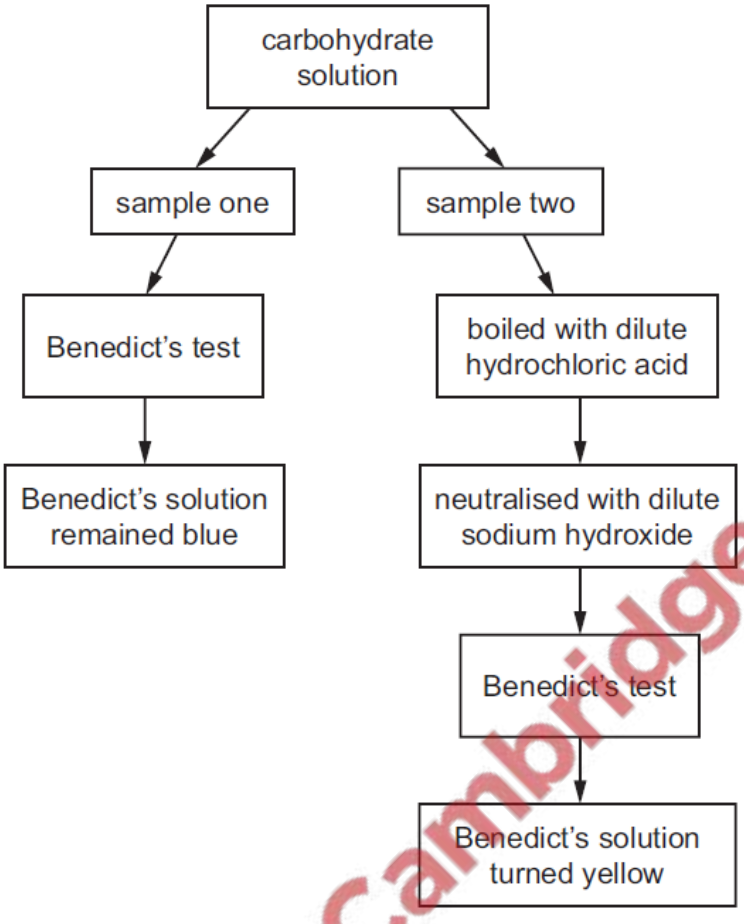
B Add 2 cm^3 of ethanol to the sample and shake.
Pour the ethanol into a test-tube containing 2 cm^3 of water and boil.
Lipids are present if the mixture becomes clear.

C Add 2 cm^3 of water to the sample and shake.
Pour the water into a test-tube containing 2 cm^3 of ethanol and boil.
Lipids are present if the mixture becomes cloudy.

D Add 2 cm^3 of ethanol to the sample and shake.
Pour the ethanol into a test-tube containing 2 cm^3 of water and shake again.
Lipids are present if the mixture becomes cloudy.

6. June/2023/Paper_9700/12/No.8

A student was provided with a solution of carbohydrate. They removed two samples from the solution and performed tests on each sample, as shown.



Which statement explains the results?

A Condensation reactions occur in sample two to release reducing sugar.

B Glycosidic bonds in a polysaccharide have been broken to release reducing sugar.

C Sample one shows that sucrose is present in the carbohydrate solution.

D The change in colour to a yellow solution shows that glucose is present.

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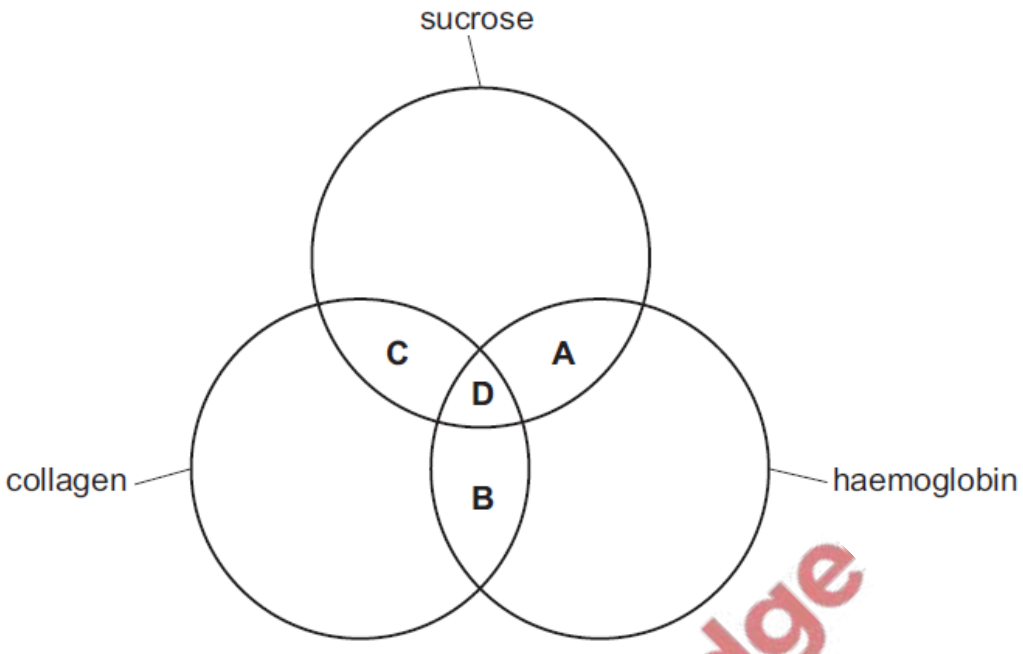
7. June/2023/Paper_9700/12/No.9

Which molecules contain at least two double bonds?



8. June/2023/Paper_9700/12/No.10

What describes cellulose?

A a branched chain of 1-4 α-glucose

B a branched chain of 1-4 β-glucose

C an unreactive linear chain of 1-4 α-glucose

D an unreactive linear chain of 1-4 β-glucose

9. June/2023/Paper_9700/12/No.11

Which part of the structure of haemoglobin carries oxygen?

A four polypeptide chains

B haem groups

C hydrogen bonds

D hydrophilic R groups

10. June/2023/Paper_9700/12/No.12

What is the maximum number of hydrogen bonds that can form between two single water molecules?

A 1 **B** 2 **C** 3 **D** 4

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11. June/2023/Paper_9700/13/No.7

Steps 1, 2, 3 and 4 are used to test for a non-reducing sugar.

1 Put 5 cm^3 of solution into a test-tube.

2 Add a few drops of acid.

3 Neutralise with alkali.

4 Add 6 cm^3 of Benedict's solution.

When is the solution heated or boiled?

A between steps 1 and 2

B between steps 2 and 3, and after step 4

C between steps 2 and 3 only

D after step 4 only

12. June/2023/Paper_9700/13/No.8

Which features contribute to the function of a cellulose molecule?

1 Long chains of glucose molecules coil into a helix.

2 Many hydrogen bonds form between adjacent chains.

3 It is insoluble in water.

A 1, 2 and 3 **B** 1 and 3 only **C** 2 and 3 only **D** 2 only

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13. June/2023/Paper_9700/13/No.9

What correctly describes triglycerides?

A non-polar molecules that are soluble in ethanol

B non-polar molecules that are soluble in water

C polar molecules that are soluble in ethanol

D polar molecules that are soluble in water

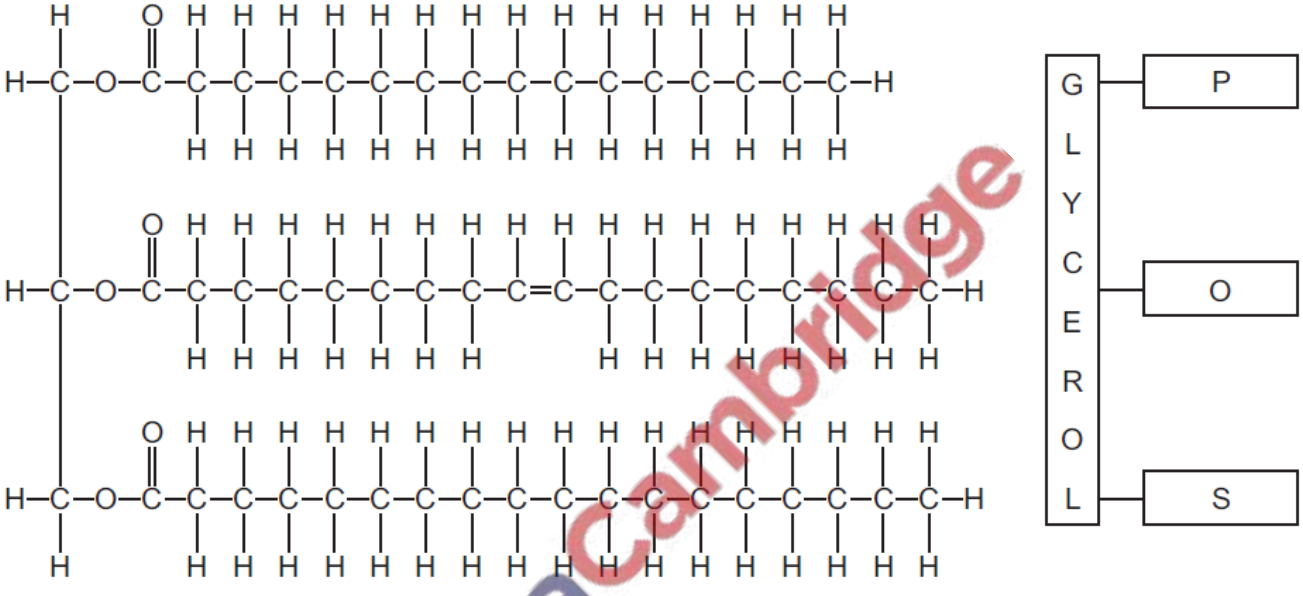
14. June/2023/Paper_9700/13/No.10

Cocoa butter contains three different triglycerides. These triglycerides are made from the fatty acids:

- oleic acid (O)
- palmitic acid (P)
- stearic acid (S).

The three triglycerides found in cocoa butter are POS, SOS and POP.

The chemical structure of the triglyceride POS is shown next to a diagrammatic representation of POS.



Which statement is correct?

A Triglyceride POP contains two unsaturated fatty acids joined by ester bonds to glycerol.

B Triglyceride POS contains two less carbon atoms than triglyceride POP.

C Triglyceride SOS contains four more carbon atoms than triglyceride POP.

D Triglyceride SOS contains two saturated fatty acids joined by hydrolysis to glycerol.

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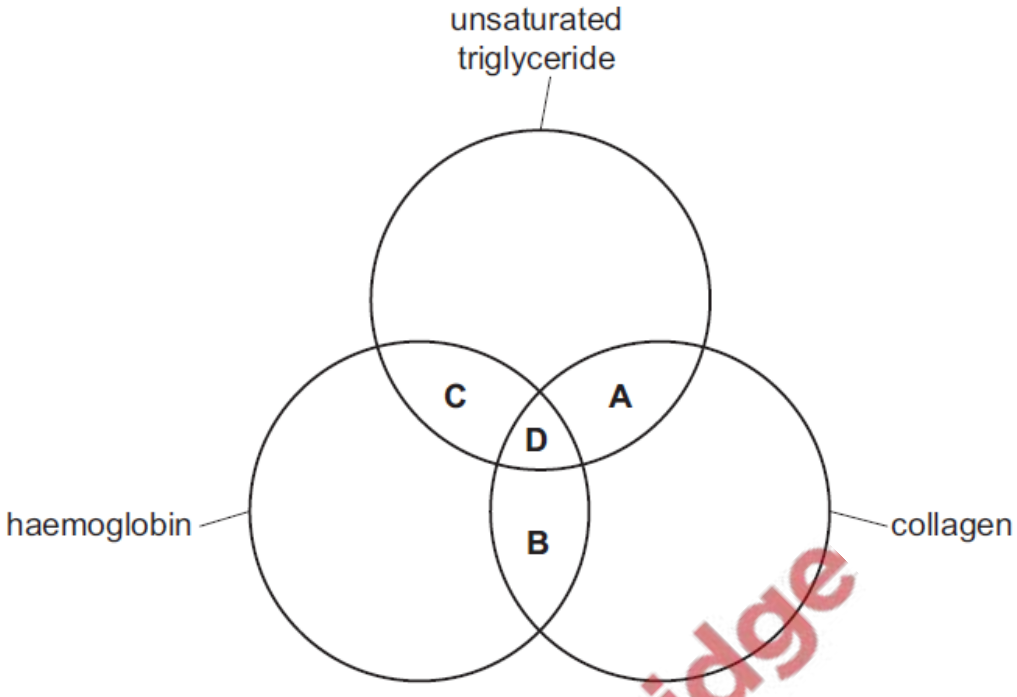
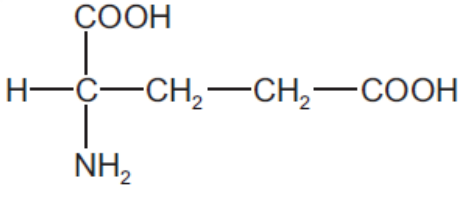
15. June/2023/Paper_9700/13/No.11

Which molecules contain at least four double bonds?



16. June/2023/Paper_9700/13/No.12

The diagram shows the amino acid glutamic acid.



What is the R group for glutamic acid?

A NH_2

B H

C COOH

D $CH_2—CH_2—COOH$

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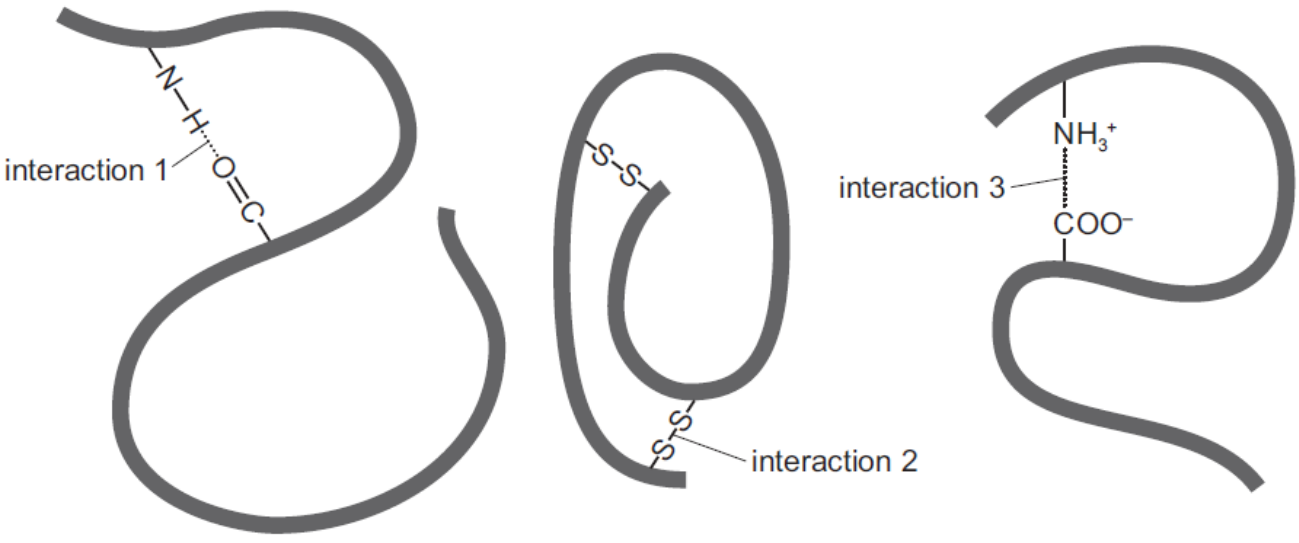
17. June/2023/Paper_9700/13/No.13

The diagram shows three interactions that hold protein molecules in shape.



Which row identifies these interactions?

	interaction 1	interaction 2	interaction 3
A	hydrogen bond	disulfide bond	hydrophobic interaction
B	hydrogen bond	covalent bond	ionic bond
C	hydrophobic interaction	ionic bond	hydrogen bond
D	ionic bond	disulfide bond	peptide bond

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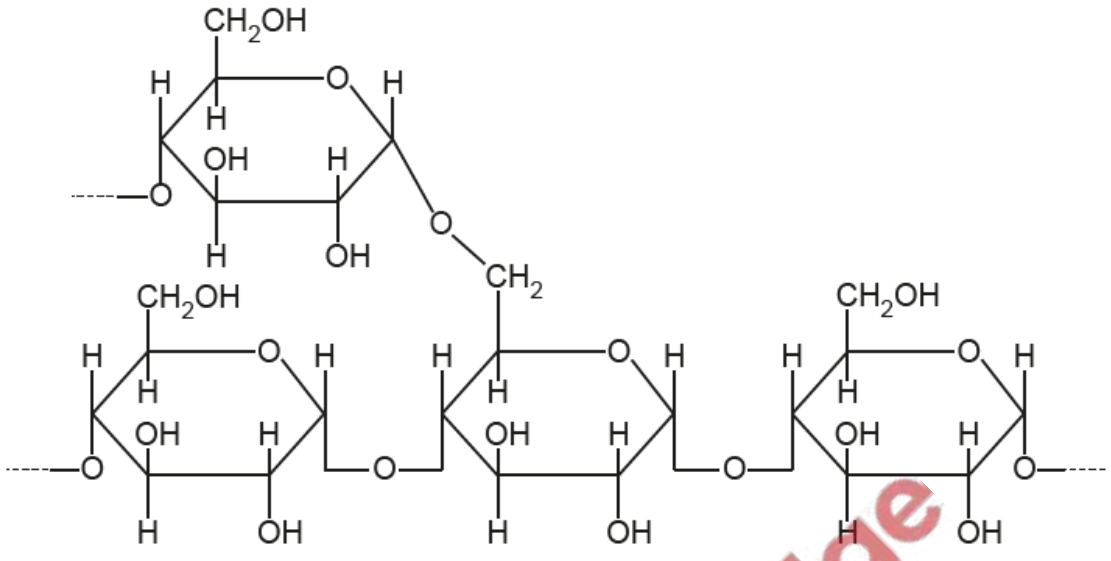
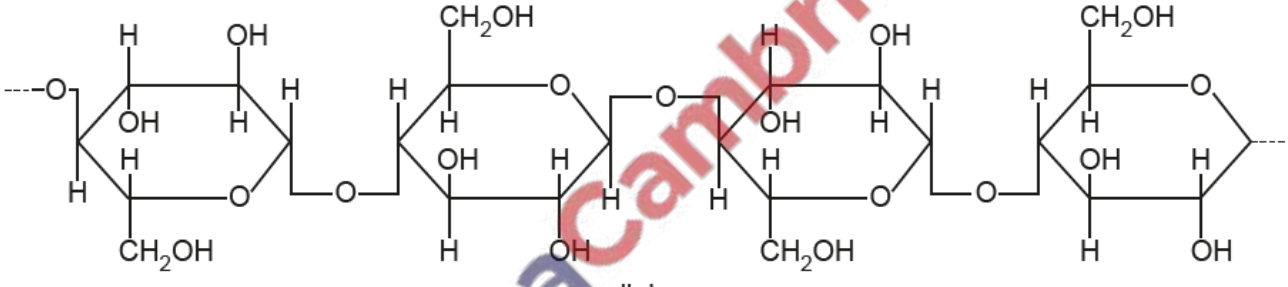
18. June/2023/Paper_9700/21/No.2

Glycogen and cellulose are polymers.

Fig. 2.1 shows small, representative regions of a glycogen molecule and a cellulose molecule.



glycogen



cellulose

Fig. 2.1

(a) Describe **three** ways, **visible in Fig. 2.1**, in which the molecule of glycogen differs from the molecule of cellulose.

1 .....

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2 .....

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3 .....

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[3]

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(b) Glycogen is found in the form of granules in mammalian liver and muscle cells. Fig. 2.2 is a diagram of part of a molecule of glycogen isolated from a glycogen granule.

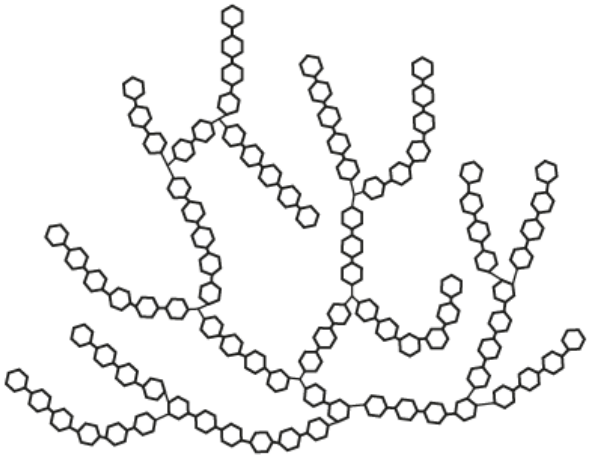

Fig. 2.2

Explain how the structure of glycogen is related to its function in cells.

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..... [3]

(c) Explain how the arrangement of cellulose molecules in plant cell walls is related to their function.

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..... [3]

[Total: 9]

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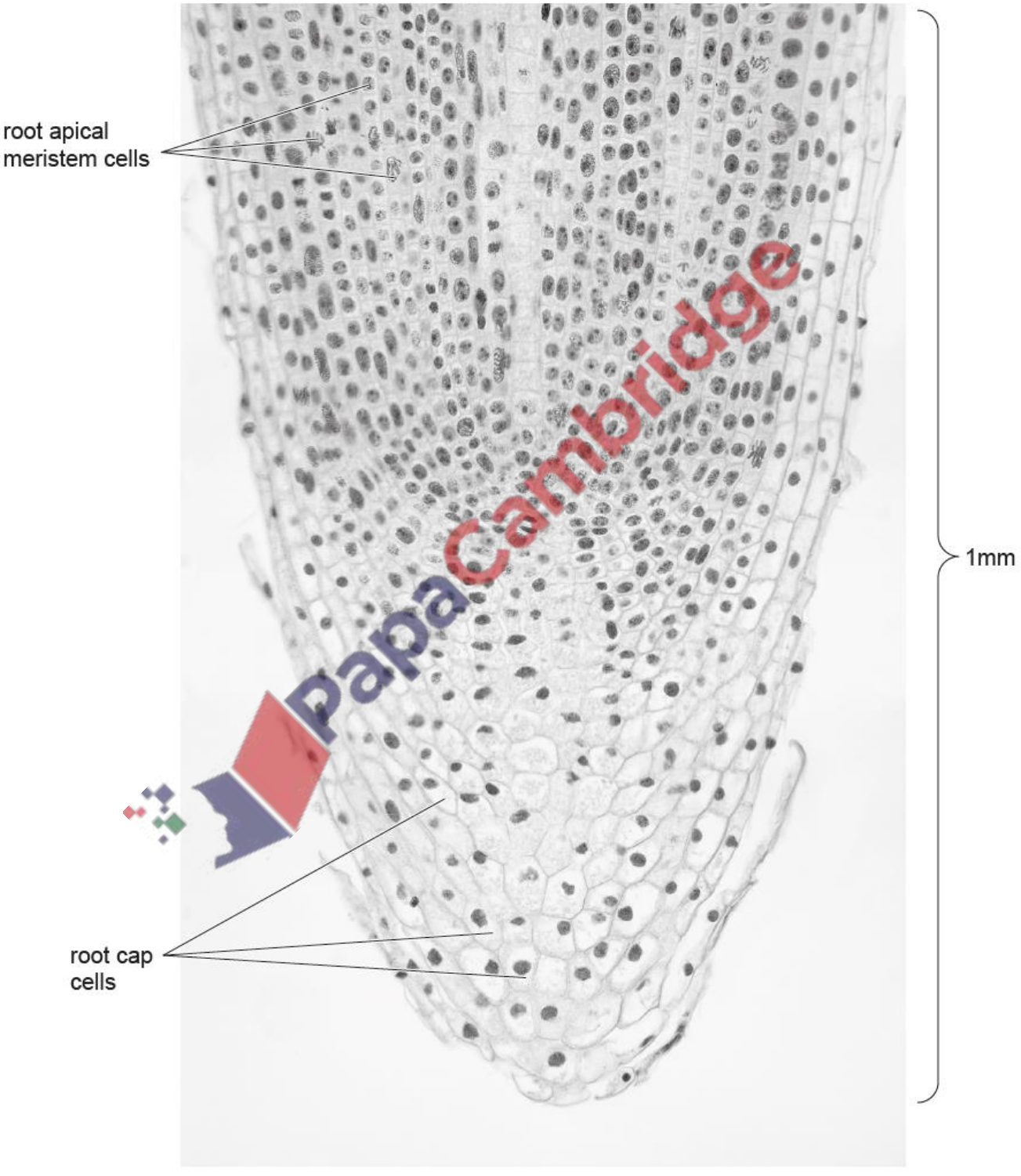
19. June/2023/Paper_9700/22/No.2

Fig. 2.1 is a photomicrograph of a longitudinal section (LS) through a root tip. Two different regions are visible:

- the root apical meristem
- the root cap.

Cells in the root cap synthesise a gel-like, sticky secretion known as mucilage, which is important in reducing friction between soil and the growing root. It is composed mainly of polysaccharides and also contains some amino acids and enzymes.



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(a) Describe **three** differences, **visible** in Fig. 2.1, between root apical meristem cells and root cap cells.

1 .....

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2 .....

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3 .....

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[3]

(b) Mucilage acts as a glue to bind tiny soil particles together, forming small clumps close to the root. These small clumps help to maintain the soil water around the root tip and prevent the loss of water.

With reference to the cohesive **and** adhesive properties of water, suggest **and** explain how the formation of small clumps of soil helps to maintain the soil water around the root tip.

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..... [3]

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(c) Enzymes present in mucilage catalyse the breakdown of organic compounds in the soil. This increases the presence of mineral ions in the soil.

State the term used to describe enzymes that act **outside** the cells that synthesise them.

..... [1]

(d) The polysaccharides and amino acids present in the mucilage are a source of nutrients for soil microorganisms that live in the area surrounding the root. Some of these microorganisms can break down soil compounds to release mineral ions.

(i) Explain what is meant by a polysaccharide.

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..... [2]

(ii) The soil microorganisms use amino acids to synthesise proteins. All of the twenty different amino acids that are present in proteins have the same general structure.

Draw the general structure of an amino acid in the space provided **and** use this drawing to explain how it is possible to have many different amino acids.

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.....

..... [2]

(iii) Mineral ions are usually present in the soil in very low concentrations. The action of mucilage enzymes and soil microorganisms can help to increase the presence of mineral ions.

Root hair cells are specialised for the uptake of these mineral ions **and** for the absorption of water from the soil.

Suggest **and** explain how the presence of mineral ions in the root hair cell can **increase** the absorption of water by the root hair cells.

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..... [3]

[Total: 14]

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20. June/2023/Paper_9700/23/No.6

Polysaccharides, such as glycogen, are composed of thousands of monomers.

Oligosaccharides are carbohydrates that contain three to ten monomers in their chain.

(a) Nystose is one example of an oligosaccharide. The structure of nystose is shown in Fig. 6.1.

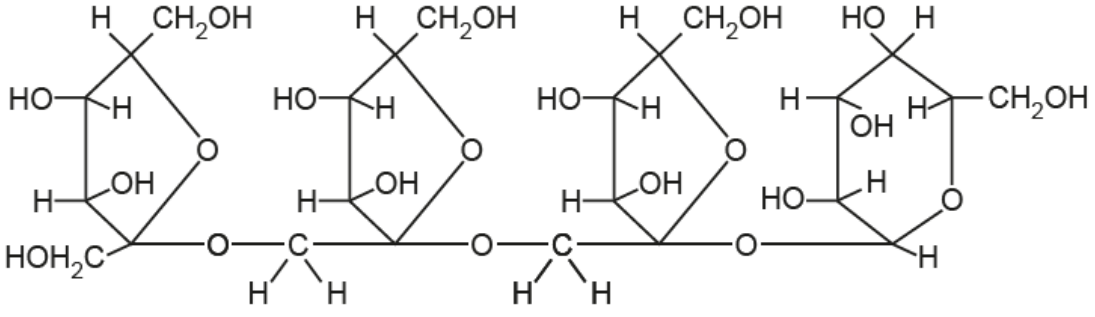

Fig. 6.1

State **three** differences between the structures of nystose and glycogen, **other** than the number of monomers in the molecules.

1 .....

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.....

2 .....

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3 .....

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.....

[3]

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(b) Cells use oligosaccharides to synthesise glycoproteins, which are transported to cell surface membranes.

Describe the roles of the rough endoplasmic reticulum and the Golgi body in synthesising glycoproteins.

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..... [4]

(c) State **one** role of glycoproteins in the cell surface membrane.

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..... [1]

[Total: 8]

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21. March/2023/Paper_9700/12/No.7

To estimate the concentration of glucose in an unknown solution, equal volumes of a range of known concentrations of glucose were each mixed with the same excess volume of Benedict's solution. After mixing, the solutions were placed in a thermostatically controlled water-bath at 90 °C for three minutes.

The unknown solution was then treated in the same way and the colours of the known and unknown solutions compared.

What is the independent variable in this procedure?

A concentration of glucose

B final colour of solutions

C temperature of water-bath

D volume of glucose solutions

22. March/2023/Paper_9700/12/No.8

Which statements are correct for amylose and also for amylopectin?

1 They are carbohydrate molecules.

2 They are formed by condensation reactions.

3 They are linear molecules.

4 They contain α-1,4 glycosidic bonds.

A 1, 2 and 3 **B** 1, 2 and 4 **C** 1, 3 and 4 **D** 2, 3 and 4

23. March/2023/Paper_9700/12/No.9

Which statement is a correct comparison between saturated triglyceride molecules and unsaturated triglyceride molecules of approximately the same molecular masses?

A Unsaturated triglycerides have more double bonds and fewer hydrogen atoms than saturated triglycerides.

B Unsaturated triglycerides have fewer double bonds and fewer hydrogen atoms than saturated triglycerides.

C Unsaturated triglycerides have more double bonds and more hydrogen atoms than saturated triglycerides.

D Unsaturated triglycerides have fewer double bonds and more hydrogen atoms than saturated triglycerides.

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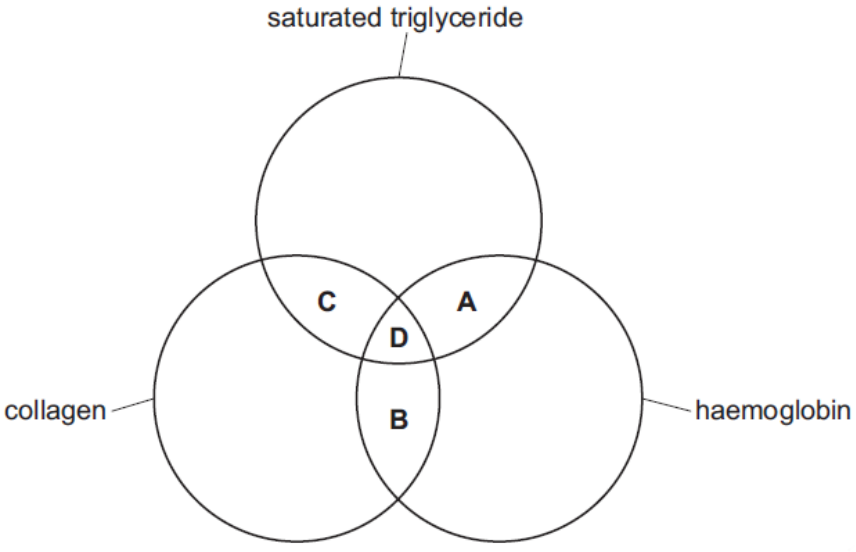
24. March/2023/Paper_9700/12/No.12

Which molecules contain at least three double bonds?



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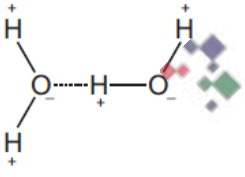
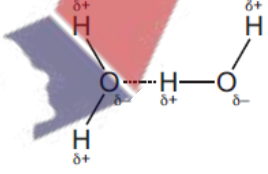
25. March/2023/Paper_9700/12/No.13

Which diagram correctly shows hydrogen bonding between two water molecules?

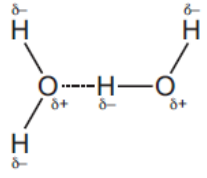
A



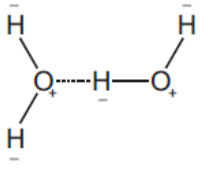
B



C



D



26. March/2023/Paper_9700/22/No.2

(a) Cysteine is an amino acid containing sulfur. Fig. 2.1 shows the structure of the molecule formed by joining two cysteine molecules together.

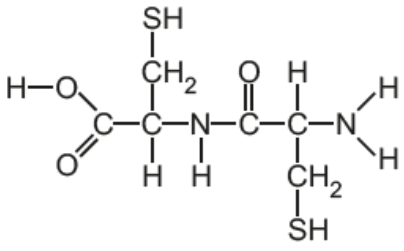


Fig. 2.1

Draw a circle around an R-group in the molecule shown in Fig. 2.1. [1]

(b) Goblet cells in the human gas exchange system produce proteins called mucins.

(i) The ends of mucin molecules contain many cysteine residues. Mucin strands are formed by joining the ends of mucin molecules together through covalent bonds between R-groups.

State the name of these covalent bonds.

..... [1]

(ii) Mucin strands are transported out of the goblet cells and then absorb water to form mucus.

Suggest **and** explain how mucin strands are transported out of the goblet cells.

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..... [3]

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Cystic fibrosis is a genetic disease caused by a mutation in the human *CFTR* gene. This results in mucus that is thicker than normal.

(c) Suggest how thicker mucus interferes with the maintenance of healthy gas exchange surfaces in the lungs.

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..... [2]

(d) Row 1 and row 2 of Table 2.1 show the DNA base sequences of part of the normal *CFTR* allele and the same part of a mutated *CFTR* allele. The base sequences shown are for the DNA strands used in the synthesis of RNA. When Table 2.1 is completed, row 3 will show the base sequence of the RNA synthesised from the same part of the mutated *CFTR* allele.

Table 2.1

1	DNA base sequence of part of the normal *CFTR* allele	T	A	G	T	A	G	A	A	A	C	C	A
2	DNA base sequence of part of the mutated *CFTR* allele	T	A	G	T	A	A	C	C	A	C	A	A
3	RNA base sequence synthesised from the mutated *CFTR* allele												

(i) The difference between the DNA base sequence in row 1 and the DNA base sequence in row 2 of Table 2.1 is caused by a single gene mutation.

State the name of this type of gene mutation.

..... [1]

(ii) Row 1 and row 2 in Table 2.1 show the DNA strands used in the synthesis of RNA.

State the term used to describe the DNA strand that is used in the synthesis of RNA.

..... [1]

(iii) Complete Table 2.1 to show the missing bases in row 3. [1]

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(iv) The normal *CFTR* allele is approximately 189 000 base pairs in length. The CFTR polypeptide consists of only 1480 amino acids.

Explain the reasons for this difference between the number of base pairs and the number of amino acids.

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..... [3]

[Total: 13]

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