Past-paper walk-through

Carbohydrates and lipids ▪ 2.2

eXercise

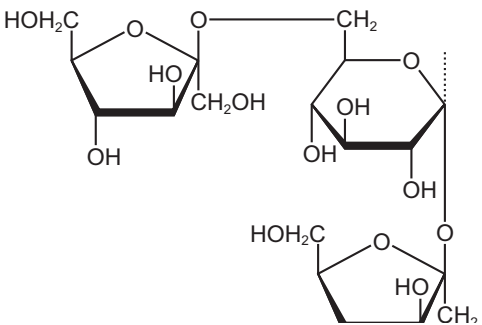
Questions in this set

- 9700/11 N25 Q7 ▪ 1 mark
- 9700/11 N25 Q8 ▪ 1 mark
- 9700/11 N25 Q9 ▪ 1 mark
- 9700/11 N25 Q10 ▪ 1 mark
- 9700/12 N25 Q7 ▪ 1 mark
- 9700/13 N25 Q9 ▪ 1 mark
- 9700/13 N25 Q11 ▪ 1 mark
- 9700/13 N25 Q13 ▪ 1 mark
- 9700/14 N25 Q7 ▪ 1 mark
- 9700/14 N25 Q9 ▪ 1 mark

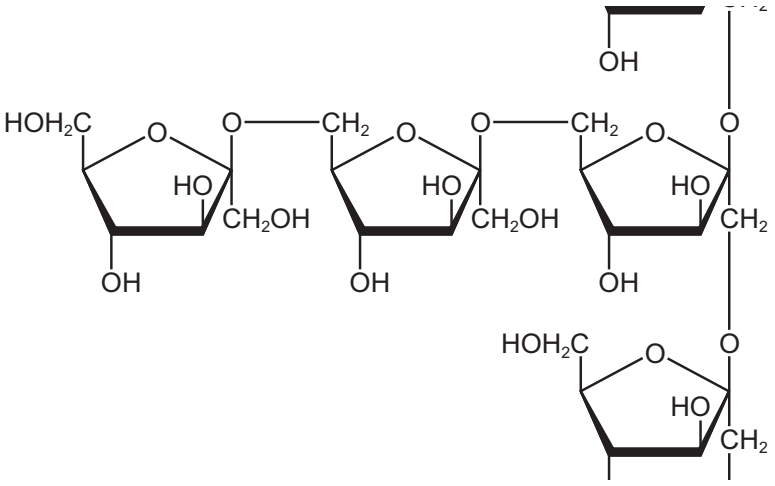
Question 7

9700/11 N25 ▪ Q7 ▪ 1 mark

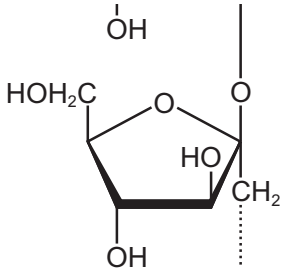
7 The diagram shows the structure of part of a biological molecule.



Question 7


OH
HOH2C
O
O
CH2
O
O
CH2
O
O
HO
CH2OH
HO
CH2OH
HO
CH2
OH
OH
OH
HOH2C
O
O
HO
CH2

Question 7



Which statements about this biological molecule are correct?

1 It has monomers joined by ester bonds.

2 It is a macromolecule.

Question 7

3 It is a polysaccharide.

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

Solution 7

Answer: **D**

Why

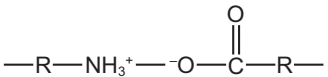
- The repeating ring units joined by O bridges show it is a polysaccharide built from monomers.
- The many branch points identify it as a branched storage polysaccharide.
- Read the structure rather than the name: count the monomer units and look for side chains.

Question 8

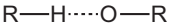
9700/11 N25 ▪ Q8 ▪ 1 mark

8 Which diagram has a covalent bond that joins monomers together to form a biological polymer in eukaryotes?

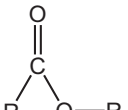
A



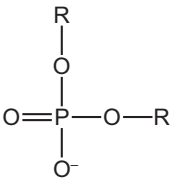
B



C



D



Solution 8

Answer: **D**

Why

- Polymers in eukaryotes are joined by condensation, each forming a specific covalent linkage.
- A peptide bond joins amino acids, a glycosidic bond joins sugars and a phosphodiester bond joins nucleotides.
- Pick the diagram showing one of those linkages rather than an ionic attraction between R groups.

Question 9

9700/11 N25 ▪ Q9 ▪ 1 mark

9 Which feature of storage polysaccharides means they do **not** change the water potential of cells?

A They are easily hydrolysed.

B They are compact.

C They are insoluble.

D They are branched molecules.

Solution 9

Answer: **C**

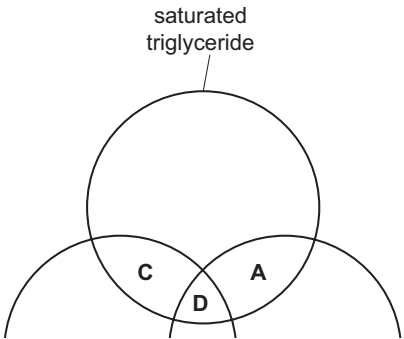
Why

- Water potential depends on the number of dissolved solute particles.
- A storage polysaccharide is insoluble, so it contributes no dissolved particles at all.
- Being compact and branched helps with storage and rapid hydrolysis, but it is the insolubility that protects the water potential.

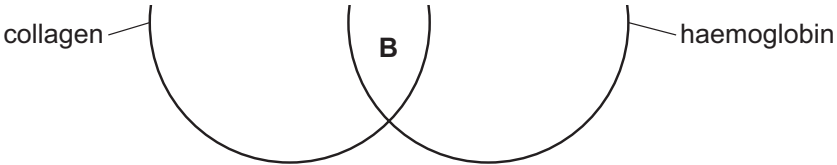
Question 10

9700/11 N25 ▪ Q10 ▪ 1 mark

10 Which molecules contain at least four double bonds?



Question 10



Solution 10

Answer: **B**

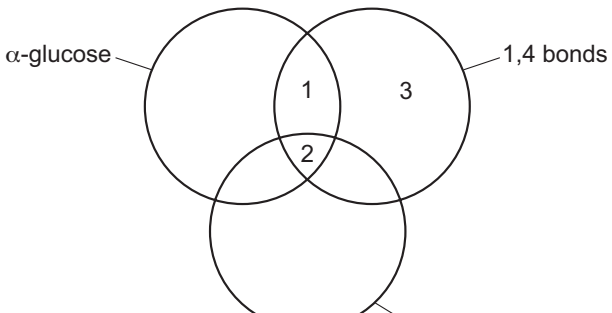
Why

- A saturated triglyceride has no C=C in its tails, but it does have three ester C=O groups.
- Collagen and haemoglobin are proteins, and every peptide bond contains a C=O.
- Count the C=O double bonds, not just C=C: the large proteins have far more than four.

Question 7

9700/12 N25 ▪ Q7 ▪ 1 mark

7 The diagram shows some relationships between features of carbohydrates.



Question 7

highly branched

Which row correctly matches the carbohydrate with some of its features?

	1	2	3
A	amylopectin	glycogen	amylose
B	amylose	amylopectin	cellulose
C	cellulose	glycogen	sucrose
D	glycogen	amylose	amylopectin

Solution 7

Answer: **B**

Why

- All three are made of α-glucose with 1,4 bonds, so those features do not separate them.
- Only glycogen and amylopectin are branched, and glycogen is the more highly branched.
- Amylose is the unbranched helical one.

Question 9

9700/13 N25 ▪ Q9 ▪ 1 mark

9 Many biological molecules exist as polymers made up of monomer subunits.

Which row correctly identifies the monomer in each of the biological molecules?

	collagen	glycogen	cellulose
A	amino acid	α-glucose	β-glucose
B	α-glucose	β-glucose	amino acid
C	β-glucose	amino acid	α-glucose
D	amino acid	β-glucose	α-glucose

Solution 9

Answer: **A**

Why

- Collagen is a protein, so its monomer is the amino acid.
- Glycogen is a storage polysaccharide built from α-glucose.
- Cellulose is structural and built from β-glucose – that difference is the whole point.

Question 11

9700/13 N25 ▪ Q11 ▪ 1 mark

11 Which row describes amylopectin?

	α-1,4 glycosidic bonds	α-1,6 glycosidic bonds	shape of molecule	function of molecule
A	✓	✓	branched	storage
B	✓	✗	helical	storage
C	✓	✓	branched	structural
D	✗	✓	helical	structural

key

✓ = present

✗ = **not** present

Solution 11

Answer: **A**

Why

- Amylopectin is a storage polysaccharide, so its role is storage, not structure.
- Its chains use α-1,4 bonds, with α-1,6 bonds at the branch points.
- Having both bond types is what makes it branched rather than a simple helix.

Question 13

9700/13 N25 ▪ Q13 ▪ 1 mark

13 An unsaturated fatty acid molecule has 17 carbon atoms in the tail which is attached to its carboxyl group. The tail contains three double bonds.

How many hydrogen atoms does the tail contain?

A 29 **B** 31 **C** 33 **D** 35

Solution 13

Answer: **A**

Why

- A saturated 17-carbon tail attached at one end carries 35 hydrogens.
- Each C=C double bond removes two hydrogens.
- Three double bonds remove six: $35 - 6 = 29$.

Question 7

9700/14 N25 ▪ Q7 ▪ 1 mark

7 Which molecules have a structural formula that contains C=O bonds?

1 glucose

2 glycerol

3 protein

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

Solution 7

Answer: **C**

Why

- Glucose has an aldehyde group in its open-chain form, which is a C=O.
- Every peptide bond in a protein contains a C=O.
- Glycerol has three –OH groups and no C=O at all.

Question 9

9700/14 N25 ▪ Q9 ▪ 1 mark

9 Which row is correct for glycogen?

	glycogen is hydrolysed rapidly due to its branched structure	glycogen is insoluble so the water potential of cells is unaffected	glycogen is a compact molecule because it contains many β-glucose molecules
A	✓	✓	✓
B	✓	✓	✗
C	✗	✗	✓

Question 9

D	✗	✓	✗

key

✓ = correct for glycogen

✗ = incorrect for glycogen

Solution 9

Answer: **B**

Why

- Glycogen's many branch ends give enzymes many places to attack, so it is hydrolysed rapidly.
- It is insoluble, so it does not affect the cell's water potential.
- Being compact is a consequence of the coiling and branching, not simply of containing α-glucose.