



Polymers of Carbohydrates

- 1
- 2
- 3
- 4
- 5



0 1 . 1

Glycogen and cellulose are both carbohydrates.
Describe **two** differences between the structure of a cellulose molecule and a glycogen molecule.

[2 marks]

1 _____

2 _____

0 1 . 2

Starch is a carbohydrate often stored in plant cells.
Describe and explain **two** features of starch that make it a good storage molecule.

[2 marks]

1 _____

2 _____



3 Blood plasma contains glucose dissolved in water. Glucose is a polar molecule that is taken up by muscle cells and used in the synthesis of glycogen.

(a) Explain why water is a good solvent.

(2)

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(b) Describe how glucose enters muscle cells through the cell membrane.

(2)

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(d) Glucose is used in the synthesis of glycogen in muscle cells.

(i) Describe the formation of glycogen from glucose.

(2)

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(ii) Describe how the structure of glycogen is related to its function as a storage molecule.

(2)

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Question	Marking guidance	Mark	Comments
<p>01.1</p>	<ol style="list-style-type: none"> 1. Cellulose is made up of β-glucose (monomers) and glycogen is made up of α-glucose (monomers); 2. Cellulose molecule has straight chain and glycogen is branched; 3. Cellulose molecule has straight chain and glycogen is coiled; 4. glycogen has 1,4- and 1,6- glycosidic bonds and cellulose has only 1,4- glycosidic bonds; 	<p>2 max</p>	<p>Ignore ref. to H bonds / microfibrils</p>
<p>01.2</p>	<p>Any two from:</p> <ol style="list-style-type: none"> 1. Insoluble (in water), so doesn't affect water potential; 2. Branched / coiled / (α-)helix, so makes molecule compact; <p>OR</p> <p>Branched / coiled / (α-)helix so can fit many (molecules) in small area;</p> <ol style="list-style-type: none"> 3. Polymer of (α-)glucose so provides glucose for respiration; 4. Branched / more ends for fast breakdown / enzyme action; 5. Large (molecule), so can't cross the cell membrane 	<p>2 max</p>	<p>Require feature and explanation for 1 mark</p> <ol style="list-style-type: none"> 1. Accept Ψ or WP 1. Accept Insoluble so doesn't affect osmosis 1. Do not allow ref to 'doesn't affect water leaving cells' 4. Ignore 'surface area' 4. Accept 'branched so glucose readily released'



Question		Answer	Marks	Guidance
22	(a)	<p><i>glycogen is</i></p> <p>1 insoluble , so has no effect on , water potential / Ψ (of cell) ✓</p> <p>2 <u>metabolically</u> inactive ✓</p> <p>3 compact / lots can be stored in a small space ✓</p> <p>4 able to store , large amounts / lots , of <u>energy</u> ✓</p> <p>5 (highly branched so) has lots of ends for , adding / removing , <u>glucose</u> (when needed) or can be broken down , fast / quickly / rapidly , to release <u>glucose</u> ✓</p>	3	<p>ACCEPT ORA for glucose for mps 1, 2 3 & 4 only</p> <p>1 ACCEPT insoluble so has no osmotic effect (on cell)</p> <p>5 IGNORE ref to surface area</p> <p>Note: 'compact so can store large amounts of energy' = 2 marks (mps 3 & 4)</p>

Question		Answer	Marks	Guidance
22	(b)	<p>1 <u>transport</u> vesicle from RER ✓</p> <p>2 modification / processing / folding ✓</p> <p>3 in / at , Golgi (body / apparatus) ✓</p> <p>4 (packaged into) <u>secretory</u> vesicle ✓</p> <p>5 vesicles move along the cytoskeleton ✓</p> <p>6 (vesicle) fuses with , cell <u>surface</u> / plasma , membrane ✓</p> <p>7 (secretion occurs by) <u>exocytosis</u> ✓</p>	3 max	<p>NOTE answers must be the in context of protein transport. Penalise once if a different material (e.g. gene) is transported to max 2</p> <p>2 ACCEPT example of modification e.g. converted into a glycoprotein ACCEPT in context of RER or Golgi</p> <p>3 IGNORE SER / smooth endoplasmic reticulum</p> <p>5 ACCEPT use of motor proteins / chaperones / microtubules</p> <p>6 ACCEPT merges with DO NOT ACCEPT binds / attaches / dissolves</p> <p>7 DO NOT ACCEPT exocytosis in context of excretion (rather than secretion) DO NOT ACCEPT vesicle being released by exocytosis</p>



Question Number	Answer	Additional Guidance	Mark
3(a)	<p>An explanation which includes reference to two of the following:</p> <ul style="list-style-type: none"> description of water as a {polar / dipole / dipolar} molecule (1) water surrounds (polar) molecules allowing them to dissolve (1) hydrogen bonds form (1) 	ALLOW correct description of uneven charges	(2)

Question Number	Answer	Additional Guidance	Mark
3(b)	<p>A description that makes reference to the following:</p> <ul style="list-style-type: none"> carrier proteins (located in membrane) (1) (glucose enters by) facilitated diffusion (1) 	ALLOW channel proteins	(2)

Question Number	Answer	Additional Guidance	Mark
3 (d)(i)	<p>A description which includes reference to the following:</p> <ul style="list-style-type: none"> joining together in condensation reactions (1) forming {1,4 and 1,6} glycosidic bonds (1) 		(2)

Question Number	Answer	Additional Guidance	Mark
3 (d)(ii)	<p>A description which includes reference to the following:</p> <ul style="list-style-type: none"> branched molecule for more rapid hydrolysis (1) compact so more can be stored (1) 	<p>ALLOW broken down</p> <p>ALLOW 'doesn't take up much space'</p>	(2)