



Q1.

(a) What is a monomer?

(1)

(b) Lactulose is a disaccharide formed from one molecule of galactose and one molecule of fructose.

Other than both being disaccharides, give one similarity and one difference between the structures of lactulose and lactose.

Similarity -----

Difference -----

(2)

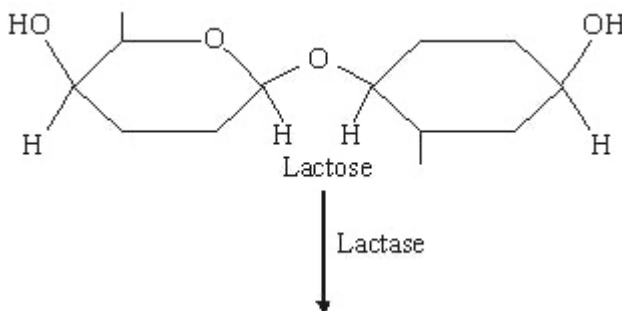
(Total 3 marks)



Q2.

Lactose is a disaccharide found in milk. In the human small intestine, the enzyme lactase catalyses the hydrolysis of lactose to the monosaccharides, galactose and glucose. These monosaccharides are then absorbed into the blood.

(a) Complete the diagram to show the hydrolysis of lactose to galactose and glucose.



(2)

(b) Name the monosaccharides of which the following disaccharides are composed.

(i) Sucrose

monosaccharides _____ and _____

(1)

(ii) Lactose

monosaccharides _____ and _____

(1)

(c) Two glucose molecules join together to form a disaccharide.

(i) Name the products of this reaction.

(2)

(ii) Name the type of reaction that joins the glucose molecules together.

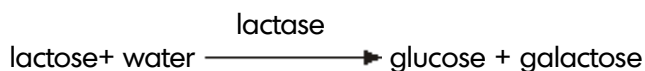
(1)

(Total 7 marks)



Q3.

Lactose is a disaccharide sugar which can be broken down by the enzyme lactase into two monosaccharides, glucose and galactose.



- (a) The formula for galactose is $C_6H_{12}O_6$. What is the formula for lactose?

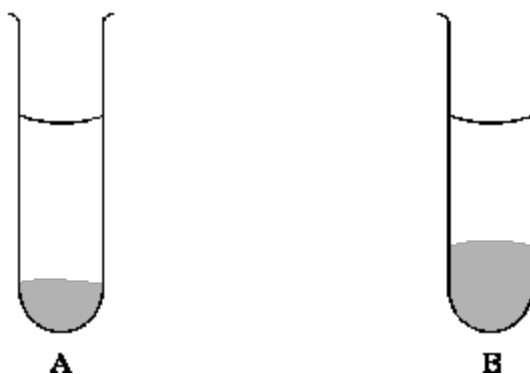
(2)

- (b) A solution containing the enzyme lactase was added to a lactose solution. The solution was incubated at 40 °C for one hour. Sample **A** was removed from the tube before incubation. Sample **B** was removed after one hour.

- (i) Describe a chemical test you could carry out on sample **A** to show that lactose is a reducing sugar.

(2)

- (ii) This chemical test was carried out on samples **A** and **B**. All experimental variables were the same in the testing of the two samples. Both tubes were left for ten minutes to allow the precipitate to settle. The diagram shows the result.



Is galactose a reducing sugar? -----

Explain how the results in the diagram support your answer.

(2)
(Total 6 marks)



Q4.

- (a) The table shows some statements about three carbohydrates. Complete the table with a tick in each box if the statement is true.

Statement	Starch	Cellulose	Glycogen
Found in plant cells			
Contains glycosidic bonds			
Contains β -glucose			

(3)

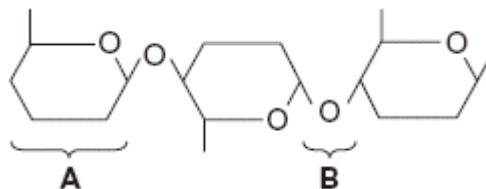
- (b) Name the type of reaction that would break down these carbohydrates into their monomers.

(1)

(Total 4 marks)

Q5.

- (a) The diagram shows part of a cellulose molecule.



- (i) Name part **A**.

(1)

- (ii) Name bond **B**.

(1)

- (b) The structure of cellulose is related to its role in plant cell walls. Explain how.

(3)

(Total 5 marks)



Q6.

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

1.

.....

.....

2.

.....

.....

(2)

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

1.

.....

.....

2.

.....

.....

(2)

(c) Tick (✓) the box that identifies the test which would be used to show the presence of starch.

Acid hydrolysis test

Benedict's test

Emulsion test

Iodine/potassium iodide test

(1)

(Total 5 marks)



Q7.

- (a) Describe the structure of a cellulose molecule and explain how cellulose is adapted for its function in cells.

(6)
(Total 6 marks)



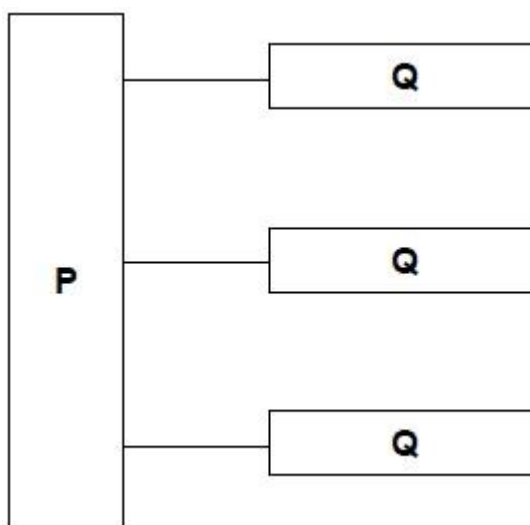
(c) Which of the fatty acids, **X** or **Y**, in the figure above is unsaturated? Explain your answer.

(1)

(Total 3 marks)

Q9.

The diagram represents a triglyceride.



(a) Name the molecules represented in the diagram by:

Box **P** -----

Box **Q** -----

(2)

(b) Name the type of bond between **P** and **Q** in the diagram.

(1)

(Total 3 marks)



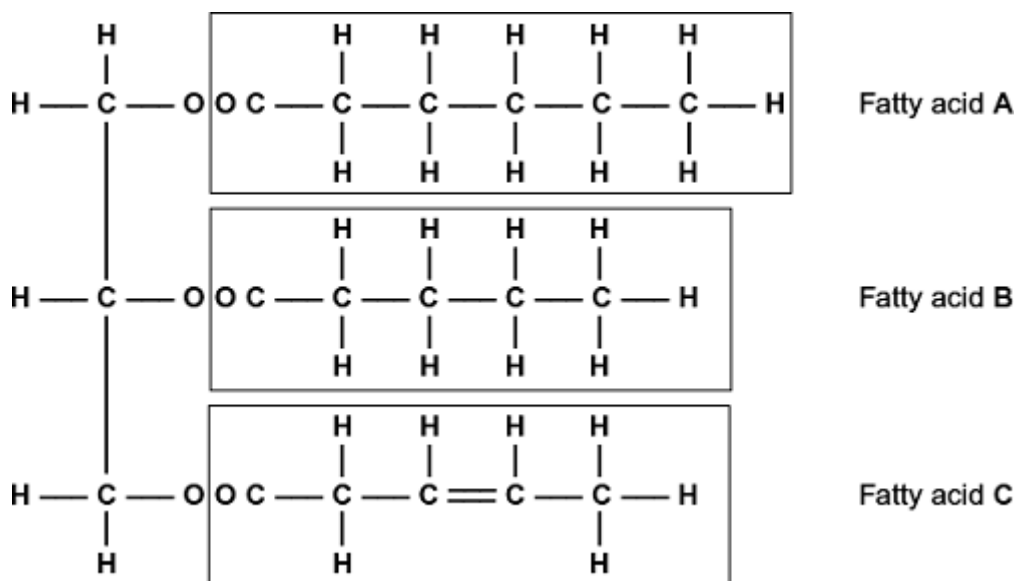
Q10.

- (a) Some seeds contain lipids. Describe how you could use the emulsion test to show that a seed contains lipids.

(Extra space) -----

(3)

- (b) A triglyceride is one type of lipid. The diagram shows the structure of a triglyceride molecule.



- (i) A triglyceride molecule is formed by condensation. From how many molecules is this triglyceride formed?

(1)



- (ii) The structure of a phospholipid molecule is different from that of a triglyceride. Describe how a phospholipid is different.

(2)

- (iii) Use the diagram to explain what is meant by an unsaturated fatty acid.

(2)

(Total 8 marks)



Mark scheme

Q1.

- (a) (a monomer is a smaller / repeating) unit / molecule from which larger molecules / polymers are made;

Reject atoms / elements / 'building blocks' for units / molecules

Ignore examples

1

- (b) **Similarity**

1. Both contain galactose / a glycosidic bond;

Ignore references to hydrolysis and / or condensation

Difference

2. Lactulose contains fructose, whereas lactose contains glucose;

Ignore alpha / beta prefix for glucose

Difference must be stated, not implied

2

[3]

Q2.

- (a) use of water;

must be above arrowhead

OH drawn correctly in place of glycosidic bond on each monosaccharide;

2

- (b) (i) Glucose and fructose;

Ignore reference to alpha and beta

Either way around

1

- (ii) Glucose and galactose;

Ignore reference to alpha and beta

Either way around

1

- (c) (i) 1. Maltose;

2. Water;

Accept H₂O

2

- (ii) Condensation;

1

[7]



Q3.

- (a) C_{12} ; $H_{22}O_{11}$; 2
- (b) (i) heat with Benedict's;
yellow / brown / orange / red; 2
- (ii) (yes)
(may appear on second line)
- more precipitate in sample **B**;
both sugars are reducing sugars / give a positive test; 2
- [6]**

Q4.

(a)

Statement	Starch	Cellulose	Glycogen
Found in plant cells	✓	✓	
Contains glycosidic bonds	✓	✓	✓
Contains β -glucose		✓	

One mark for each correct row

- (b) Hydrolysis; 3
- Accept: if phonetically correct
Do not accept: 'hydration' 1
- [4]**

Q5.

- (a) (i) β / beta Glucose;
Q Reject alpha glucose 1
- (ii) Glycosidic; 1
- (b) Long / straight / unbranched chains (of glucose joined by) hydrogen bonds;
Q Ignore reference to alpha glucose
- Form (micro)fibrils / (macro)fibrils;
- Provide rigidity / strength / support;
Allow suitable descriptions for last point e.g. 'prevents bursting'; 3
- [5]**



Q6.

- (a)
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;
- Ignore ref. to H bonds / microfibrils*

2 max

- (b) Any **two** from:

1. Insoluble (in water), so doesn't affect water potential;
 2. Branched / coiled / (α -)helix, so makes molecule compact;
- OR**
- Branched / coiled / (α -)helix so can fit many (molecules) in small area;
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

*Require feature **and** explanation for 1 mark*

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'

2 max

- (c) Iodine/potassium iodide;

1

[5]

Q7.

- (a)
1. made from β -glucose;
 2. joined by condensation / removing molecule of water / glycosidic bond;
 3. 1 : 4 link specified or described;
 4. "flipping over" of alternate molecules;
 5. hydrogen bonds linking chains / long straight chains;
 6. cellulose makes cell walls strong / cellulose fibres are strong;
 7. can resist turgor pressure / osmotic pressure / pulling forces;
 8. bond difficult to break;
 9. resists digestion / action of microorganisms / enzymes;
- (allow maximum of 4 marks for structural features)*

6 max

[6]

Q8.

- (a) Glycerol.

1

- (b) Ester.

1

- (c) **Y** (no mark)
Contains double bond between (adjacent) carbon atoms in hydrocarbon chain.

1

[3]



Q9.

(a) P – glycerol
 Q – fatty acid (chains)
Accept phonetic spelling 2

(b) Ester (bond); 1

[3]

Q10.

(a) 1. Crush / grind;
 2. With ethanol / alcohol;
 3. Then add water / then add to water;
2. Water must be added after ethanol for third mark.
 4. Forms emulsion / goes white / cloudy;
4. Do not accept carry out emulsion test. 3

(b) (i) 4 / four; 1

(ii) 1. Phosphate / PO₄;
"It" refers to phospholipid.
 2. Instead of one of the fatty acids / and two fatty acids;
1. Accept minor errors in formula. Do not accept phosphorus / phosphorus group. 2

(iii) 1. Double bonds (present) / some / two carbons with only one hydrogen / (double bonds) between carbon atoms / not saturated with hydrogen;
Answer refers to unsaturated unless otherwise clearly indicated.
May be shown in appropriate diagram.
 2. In (fatty acid) C / 3; 2

[8]