Introduction to the Biological Molecules

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_____ :

e.g.

Polymers

Molecules	Elements	Monomers	Polymers

Not Polymers

Polymers of Carbohydrates

3 Monosaccharides join to form disaccharides and polysaccharides.

(a) (i) State the type of reaction where two monosaccharides join to form a disaccharide molecule.

(1)

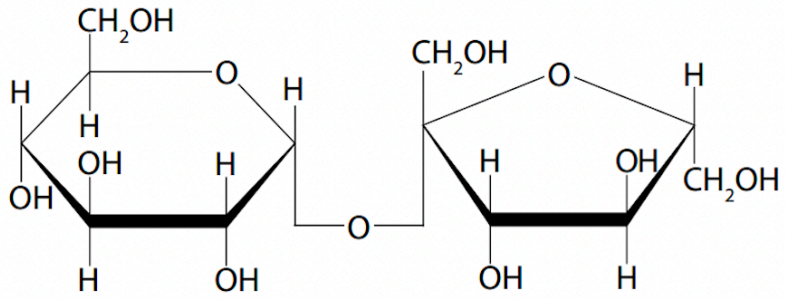
(ii) Which of the following bonds joins two monosaccharides to form a disaccharide molecule?

(1)

- ☒ **A** ester
- ☒ **B** glycosidic
- ☒ **C** hydrogen
- ☒ **D** peptide

EDXL AS P1 21 Q3b

(b) The diagram shows a molecule of sucrose.



(i) Draw the two monosaccharides that are produced when a molecule of sucrose is broken down.

(2)

(ii) Fig. 1.2 shows a representation of a short polypeptide chain made from three amino acids.

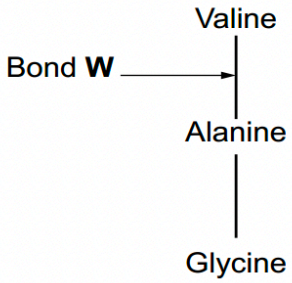


Fig. 1.2

Name bond **W and** state what type of reaction takes place to form this bond.

[1]

AQA U1 2007 JUN 1a

1 Lactose is present in milk. It is broken down by lactase into glucose and galactose. This is shown in the equation.

$$\text{lactose} + \text{water} \xrightarrow{\text{lactase}} \text{glucose} + \text{galactose}$$

(a) Name the type of reaction shown in the equation.

.....

(1 mark)

1 The equation shows the breakdown of lactose by the enzyme lactase.

$$\text{lactose} + \text{water} \xrightarrow{\text{lactase}} \text{galactose} + \text{monosaccharide X}$$

AQA U1 2011 JUN 1a

1 (a) (i) Name the type of reaction catalysed by the enzyme lactase.

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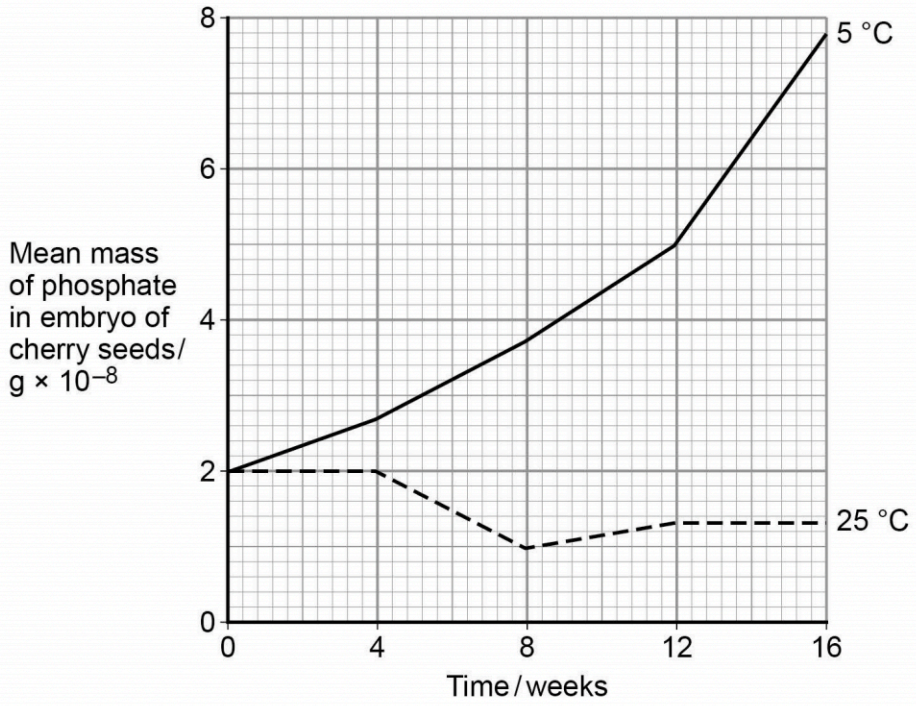
(1 mark)

0 5 The seeds of some plant species require chilling (exposure to low temperatures) before the embryos they contain grow into plants. During chilling, storage molecules in the seed that contain phosphate are broken down and phosphates are transported to the embryo. Scientists investigated the change in the mass of phosphate in the embryos of cherry seeds exposed to two different temperatures for 16 weeks.

Figure 6 shows their results.

Figure 6



0 5 . 1 Phospholipids are one of the storage molecules found in cherry seeds.

Name the type of reaction used to break down phospholipids to release phosphate.

[1 mark]

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 _____

_____

_____

22 Many multicellular organisms need to be able to convert monosaccharides into polysaccharides and back again.

Mammals convert the monosaccharide glucose into a highly branched polysaccharide called glycogen, which gets stored in liver cells.

(a) Explain why mammals store glycogen instead of glucose.

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..... **[3]**

(b) Humans use the enzyme α-amylase to break down polysaccharides in food for absorption into the blood.

The gene for human α-amylase is found on chromosome 1.

The gene is transcribed in the nucleus and translation occurs on the rough endoplasmic reticulum in cells of the salivary gland.

Describe how the molecule is prepared and secreted by cells of the salivary gland after translation has taken place.

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..... **[3]**

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)

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

(2)

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

(i) Describe the formation of glycogen from glucose.

(2)

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

(2)

3 Monosaccharides join to form disaccharides and polysaccharides.

(a) (i) State the type of reaction where two monosaccharides join to form a disaccharide molecule.

Condensation (1)

(1)

(ii) Which of the following bonds joins two monosaccharides to form a disaccharide molecule?

(1)

- ☒ **A** ester
- ☒ **B** glycosidic
- ☒ **C** hydrogen
- ☒ **D** peptide

B- glycosidic
A is incorrect because ester bonds are found in lipids
C is incorrect because disaccharides do not contain hydrogen bonds
D is incorrect because peptide bonds are found in proteins

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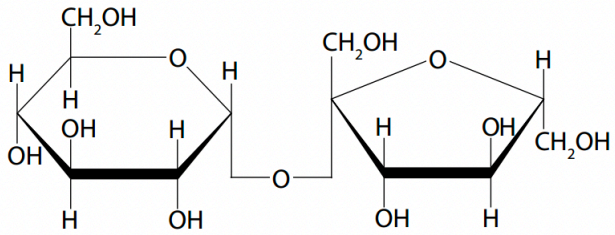
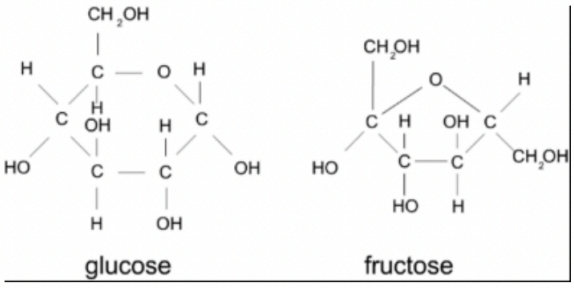
(b) The diagram shows a molecule of sucrose.



(i) Draw the two monosaccharides that are produced when a molecule of sucrose is broken down.

(2)

An answer that makes reference to the following:
- correct glucose molecule drawn (1)
- correct fructose molecule drawn (1)



(ii) Fig. 1.2 shows a representation of a short polypeptide chain made from three amino acids.

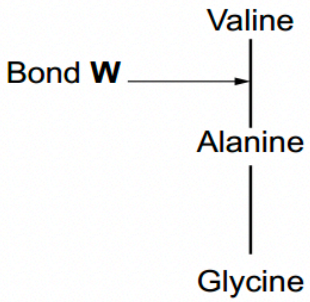


Fig. 1.2

Name bond **W and** state what type of reaction takes place to form this bond.

Both must be correct for mark
peptide / amide (bond)
and
condensation (reaction)✓

Additional incorrect answer on either line = 0 marks
IGNORE covalent
DO NOT ALLOW dipeptide
DO NOT ALLOW hydrolysis

[1]

Question 1

(a) Hydrolysis; 1

1(a)(i)	Hydrolysis;	1	Accept phonetic spelling. Ignore reaction.

0 5 . 1 Phospholipids are one of the storage molecules found in cherry seeds.

Name the type of reaction used to break down phospholipids to release phosphate.

[1 mark]

Hydrolysis (reaction);

Question	Marking guidance	Mark	Comments
01.1	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;	2 max	Ignore ref. to H bonds / microfibrils
01.2	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	2 max	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'

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

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

Question Number	Answer	Additional Guidance	Mark
3(a)	An explanation which includes reference to two of the following: • 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)	A description that makes reference to the following: • 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)	A description which includes reference to the following: • 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)	A description which includes reference to the following: • branched molecule for more rapid hydrolysis (1) • compact so more can be stored (1)	ALLOW broken down ALLOW 'doesn't take up much space'	(2)