

0 2 . 1 What is a monomer?

[1 mark]

---

---

---

---

---

0 2 . 2 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.

[2 marks]

Similarity \_\_\_\_\_

---

---

---

---

Difference \_\_\_\_\_

---

---

---

---



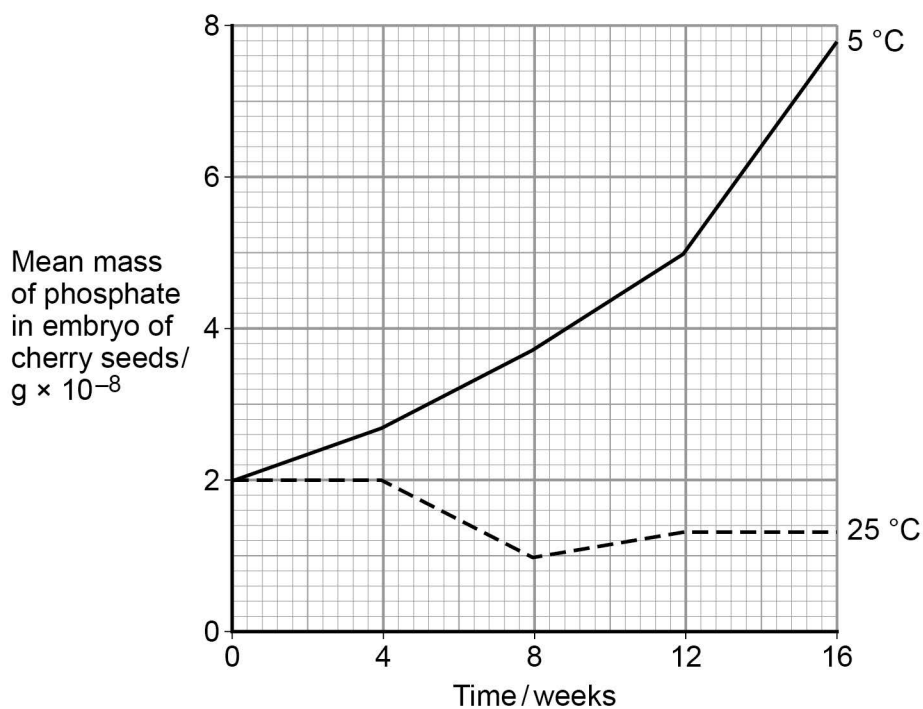


0 5

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 5** . **2**

The scientists concluded that an increase in phosphate in the embryo was linked to growth of the embryo.

Suggest **two** reasons why an increase in phosphate can be linked to growth of the embryo.

**[2 marks]**

1 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**0 5** . **3**

Calculate the ratio of the mean mass of phosphate found at 5 °C to the mean mass of phosphate found at 25 °C after 9 weeks of chilling.

**[1 mark]**

Ratio = \_\_\_\_\_

**Question 5 continues on the next page**



Answer **all** questions in the spaces provided.

- 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 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- 0 1** . **3** Tick (✓) the box that identifies the test which would be used to show the presence of starch.

[1 mark]

Acid hydrolysis test

Benedict's test

Emulsion test

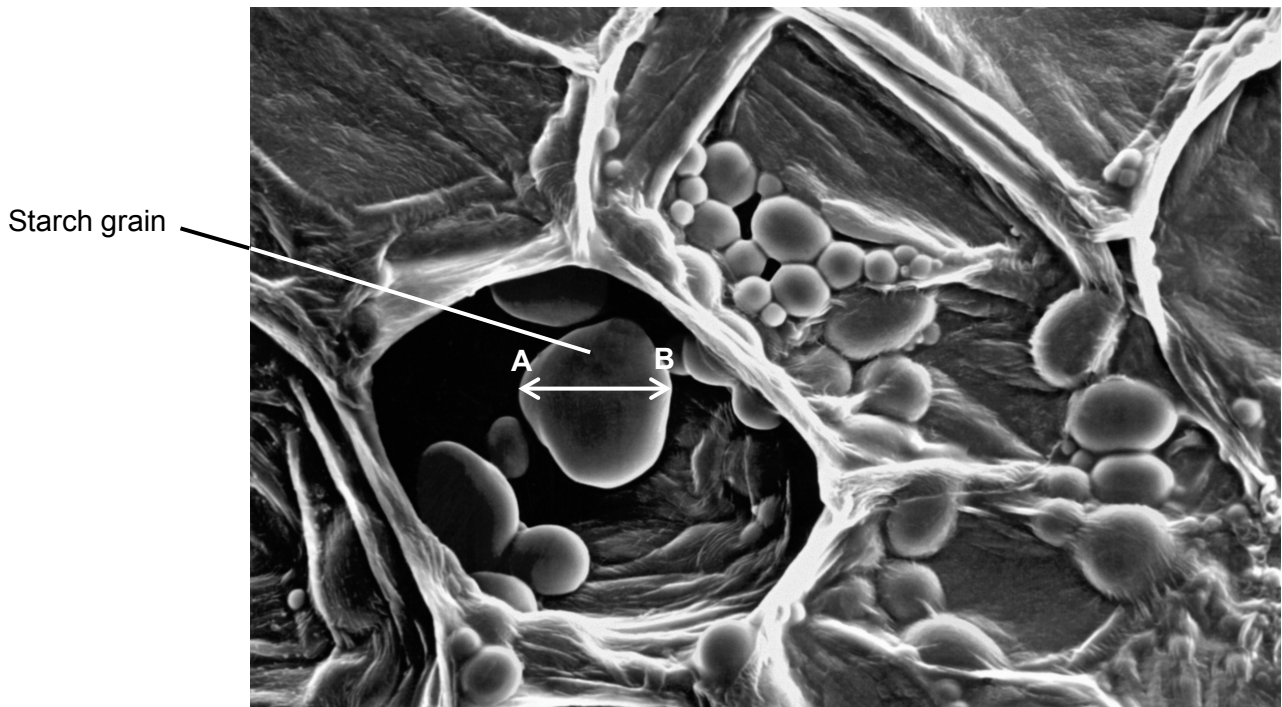
Iodine/potassium iodide test



0 1 . 4

Figure 1 shows a section through a plant tissue at a magnification of  $\times 500$ .

Figure 1



Calculate the actual diameter of the starch grain between points **A** and **B**.

[2 marks]

Answer = \_\_\_\_\_  $\mu\text{m}$

0 1 . 5

What type of microscope was used to obtain the image shown in **Figure 1**?  
Give **one** piece of evidence to support your answer.

[2 marks]

Type of microscope \_\_\_\_\_

Evidence \_\_\_\_\_

\_\_\_\_\_







0 7 . 2 The part of the phospholipid in **Figure 8** labelled **A** is formed from a particular molecule. Name this molecule. [1 mark]

---

0 7 . 3 Name the type of bond between **A** and fatty acid **X**. [1 mark]

---

0 7 . 4 Which of the fatty acids, **X** or **Y**, in **Figure 8** is unsaturated? Explain your answer. [1 mark]

---

---

---

---

**Question 7 continues on the next page**

**Turn over ▶**

Scientists investigated the percentages of different types of lipid in plasma membranes from different types of cell. **Table 2** shows some of their results.

**Table 2**

Type of lipid	Percentage of lipid in plasma membrane by mass		
	Cell lining ileum of mammal	Red blood cell of mammal	The bacterium <i>Escherichia coli</i>
Cholesterol	17	23	0
Glycolipid	7	3	0
Phospholipid	54	60	70
Others	22	14	30

**0 7 . 5** The scientists expressed their results as **Percentage of lipid in plasma membrane by mass**. Explain how they would find these values.

**[2 marks]**

---



---



---



---

Cholesterol increases the stability of plasma membranes. Cholesterol does this by making membranes less flexible.

**0 7 . 6** Suggest **one** advantage of the different percentage of cholesterol in red blood cells compared with cells lining the ileum.

**[1 mark]**

---



---



---

0 7 . 7 *E. coli* has no cholesterol in its cell-surface membrane. Despite this, the cell maintains a constant shape. Explain why.

[2 marks]

---

---

---

---

**Turn over for the next question**

**Turn over ▶**

0 2 . 1

Describe the difference between the structure of a triglyceride molecule and the structure of a phospholipid molecule.

**[1 mark]**

---

---

---

0 2 . 2

Describe how you would test for the presence of a lipid in a sample of food.

**[2 marks]**

---

---

---

---

0 2 . 3

Animal fats contain triglycerides with a high proportion of saturated fatty acids. If people have too much fat in their diet, absorption of the products of fat digestion can increase the risk of obesity. To help people lose weight, fat substitutes can be used to replace triglycerides in food.

Describe how a saturated fatty acid is different from an unsaturated fatty acid.

**[1 mark]**

---

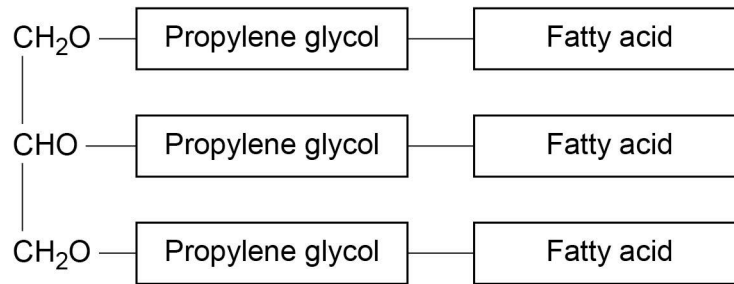
---

---



Figure 1 shows the structure of a fat substitute.

Figure 1



0 2 . 4

This fat substitute **cannot** be digested in the gut by lipase.

Suggest why.

[2 marks]

---



---



---



---



---

0 2 . 5

This fat substitute is a lipid. Despite being a lipid, it cannot cross the cell-surface membranes of cells lining the gut.

Suggest why it **cannot** cross cell-surface membranes.

[1 mark]

---



---



---



Question	Marking Guidance	Mark	Comments
02.1	(a monomer is a smaller / repeating) unit / molecule from which larger molecules / polymers are made;	1	Reject atoms / elements / 'building blocks' for units / molecules Ignore examples
02.2	<p><b>Similarity</b></p> <p>1. Both contain galactose / a glycosidic bond;</p> <p><b>Difference</b></p> <p>2. Lactulose contains fructose, whereas lactose contains glucose;</p>	2	<p>1. Ignore references to hydrolysis and / or condensation</p> <p>2. Ignore alpha / beta prefix for glucose</p> <p>2. Difference must be stated, not implied</p>
02.3	<p>1. (Lactulose) lowers the water potential of faeces / intestine / contents of the intestine;</p> <p>2. Water retained / enters (due to osmosis) <b>and</b> softens the faeces;</p>	2	<p>1. Accept <math>\Psi</math> for water potential</p> <p>2. Accept descriptions of soft faeces, eg faeces is less dry / less hard</p>
02.4	(-) 84.1(%);;	2	<p>Accept (-) 84.15(%)</p> <p>Allow 1 mark for 84</p> <p><b>OR</b></p> $\frac{2.82 \times 10^{-7} - 4.47 \times 10^{-8}}{2.82 \times 10^{-7}}$ <p><b>OR</b></p> $\frac{2.37 \times 10^{-7}}{2.82 \times 10^{-7}}$

Question	Marking Guidance	Mark	Comments
05.1	Hydrolysis (reaction);	1	
05.2	<ol style="list-style-type: none"> <li>1. (Phosphate required) to make RNA;</li> <li>2. (Phosphate required) to make DNA;</li> <li>3. (Phosphate required) to make ATP/ADP;</li> <li>4. (Phosphate required) to make membranes;</li> <li>5. (Phosphates required) for phosphorylation;</li> </ol>	2 max	<p>1 and 2. If neither DNA or RNA are named allow one mark for nucleotide/nucleic acid/phosphodiester bonds/sugar-phosphate backbone.</p> <p>4. Ignore: phospholipids without reference to membranes.</p> <p>Accept: as additional mark points any named biological molecule containing phosphate e.g. NADP, AMP, RuBP.</p>
05.3	Accept answer in range from 3.7 : 1 to 4.1 : 1;	1	Reject any ratio not : 1.
05.4	<ol style="list-style-type: none"> <li>1. Seeds/embryo remain dormant/inactive in winter/cold <b>OR</b> Growth/development of seed/embryo during winter/cold;</li> <li>2. Seeds/plants develop in spring/summer <b>OR</b> Seeds/plants develop when temperature/light increases;</li> <li>3. Plant photosynthesise (in spring/when warm);</li> <li>4. Produce (more) seeds/offspring in spring/growing season;</li> </ol>	3 max	<p>1. Ignore: hibernate.</p> <p>1. Accept: 'seed survives winter/cold'.</p> <p>1. Reject: plant develops or seed germinates during winter/cold.</p> <p>2. Accept: seeds/plants develop when more light or when temperature is higher.</p> <p>2. Accept: seed germinates/'sprouts' during spring/summer or when temp/light increases.</p>

Question	Marking guidance	Mark	Comments
01.1	1. Cellulose is made up of $\beta$ -glucose (monomers) <b>and</b> glycogen is made up of $\alpha$ -glucose (monomers); 2. Cellulose molecule has straight chain <b>and</b> glycogen is branched; 3. Cellulose molecule has straight chain <b>and</b> glycogen is coiled; 4. glycogen has 1,4- and 1,6- glycosidic bonds <b>and</b> cellulose has only 1,4- glycosidic bonds;	2 max	Ignore ref. to H bonds / microfibrils
01.2	Any <b>two</b> from: 1. Insoluble (in water), so doesn't affect water potential; 2. Branched / coiled / ( $\alpha$ -)helix, so makes molecule compact; OR Branched / coiled / ( $\alpha$ -)helix so can fit many (molecules) in small area; 3. Polymer of ( $\alpha$ -)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 <b>and</b> explanation for 1 mark 1. Accept $\Psi$ or WP 1. Accept Insoluble so doesn't affect osmosis  1. Do <b>not</b> allow ref to 'doesn't affect water leaving cells'  4. Ignore 'surface area' 4. Accept 'branched so glucose readily released'
01.3	Iodine/potassium iodide;	1	Auto mark
01.4	For correct answer of 40 ( $\mu$ m) award 2 marks;; Evidence of division by 500: award 1 mark	2	Allow tolerance of 0.5mm ie $20 \pm 0.5$ mm
01.5	1. Scanning electron (microscope); 2. 3D (image);	2	Accept SE(M) 2. Ignore any other correct features



Question	Marking Guidance	Mark	Comments
07.1	1. Dissolve in alcohol, then add water; 2. White emulsion shows presence of lipid;	2	
07.2	Glycerol;	1	
07.3	Ester;	1	
07.4	<b>Y</b> (no mark) Contains double bond between (adjacent) carbon atoms in hydrocarbon chain;	1	
07.5	1. Divide mass of each lipid by total mass of all lipids (in that type of cell); 2. Multiply answer by 100;	2	
07.6	Red blood cells free in blood/not supported by other cells so cholesterol helps to maintain shape;	1	Allow converse for cell from ileum – cell supported by others in endothelium so cholesterol has less effect on maintaining shape
07.7	1. Cell unable to change shape; 2. (Because) cell has a cell wall; 3. (Wall is) rigid/made of peptidoglycan/murein;	2 max	

Question	Marking Guidance	Mark	Comments
02.1	1. In phospholipid, one fatty acid replaced by a phosphate;	1	Ignore references to saturated and unsaturated 1. Accept $\text{Pi}/\text{PO}_4^{3-}$ / $\text{P}$ 1. Reject P/Phosphorus Accept annotated diagrams
02.2	1. Add ethanol, then add water; 2. White (emulsion shows lipid);	2	1. Reject ethanal/ethonal Accept 'Alcohol/named alcohol' 2. Accept milky – Ignore 'cloudy' Sequence must be correct If heated then DQ point 1 Reject precipitate
02.3	Saturated single/no double bonds (between carbons) <b>OR</b> Unsaturated has (at least one) double bond (between carbons);	1	Accept hydrocarbon chain/R group for 'between carbons' for either  Accept Sat = max number of H atoms bound 'It' refers to saturated
02.4	1. (Fat substitute) is a different/wrong shape/not complementary; <b>OR</b> Bond between glycerol/fatty acid and propylene glycol different (to that between glycerol and fatty acid)/no ester bond; 2. Unable to fit/bind to (active site of) lipase/no ES complex formed;	2	If wrong bond name given (e.g. peptide/glycosidic), then penalise once
02.5	It is hydrophilic/is polar/is too large/is too big;	1	Ignore 'Is not lipid soluble'