Mark scheme

<table>
<tr><th colspan="3">Question</th><th>Answer/Indicative content</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1</td><td></td><td></td><td>
<table>
<tr><th>Statement</th><th>True</th><th>False</th></tr>
<tr><td>Breaking one ester bond in a triglyceride produces glycerol and three fatty acids.</td><td></td><td>✓</td></tr>
<tr><td>Ribose is a hexose monosaccharide.</td><td></td><td>✓</td></tr>
<tr><td>In an alpha glucose molecule, the hydroxyl (OH) group is positioned below carbon 1.</td><td>✓</td><td></td></tr>
</table>
All 3 rows correct ✓ ✓
Any 2 rows correct ✓
</td><td>2</td><td>ALLOW a cross in place of a tick

<u>Examiner’s Comments</u>

Well answered with a large number of candidates achieving 2 marks. The common error was stating that ribose was a hexose.</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>2</td><td></td></tr>
<tr><td>2</td><td>a</td><td></td><td>
<table>
<tr><th>Biological molecule</th><th>Is a monomer</th><th>Is a polymer</th><th>Contains glycosidic bond(s)</th></tr>
<tr><td>Amino acid</td><td>✓</td><td></td><td></td></tr>
<tr><td>Amylopectin</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Glucose</td><td>✓</td><td></td><td></td></tr>
<tr><td>Sucrose</td><td></td><td></td><td>✓</td></tr>
</table>
1 mark per correct row ✓✓✓
</td><td>3</td><td>IGNORE crosses and hybrid ticks

<u>Examiner’s Comments</u>

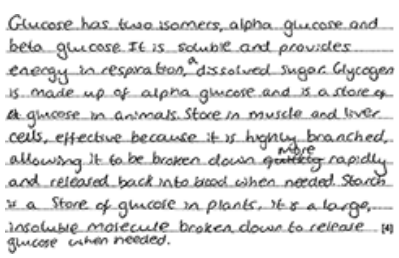
Many candidates were able to recall the correct features of amylopectin and glucose. Fewer were able to correctly complete the row for sucrose. A common error was to include sucrose as a polymer. Most candidates followed the instructions in the question to place a tick (rather than a cross), and there were very few “hybrid” ticks, with candidates who changed their minds crossing out and rewriting.</td></tr>
<tr><td></td><td>b</td><td></td><td>(α-) <u>gly</u>cosidic ✓

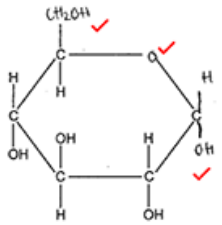
carbon 1 to carbon 4 (bond) ✓</td><td>2</td><td>ALLOW marks clearly shown on annotated diagram
IGNORE ref to any named carbohydrate

ALLOW (α-)1,4 glycosidic bond for 2 marks
DO NOT ALLOW beta / β</td></tr>
</table>

					ALLOW 1,4 (bond) **DO NOT ALLOW** 1,6 (bond) **ECF** e.g β-1,4 glycosidic bond gets **MP2** beta / β 1, 6 (bond) = 0 marks **Examiner's Comments** Most candidates correctly stated that the bond was glycosidic, and many were able to achieve both marks by recognising it as a 1-4 bond. Some candidates lost the second mark by incorrectly stating that it was a 1-6 glycosidic bond. It is also worthwhile noting the importance of spelling here for the 'glycosidic' bond.
	c	i	H_2O / water ✓ 2 / two ✓	2	**ALLOW** 1 mark for just H_2O / water **IGNORE** incorrect number e.g. 3 for **MP1** **Examiner's Comments** This question was generally well-answered. Most candidates knew that water was used for one mark and many correctly understood that two water molecules would be used in this hydrolysis reaction. Some candidates incorrectly suggested that three molecules of water were used, possibly because there were three glucose molecules. There were several 'no responses' for this question and this may be because candidates simply did not notice it due to lack of an answer line.
		ii	(maltotriose is) complementary to the <u>active site</u> (of maltase / the enzyme) **OR** (maltotriose also) contains (α-1,4) glycosidic bonds **OR** (maltase / the enzyme) hydrolyses (α-1,4) glycosidic bonds ✓	1	**ALLOW** (maltotriose) can bind to or fit into <u>active site</u> (of maltase / the enzyme) **DO NOT ALLOW** beta / β **ALLOW** breaks down for hydrolyses **Examiner's Comments** This question part was also generally well-answered with the full range of marking points being given as correct responses. Incorrect responses often referred to maltotriose as a polysaccharide or did not include the

					appropriate scientific terminology for a mark to be given.
			Total	**8**	
3			C ✓	1	**Examiner's Comments** Some candidates were able to identify C as the correct response and they were either familiar with the formula of lactose or that it was a disaccharide and were also able to take into account the loss of a water molecule in the formation of it to find the correct formula.
			Total	**1**	
4			*glucose* soluble / polar ✓ has chemical energy in its bonds **OR** is a, respiratory substrate / source of energy ✓ *starch / glycogen* insoluble **and** compact **OR** large(r), SA ✓ used for (energy / glucose) storage / allows quick release (of stored energy / glucose) ✓ *idea that* glycogen is broken down faster than starch due to, higher SA / many branch ends ✓	4	**IGNORE** descriptions of structure (e.g. 'glycogen is branched') **IGNORE** misspelling of 'glycogen' throughout **ALLOW** release, energy / ATP **IGNORE** starch / glycogen, can be stored **IGNORE** broken down more easily **Examiner's Comments** An excellent discriminator with only the most able candidates achieving the full 4 marks in a well organised and concise response. Almost all candidates had some knowledge to share even it was often confused and organised poorly. Less able candidates described the general structure of the carbohydrates while a few included the structure of cellulose. The most frequently given marks were glucose being soluble, glucose being used in respiration and starch or glycogen being used for storage. Some common mistakes included: easy release of glucose from the polysaccharides rather than rapid release, or not comparing the potential rate of release in glycogen to that in starch. Exemplar 3

					 Glucose has two isomers, alpha glucose and beta glucose. It is soluble and provides energy in respiration, a dissolved sugar. Glycogen is made up of alpha glucose and is a store of glucose in animals. Store in muscle and liver cells, effective because it is highly branched, allowing it to be broken down more rapidly and released back into blood when needed. Starch is a store of glucose in plants. It is a large, insoluble molecule broken down to release glucose when needed. [4] The exemplar shown an organised response. The candidate has written about glucose, then about glycogen followed by starch. The response scored 3 marks out of the 4 available. The candidate has stated that glucose is soluble and used in respiration. The third mark is given for glycogen being a store of glucose. The candidate has narrowly missed out on 2 further mark points. Lower down in the response the candidate writes that glycogen can be broken down more rapidly. Unfortunately, it is not clear that glycogen is broken down more rapidly than starch due to the larger number of branch-ends available. The candidate has also mentioned that starch is insoluble but has not added that it is compact. Overall, this was a good well-structured response from an able candidate.
			Total	**4**	
5			D ✓	1	
			Total	**1**	
6			A ✓	1	**Examiner's Comments** Many candidates selected the correct response, A. Examiners noted that for a number of candidates drawing out the molecule in the space beside the question was a successful strategy.
			Total	**1**	
7			D ✓	1	**Examiner's Comments** Many candidates selected the correct response, D. A common incorrect response was B as candidates obviously knew that cellulose contains

					β-glucose but did not realise that cellulose is not branched.
			Total	**1**	
8		i	*correct positions for* CH_2OH ✓ O ✓ H OH ✓	3 (AO1.1)	**ALLOW** bond line to any part of the group **ALLOW** correct displayed formula **IGNORE** bond angles  **Examiner's Comments** This question differentiated well between candidates. Around two thirds got either the 'O' or the groups on 'C_1 ' correct and many candidates got both correct. A smaller proportion got the C_6 group correct but almost half achieved full marks. Some candidates, usually those who didn't perform well on the rest of the paper, achieved 0 marks.
		ii	small so it can cross membranes ✓ OH / H (groups) , allow , H bond formation / solubility / bonding with water molecules ✓	2 (AO2.1)	**ALLOW** small enough to fit through protein channels **Examiner's Comments** This question was low demand but only half of the candidates scored one mark. Both marking points were seen but more common was the solubility idea. Candidates often stopped after explaining one feature and so the award of 2 marks was rare. Many candidates described the properties of glucose without linking this to the structure.
			Total	**5**	
9			D ✓	1 (AO1.1)	**Examiner's Comments** Around 4 out of 5 candidates selected the correct response, option **D**,

					showing good understanding of glycosidic bonds and polysaccharides. Option **A** was the most common incorrect response.
			Total	**1**	
10			C ✓	1 (AO1.2)	**Examiner's Comments** A very large proportion of candidates, selected the correct option for this question, **C**. Very few candidates chose options **A** or **B**.
			Total	**1**	
11			A ✓	1 (AO1.1)	
			Total	**1**	
12		i	glycosidic (bond) ✓ hydrolysis **OR** water, added / needed ✓	2 (AO1.1)	**IGNORE** numbers **DO NOT ALLOW** condensation / water produced **ALLOW** description OH joins, one sugar / galactose, and H joins, the other / glucose (plus O from glycosidic bond) **Examiner's Comments** This was fairly straightforward and many candidates named the glycosidic bond and referred to hydrolysis. Incorrect responses included peptide, disulphide and hydrogen bonds and the term condensation.
		ii	**1** (undigested) lactose lowers the water potential ✓ **2** water enters (the large intestine) by osmosis ✓	2 (AO2.6)	**1 ALLOW** bacteria break down the lactose so, (unabsorbed) glucose / galactose, lower Ψ **2 ALLOW** down Ψ gradient for 'osmosis' **Examiner's Comments** This high demand question was where marks were gained by the fewest candidates. It was rare for a candidate to think laterally and creatively and to link fluid build-up to water moving by osmosis. Lactose is soluble in water so exerts an osmotic effect. It may also be hydrolysed by bacteria in the large intestine

					producing more soluble monosaccharides.
			Total	**4**	
13			D ✓	1(AO1.1)	**Examiner's Comments** Almost half of answers were correct. The most common incorrect response was B. It should be noted that, although most animals do not produce cellulases, enzymes that digest cellulase are common in microorganisms.
			Total	**1**	
14			D ✓	1(AO1.1)	**Examiner's Comments** Only a third of candidates got this right. The most common incorrect response was A.
			Total	**1**	