Question	Answers	Extra information	Mark	AO Spec reference
1(a)	circle drawn around CH_3 ✔	Accept a clear annotation that indicates CH_3	1	AO1 2.1.2.k
1(b)(i)	$(R_f =)$ 0.38 ✔✔	*The correct answer of 0.38 should be awarded 2 marks even when no working is shown* Accept any value in the range 0.36–0.40 If the final answer is incorrect, 1 mark should be awarded for dividing any value by 5(cm)	2	AO2 2.1.2.s(i)
1(b)(ii)	R_f = 0.13 ✔ glutamine ✔		2	AO2 2.1.2.s(i)
1(b)(iii)	Any two from: similar chemical properties ✔ similar R groups ✔ similar solubility ✔	Accept alternative wording	2 max	AO2 2.1.2.s(i) 2.1.2.s(ii)
1(b)(iv)	Any two from: *idea of* leave a larger gap between the pencil line and the solvent ✔ add cap to jar (to prevent solvent evaporation) ✔ *idea of* monitor solvent rather than leaving it for a set time ✔		2 max	AO3 2.1.2.s(i) 2.1.2.s(ii)
2(a)	hydrogen bond shown between O of one molecule and H of another ✔ negative dipole shown on both O atoms ✔ positive dipole shown on all 4 H atoms ✔	Hydrogen bonds can be represented by dotted or dashed lines	3	AO1 2.1.2.a

Question	Answers	Extra information	Mark	AO Spec reference
2(b)	Any three from: blood plasma is (predominantly) water ✓ glucose and amino acids are polar ✓ glucose has O–H bonds ✓ amino acids have N–H bonds ✓ hydrogen bonds form between molecules and water ✓		3 max	AO1 2.1.2.a 2.1.2.d 2.1.2.k 3.1.2.d
2(c)	stomata ✓ transpiration ✓ cohesion ✓ adhesion ✓		4	AO1 3.1.3.d
2(d)	(see table below)	Award one mark for each correct row in the table	4	AO1 2.1.2.e 2.1.2.i 2.1.2.l
3(a)	sodium hydroxide ✓ volumes ✓ purple / violet ✓		3	AO1 2.1.2.q
3(b)(i)	*idea that* green colour indicates sugar is present ✓ *idea that* no conclusion can be made about the concentration of reducing sugar without knowing the concentration and volume of Benedict's added ✓ *idea that* the sugar could be another reducing sugar (and not glucose) ✓		3	AO3 2.1.2.q

Table for 2(d):

Molecule being hydrolysed	Bond broken	Molecule(s) formed
starch	glycosidic	maltose
sucrose	glycosidic	glucose and fructose
triglyceride	ester	fatty acids and glycerol
polypeptide/peptide /dipeptide	peptide	amino acids

Question	Answers	Extra information	Mark	AO Spec reference
3(b)(ii)	Any two from: conduct Benedict's test (which would give a negative result) ✓ add dilute HCl ✓ boil ✓ neutralise with sodium hydroxide ✓ conduct the Benedict's test again ✓		3 max	AO1 2.1.2.q
3(c)	**B** blood plasma ✓ *explanation*: positive result for (named) reducing sugar ✓ **C** sieve tube fluid ✓ *explanation*: positive result for sucrose / non-reducing sugar ✓ *idea that* A cannot be either sample because neither would contain starch ✓		4 max	AO3 2.1.2.q 3.1.3.f
3(d)	*idea that* the sample should be mixed first with ethanol rather than water ✓ decant into water rather than ethanol ✓ *idea that* the mixture does not need to be heated ✓		2 max	AO3 2.1.2.q
4(a)(i)	C, H, O, N ✓ S ✓	Accept names or chemical symbols for each element	2	AO2 2.1.2.c
4(a)(ii)	(34 350 × 3 =) 103 050 (RNA nucleotides)	Accept 103 053 (if a stop codon is referenced) or 103 056 (if a stop codon and a start codon are referenced)	1	AO2 2.1.3.f
4(b)	Any five from: *idea that* the primary structure is a polypeptide containing 348 amino acids ✓ secondary structure has alpha helices ✓ formed by hydrogen bonds ✓ tertiary structure has disulphide bonds ✓ (rhodopsin is) a glycoprotein / conjugated ✓ retinal is a cofactor / prosthetic group ✓	The descriptions should be linked to the correct level of protein structure for the marks 1–4 to be awarded.	5 max	AO2 2.1.2.m

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Question	Answers	Extra information	Mark	AO Spec reference
	idea that (rhodopsin must have) hydrophobic regions (within the membrane) and hydrophilic regions (either side of the membrane) ✓			
4(c)(i)	globular ✓ Plus, any two marks from: specific 3D shape (which can be inferred from the presence of an active site, as it is an enzyme) ✓ no repeating pattern / many different regions ✓ enzymatic role ✓	Accept alternative wording	3 max	AO2 2.1.2.n 2.1.2.o
4(c)(ii)	tertiary		1	AO2 2.1.2.m 2.1.4.c
4(c)(iii)	Any three from: hydrogen bonds break ✓ enzyme denatures ✓ tertiary structure changed ✓ active site no longer complementary to substrate / ADP ✓		3 max	AO1 2.1.4.d 2.1.4.i
5(a)(i)	<table><tr><td>Molecule</td><td>glycogen</td><td>amylopectin</td></tr><tr><td>Type of glycosidic bonds</td><td>1,4 and 1,6 links</td><td>1,4 and 1,6 links</td></tr><tr><td>Helical?</td><td>yes</td><td>yes</td></tr><tr><td>Branched?</td><td>yes</td><td>yes</td></tr></table>	*Award one mark for each correct row in the table*	3	AO1 2.1.2.f
5(a)(ii)	Any two from: insoluble ✓ compact due to branching ✓ *idea that* branches increases rate of hydrolysis when glucose is required ✓		2 max	AO1 2.1.2.g

Question	Answers	Extra information	Mark	AO Spec reference
5(b)(i)	The H and OH on carbon 1 face different directions ✓	Accept an annotated diagram Accept alternative wording	1	AO1 2.1.2.d
5(b)(ii)	Any three from: insoluble ✓ hydrogen bonds / cross links between polysaccharide chains ✓ increase strength ✓ (for) structural support ✓	Accept alternative wording	3 max	AO1 2.1.2.g
6(a)(i)	*idea of* dilute 1 part protein solution to 4 parts water ✓		1	AO2 2.1.2.r
6(a)(ii)	Any one from: use a clean pipette each time ✓ *idea of* remember or write down the order of the solutions (because cuvettes cannot be labelled) ✓		1 max	AO3 2.1.2.r
6(a)(iii)	Any two from: the biuret test produces a purple colour ✓ (which means) green light is absorbed ✓ (using the filter) increases the accuracy of the results ✓		2 max	AO3 2.1.2.q 2.1.2.r
6(a)(iv)	*x*-axis labelled 'percentage (concentration of) protein (solution)' **AND** *y*-axis labelled 'absorbance / AU' ✓ straight line from origin showing a positive correlation ✓		2	AO2 2.1.2.r
6(b)	Any two from: protein solution concentration / volume ✓ temperature ✓ volume of protease solution ✓ biuret solution concentration / volume ✓ pH ✓		2 max	AO3 2.1.2.r

A Level OCR Biology
3 Biological molecules – answers

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Question	Answers	Extra information	Mark	AO Spec reference
7	**Level 3 (5–6 marks)** Provides descriptions of the properties of several molecules **and** explains their roles in membrane function. *There is a well-developed line of reasoning, which is clear and logically structured and uses scientific terminology at an appropriate level. All the information presented is relevant and forms a continuous narrative.* **Level 2 (3–4 marks)** Provides descriptions of the properties of molecules **and** at least one explanation of a role in membrane function. *There is a line of reasoning presented with some structure and use of appropriate scientific language. The information presented is mostly relevant.* **Level 1 (1–2 marks)** Provides a description of a property of a molecule **or** an explanation of a role in membrane function. *The information is communicated with only a little structure. Communication is hampered by the inappropriate use of technical terms.* **0 marks** No response or no response worthy of credit.	**Indicative content:** *Phospholipid* • hydrophilic head and hydrophobic tail • creates physical barrier while allowing regulated exchange of substances in and out of the cell *cholesterol* • small ✓ hydrophobic and hydrophilic regions • stabilises membranes *glycoproteins* • specific shapes and molecular groups • receptors to specific molecules *carrier/channel proteins* • specific tertiary structure facilitated diffusion (through carrier or channel proteins) and active transport (through carrier proteins) of specific molecules and ions	6	AO1 2.1.2.j 2.1.5.b
8	**Level 3 (5–6 marks)** Describes similarities **and** differences between **both** pairs of polysaccharides with few or no errors. *There is a well-developed line of reasoning, which is clear and logically structured and uses scientific terminology at an appropriate level. All the information presented is relevant and forms a continuous narrative.*	**Indicative content:** **Chitin and cellulose** Similarities: • 1,4 links • No branching or helices • Cross links between polymer chains	6	AO2 2.1.2.g

A Level OCR Biology
3 Biological molecules – answers

OXFORD Revise

Question	Answers	Extra information	Mark	AO Spec reference
	Level 2 (3–4 marks) Describes similarities **and** differences between **one** pair of polysaccharides with few or no errors **OR** describes similarities **and** differences between **both** pairs with some errors. *There is a line of reasoning presented with some structure and use of appropriate scientific language. The information presented is mostly relevant.* **Level 1 (1–2 marks)** Describes similarities **or** differences for at least one pair of polysaccharides. *The information is communicated with only a little structure. Communication is hampered by the inappropriate use of technical terms.* **0 marks** No response or no response worthy of credit.	Differences: • Cellulose has β-glucose monomers • Cellulose does not contain nitrogen ***Arabinoxylan and amylopectin*** Similarities: • 1,4 links • Branching • No links between polymer chains Differences: • Amylopectin has 1,6 links rather than 2, 3 links • Amylopectin is not helical • Amylopectin has only one monomer (α-glucose)		

A Level OCR Biology
3 Biological molecules – answers

Skills box answers

1.

Test tube	Final concentration of sodium chloride (mol dm^{-3})	Volume distilled water (cm^3)	Volume 1 mol dm^{-3} sodium chloride solution (cm^3)	Final volume (cm^3)
A	0.00	10.0	0.0	10.0
B	0.25	7.5	2.5	10.0
C	0.50	5.0	5.0	10.0
D	0.75	2.5	7.5	10.0
E	1.00	0.0	10.0	10.0

2.

Test tube	Final concentration of glucose (mol dm^{-3})	Volume distilled water (cm^3)	Volume 2 mol dm^{-3} glucose solution (cm^3)	Final volume (cm^3)
A	0.0	10.0	0.0	10.0
B	0.1	9.5	0.5	10.0
C	0.3	8.5	1.5	10.0
D	0.5	7.5	2.5	10.0
E	0.7	6.5	3.5	10.0
F	0.9	5.5	4.5	10.0
G	1.0	5.0	5.0	10.0