Mark Scheme (Results)

October 2025

Pearson Edexcel International Advanced Subsidiary Level in Biology
WBI11/01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Additional guidance	Mark
1(a)	An answer that makes reference to the following points : • phosphate (ion / group) (1) • deoxyribose (1) • phosphodiester (1)	 **ACCEPT** PO_4^{3-} **NB** accept 'deoxyribose' if the second answer is {blank / says phosphate} **ACCEPT** pentose / 5 C sugar **DO NOT ACCEPT** ribose **ACCEPT** covalent	**(3)**

Question number	Answer	Mark
1(b)		**(2)**

Feature	Types of RNA			
	both mRNA and tRNA	**mRNA only**	**tRNA only**	**neither mRNA nor tRNA**
single-stranded	☒			
folded			☒	

Question number	Answer	Mark
2(a)	**The only correct answer is C** ***A*** *is incorrect because ATG is the code for methionine* ***B*** *is incorrect because GTT is the code for valine* ***D*** *is incorrect because TTT is the code for phenylalanine*	**(1)**

Question number	Answer	Additional guidance	Mark
2(b)(i)	• A G A U C U		**(1)**

Question number	**Answer**	**Additional guidance**	**Mark**
2(b)(ii)	• U C U (A G A)		**(1)**

Question number	Answer	Additional guidance	Mark
2(c)	An explanation that makes reference to the following points: • because using (one or) two bases would not make enough {combinations / codes / sequences} (1) • (to code) for all the amino acids (in proteins) (and the start and stop codons) (1)	**ACCEPT** two bases would only make 16 {combinations / codes} …… and {codes are needed for 20 amino acids / 21 codes are needed}	**(2)**

Question number	Answer	Additional guidance	Mark
2(d)	An answer that makes reference to three of the following points: **Similarities:** • all start with cys (and tyr) and end with gly (1) • all have gln, asn, cys and pro (1) **Differences:** • A has ile (at position 3) but B and C have phe / A has ile instead of phe (at position 3) (1) • C had lys (at position 8) but A and B have arg / C has lys instead of arg (at position 8) (1)	**DO NOT PIECE TOGETHER** Piece together separate statements 'all start with cys (and tyr)' with 'all end with gly' **ACCEPT** all have cys in position 1 and gly in position 9 **ACCEPT** all positions correctly given with no reference to amino acid names if neither mp 1 nor mp 2 given 1, 2, 4, 5, 6, 7, 9 / all positions except 3 and 8	**(3)**

Question number	Answer	Mark
3(a)	**The only correct answer is A** ***B*** *is incorrect because enzymes also contain nitrogen and sulfur* ***C*** *is incorrect because there are extracellular enzymes as well* ***D*** *is incorrect because enzymes also contain nitrogen and sulfur and there are extracellular enzymes as well*	**(1)**

Question number	Answer	Additional guidance	Mark
3(b)(i)	A description that makes reference to the following points: • type 2 slows down the rate of reaction more (1) • type 2 causes the rate of reaction to level off / but type 1 {does not / levels off at higher concentrations} (in the concentration range shown) (1)	**ACCEPT** converse throughout **ACCEPT** rate of reaction is {slower / lower} for type 2 **ACCEPT** type 2 does not go as fast as the reaction without an inhibitor (but type 1 does) **IGNORE** type 2 has a greater effect unless reference to inhibition or rate slowing **ACCEPT** at high concentrations {type 1 no longer inhibits / type 2 does inhibit} **DO NOT ACCEPT** faster / slower	**(2)**

Question number	Answer	Additional guidance	Mark
3(b)(ii)	An explanation that makes reference to three of the following points: • the shape of the substrate and the inhibitor are similar (1) • therefore {the inhibitor / part of the inhibitor} can {enter / bind / fit / connects / complementary} the active site (1) • therefore there will be fewer {enzyme-substrate complexes formed / enzymes available to react with substrate} (1) • per unit time / at the same time (1)	**ACCEPT** same shape part of the shape of substrate and inhibitor are the same both substrate and inhibitor have a {pointed end / diamond shape} **ACCEPT** less substrate can bind with enzyme substrate and inhibitor compete for active site type 1 is a competitive inhibitor NB this mp is linked to mp 3	**(3)**

Question number	Answer	Additional guidance	Mark
3(b)(iii)	An explanation that makes reference to the following points: • the active site changes shape because the inhibitor binds to the enzyme (1) • therefore fewer active sites for substrate to bind to (1)	**ACCEPT** active site is affected because the inhibitor binds to the {enzyme / allosteric site} **ACCEPT** so substrate no longer {fits into / binds to / etc} the active site	**(2)**

Question number	Answer	Mark
4(a)(i)		**(2)**

Feature	Structures of proteins			
	both secondary and tertiary	**secondary only**	**tertiary only**	**neither secondary nor tertiary**
peptide bonds	☒	☒	☒	☒
beta (ß) pleated folding	☒	☒	☒	☒

Question number	Answer	Additional guidance	Mark
4(a)(ii)	An explanation that makes reference to two of the following points: • has (four) {haem (groups) / iron ion / porphyrin} {to bind / to carry} oxygen (molecules) (1) • {globular / has polar R groups on the outside} to {dissolve / be soluble} (in cytoplasm / red blood cells) (1) • (four) subunits have different affinities for oxygen at different partial pressures of oxygen (1)	**ACCEPT** iron if a ref made to haem or porphyrin ..... to form oxyhaemoglobin **IGNORE** carbon dioxide binding to haem groups / valency of iron ion **IGNORE** water **DO NOT ACCEPT** blood **ACCEPT** four subunits allow oxygen to be {released / attached} at different concentrations of oxygen cooperative binding idea that binding of oxygen is staggered	**(2)**

Question number	Answer	Additional guidance	Mark
4(b)	An answer that makes reference to four of the following points: • partial pressures {between 4 800 m and 5 400 m (above sea level) / above 4 800 m / high altitudes / altitudes that llamas live} are low (than at lower altitudes) (1) • the dissociation curve for the llama is to the left (of that for the camel) (1) • therefore the llama's haemoglobin will have a higher affinity for oxygen (above 2 kPa) (1) • and will {be able to bind more oxygen / will have a higher percentage saturation} (at lower partial pressure of oxygen) (1) • therefore {sufficient / enough / more} oxygen {will reach the cells / for respiration} (of the llama) (1)	**ACCEPT** converse for camels **ACCEPT** line	**(4)**

Question number	Answer	Mark
5(a)	**The only correct answer is C** *A is incorrect because the oxygen is slightly negatively charged and the hydrogen slightly positively charged* *B is incorrect because there is one oxygen and two hydrogens* *D is incorrect because there is one oxygen and two hydrogens*	**(1)**

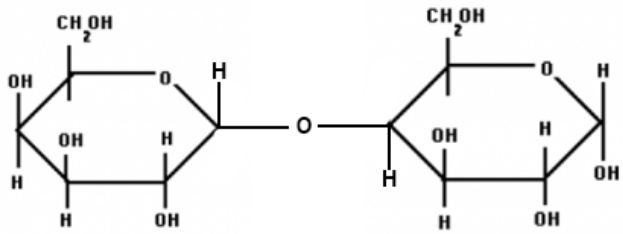
Question number	Answer	Additional guidance	Mark
5(b)	• (volume of freshwater calculated as) 3.5×10^{10} (1) • 3.5×10^{9} (km^3) (1)	**ACCEPT** $3.5 \cdot 10^{10}$ incorrect standard form e.g. 0.035×10^{12} **ACCEPT** 3.50×10^{9} / $3.5 \cdot 10^{9}$ Bald answer of 3.5×10^{9} = 2 marks Bald answer of correct answer but in incorrect standard form = 1 mark correct answer for volume of freshwater in correct standard form (3.5×10^{10}) = 1 mark	**(2)**

Question number	Answer	Additional guidance	Mark
5(c)	• <u>increase</u> in {population (humans / farm animals) / food demand / industrial demands} / <u>decrease</u> in rain / <u>faster</u> evaporation / <u>more</u> water in the atmosphere (1)	**NB** must be comparative **IGNORE** increase temperature / global warming / greenhouse gases / climate change **DO NOT ACCEPT** contradictions e.g. increase in melting of ice caps	**(1)**

Question number	Answer	Additional guidance	Mark
5(d)	An explanation that makes reference to two of the following points: • because water is {polar / dipolar / hydrophilic} (and the ions are charged) (1) • therefore the sodium ions will {bind to / be attracted to} the oxygen (of water) (1) • therefore the chloride ions will {bind to / be attracted to} the hydrogens (of water) (1)		**(2)**

Question number	Answer	Additional guidance	Mark
5(e)	An explanation that makes reference to four of the following points: • (fresh / pure) water passes by osmosis {out of the sea water / into the hydrogel} (1) • because the water potential of the sea water is greater (than that of the hydrogel) (1) • but the {(sodium chloride) ions / salt} cannot pass through (the partially permeable membrane) (1) • the (fresh) water {separated / released / removed / collected} (by squeezing the hydrogel) (1) • the (squeezed / dry) hydrogel has lower water potential (again) (1)	**DO NOT ACCEPT** sea water **ACCEPT** in a description e.g. water moves from high water potential to low water potential' if clearly linked to process high to low solute potential sea water is hypotonic / hydrogel is hypertonic **IGNORE** high water concentration to low water concentration **IGNORE** reasons **NB** 'produced fresh water' is too vague as it is in the stem of the question **DO NOT ACCEPT** sea water	**(4)**

Question number	Answer	Mark
6(a)(i)	**The only correct answer is D** ***A*** *is incorrect because sucrose is a disaccharide and fructose is a monosaccharide* ***B*** *is incorrect because maltose is a disaccharide* ***C*** *is incorrect because sucrose is a disaccharide*	**(1)**

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An answer that makes reference to the following points: • glycosidic bond drawn correctly between C1 and C4 (1) • H added to C1 and C4 (1)	 **IGNORE** indications of water being formed	**(2)**

Question number	Answer	Additional guidance	Mark
6(a)(iii)	A description that makes reference to the following points: • {polymer of / polysaccharide of / made of many} (α) glucose (1) • branched with (1 – 4 and 1 – 6 / together with 1 - 4) glycosidic bonds (joining glucoses) / has 1 – 4 and 1 – 6 glycosidic bonds (1)	**DO NOT ACCEPT** made of amylose and amylopectin	**(2)**

Question number	Answer	Additional guidance	Mark
6(b)	• 108 – 79 / 29 (1) • 30 mg dm^{-3} / 40 % (1)	Bald answer of 30 mg dm^{-3} / 40 % = 2 marks Bald answer of 30 / 40 (with no units or wrong units) = 1 mark 29 mg dm^{-3} = 1 mark	**(2)**

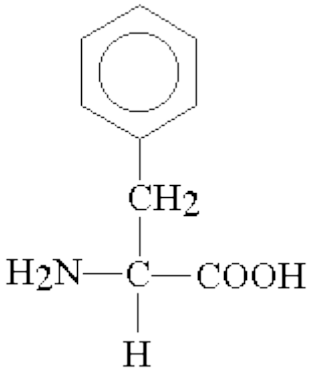
Question number	Answer
*6(c)	**1. Carbohydrate metabolism:** • carbohydrates broken down by hydrolysis • by enzymes • to speed up rate of reaction / to lower activation energy (E) • starch to maltose / glucose, lactose to glucose and galactose, maltose to glucose, sucrose to glucose and fructose • because starch is insoluble (so cannot move into blood) (E) • so that sugars are soluble (and can be moved into the blood stream) (E) **2. Carbohydrate transport:** • monomers / named monomer pass into blood by facilitated diffusion / channel proteins / carrier proteins • because it is a large / polar molecule (E) • as there is more glucose in digestive system than in blood (E) • transported in blood by mass transport • to overcome the limitations of diffusion (E) • because dissolves in blood plasma (E) • because they are polar molecules (E) **3. Carbohydrate usage in cells:** • glucose passes into cells by facilitated diffusion / channel proteins / carrier proteins • because more glucose in blood than cells (E) • used as a respiratory substrate / respiration • respiration to release energy (for cells) (E) • used to form glycoproteins • glycoproteins for cell membranes (E) **4. Carbohydrate storage in liver:** • liver stores carbohydrate as glycogen • to lower blood sugar levels / glucose is in excess (E) • glucoses joined by condensation reactions • glycogen is insoluble (so can be stored) (E) • glycogen does not have osmotic effect (E) • glycogen broken down to re-enter blood stream • as glycogen too large / insoluble to pass out of cells (E) • when blood sugar levels are too low (E) **6**

			Additional guidance
Level 0	0	No awardable content	
Level 1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information and with a focus on mainly just one piece of scientific information. The explanation will contain basic information, with some attempt made to link knowledge and understanding to the given context.	Simple descriptions of data with no real attempt of an explanation 1 mark = one description made 2 marks = three descriptions made
Level 2	3-4	An explanation will be given, with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows some linkages and lines of scientific reasoning, with some structure.	Some explanation given (E) 3 marks = explanation for one aspect of question 4 marks = explanation for two aspects of question
Level 3	5-6	An explanation is made that is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows a well-developed and sustained line of scientific reasoning, which is clear and logically structured.	Extended explanation given (E) 5 marks = explanation for three aspects of question 6 marks = explanation for four aspects of question

Question number	Answer	Additional guidance	Mark
7(a)(i)	An answer that makes reference to two of the following points: • not everyone will {know that they have cystic fibrosis / be tested / asked} (1) • world population is constantly changing / babies are constantly being born / people are constantly dying (1) • not all {birth / deaths} registered (1) • cannot count everyone because {too many / too distributed / rural areas / nomadic} (1)		**(2)**

Question number	Answer	Additional guidance	Mark
7(a)(ii)	• $\frac{7}{800000}$ / 0.0009 % / 0.001 % / 1 in 100 000 / 1 in 114 000	9×10^{-4} % / 1×10^{-3} % 0.00001 / 0.000009 $\frac{7}{8 \times 10^5}$	**(1)**

Question number	Answer	Additional guidance	Mark
7(b)(i)	An answer that makes reference to the following points: • because a deletion (mutation) took place (in base sequence) (1) • removing the {three bases / codon} that code for phenylalanine (1) **OR** • because a substitution (mutation) took place (in base sequence) (1) • replacing (a phenylalanine) with a different amino acid (1)	**ACCEPT** description e.g. removing nucleotides **IGNORE** wrong number of bases deleted **DO NOT ACCEPT** insertion **ACCEPT** description e.g. swapping bases **DO NOT ACCEPT** insertion **DO NOT ACCEPT** stop codon	**(2)**

Question number	Answer	Additional guidance	Mark
7(b)(ii)	An answer that makes reference to the following points: • central carbon with a hydrogen (attached to CH_2) (1) • amino group shown as {NH_2 / NH_3^+} (attached to the central C or the CH_2 group if central carbon not shown) (1) • carboxyl group shown as {COOH / COO^-} (attached to the central C or the CH_2 group if central carbon not shown) (1)		**(3)**

Question number	Answer	Additional guidance	Mark
7(c)(i)	An explanation that makes reference to the following points: • (mutation results in a) CFTR (protein) that cannot function properly (1) • credit details of result (1) • credit an example of the effect of mucus on sperm or egg cells (1)	**ACCEPT** {change in shape / structure / faulty} CFTR (protein) e.g. reduced transport of chloride ions out of the cell sodium ions move into the cell water leaves the mucus and enters the cell chloride ions remain in the cell **e.g.** prevents {sperm / egg cells} from getting through traps the {sperm / egg cells} blocks the {cervix / reproductive tract / oviduct}	**(3)**

Question number	Answer	Additional guidance	Mark
7(c)(ii)	An explanation that makes reference to two of the following points: • (male) carriers {are heterozygous / cells have one normal allele and one defective allele (1) • {on production of sperm cells / during meiosis} the alleles are shared equally between the sperm cells (1) • (half the) sperm will have the defective allele will be {unhealthy / unable to fertilise an egg cell} (1) • (half the) sperm will carry the normal allele and be {healthy / able to fertilise the egg cell} (1)	**DO NOT ACCEPT** a reference to sex-linked **ACCEPT** recessive allele if clear idea of damaged sperm **NB** in context of haploid sperm **ACCEPT** dominant allele if clear **NB** in context of haploid sperm	**(3)**

Question number	Answer	Additional guidance	Mark
8(a)	An explanation that makes reference to two of the following points: • because the elastic {fibres / tissue} can stretch (1) • to widen the aorta when (blood) {pressure / volume} is high (1) • collagen for strength (in the wall) (1)	**ACCEPT** elastin **IGNORE** recoil **ACCEPT** increase {diameter / lumen}	**(2)**

Question number	Answer	Additional guidance	Mark
8(b)(i)	• measured diameter divided by actual diameter (1) • 0.69 / 0.7 / 0.75 / 0.8 / 0.81 (1)	12 ÷ 17.3 = 0.693641 13 ÷ 17.3 = 0.751445 14 ÷ 17.3 = 0.809249 Bald answer of 0.69 / 0.7 / 0.75 / 0.8 / 0.81 = 2 marks Bald answer of 0.693641 / 0.751445 / 0.809249 correctly rounded to more than 2 dps = 1 mark	**(2)**

Question number	Answer	Additional guidance	Mark
8(b)(ii)	• 3.18 (1)	**DO NOT ACCEPT** 3.180	**(1)**

Question number	Answer	Additional guidance	Mark
8(b)(iii)	• 1 in 10 / 1 in 11 / 9.2% / 0.092 / 23/250 (1)		**(1)**

Question number	Answer	Additional guidance	Mark
8(c)(i)	An answer that makes reference to the following points: • because antioxidants {reduce / neutralise / bind to} free radicals (1) • therefore reduces damage to the {endothelia / artery wall / artery lining} (which causes AAA) (1)	**ACCEPT** reduce oxidative stress **NB** do not award in context of {atherosclerosis / plaque} only	**(2)**

Question number	Answer
*8(c)(ii)	**Table:** • the salt solution is acting as a control • the salt solution shows that chemical C is inducing AAA **Graph 1:** • drug D reduces the incidence of AAA • no indication of statistical analysis so cannot comment on if the difference is significant • no indication of effect of control on AAA / cannot tell if chemical C increased AAA **Graph 2:** • injection of chemical C increases the diameter of the abdominal aorta • drug D reduces the diameter of the abdominal aorta (in mice who had chemical C) / could improve AAA • error bars are not overlapping so the difference in the effect of drug D is statistically significant • drug D has no effect on the diameter of mice given control / salt solution • cannot tell effect of salt solution as no mice given nothing / water **Graph 3:** • injection of chemical C increases the area of atherosclerosis • drug D reduces the area of atherosclerosis • error bars do not overlap so the difference in the effect of drug D is statistically significant • cannot tell if the small area of atherosclerosis was induced by saline or not as there are no untreated mice • treatment with C has a variable effect on the area of the atherosclerosis • drug D does not appear to reduce these areas as means are the same **(6)**

			Additional guidance
Level 0	0	No awardable content	
Level 1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context.	1 mark = one description of data 2 marks = two descriptions of data
Level 2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts / concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows some linkages and lines of scientific reasoning with some structure.	3 marks = comment on one visual 4 marks = comment on two visuals
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant biological facts / concepts. Consequences are discussed which supported throughout by sustained linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.	5 marks = comments on three visuals which includes at least one about treatment C and one about drug D 6 marks = four comments covering three visuals which includes at least one about treatment C and one about drug D