Mark Scheme (Results)

October 2022

Pearson Edexcel International Advanced Level In Biology (WBI11) Paper 01 Molecules, Diet, Transport and Health

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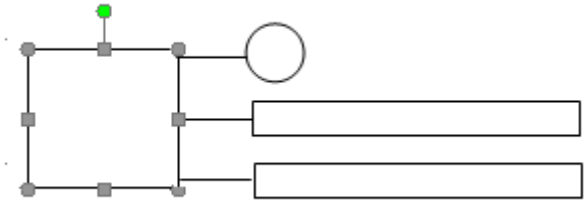
General Marking Guidance

- 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)(i)	A diagram that makes reference to the following points: • one glycerol (squarish / labelled), two fatty acids (rectangular / labelled), one phosphate and three bonds shown (1) • all components drawn together correctly (1)	 ecf if: {one / three} fatty acids drawn attached to glycerol but rest correct glycerol missing but two fatty acids attached to head with bonds bonds missing but all four components are touching correctly	**(2)**

Question number	Answer	Mark
1(a)(ii)	**The only correct answer is A** (ester) *B is incorrect because glycosidic bonds are found in carbohydrates* *C is incorrect because there are no hydrogen bonds in phospholipids* *D is incorrect because peptide bonds are found in proteins*	**(1)**

Question number	Answer	Mark
1(b)(i)	**The only correct answer is B** (by diffusion) *A is incorrect because active transport moves polar molecules* *C is incorrect because nonpolar molecules can diffuse through the nonpolar fatty acids* *D is incorrect because only water moves by osmosis*	**(1)**

Question number	Answer	Mark
1(b)(ii)	**The only correct answer is B** (one) *A is incorrect because the second statement is the only correct one* *C is incorrect because the second statement is the only correct one* *D is incorrect because the second statement is the only correct one*	**(1)**

Question number	Answer	Mark
2(a)	**The only correct answer is D** (vena cava) *A is incorrect because the diagram shows a blood vessel bringing blood back into the right atrium* *B is incorrect because the diagram shows a blood vessel bringing blood back into the right atrium* *C is incorrect because the diagram shows a blood vessel bringing blood back into the right atrium*	**(1)**

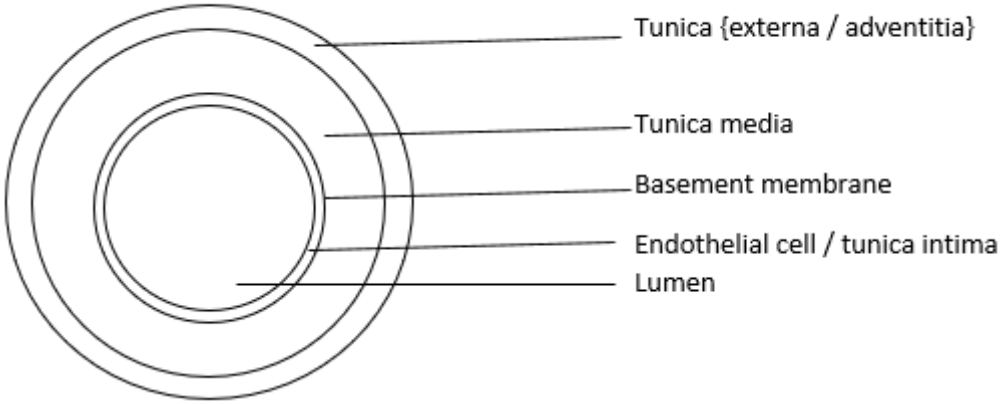
Question number	Answer	Additional guidance	Mark
2(b)(i)	• (cardiac) diastole (1)	**ACCEPT** (heart / complete / total / ventricular and atrial / atrioventricular) diastole **DO NOT ACCEPT** diasystole / dystole / ventricular diastole / systic diastole	**(1)**

Question number	Answer	Additional guidance	Mark
2(b)(ii)	An answer that makes reference to the following points: • length of one heart beat calculated (1) • 0.06 / 0.061 / 0.0608 (1)	Example of calculation 0.821917808219178082191780821917 81 6 / 6.1 / 6.08 % 5/82 Ecf if 73 ÷ 60 : 0.04 / 0.041 / 0.0411 4 / 4.1 / 4.11 % 3/73 Bald answer score two marks Bald answer with incorrect number of decimal places scores 1 mark.	**(2)**

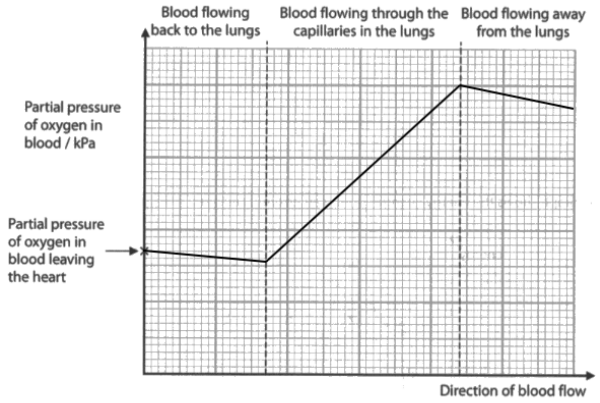
Question number	Answer	Additional guidance	Mark
2(c)(i)	• 104 / 104.17 / 104.2 (1)		**(1)**

Question number	Answer	Additional guidance	Mark
2(c)(ii)	An explanation that makes reference to the following points: • to delay the movement of the impulse across the (atrioventricular) septum (1) • so that the atria can finish emptying (1) • so that the atrioventricular valves can close (1)	 **ACCEPT** to delay the contraction of the ventricles **ACCEPT** so that ventricles can fill NB Accept answers that refer to right atrium and right ventricle	**(2)**

Question number	Answer	Additional guidance	Mark
3(a)	A description that makes reference to the following points: • one structure (1) • linked function (1)	 e.g. single layer of cells / pores / small diameter **ACCEPT** thin cells / walls e.g. (single layer) gas exchange / diffusion of gases (in the lungs) (pores) plasma forced out / WBC leave / molecules can leave (small diameter) all cells close to capillaries	**(2)**

Question number	Answer	Additional guidance	Mark
3(b)	A drawing that shows the following points: • lumen + {three layers / three other layers + endothelial layer / two layers + endothelial layer} (1) • one feature correctly labelled (1) • a second feature correctly labelled (1)	 **ACCEPT** Epithelial {layer / lining / cells} / fenestrated membrane Tunica interna Layer of (smooth) muscle and elastic fibres (and collagen) for 1 layer Award marks for longitudinal section **NB** regards mp 2 and 3 1 right + 1 wrong label = 1 mark 2 right + 1 wrong label = 1 mark 1 right + 2 wrong labels = 0 marks	**(3)**

Question number	Answer	Additional guidance	Mark
3(c)	An explanation that makes reference to the following points: • to prevent backflow (of blood) (1) • (as blood is usually returning) {under low pressure / (often) against gravity} (1)	 **ACCEPT** so that blood returns to the heart blood flow is in one direction	**(2)**

Question number	Answer	Additional guidance	Mark
3(d)	A drawing that shows the following points: • pp of O_2 remaining constant as blood flows to lungs (1) • pp of O_2 rising as blood flows through the capillaries (1) • pp of O_2 remaining constant as blood flows away from lungs (1)	**ACCEPT** within 1 sm square of the verticals in each section **ACCEPT** slightly decreasing (within 1 large square) **ACCEPT** slightly decreasing (within 1 large square)  	**(3)**

Question number	Answer	Additional guidance	Mark
4(a)	An answer that makes reference to the following points: • {protein / found in organisms} (1) • that {decreases activation energy / speeds up (the rate of) reaction} (without being used up) (1)	 **ACCEPT** in our {bodies / cells / cytoplasm} / in a named organism **ACCEPT** description of activation energy	**(2)**

Question number	Answer	Mark
4(b)	**The only correct answer is B** (Q) ***A*** *is incorrect because Q is the activation energy* ***C*** *is incorrect because Q is the activation energy* ***D*** *is incorrect because Q is the activation energy*	**(1)**

Question number	Answer	Additional guidance	Mark
4(c)	An explanation that includes the following points: • substrate {binds / fits / forms enzyme-substrate complex} to the <u>active site</u> of the enzyme (1) • due to the <u>shape</u> of the {active site / enzyme / substrate} (1) • which is due to the {R groups / amino acids} (forming the active site) (1) • AB <u>and</u> AC {are a different shape to A and B / do not fit into E_1} (1)	**ACCEPT** are not complementary to (E_1) enzyme	**(3)**

Question number	Answer	Additional guidance	Mark
4(d)	A description that includes the following points: • pH 4 is the {most suitable / best} pH (1) • 30°C is the {most suitable / best} temperature (1) • pH 2 <u>and</u> 60°C (both) denature the enzyme (1)		**(2)**

Question number	Answer	Additional guidance	Mark
5(a)	• Fick's (Law of Diffusion) (1)		(1)

Question number	Answer	Mark
5(b)	**The only correct answer is C** (it will halve) *A is incorrect because the value will halve* *B is incorrect because the value will halve* *D is incorrect because the value will halve*	(1)

Question number	Answer	Additional guidance	Mark
5(c)	A description that includes the following points: • lots of alveoli for large surface area (1) • {single-celled / thin-walled} {alveoli / capillaries} for short diffusion distance (1) • good blood supply for high concentration gradient (1)	**ACCEPT** lots of capillaries for large surface area air sacs for alveoli ref to lots of alveoli <u>and</u> thin-walled <u>and</u> good blood supply = 1 mark if no other marks awarded	**(3)**

Question number	Answer
***5(d)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material indicated as relevant. Additional content included in the response must be scientific and relevant. Structure • salamanders have both lungs and their skin for more gas exchange • lungs allow oxygen from air and skin oxygen from water • the skin is folded to increase surface area • flattened body to increase surface area • so that gas exchange will be faster • skin has a good blood supply so that there will be high concentration gradient • skin is very permeable to gases so that they can diffuse in faster Behaviour • salamanders live in fast-flowing water which will have high levels of oxygen • shallow water will also have higher levels of oxygen • shallow water will make breathing with lungs easier • the rocking / swaying movements stir up the water • which helps to aerate the water • so that water with higher oxygen content is in contact with their skin • so that there is a higher concentration gradient • so that {gas exchange / diffusion of gases} will be faster • the rocking / swaying maintains the levels of oxygen in the blood Graph • at low levels of oxygen in the water the frequency of rocking is high • accompanied by an increase in blood pO_2 • as oxygen levels in the water increase the frequency of rocking decreases • but the blood pO_2 continues to increase • sufficient oxygen in water to diffuse into lungs and skin • to maintain levels of oxygen • rocking stops to conserve energy **(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.	Simple links made between gas exchange and information given or own knowledge 1 mark = 1 comment which can include a description of data 2 marks = 3 comments which can include a description 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.	Extended links made between gas exchange and information given 3 marks = comments on both structure and behaviour with extended comment on one 4 marks = extended comments made on both structure and behaviour
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.	Understanding of graph used to support discussion 5 marks = plus some discussion of graph to support answer 6 marks = plus an understanding of the relationships shown in the graph

Question number	Answer	Mark
6(a)	**The only correct answer is C** (two) *A is incorrect because thromboplastin is an active enzyme found in the platelets but is not converted into thrombin* *B is incorrect because thromboplastin is an active enzyme found in the platelets but is not converted into thrombin* *D is incorrect because thromboplastin is an active enzyme found in the platelets but is not converted into thrombin*	**(1)**

Question number	Answer	Additional guidance	Mark
6(b)	An answer that includes the following points: • 1.8 to 3.5 (1) • below 1.8 there is a high risk of stroke (1) • above 3.5 there is an increased risk of bleeding (within the skull) (1) **OR** • 1.8 to 2.5 (1) • below 1.8 there is a high risk of stroke (1) • above 2.5 the risk of bleeding (within the skull) starts to increase (1) **OR** • 2.0 to 2.5 (1) • both risks are low / they are the lowest (combination) (1) • 3.1-3.5 has a lower risk of stroke but a higher risk of bleeding (1)	**ACCEPT** other ranges {have either high risk of bleeding or high risk of stroke / both risks are low} = 1 mark if mp 2 and 3 not awarded **ACCEPT** other ranges {have either higher risk of bleeding or high risk of stroke / both risks are low} = 1 mark if mp 2 and 3 not awarded	**(3)**

Question number	Answer	Additional guidance	Mark
6(c)	An explanation that includes the following points: • warfarin reduces {a blood clot forming / thrombosis} (1) • (if a blood clot does not form) it cannot block the <u>coronary artery</u> (1) • if oxygen is supplied to the heart {muscle / cells} it will continue to {contract / respire} (1)	**ACCEPT** no blood clots forming less blood clotting reduces blood clot (size)	**(3)**

Question number	Answer	Additional guidance	Mark
6(d)(i)	• 1 012 / 1 013 (1)		**(1)**

Question number	Answer	Additional guidance	Mark
6(d)(ii)	An answer that includes the following points: • select a group of patients who have had a heart attack (1) • of similar {age / sex at birth / background / lifestyle} (as in the first study) (1) • give each person the same quantity of warfarin (used in the first study) (1) • (monitor for) {the same time period / four years} (1) • use of a statistics (1)	**ACCEPT** other appropriate factors no other health issues **ACCEPT** in context of one group split into two groups **ACCEPT** description of double-blind trial / double-blind trial / suitable named statistics test	**(4)**

Question number	Answer	Mark
7(a)	**The only correct answer is A** (position R, position P) *B is incorrect because P will have a carboxyl group and R will have an amino group (Q will have a carboxyl group)* ***C** is incorrect because P will have a carboxyl group and R will have an amino group (Q will have a carboxyl group)* ***D** is incorrect because P will have a carboxyl group and R will have an amino group (Q will have a carboxyl group)*	**(1)**

Question number	Answer	Additional guidance	Mark
7(b)(i)	• 39 / 39.3 / 39.29 (1)		(1)

Question number	Answer	Additional guidance	Mark
7(b)(ii)	• 0.13 : 1 / 0.1 : 1 / 0.13 / 0.1 (1)	**ACCEPT** 1 : 7.5 / 1 : 8	(1)

Question number	Answer	Additional guidance	Mark
7(c)	A description that includes the following points: • hydrolysis / using enzymes (1) • of the peptide bonds between P and the connecting chain and R and the connecting chain (1)	 **ACCEPT** protease **ACCEPT** of peptide bonds between A chain and connecting region and B chain and connecting region	(2)

Question number	Answer	Additional guidance	Mark
7(d)	An answer that includes the following points: Similarities : • αlpha glucose (1) • contain C, H and O (only) (1) Differences : • glucose is a monosaccharide and glycogen is a polysaccharide (1) • glycogen has (1-4 / 1-6) glycosidic bonds but glucose does not (1)	**DO NOT PIECE TOGETHER**	**(3)**

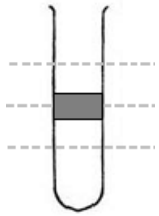
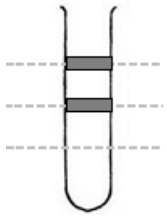
Question number	Answer	Mark
*7(e)	Indicative content: Healthy rats given water • levels of glucose {fell slightly / maintained} (D) • because the healthy rats were producing insulin (E) • so were controlling the blood glucose levels naturally (E) Healthy rats given cinnamon • levels of glucose very slightly lower (D) • as cinnamon was adding to the effect of insulin (CE) OR • levels of glucose very similar (D) • as cinnamon had no (added) effect in healthy rats (CE) Diabetic rats given water • levels of glucose rose (D) • levels of glucose were higher that healthy rats (D) • because diabetic rats had no insulin to control their blood glucose levels (E) Diabetic rats given cinnamon • unhealthy rats given cinnamon had fairly constant levels of glucose (D) • cinnamon lowered blood glucose by moving it into the liver (E) • cinnamon stimulated enzymes to convert glucose into glycogen (E) • so that it could not diffuse back into the blood (E) • levels of glucose were higher than in the healthy rats (D) • because cinnamon not as effective as insulin (CE) • possibly {not absorbed well / worked slowly / did not stimulate so many enzymes} (CE) • fluctuations in levels of glucose (D) • depending on how much glucose is used (E)	(6)

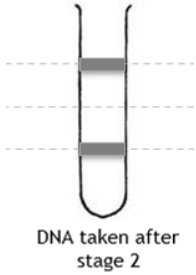
			Additional guidance
Level 0	0	No awardable content	
Level 1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information and with a focus on mainly just one piece of scientific information. The explanation will contain basic information, with some attempt made to link knowledge and understanding to the given context.	Simple descriptions of data with no real attempt of an explanation 1 mark = some description of the data 2 marks = detailed description of the data
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 using the information given / own knowledge (E) 3 marks = simple explanation of what {cinnamon / insulin} is doing 4 marks = more detailed explanation of how {cinnamon / insulin} decreases glucose level
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.	Data logically explained with extended use of information provided (CE) 5 marks = plus a comparison made of effectiveness of cinnamon compared to insulin 6 marks = data explained in detail

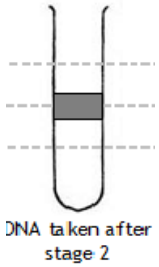
Question number	Answer	Additional guidance	Mark
8(a)	An explanation that includes the following points: • form base pairs to hold the two {polynucleotide / strands} together (1) • because of the number of hydrogen bonds that each type of base can form (1) • a {large base / purine} bonds with a {small base / pyrimidine} (1) • so that the strands are parallel (1)	**ACCEPT** adenine and thymine form two hydrogen bonds <u>and</u> guanine and cytosine form three hydrogen bonds **ACCEPT** single ring bonds to double ring	**(3)**

Question number	Answer	Additional guidance	Mark
8(b)(i)	• 6.6×10^2 (1)	**ACCEPT** 6.596×10^2	**(1)**

Question number	Answer	Additional guidance	Mark
8(b)(ii)	• mass of DNA after three divisions calculated (1) • {4 / 4.1 / 4.14 / 4.142} × 10^{-14} (1)	($3.1 \times 10^9 \times 8$) 24.8×10^9 NB Correct answer but wrong standard form = 1 mark ECF {2 / 1.6 / 1.55} × 10^{-14} = 1 mark	**(2)**

Question number	Answer	Additional guidance	Mark
8(c)(i)	A diagram that shows the following points: • a band the same width as stage 1 in the middle of the tube (1) • bands drawn at the top and middle of tube (1) • both bands half the width of stage 1 (1)	 DNA taken after stage 2  DNA taken after stage 3 **NB** For mp 3, if 1 band is drawn allow 1 mark if same width as the band in stage 1 level and above it	**(3)**

Question number	Answer	Additional guidance	Mark
8(c)(ii)	A diagram that shows the following points: • bands drawn at the top and bottom of tube (1) • both bands half the width of stage 1 (1)	 **NB** If 1 band is drawn allow 1 mark if same width as the band in stage 1 and above it	**(2)**

Question number	Answer	Additional guidance	Mark
8(c)(iii)	A diagram that shows the following points: • one band drawn in the middle (1) • of similar thickness to band in stage 1 (1)	 	**(2)**

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