Pearson Edexcel

Mark Scheme (Results)

Summer 2025

Pearson Edexcel International Advanced Subsidiary 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)	An answer that includes the following points (in order): • blood / (blood) plasma / blood (stream) / blood vessels (1) • thromboplastin (1) • fibrinogen (1)	 **IGNORE** arteries / veins **ACCEPT** thrombokinase **DO NOT ACCEPT** other named molecules **DO NOT ACCEPT** other named molecules	**(3)**

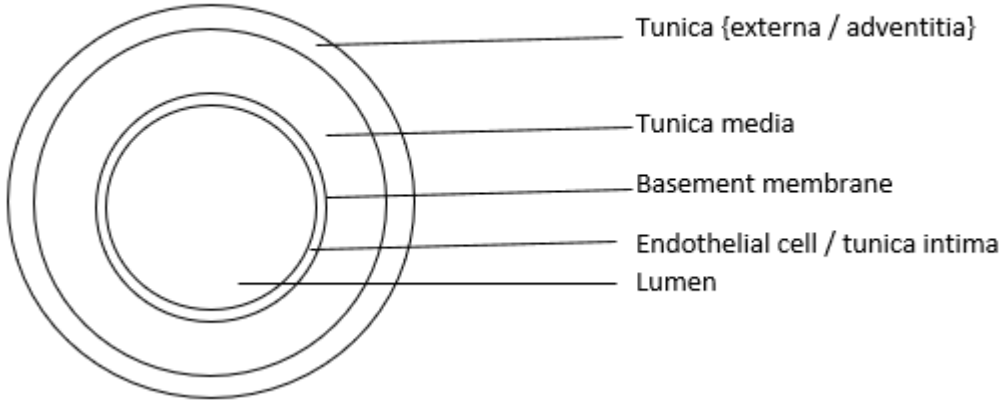
Question number	Answer	Additional guidance	Mark
1(b)	The correct answer is **B** ***A*** *is incorrect because antihypertensives treat high blood pressure* ***C*** *is incorrect because antihypertensives treat high blood pressure and statins treat high cholesterol* ***D*** *is incorrect because statins treat high cholesterol*		**(1)**

Question number	Answer	Additional guidance	Mark
1(c)	• 18 / 17.6 / 17.65 (%)		(1)

Question number	Answer	Additional guidance	Mark
2(a)(i)	The correct answer is **D** ***A*** *is incorrect because it is sigmoid curve showing a positive correlation* ***B*** *is incorrect because it is sigmoid curve showing a positive correlation* ***C*** *is incorrect because it is sigmoid curve showing a positive correlation*		(1)

Question number	Answer	Additional guidance	Mark
2(a)(ii)	The correct answer is **B** ***A*** *is incorrect because Benedict was involved with Benedict's solution* ***C*** *is incorrect because Fick was involved with diffusion* ***D*** *is incorrect because Stahl was involved with DNA*		(1)

Question number	Answer	Additional guidance	Mark
2(b)	An explanation that includes three of the following points: • (four) {haem (groups) / iron ion / porphyrin} to {bind to / carry} oxygen (molecules) (1) • {globular / hydrophilic R groups on outside} to {dissolve / be soluble} (in cytoplasm / RBC) (1) • four subunits have different affinities for oxygen at different partial pressures of oxygen (1) • carbon dioxide is able to bind to the amino {groups / ends} of (poly)peptide (1) • a structure that has higher affinity for carbon dioxide to cause the oxygen to dissociate (1)	**ACCEPT** iron if a ref made to haem or porphyrin **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 idea that binding of oxygen is staggered **DO NOT ACCEPT** carbon dioxide binding to haem groups **ACCEPT** carbaminohaemoglobin is formed at low concentrations of oxygen	**(3)**

Question number	Answer	Additional guidance	Mark
3(a)	A drawing that shows the following points: A drawing that shows the following points: • (lumen) + three layers **OR** (lumen) + three other layers + endothelial layer drawn in or labelled **OR** (lumen) + two layers + endothelial layer drawn in or labelled (1) • one feature correctly labelled (1) • a second feature correctly labelled (1)	 **ACCEPT** labels pointing to a line endothelia / epithelial {layer / lining / cells} / fenestrated membrane tunica interna t. media / (tunica) media etc (layer of) (smooth) muscle <u>and</u> {elastic fibres / elastin} (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(b)(i)	The correct answer is **D** ***A*** *is incorrect because the answer is 60.00 : 1.00* ***B****is incorrect because the answer is 60.00 : 1.00* ***C*** *is incorrect because the answer is 60.00 : 1.00*		**(1)**

Question number	Answer	Additional guidance	Mark
3(b)(ii)	• diameter of lumen calculated as 38 (μm) / radius of lumen calculated as 19 (μm) (1) • cross-sectional area calculated as 1 083 / 1 119 / 1 134 (1)	**ACCEPT (**$38)^2$ **ACCEPT** standard form written correctly and to 3 dps Bald answer of 1083 / 1119 / 1134 = 2 marks Bald answer of correct value not rounded to whole number = 1 mark Bald answer of 19 / 38 (ignore units) = 1 mark Bald answer of correct value as a whole number for diameter of 46 or 42 (1323 / 1367 / 1385 / 1386 / 1587 / 1640 / 1661 / 1662) = 1 mark	**(2)**

Question number	Answer	Additional guidance	Mark
4(a)	An explanation that includes three of the following points: • gills are important whilst the tadpole is getting oxygen from water / gills not used when oxygen is obtained from air (1) • lungs increase their role as developing frog starts using oxygen in the air / lungs develop from the start so that they are functional when the frog uses oxygen in the air (1) • skin is used to get oxygen in {all stages of development / tadpoles and (decreases in) frogs} (1) • credit an explanation of why the skin is useful (1)	**ACCEPT** frog uses lungs to get oxygen from air **NB** piece together **e.g.** skin can be used because tadpole as {large surface area (to volume ratio) / thin skin / short diffusion distance} skin used less in adult frog as {smaller surface area (to volume ratio) / thicker skin} oxygen can be obtained from water through skin when adult is in water	**(3)**

Question number	Answer	Additional guidance	Mark
4(b)	An answer that includes the following points: • (similarity) both have two {atria (and one ventricle) / (atrioventricular) valves} (1) • (difference) frog has one ventricle (and mammals have two) / frog has three chambers (but human heart has four) (1)	**ACCEPT** atriums for atria left and right atrium **ACCEPT** frog has no {wall / muscle / septum / separation} (between ventricles)	**(2)**

Question number	Answer	Additional guidance	Mark
*4(c)	**Indicative content:** **Gas exchange surfaces** • both lungs and skin are used as gas exchange surface - therefore surface area increased / more oxygen can be absorbed • more blood goes to lungs than skin - because more gas exchange occurs in lungs than skin • skin has large surface area / permeable to oxygen / moist (for gas exchange) **Circulatory system** • oxygenated blood from lungs passes into right atrium • most of blood pumped from the heart to the cells is oxygenated – to supply the cells with oxygen <u>for respiration</u> - to ensure cells receive enough oxygen for metabolic demands • some of this blood is pumped to the skin <u>cells</u> / lung <u>cells</u> / heart <u>cells</u> – therefore supplying these cells with oxygen • blood from skin and cells return to the left atrium • one ventricle is sufficient because large proportion of blood pumped to the gas exchange surfaces / frog has relatively low oxygen demands / frog is relatively small	**Level 1: Descriptions** 1 mark = one relevant comment from either the diagram or own knowledge 2 marks = three descriptions of the information shown in the diagram **OR** description of gas exchange surfaces **Level 2: Simple explanations for diagram** 3 marks = one explanation 4 marks = two explanations **Level 3: Detailed explanations for diagram** 5 marks = three explanations that includes: why more deoxygenated blood goes to the lungs than the skin **OR** why more blood from the lungs goes to the cells **OR** why one ventricle is sufficient 6 marks = three explanations that includes **TWO** from: why more deoxygenated blood goes to the lungs than the skin why more blood from the lungs goes to the cells why one ventricle is sufficient	**(6)**

Question number	Answer	Additional guidance	Mark
5(a)	An explanation that includes two of the following points: • because of semiconservative replication (1) • both (parent / original) strands acting as a <u>template</u> (for synthesis of new strands) (1) • because a <u>complementary</u> strand is made against each parent strand / description of binding of <u>complementary</u> nucleotides to parent strands (1)	**ACCEPT** nucleotide with adenine binds with thymine (on template) etc **IGNORE** complementary bases **NB** a complementary strand is made against each template strand = 2 marks	**(2)**

Question number	Answer	Additional guidance	Mark
5(b)	A description that includes three of the following points: • to produce {a (poly)peptide chain / (correct) order of amino acids} (1) • mRNA involved in transcription and tRNA involved in translation (1) • mRNA carries a <u>copy</u> of the gene {out of the nucleus / into the cytoplasm / to the ribosomes} (1) • tRNA holds the specific amino acid {in place / until the peptide bonds have formed} (1)	**PIECE TOGETHER** **ACCEPT** {(genetic) code / DNA base sequence / DNA bases / DNA / genetic instructions} **NB** copy is the noun not the verb **ACCEPT** appropriate / corresponding / particular / a certain for specific carries specific amino acid to the mRNA	**(3)**

Question number	Answer	Additional guidance	Mark
5(c)(i)	An answer that includes the following points: Advantage: • {visual / clear / easy / simple} (way of presenting data / to understand) (1) Disadvantage: • cannot {compare / interpret} (polygons with) different shapes (but similar size) (1)	**ACCEPT** areas of polygons cannot be {compared / (easily) determined} values for {percentages / mass / proportions} not given **IGNORE** confusing unless qualified	**(2)**

Question number	Answer	Additional guidance	Mark
*5(c)(ii)	**Indicative content:** • DNA would increase • because DNA synthesis / replication will take place / each new cell will need a copy of the DNA • DNA would decrease • as only one of each molecule in each cell • description of change in glycogen / lipids / other molecules • explanation for change in glycogen / lipids linked to energy requirements (once) • glycogen decreases as broken down into glucose • change in lipids linked to role in membranes • change in glucose linked to energy requirements • change in phospholipids linked to membrane requirements • increase in proteins • needed (as enzymes) in DNA synthesis/ structural proteins • increase in mRNA • as there will be more transcription for protein synthesis • increase in tRNA / rRNA • as there will be more for translation **Stage 1: Bacterial cell preparing to divide** • proportion of other components would decrease - if increase in DNA **Stage 2: One of the two daughter cells formed** • proportion of components would be the same as in the cell preparing for division – once DNA split between two cells **Stage 3: One of the daughter cells as it increases in size** • proportion of DNA will decrease as other components increase **Cells at end of process / cell prepares to divide again** • Voronoi diagram would look identical to the one in diagram / original as cells are genetically identical	**Level 1** Simple description / explanation 1 mark = one description of a change 2 marks = one simple explanation of a change **Level 2** Explanations of changes, not necessarily linked clearly to stages / proportions 3 marks = explanations of changes in two {molecules / Voronoi diagram} 4 marks = explanations of changes in three {molecules / Voronoi diagram} **Level 3** Explanations linked to a stage and proportion on the diagram 5 marks = explanations of changes in four {molecules / Voronoi diagram} with some link made to the stages 6 marks = four explanations of {molecules / Voronoi diagram} with some link made to the stages and either includes 'other' molecules or the relative changes in proportion / area in diagram	**(6)**

Question number	Answer	Mark
6(a)(i)	The only correct answer is **B** ***A*** *is incorrect because phosphate heads are polar* ***C*** *is incorrect because carbohydrates are not non-polar* ***D*** *is incorrect because protein pumps help polar molecules across the membrane*	**(1)**

Question number	Answer	Mark
6(a)(ii)	The only correct answer is **D** ***A*** *is incorrect because it is an intrinsic protein* ***B*** *is incorrect because phospholipids would prevent polar molecules diffusing through* ***C*** *is incorrect because glycoproteins not involved in diffusion*	**(1)**

Question number	Answer	Mark
6(a)(iii)	The only correct answer is **C** ***A*** *is incorrect because it is an intrinsic protein* ***B*** *is incorrect because it is the whole of the phospholipid that moves* ***D*** *is incorrect because this is a protein channel that can only move if the phospholipids move*	**(1)**

Question number	Answer	Mark
6(b)	The only correct answer is **B** ***A*** *is incorrect because the polar region will interact with the phosphate heads and the non-polar region will be amongst the lipid tails* ***C*** *is incorrect because the polar region will interact with the phosphate heads and the non-polar region will be amongst the lipid tails* ***D*** *is incorrect because the polar region will interact with the phosphate heads and the non-polar region will be amongst the lipid tails*	**(1)**

Question number	Answer	Additional guidance	Mark
6(c)	A description that includes three of the following points: • increase in membrane fluidity with temperature with cholesterol present (1) • increase in membrane fluidity with temperature with cholesterol absent (1) • linear relationship with cholesterol present **OR** {S shape / sigmoidal} relationship with cholesterol absent (1) • below a certain temperature membrane fluidity {increases / is} more with cholesterol present (than without cholesterol present) **OR** above a certain temperature membrane fluidity {increases / is} more without cholesterol present (than with cholesterol present) (1)	**IGNORE** any explanation given references to rate **ACCEPT** positive correlation for increase in both mp 1 and mp 2 **ACCEPT** increase in membrane fluidity with temperature = 1 mark if neither mp 1 or 2 given **ACCEPT** at lower temperatures converse **ACCEPT** at higher temperatures converse	**(3)**

Question number	Answer	Additional guidance	Mark
6(d)(i)	• 1.14 (: 1)		**(1)**

Question number	Answer	Additional guidance	Mark
6(d)(ii)	An answer that includes three of the following points: Similarities : • all contain protein and lipid (1) • all contain {more / higher percentage of} protein (than lipid) (1) Differences : • C has no carbohydrate but A and B do (1) • composition of each membrane is different (1)	**PIECE TOGETHER** a statement about all containing protein and a separate statement about all containing lipid **ACCEPT** example of a difference about all 3 membranes e.g. A and B have a lot more lipid that C, C has more protein than A and B	**(3)**

Question number	Answer	Additional guidance	Mark
7(a)	An explanation that includes the following points: • the {primary structure / amino acids / R groups} (determine the shape / properties of the active site) (1) • credit an example of how the R groups might vary (1) **OR** • pH (1) • as this affects the ionisation of the R groups (1)	e.g. {hydrophobic / hydrophilic / polar / non-polar} types of {bonds / interactions} (formed within active site / formed with substrate) **ACCEPT** temperature **ACCEPT** (temperature) changes {shape of active site / substrate specificity}	**(2)**

Question number	Answer	Additional guidance	Mark
7(b)(i)	An explanation that includes three of the following points: • because at high temperatures {heat / kinetic} energy is {high / more} (1) • that causes the R groups to vibrate (more) (1) • resulting in {distortion of the active site / denaturing (of enzyme / active site) / bonds broken} (1) • therefore {the substrate cannot bind to the enzyme / an enzyme-substrate complex cannot form} (1)	**ACCEPT** atoms / molecules / amino acids in the enzyme to vibrate **ACCEPT** named bond broken **ACCEPT** ESC substrate cannot fit / no longer complementary	**(3)**

Question number	Answer	Additional guidance	Mark
7(b)(ii)	An answer that includes two of the following points: • because {more / different / stronger} bonds (within the enzyme) (1) • therefore {will need more energy to break bonds / will not be enough energy to break the bonds} (1) • and therefore the tertiary structure will be held in place at higher temperatures (1)	**ACCEPT** disulfide bridges are stronger than {ionic bonds / H bonds} ionic bonds are stronger than H bonds **ACCEPT** no {change in shape of / denaturing of} <u>active site</u> **IGNORE** active site not affected	**(2)**

Question number	Answer	Additional guidance	Mark
7(b)(iii)	An answer that includes the following points: • (new bonds) may alter the {shape / properties} of the <u>active site</u> (1) • therefore the {plastics can no longer bind to the enzyme / the active site and plastics are no longer complementary} (1)	**ACCEPT** fit for binding	**(2)**

Question number	Answer	Additional guidance	Mark
7(c)(i)	An explanation that includes two of the following points: • a larger active site may make it easier for the plastics to <u>enter</u> the active site (1) • therefore ({more / larger} plastics can {enter / bind / breakdown} the active site) {per unit time / in the same time / frequently} (1) • more bonds broken {between subunits / within plastics} per unit time (1)	**IGNORE** refs to large surface area throughout **ACCEPT** more collisions between substrate and <u>active site</u> larger / more pieces of plastic can <u>enter</u> **ACCEPT** more enzyme-substrate complexes formed per unit time **IGNORE** faster **NB** per unit time only needed once for both mp 2 and 3 to be awarded	**(2)**

Question number	Answer	Additional guidance	Mark
7(c)(ii)	• a larger active site will {separate out the R groups so the plastic can no longer bind / not hold the substrate in place long enough / only some R groups will be able to bind to plastic / spaces between substrate and R groups / other molecules could enter and stop the enzyme binding to the substrate} (1)	**ACCEPT** active site will no longer {fit / be complementary with} substrate	**(1)**

Question number	Answer	Additional guidance	Mark
7(d)	An explanation that includes two of the following points: • because two enzymes working on same molecule, at any one time (1) • enzyme 2 will work faster if in close proximity to the products of enzyme 1 / because as soon as enzyme 1 breaks plastic down into short chains, they can bind to enzyme 2 (1) • breaking plastic into smaller ones will reveal more sites for breaking the small plastics down into monomers (1)	**IGNORE** more active sites **ACCEPT** increases concentration of short chains near active site short chains and enzyme 2 more likely to collide	**(2)**

Question number	Answer	Additional guidance	Mark
8(a)	• (70 % of adults =) 5,655,159,356 (1) • 6×10^9 (1) **OR** • (70 % of adults approximately =) 5,600,000,000 (1) • 6×10^9 (1)	**ACCEPT** 5.66×10^9 / 5.7×10^9 $5,7 . 10^9$ etc **ACCEPT** 5.6×10^9 Bald correct answer score two marks Bald answer that scores 1 mark: • incorrectly expressed standard form of right magnitude with correct rounding e.g. 57×10^8 • correct standard form but too many decimal places e.g. 5.655×10^9 • correct values to max of 3 figs but not in standard form e.g. 5,660,000,000	**(2)**

Question number	Answer	Additional guidance	Mark
8(b)	An answer that includes **two** of the following points: (regular) exercise / active / sport {low / no} alcohol low {saturated fat / cholesterol / LDL} (in diet) low sugar / appropriate number of calories (in the diet) low salt (in diet) high fibre (in diet) high antioxidants (in diet) no smoking	**ACCEPT** more / less / increase / decrease throughout **ACCEPT** high HDL **DO NOT ACCEPT** low HDL / high LDL etc	**(1)**

Question number	Answer	Additional guidance	Mark
8(c)(i)	• a change in one variable is reflected (by a change) in another variable (1)	**ACCEPT** increases / decreases factors / data relationship / in a similar manner / pattern / tendency **DO NOT ACCEPT** causation / causes / affects / results in / leading to / followed by	**(1)**

Question number	Answer	Additional guidance	Mark
8(c)(ii)	An explanation that includes three of the following points: • because {high / increase in} blood pressure can increase (the risk of) CVD (1) • because {high / increase in} blood pressure can damage the endothelial cells, (triggering the process) (1) • because the {study / results} will no longer be valid (1) • and therefore any {conclusions / comparisons} (about gum disease / inflammation / chemical and CVD) would not be valid (1)	**ACCEPT** causes CVD / is a (risk) factor for CVD / plaque formation **ACCEPT** endothelium / endothelial lining **ACCEPT** converse in correct context investigation / experiment will not be able to determine if damage due to {gum disease / inflammation / the chemicals} **ACCEPT** converse in correct context **DO NOT ACCEPT** neutrophils	**(3)**

Question number	Answer	Additional guidance	Mark
8(c)(iii)	• 8.1 / 8.13 (1)		**(1)**

Question number	Answer	Additional guidance	Mark
8(c)(iv)	An explanation that includes the following points: • because damage to endothelial cells, triggers {an inflammatory response / build up of white blood cells / blood clotting} (1) • and a build up of {cholesterol / atheroma / plaque} (1) • (atheroma / blood clot) {blocks / narrows / reduces blood flow in} a {(blood) vessel / named blood vessel / lumen} (1)	**DO NOT ACCEPT** caused by blood clotting	**(3)**

Question number	Answer	Additional guidance	Mark
8(c)(v)	An answer that includes four of the following points: • (overall in both males and females) as the number of neutrophils in the saliva increases the proportion of healthy endothelial cells decrease (1) • the data is more spread {for a low count / below 2.5} neutrophils (1) • (more) males have a low neutrophil count • (overall) males have the lower proportion of healthy endothelial cells (1) • there are no {error bars / S.D.} to {determine / know} the {significance / strength of the relationship} (1)	**NB** Ignore explanations **ACCEPT** (weak) negative correlation there are fewer healthy endothelial cells when the count is (high / above 2.5} **ACCEPT** converse for low count **ACCEPT** converse for high count **ACCEPT** converse for high count or females **ACCEPT** converse for higher healthy cells / females	**(4)**

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