



Mark Scheme (Results)

June 2022

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

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June 2022

Question paper log number P70960A

Publications Code WBI11_01_2206_MS

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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	<p>An answer that includes the following points (in order):</p> <ul style="list-style-type: none"> • dipolar (1) • positive (1) • solvent (1) • hydrolysis (1) • lactose (1) 	<p>ACCEPT dipole / polar</p> <p>ACCEPT medium</p> <p>DO NOT ACCEPT hydration</p> <p>DO NOT ACCEPT lactase / other named molecules</p>	(5)

Question number	Answer	Additional guidance	Mark
2(a)	<p>The correct answer is C, fibrin</p> <p><i>A is incorrect because cholesterol is not part of the wound</i> <i>B is incorrect because collagen is inside the artery wall</i> <i>D is incorrect because fibrinogen is soluble</i></p>		(1)

Question number	Answer	Additional guidance	Mark
2(b)	<p>The correct answer is A, 1</p> <p><i>B is incorrect because prothrombin is the only inactive enzyme precursor in the list</i></p> <p><i>C is incorrect because prothrombin is the only inactive enzyme precursor in the list</i></p> <p><i>D is incorrect because prothrombin is the only inactive enzyme precursor in the list</i></p>		(1)

Question number	Answer	Additional guidance	Mark
2(c)	<p>The correct answer is C, 3</p> <p><i>B is incorrect because fibrin is the only insoluble molecule in the list</i></p> <p><i>C is incorrect because fibrin is the only insoluble molecule in the list</i></p> <p><i>D is incorrect because fibrin is the only insoluble molecule in the list</i></p>		(1)

Question number	Answer	Additional guidance	Mark
2(d)	<p>An explanation that includes three of the following points:</p> <ul style="list-style-type: none"> • to keep thromboplastin separate from prothrombin (1) • so that prothrombin will not be converted into thrombin (1) • the blood clotting process will be prevented (1) • to have thromboplastin {available / released quickly} (when needed) (1) 	<p>ACCEPT other descriptions of what will not happen e.g. fibrin will not be formed</p> <p>ACCEPT will be at a high concentration (when needed)</p> <p>NB award mps if candidate clearly states what would happen if the thromboplastin was NOT inside platelets</p>	(3)

Question number	Answer	Additional guidance	Mark
3(a)	The correct answer is C , protein <i>A is incorrect because enzymes are proteins</i> <i>B is incorrect because enzymes are proteins</i> <i>D is incorrect because enzymes are proteins</i>		(1)

Question number	Answer	Additional guidance	Mark
3(b)	An explanation that includes the following points: <ul style="list-style-type: none"> • because they are found in living organisms (1) • because they speed up the rate of reaction (without being used up) (1) 	ACCEPT in our bodies / named organism / are proteins / in cells / in cytoplasm ACCEPT lower {activation energy / description of activation energy}	(2)

Question number	Answer	Additional guidance	Mark
3(c)(i)	<ul style="list-style-type: none"> • 8.5 (a.u. per °C) 	IGNORE decrease of / ↓ / -	(1)

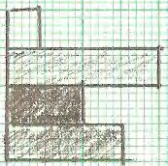
Question number	Answer	Additional guidance	Mark
3(c)(ii)	<ul style="list-style-type: none"> • because the {enzyme is denatured / active site to change shape / bonds to break} (1) 	DO NOT ACCEPT starts to	(1)

Question number	Answer	Additional guidance	Mark
4(a)	<ul style="list-style-type: none"> surface area of one vein calculated (1) total surface area = $1.4 \times 10^3 / 1.5 \times 10^3$ (1) length of vena cava = 40.7 / 40.8 / 42.7 (1) 	<p>37.68 DO NOT ACCEPT 37</p> <p>ecf for wrong value in mp 1 but multiplied by 40 and incorrect standard form</p> <p>Bald answer in table or in space (provided same as in table if given) = 2 marks Bald answer of {36 / 37.68 / 37.7 / or in correct standard form} in box = 1 mark NB if they have shown the correct answer but not in standard form, award mp 1 as they must have calculated this value correctly (check the box below)</p>	(3)

mp	Value used for π		
	3	3.14	calculator
1. S.A. of one vein	36	37.68	37.699111843077518861551720599354
2. Total S.A	1,440 1.4×10^3	1,507.2 1.5×10^3	1,507.9644737231007544620688239742 1.5×10^3
3. Length	42.666666666666666666666666666667 42.7	40.764331210191082802547770700637 40.8	40.743665431525205956834243423363 40.7

Question number	Answer	Additional guidance	Mark
4(b)	<p>An explanation that includes the three of the following points:</p> <ul style="list-style-type: none"> • blood in aorta is under higher pressure as it has just been pumped out of the {heart / (left) ventricle} (1) • aorta branches into many arteries /(blood flowing through) more vessels (1) • the {friction / resistance} between blood and vessel (slows the velocity down) (1) • blood cannot be pushed through because of {loss of elasticity in arteries / less elastic recoil} (1) 	<p>NB may need to piece together NB statements about the arteries do not need qualifying as the question is about arteries. If comparative statements about the aorta are made then they must be qualified</p> <p>ACCEPT velocity slower in arteries as they do not receive blood directly from the heart</p> <p>ACCEPT (total) cross-sectional area of arteries are greater than the aorta</p> <p>ACCEPT diameter of artery <u>lumen</u> is smaller / artery <u>lumen</u> is narrower diameter of aorta <u>lumen</u> is greater so velocity will be faster</p> <p>ACCEPT in the form of a comparison with the aorta being able to force blood because of more elastic fibres</p>	(3)

ion number	Answer	Additional guidance	Mark
4(c)	<p>An explanation that includes the following points:</p> <ul style="list-style-type: none"> • more plasma is able to leave (the capillaries) (1) • results in faster diffusion (1) • more capillaries are in contact with the cells (in the tissue) (1) 	<p>ACCEPT named molecule e.g. oxygen, glucose ACCEPT faster gas exchange / rate of diffusion is fast enough / diffusion is rapid</p> <p>ACCEPT capillaries are close to more cells / diffusion distance is short</p>	(2)

Question number	Answer	Additional guidance	Mark
4(d)(i)	<p>The correct answer is A,</p>  <p><i>B is incorrect because arteries have a high proportion of elastic fibres</i> <i>C is incorrect because arteries have an endothelial lining</i> <i>D is incorrect because artery walls contain collagen</i></p>		(1)

Question number	Answer	Additional guidance	Mark
4(d)(ii)	<ul style="list-style-type: none"> a diagram showing a bar for the endothelial cell layer only (1) 	ACCEPT any length	(1)

Question number	Answer	Additional guidance	Mark
5(a)(i)	<p>A description that includes two of the following points:</p> <ul style="list-style-type: none"> long (chains of amino acids / polypeptides / proteins) (1) repeating sequences of amino acids (1) high proportion of {small / non-polar / hydrophobic} {R groups / amino acids} (1) (parallel) chains held with {cross links / hydrogen bonds} 	<p>IGNORE large</p> <p>ACCEPT a description IGNORE named amino acids</p> <p>ACCEPT hydrophobic groups on the outside</p> <p>IGNORE stated number of chains / refs to triple helix DO NOT ACCEPT other named bonds</p>	(2)

Question number	Answer	Additional guidance	Mark
5(a)(ii)	<p>A diagram that includes the following points:</p> <ul style="list-style-type: none"> • a central carbon atom (1) • an amino group and a carboxyl group (1) • a hydrogen and the cysteine R group (attached by the C) (1) 	<p>The diagram shows three representations of a cysteine molecule. The first is a neutral form: a central carbon atom bonded to a hydrogen atom (H), a carboxyl group (COOH), an amino group (NH2), and a methylene group (CH2) which is further bonded to a thiol group (SH). The second is a zwitterion form: a central carbon atom bonded to a hydrogen atom (H), a carboxyl group (COOH), a protonated amino group (H2N+), and a methylene group (CH2) which is further bonded to a thiol group (SH). The third is another zwitterion form: a central carbon atom bonded to a hydrogen atom (H), a carboxylate group (COO-), a protonated amino group (H3N+), and a methylene group (CH2) which is further bonded to a thiol group (SH).</p>	(3)

Question number	Answer	Additional guidance	Mark
5(b)(i)	<p>A description that includes the following points:</p> <ul style="list-style-type: none"> • β {pleated / sheet} / α helix (1) • (held together by) hydrogen bonds (between amino acids) (1) 	<p>DO NOT ACCEPT {double helix / triple helix} even if β sheet named IGNORE B / A</p> <p>DO NOT ACCEPT other bonds DO NOT ACCEPT between the R groups</p>	(2)

Question number	Answer	Additional guidance	Mark
5(b)(ii)	<p>An explanation that includes four of the following points:</p> <ul style="list-style-type: none">• primary structure remains the same length and secondary structure is longer with higher temperature (1)• (primary structure remains the same length) because the peptide bonds are not affected (by the heat) (1)• secondary structure is shorter than primary structure because of the {folding / winding} (1)• (secondary structure gets longer) because (the heat) hydrogen bonds break (1)• due to increase in vibration of the {R groups / amino acids / molecule} (1)	<p>Piece together</p> <p>ACCEPT strong / hard to break</p> <p>ACCEPT increase in kinetic energy results in more movement within the molecule.</p>	<p>(4)</p>

Question number	Answer	Additional guidance	Mark
6(a)(i)	<p>An answer that includes three of the following points:</p> <ul style="list-style-type: none"> • (in general) people's perceptions of risks are lower than the actual risks (except being overweight) (1) • people seem to have a realistic perception of the risk of {smoking / being overweight} (1) • overweight is the most common risk factor / smoking is the least common risk factor (1) 	<p>ACCEPT converse that actual risks are higher (in general) (in general) people underestimate their risks</p> <p>ACCEPT perception and actual risks are very close IGNORE perceived risk is lower than actual risk for overweight</p> <p>ACCEPT <u>actual</u> risk of high blood pressure and cholesterol are the same IGNORE the most number of people are overweight / least number of people smoke</p>	(2)

Question number	Answer	Additional guidance	Mark
6(a)(ii)	<p>An explanation that includes three of the following points:</p> <ul style="list-style-type: none"> • large group of people (1) • sample size is large for {repeatability / reproducibility} (1) • people should not know if they have underlying health risks (before being interviewed) (1) • no known health risks for validity / otherwise it is not a perception that is being studied (1) • people should have some knowledge of CVD (1) • some knowledge for validity / to reduce the number of guesses / to make an informed decision (1) 	<p>NB mp 2, 4 and 6 can only be awarded if mp 1, 3 and 5 have been awarded, respectively</p> <p>ACCEPT large sample size / more people</p> <p>ACCEPT to allow for a statistical analysis / description of statistical analysis e.g. SD calculated</p> <p>IGNORE accurate / precise / valid / reliable</p> <p>ACCEPT named example e.g. family history should not be on medication for CVD</p>	(3)

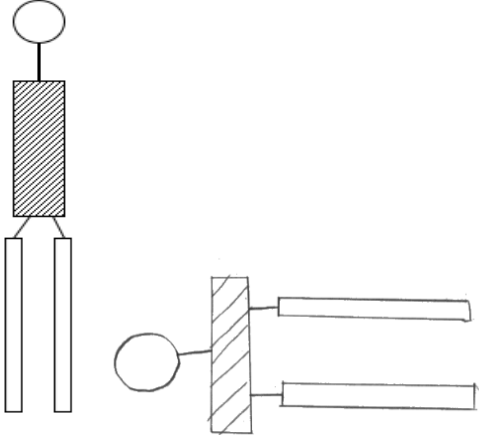
Question number	Answer	Additional guidance	Mark
6(a)(iii)	<p>An explanation that includes three of the following points:</p> <ul style="list-style-type: none"> • lifestyle can be modified (to reduce the risk / slow down progression) (1) • they could have a {blood / health} test (to assess the risk / check on the progression) (1) • medication can be {prescribed / taken} (to reduce the risk / slow down progression) (1) • if perception is greater than actual, an unnecessary change may be made (1) 	<p>ACCEPT converse i.e. what a person would not do if they underestimated the risk for mp 1, 2 and 3</p> <p>ACCEPT if people know they are at risk then they can do something about it</p> <p>ACCEPT a described change in a named example</p> <p>ACCEPT named example</p> <p>ACCEPT named example of a change may cause stress</p>	(3)

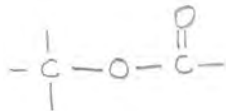
Question number	Answer	Additional guidance	Mark
6(b)(i)	<ul style="list-style-type: none"> • points added up (1) • 8 (%) (1) 	<p>$(-3 + 11 + 9 + 2) 19$</p> <p>Bald answer = 2 marks $(11+9+ 2=22) 17(\%) = 1$ mark</p>	(2)

Question number	Answer	Additional guidance	Mark
6(b)(ii)	<p>An explanation that includes two of the following points:</p> <ul style="list-style-type: none"> • stop smoking as this would reduce {damage to the endothelial lining / lower blood pressure} (1) • reduce {cholesterol / saturated fats} in the diet so less to build up the {plaque / atheroma} (in the arteries) (1) • reduce {salt intake / stressful activities} as this would lower blood pressure (1) 	<p>ACCEPT the converse throughout for what would happen if the changes were not made</p> <p>ACCEPT increase antioxidants to reduce free radicals generated by smoking</p> <p>ACCEPT atherosclerosis increase in fibre to reduce absorption of cholesterol</p> <p>ACCEPT <u>increase</u> exercise / consume less caffeine</p>	(2)

Question number	Answer	Mark
6(b)(iii)	<p>The only correct answer is D, antihypertensives and statins</p> <p><i>A is incorrect because anticoagulants do not reduce blood pressure or blood cholesterol levels</i> <i>B is incorrect because anticoagulants do not reduce blood pressure or blood cholesterol levels</i> <i>C is incorrect because platelet inhibitors do not reduce blood pressure or blood cholesterol levels</i></p>	(1)

Question number	Answer	Additional guidance	Mark
6(b)(iv)	<p>An answer that includes two of the following points:</p> <ul style="list-style-type: none"> • other factors are risk factors that have not been included (1) • the {cholesterol levels / blood pressure} may have to be estimated (1) • does not include {the number of cigarettes smoked / ex smoker} (1) 	<p>ACCEPT named factor e.g. body mass, activity levels, diabetic, genetic predisposition, passive smoking IGNORE sex / gender</p> <p>ACCEPT does not include {HDL / LDL:HDL} / diastolic B P IGNORE not accurate IGNORE under estimates / lying / passive smoking</p>	(2)

Question number	Answer	Additional guidance	Mark
7(a)(i)	<p>A diagram that includes the following points:</p> <ul style="list-style-type: none"> one glycerol (shaded / labelled), two fatty acids (not shaded / labelled), one phosphate and three bonds shown (1) all components drawn together correctly (1) 	 <p>ecf if:</p> <ul style="list-style-type: none"> {one / three} fatty acids drawn attached to glycerol but rest correct glycerol missing but fatty acids attached to head with bonds bonds missing but all four components are touching correctly {all shaded / nothing shaded} with no labels 	(2)

Question number	Answer	Mark
7(a)(ii)	<p>The only correct answer is C,</p>  <p><i>A is incorrect because it is not an ester bond</i> <i>B is incorrect because it is not an ester bond</i> <i>D is incorrect because it is not an ester bond</i></p>	(1)

Question number	Answer	Additional guidance	Mark
7(b)(i)	<p>An explanation that includes two of the following points:</p> <ul style="list-style-type: none"> because {phospholipids / molecules} have more (heat / kinetic) energy (1) because {forces / interactions} between {fatty acid chains / phospholipids} break (1) therefore <u>phospholipids</u> can move around (within the membrane) / phospholipid bilayer} more (1) 	<p>IGNORE proteins</p> <p>ACCEPT bonds break bonds between {fatty acids and cholesterol / phospholipids} Van der waals forces</p>	(2)

Question number	Answer	Mark				
7(b)(ii)	<p>The only correct answer is C</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Has double bonds between two carbons</th> <th>Number of hydrogens</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">yes</td> <td style="text-align: center;">fewer than the saturated fatty acid</td> </tr> </tbody> </table> <p><i>A is incorrect because unsaturated fatty acids have double bonds between carbons</i> <i>B is incorrect because unsaturated fatty acids have double bonds between carbons</i> <i>D is incorrect because unsaturated fatty acids have fewer hydrogen</i></p>	Has double bonds between two carbons	Number of hydrogens	yes	fewer than the saturated fatty acid	(1)
Has double bonds between two carbons	Number of hydrogens					
yes	fewer than the saturated fatty acid					

Question number	Answer	Additional guidance	Mark
7(b)(iii)	<p>An explanation that includes the following points:</p> <ul style="list-style-type: none"> • cholesterol interacts with {phospholipids / fatty acids} (1) • (if less cholesterol) movement of <u>phospholipids</u> no longer restricted (by interaction with cholesterol) (1) 	<p>NB we are not looking for the idea that cholesterol is acting as a barrier or taking up space</p> <p>ACCEPT bonds</p> <p>ACCEPT so <u>phospholipids</u> can move around more</p>	(2)

Question number	Answer	Additional guidance	Mark
7(b)(iv)	<ul style="list-style-type: none"> will require less (kinetic) energy to move / because there are fewer interactions (with {other fatty acids / phospholipids / cholesterol}) (1) 	ACCEPT bonds converse for longer chains	(1)

Question number	Answer	Additional guidance	Mark
7(c)(i)	An answer that includes the following points: <ul style="list-style-type: none"> convert saturated fatty acids into unsaturated fatty acids (1) convert long side chains into shorter ones (1) 	ACCEPT become unsaturated / increase in unsaturated / decrease in saturated fats ACCEPT become shorter	(2)

Question number	Answer	Additional guidance	Mark
7(c)(ii)	<p>An answer that includes two of the following points:</p> <ul style="list-style-type: none"> to maintain the fluidity of the membrane (1) so that membrane can change shape (1) so that fusion of membranes can occur (1) so that substances can continue to move across membrane (1) 	<p>ACCEPT otherwise the fluidity will decrease</p> <p>ACCEPT named example e.g phagocytosis, endocytosis, exocytosis, red blood cells, formation of vesicles</p> <p>ACCEPT named example e.g. of nuclei (during fertilisation) fusion of vesicles</p> <p>ACCEPT named substance</p>	(2)

Question number	Answer	Additional guidance	Mark
8(a)	<ul style="list-style-type: none"> number of deaths not due to cancer calculated (1) 0.45 : 1 / 0.45 (1) 	<p>(541589 - 166800) 374 789</p> <p>ACCEPT 1 : 2.25</p> <p>Bald answer of 0.45 : 1 or 0.45 or 1 : 2.25 = 2 marks</p>	(2)

	Answer	Additional guidance	Mark
8(b)(i)	An answer that includes the following points: <ul style="list-style-type: none">• insertion and deletion (1)	ACCEPT chromosome or translocation IGNORE point / gene / frameshift / addition / subtraction / substitution / named disorders / missense / nonsense / inversion / duplication	(1)

Question number	Answer	Additional guidance	Mark
8(b)(ii)	<ul style="list-style-type: none"> • 65 (%) 	ACCEPT any number to one decimal place in the range 58.0 to 67.0	(1)

Question number	Answer	Additional guidance	Mark
8(b)(iii)	<p>An explanation that includes four of the following points:</p> <ul style="list-style-type: none"> • substitution mutation swaps one base (in the DNA sequence / gene) (1) • this will result in a different <u>base</u> being inserted into the mRNA (during transcription) (1) • the genetic <u>code</u> is degenerate (1) • therefore codes for the same amino acid (1) • and therefore the protein will have the same {structure / function} as the R groups will be the same (1) 	ACCEPT substitution only affects one base example using two sets of bases	(4)

Question number	Answer	Mark
8(c)(i)	<p>The only correct answer is B, 0.125</p> <p><i>A is incorrect because 1 in 4 chance of having child with PKU and 1 in 2 chance of having a boy</i> <i>C is incorrect because 1 in 4 chance of having child with PKU and 1 in 2 chance of having a boy</i> <i>D is incorrect because 1 in 4 chance of having child with PKU and 1 in 2 chance of having a boy</i></p>	(1)

Question number	Answer	Additional guidance	Mark
*8(c)(ii)	<p>Group 1 : Individuals 1 and 2</p> <ul style="list-style-type: none"> • must be carriers / heterozygous (S) • because they did not have PKU but some of their children did (E) <p>Group 2 : Individuals 3 and 4</p> <ul style="list-style-type: none"> • must be homozygous (S) • because they both had PKU (E) • because both alleles need to be recessive (E) <p>Group 3 : Individuals 5 and / or 6</p> <ul style="list-style-type: none"> • cannot tell if homozygous dominant or heterozygous / carrier (S) • because both these genotypes will give an individual without PKU (E) • we do not know anything about individual 6' family (U) • because no evidence in individuals 7, 8 or 9 of the disease (U) • so less likely that they are both carriers (U) <p>Group 4 : Individuals 7 and / or 8 and / or 9</p> <ul style="list-style-type: none"> • cannot tell if they are homozygous dominant or heterozygous (S) • because both these genotypes will give an individual without PKU (E) • and we cannot determine genotypes of individuals 5 and 6 (U) • no offspring to give any clues (U) • but PKU is in individual 5's family (U) • so any of individuals 7, 8 or 9 could be carriers (U) 	<p>Level 1</p> <p>1 mark = genotypes for one group of individuals stated OR women are XX and men are XY OR a description of what pedigree diagrams {show / can be used for}</p> <p>2 marks = explanation for one group OR genotypes for two groups stated</p> <p>Level 2</p> <p>3 marks = explanations for two groups</p> <p>4 marks = explanations for three or four groups with no uncertainty</p> <p>Level 3</p> <p>5 marks = three groups explaining the uncertainty of either group 3 or 4</p> <p>6 marks = four groups explaining the uncertainty of both groups 3 and 4</p> <p>NB max 2 marks if they have discussed in relation to sex linkage</p>	(6)

