Mark Scheme (Results)

June 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	An answer that includes the following points (in order): • dipolar (1) • positive (1) • solvent (1) • hydrolysis (1) • lactose (1)	 **ACCEPT** dipole / polar **ACCEPT** medium **DO NOT ACCEPT** hydration **DO NOT ACCEPT** lactase / other named molecules	**(5)**

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

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

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

Question number	Answer	Additional guidance	Mark
2(d)	An explanation that includes three of the following points: • 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)	**ACCEPT** other descriptions of what will not happen e.g. fibrin will not be formed **ACCEPT** will be at a high concentration (when needed) **NB** award mps if candidate clearly states what would happen if the thromboplastin was NOT inside platelets	**(3)**

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

Question number	Answer	Additional guidance	Mark
3(b)	An explanation that includes the following points: • 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)	• 8.5 (a.u. per °C)	**IGNORE** decrease of / ↓ / -	**(1)**

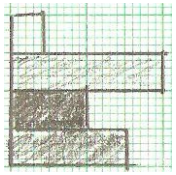
Question number	Answer	Additional guidance	Mark
3(c)(ii)	• because the {enzyme is denatured / active site to change shape / bonds to break} (1)	**DO NOT ACCEPT** starts to	**(1)**

Question number	Answer	Additional guidance	Mark
4(a)	• surface area of one vein calculated (1) • total surface area = 1.4×10^3 / 1.5×10^3 (1) • length of vena cava = 40.7 / 40.8 / 42.7 (1)	37.68 **DO NOT ACCEPT** 37 ecf for wrong value in mp 1 but multiplied by 40 and incorrect standard form 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)	**(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	1,507.964473723100754462068823974 2 1.5×10^3
3. Length	42.666666666666666666666666666667 42.7	40.764331210191082802547770700637 40.8	40.743665431525205956834243423363 40.7

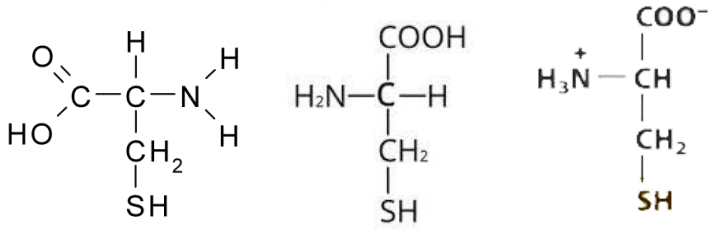
Question number	Answer	Additional guidance	Mark
4(b)	An explanation that includes the three of the following points: • blood in aorta is under higher pressure as it has just been pumped out of the {heart / (left) ventricle} (1) • aorta branches into many arteries /(blood flowing through) more vessels (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)	**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 **ACCEPT** velocity slower in arteries as they do not receive blood directly from the heart **ACCEPT** (total) cross-sectional area of arteries are greater than the aorta **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 **ACCEPT** in the form of a comparison with the aorta being able to force blood because of more elastic fibres	**(3)**

ion number	Answer	Additional guidance	Mark
4(c)	An explanation that includes the following points: • 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)	**ACCEPT** named molecule e.g. oxygen, glucose **ACCEPT** faster gas exchange / rate of diffusion is fast enough / diffusion is rapid **ACCEPT** capillaries are close to more cells / diffusion distance is short	**(2)**

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

Question number	Answer	Additional guidance	Mark
4(d)(ii)	• 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)	A description that includes two of the following points: • 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}	**IGNORE** large **ACCEPT** a description **IGNORE** named amino acids **ACCEPT** hydrophobic groups on the outside **IGNORE** stated number of chains / refs to triple helix **DO NOT ACCEPT** other named bonds	**(2)**

Question number	Answer	Additional guidance	Mark
5(a)(ii)	A diagram that includes the following points: • 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)		**(3)**

Question number	Answer	Additional guidance	Mark
5(b)(i)	A description that includes the following points: • ß {pleated / sheet} / α helix (1) • (held together by) hydrogen bonds (between amino acids) (1)	**DO NOT ACCEPT** {double helix / triple helix} even if ß sheet named **IGNORE** B / A **DO NOT ACCEPT** other bonds **DO NOT ACCEPT** between the R groups	**(2)**

Question number	Answer	Additional guidance	Mark
5(b)(ii)	An explanation that includes four of the following points: • 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)	Piece together **ACCEPT** strong / hard to break **ACCEPT** increase in kinetic energy results in more movement within the molecule.	**(4)**

Question number	Answer	Additional guidance	Mark
6(a)(i)	An answer that includes three of the following points: • (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)	**ACCEPT** converse that actual risks are higher (in general) (in general) people underestimate their risks **ACCEPT** perception and actual risks are very close **IGNORE** perceived risk is lower that actual risk for overweight **ACCEPT** actual risk of high blood pressure and cholesterol are the same **IGNORE** the most number of people are overweight / least number of people smoke	**(2)**

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An explanation that includes three of the following points: • 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)	**NB** mp 2, 4 and 6 can only be awarded if mp 1, 3 and 5 have been awarded, respectively **ACCEPT** large sample size / more people **ACCEPT** to allow for a statistical analysis / description of statistical analysis e.g. SD calculated **IGNORE** accurate / precise / valid / reliable **ACCEPT** named example e.g. family history should not be on medication for CVD	**(3)**

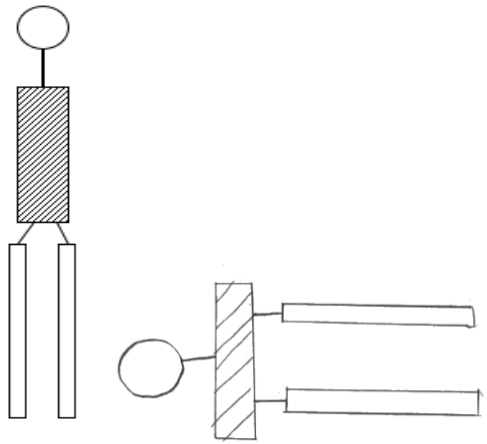
Question number	Answer	Additional guidance	Mark
6(a)(iii)	An explanation that includes three of the following points: • lifestyle can be modified (to reduce the risk / slow down progression) (1) • they could have a {blood / health} test (to assess the risk / check on the progression) (1) • medication 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)	**ACCEPT** converse i.e. what a person would not do if they underestimated the risk for mp 1, 2 and 3 **ACCEPT** if people know they are at risk then they can do something about it **ACCEPT** a described change in a named example **ACCEPT** named example **ACCEPT** named example of a change may cause stress	**(3)**

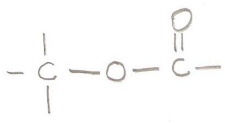
Question number	Answer	Additional guidance	Mark
6(b)(i)	• points added up (1) • 8 (%) (1)	(-3 + 11 + 9 + 2) 19 Bald answer = 2 marks (11+9+ 2=22) 17(%) = 1 mark	**(2)**

Question number	Answer	Additional guidance	Mark
6(b)(ii)	An explanation that includes two of the following points: •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)	**ACCEPT** the converse throughout for what would happen if the changes were not made **ACCEPT** increase antioxidants to reduce free radicals generated by smoking **ACCEPT** atherosclerosis increase in fibre to reduce absorption of cholesterol **ACCEPT** <u>increase</u> exercise / consume less caffeine	**(2)**

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

Question number	Answer	Additional guidance	Mark
6(b)(iv)	An answer that includes two of the following points: • 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)	**ACCEPT** named factor e.g. body mass, activity levels, diabetic, genetic predisposition, passive smoking **IGNORE** sex / gender **ACCEPT** does not include {HDL / LDL:HDL} / diastolic B P **IGNORE** not accurate **IGNORE** under estimates / lying / passive smoking	**(2)**

Question number	Answer	Additional guidance	Mark
7(a)(i)	A diagram that includes the following points: • one glycerol (shaded / labelled), two fatty acids (not shaded / 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 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)	The only correct answer is **C,**  ***A** is incorrect because it is not an ester bond* ***B** is incorrect because it is not an ester bond* ***D** is incorrect because it is not an ester bond*	**(1)**

Question number	Answer	Additional guidance	Mark
7(b)(i)	An explanation that includes two of the following points: • 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)	**IGNORE** proteins **ACCEPT** bonds break bonds between {fatty acids and cholesterol / phospholipids} Van der waals forces	**(2)**

Question number	Answer	Mark
7(b)(ii)	The only correct answer is **C** **Has double bonds between two carbons:** yes **Number of hydrogens:** fewer than the saturated fatty acid ***A** is incorrect because unsaturated fatty acids have double bonds between carbons* ***B** is incorrect because unsaturated fatty acids have double bonds between carbons* ***D** is incorrect because unsaturated fatty acids have fewer hydrogen*	**(1)**

Question number	Answer	Additional guidance	Mark
7(b)(iii)	An explanation that includes the following points: • cholesterol interacts with {phospholipids / fatty acids} (1) • (if less cholesterol) movement of <u>phospholipids</u> no longer restricted (by interaction with cholesterol) (1)	**NB** we are not looking for the idea that cholesterol is acting as a barrier or taking up space **ACCEPT** bonds **ACCEPT** so <u>phospholipids</u> can move around more	**(2)**

Question number	Answer	Additional guidance	Mark
7(b)(iv)	• 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: • 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)	An answer that includes two of the following points: • 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)	**ACCEPT** otherwise the fluidity will decrease **ACCEPT** named example e.g phagocytosis, endocytosis, exocytosis, red blood cells, formation of vesicles **ACCEPT** named example e.g. of nuclei (during fertilisation) fusion of vesicles **ACCEPT** named substance	**(2)**

Question number	Answer	Additional guidance	Mark
8(a)	• number of deaths not due to cancer calculated (1) • 0.45 : 1 / 0.45 (1)	(541589 – 166800) 374 789 **ACCEPT** 1 : 2.25 Bald answer of 0.45 : 1 or 0.45 or 1 : 2.25 = 2 marks	**(2)**

	Answer	Additional guidance	Mark
8(b)(i)	An answer that includes the following points: • 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)	• 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)	An explanation that includes four of the following points: • substitution mutation swaps one base (in the DNA sequence / gene) (1) • this will result in a different base being inserted into the mRNA (during transcription) (1) • the genetic code 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)	The only correct answer is **B**, 0.125 ***A*** *is incorrect because 1 in 4 chance of having child with PKU and 1 in 2 chance of having a boy* ***C*** *is incorrect because 1 in 4 chance of having child with PKU and 1 in 2 chance of having a boy* ***D*** *is incorrect because 1 in 4 chance of having child with PKU and 1 in 2 chance of having a boy*	**(1)**

Question number	Answer	Additional guidance	Mark
*8(c)(ii)	**Group 1 : Individuals 1 and 2** • must be carriers / heterozygous (S) • because they did not have PKU but some of their children did (E) **Group 2 : Individuals 3 and 4** • must be homozygous (S) • because they both had PKU (E) • because both alleles need to be recessive (E) **Group 3 : Individuals 5 and / or 6** • 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) **Group 4 : Individuals 7 and / or 8 and / or 9** • 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)	**Level 1** 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} 2 marks = explanation for one group OR genotypes for two groups stated **Level 2** 3 marks = explanations for two groups 4 marks = explanations for three or four groups with no uncertainty **Level 3** 5 marks = three groups explaining the uncertainty of either group 3 or 4 6 marks = four groups explaining the uncertainty of both groups 3 and 4 **NB** max 2 marks if they have discussed in relation to sex linkage	**(6)**

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