Mark Scheme (Results)

June 2022

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

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)**

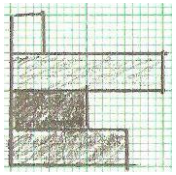
Question number	Answer	Additional guidance	Mark
3(c)(ii)	• because the {enzyme is denatured / active site to change shape / bonds to break} (1)	**DO NOT ACCEPT** starts to	**(1)**

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

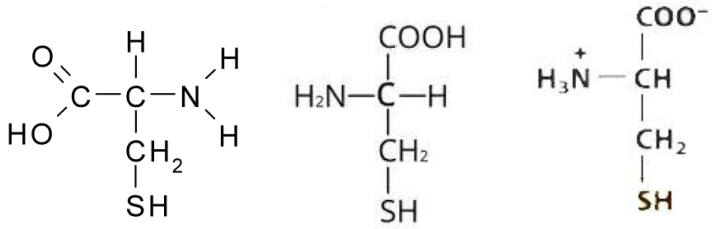
Question number	Answer	Additional guidance	Mark
4(b)	An explanation that includes the three of the following points: • blood in aorta is under higher pressure as it has just been pumped out of the {heart / (left) ventricle} (1) • aorta branches into many arteries /(blood flowing through) more vessels (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)**

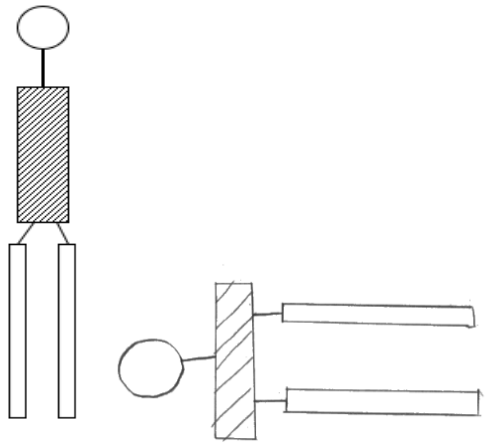
Question number	Answer	Additional guidance	Mark
6(a)(iii)	An explanation that includes three of the following points: • lifestyle can be modified (to reduce the risk / slow down progression) (1) • they could have a {blood / health} test (to assess the risk / check on the progression) (1) • medication 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)**

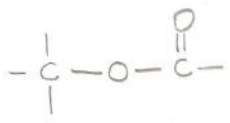
Question number	Answer	Additional guidance	Mark
6(b)(i)	• points added up (1) • 8 (%) (1)	(-3 + 11 + 9 + 2) 19 Bald answer = 2 marks (11+9+ 2=22) 17(%) = 1 mark	**(2)**

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)**