Mark Scheme (Results)

January 2017

Pearson Edexcel
International Advanced Subsidiary Level
in Biology (WBI01)
Paper 01 Lifestyle, Transport, Genes 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)	1. movement down a concentration gradient ; 2. that requires a { membrane / channel / carrier } protein ; 3. does not require ATP / is a passive process / eq ;	**MP1** Accept description of concentration gradient. **MP 3 Ignore:** 'does not need energy'	**Type: Expert** **(2)**

Question Number	Answer	Additional guidance	Mark
1(b)(i)	glycosidic (link) ;	**Ignore** any reference to type of glycosidic link e.g. 1-4	**Type: Clerical (1)**

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	hydrolysis ;	**Accept:** 'catabolic reaction' **Do not accept**: answer that include both hydrolysis and condensation	**Type: Clerical (1)**

Question Number	Answer	Additional guidance	Mark
1(b)(iii)	1. Idea of branching (polysaccharide) ; 2. that is {rapidly hydrolysed / eq} ; 3. allows the storage of large quantities of glucose in a small space (in a cell)/ eq ; 4. low solubility / it does not diffuse out of cells / it has no osmotic effect / eq ;	 **Ignore** easily hydrolysed MP3 is about energy density not just stores lots of energy. **MP3 Accept** 'compact molecule' in the context of storing lots of energy/glucose **MP4 Allow** 'insoluble'	**Type: Expert** **(3)**

Question Number	Answer	Additional guidance	Mark
2(a)(i)	**The only correct answer is A** **B** is not correct because because atherosclerosis is not initiated by damage to muscle cells **C** is not correct because atherosclerosis is not initiated by damage to red blood cells **D** is not correct because atherosclerosis is not initiated by damage to white blood cells	A endothelial cells	**Type: Computer (1)**

Question Number	Answer	Additional guidance	Mark
2(a)(ii)	**The only correct answer is A** **B** is not correct because atherosclerosis does not occur in the atria **C** is not correct because atherosclerosis does not occur in the capillaries **D** is not correct because atherosclerosis does not occur in the ventricles	A arteries	**Type: Computer (1)**

Question Number	Answer	Additional guidance	Mark
2(a)(iii)	**The only correct answer is A** **B** is not correct because in atherosclerosis, the blood vessels lumen narrows **C** is not correct because in atherosclerosis, the blood vessels become less elastic **D** is not correct because in atherosclerosis, the blood vessels become less elastic and the lumen narrows	A less elastic with a narrow lumen	**Type: Computer (1)**

Question Number	Answer	Additional guidance	Mark
2(b)	1. formation of blood clot / thickening of artery wall / eq ; 2. { blocks / narrows } coronary arteries ; 3. reduces blood flow ; 4. depriving heart muscle of { oxygen / nutrients / eq } ;	**MP 2 allow 'arteries supplying the heart (muscle)'**	**Type: Expert (3)**

Question Number	Answer	Additional guidance	Mark
2(c)(i)	1. there are fewer heart attacks in the group treated with Captopril ; 2. Captopril reduces heart attacks by { x2.6 / 62% } compared to propranolol : 3. there is {little / no difference / eq} in the percentage of strokes for the different drugs ;	**MP 1 ACCEPT** converse for propranolol **MP 1 ACCEPT** Propranolol increases the number of heart attacks compared to Captopril **MP 2 ACCEPT** the difference is 6.4%	**Type: Expert** **(2)**

Question Number	Answer	Additional guidance	Mark
2(c)(ii)	1. unethical not to treat patients with high blood pressure; 2. Idea of comparing the two drugs	**Accept:** • using a placebo puts patients at risk	**Type: Graduate** **(1)**

Question Number	Answer	Additional guidance	Mark
2(c)(iii)	<u>Two from</u>: 1. study population was small ; 2. only carried out in {one country / Finland} ; 3. age range is too broad / not all age groups included; 4. study followed for only six years ;	**IGNORE** reference to • no placebo / control group • missing information e.g. gender /drug dose / activity **MP3 IGNORE** 'age is not controlled' unless qualified	**Type: Graduate** **(2)**

Question Number	Answer	Additional guidance	Mark
3(a)(i)	**The only correct answer is D** **A** is not correct because pressure in the aorta does not increases during atrial diastole **B** is not correct because pressure in the aorta does not increases during atrial systole **C** is not correct because pressure in the aorta does not increases during ventricular diastole	D ventricular systole	**Type: Computer (1)**

Question Number	Answer	Additional guidance	Mark
3(a)(ii)	1. 15.6 – 10 ; 5.6 ÷ 15.6 = 35.9 (%); Correct answer with no working gains full marks	Allow 5.6 for mp 1 Allow 36 (%) Ignore plus or minus signs	**Type: Graduate (2)**

Question Number	Answer	Additional guidance	Mark
3(a)(iii)	1. heart is in (ventricular) diastole ; 2. no blood is entering the aorta / eq ; 3. blood is leaving the aorta / eq ;		**Type: Expert (2)**

Question Number	Answer	Additional guidance	Mark
3(b)	1. idea that it keeps oxygenated and deoxygenated blood separate ; 2. keeps { concentration / diffusion } gradient steep ; 3. idea that this results in sufficient oxygen being carried to the {tissues / cells / eq } ; 4. reference to different pressures in each side / need for different pressures explained ;	**MP 1** ignore reference to sides of heart **MP 3 Accept** results in removal of carbon dioxide from { tissues / cells / eq } **MP 4** any references to left and right sides must be correct	**Type: Expert** **(3)**

	Answer	Additional guidance	Mark
3(c)	1. thin walls / (walls) consist of single layer of flattened cells / eq ; 2. idea of allowing rapid diffusion ; **Or** 3. gaps between cells (in the wall) ; 4. to allow exchange (of materials) / increase permeability ;	**MP 1** allow narrow lumen **ACCEPT:** pores	**Type: Expert** **(2)**

Question Number	Answer	Additional guidance	Mark
4(a)	Any two from: 1. diffusion distance ; 2. concentration gradient ; 3. permeability ; 4. temperature ;	**MP 1 Accept** thickness of exchange surface **Accept** two or more correct answers but must have no incorrect answers for one mark Ignore moisture / mucus / blood flow references	**Type: Graduate (1)**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	0.21 : 1 **Or** 1 : 4.87 ;	**IGNORE** units **ACCEPT:** 0.2 : 1, 0.205 : 1, 1 : 4.9 or 1 : 5	**Type: Graduate (1)**

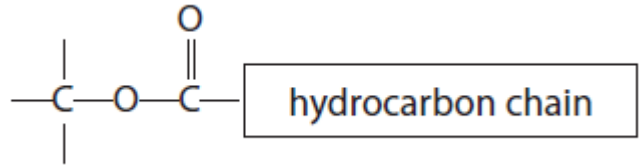
Question Number	Answer	Additional guidance	Mark
4(b)(ii)	1. as mass increases demand for oxygen increases / eq; 2. (surface area of alveoli) increases to allow for increased gas exchange / eq;	**MP 1 Accept** equivalent answers in terms of carbon dioxide production	**Type: Expert (2)**

Question Number	Answer	Additional guidance	Mark
4(c)	1. defective CFTR protein / eq ; 2. chloride ions are not transported out of the cells / sodium ions move into cells ; 3. water does not move out (of cells) / water moves in (to cells) / eq ; 4. mucus (on cell surface) { is not diluted / is thicker / is more sticky } / eq ; 5. reduced rate of gas diffusion / reducing ventilation of alveoli /eq ;	**MG 4 ALLOW** 'thick'	**Type: Expert** **(4)**

Question Number	Answer	Additional guidance	Mark
5(a)	1. the DHAR modified plants have a higher concentration (of vitamin C in both tubers and leaves) ; 2. the increase (in vitamin C concentration) in the leaves is greater than the increase in the tubers ; 3. calculation to support MP 1 or MP 2 ;	**MP 3** e.g. the increase in the tubers is 0.5, the increase in leaves 1.1	**Type: Expert** **(3)**

Question Number	Answer	Additional guidance	Mark
*5(b)	**(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. grow both types of plant under same conditions ; 2. prepare extract from each type of plant ; 3. using DCPIP ; 4. same volume of DCPIP or extract; 5. {titrate / eq } extract against DCPIP or DCPIP against extract ; 6. correct description of colour change ; 7. idea of comparison with a solution of vitamin C of known concentration / compare volumes needed to change the colour of the DCPIP ;	**QWC emphasis on clarity of expression** **MP1** Accept at least one correct condition that needs to be kept constant for both groups of plants **MP 5** an eq for titration is to add DCPIP or extract dropwise **MP 7** accept use a calibration curve	**Type: Expert** **(5)**

Question Number	Answer	Additional guidance	Mark
6(a)(i)	ester ;	Ignore references to additional details about bond e.g. covalent	**Type: Clerical (1)**

Question Number	Answer	Additional guidance	Mark
6(a)(ii)	**The only correct answer is D** **A** is not correct because the carbon oxygen double bond is missing and the 'ester group' is back to front **B** is not correct because the ester group is back to front **C** is not correct because the carbon oxygen double bond is missing	**D** 	**Type: Computer (1)**

Question Number	Answer	Additional guidance	Mark
6(a)(iii)	1. saturated fatty acid has no carbon – carbon double bonds whereas an unsaturated fatty acid has at least one carbon-carbon double bond ; 2. saturated fatty acid chains are straight unsaturated fatty acid chains are not straight / eq ; 3. ratio of H:C is higher in saturated fatty acids than unsaturated fatty acids ;	**Must be a complete comparison** MP1 must be clear that describing carbon-carbon bonds (ignore unqualified double and single bonds **ACCEPT** ref to double bonds in the hydrocarbon chain MP3 ACCEPT less H per C in unsaturated (or converse) Do not accept more hydrogens in saturated than unsaturated fatty acids	**Type: Expert** **(2)**

Question Number	Answer	Additional guidance	Mark
6(a)(iv)	1. enzymes are specific ; 2. due to { shape / structure } of active site ; 3. only allowing certain substrates to {bind / fit / form a complex / eq} ; 4. because diglyceride has a different shape from other molecules ;	**MP 1 ACCEPT:** active site is specific **MP 3 ACCEPT:** only binds to diglyceride	**Type: Expert** **(3)**

Question Number	Answer	Additional guidance	Mark
6(b)(i)	1. at the start substrate is not a limiting factor ; 2. as a reaction proceeds the concentration of substrate decreases ; 3. lower concentration of substrate limits rate of reaction ;	**MP 1 DO NOT ACCEPT** 'the substrate and enzyme are not limiting factors'	**Type: Expert** **(2)**

	Answer	Additional guidance	Mark
6(b)(ii)	1. controlling pH ; 2. otherwise pH would change as the fatty acid was used up ; 3. (changes in pH) affect the shape of the active site ; 4. (changes in pH) change ionic bonds within the enzyme ; 5. (changes in pH) change the rate of reaction ;	**MP3 ACCEPT** 'denatures the {active site / enzyme }' **MP 4 ACCEPT** 'alters charge on R groups' or 'changes ionisation' **MP5 IGNORE** comments about changes in the enzyme's activity	**Type: Expert** **(4)**

Question Number	Answer	Additional guidance	Mark
***7(a)**	**(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. reference to *phospholipid bilayer* ; 2. correct orientation and structure of the *phospholipids* in the *bilayer* ; 3. *phospholipids* have { polar */ hydrophilic* } heads and {non-polar / *hydrophobic* } tails / eq; 4. *proteins* in the *membrane* ; 5. idea of at least two different locations of proteins e.g. *extrinsic*, *intrinsic*, *transmembrane* ; 6. reference to *glycoproteins* / *glycolipids* / *lipoproteins ;* 7. reference to *cholesterol* within the membrane ;	**QWC emphasis is spelling [penalise once only]** **ACCEPT** points made on a clearly labelled diagram, but if diagram and description contradict each other then MP not awarded. **MP1 ACCEPT** 'a bilayer made of phospholipid' **MP 3 ACCEPT** description of polar and non-polar **MP 5** If only one location is provided then still get MP4	**Type: Expert** **(5)**

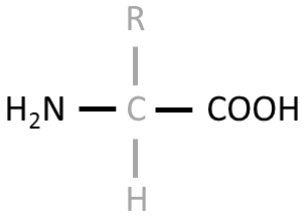
Question Number	Answer	Additional guidance	Mark
7(b)(i)	**The only correct answer is C** **A** is not correct because the solute concentration must be less than that in Q **B** is not correct because the solute concentration must be less than that in the control solution **D** is not correct because the solute concentration must be less than that in the control solution	C Less than the concentration in the cel in solution Q	**Type: Computer** **(1)**

Question Number	Answer	Additional guidance	Mark
7(b)(ii)	1. volume of cytoplasm is less ; 2. water has left the cell ; 3. reference to osmosis ; 4. {sodium chloride / solute} concentration inside the cell is lower than the solute concentration outside the cell ; ; ;	**MP 1 ACCEPT** descriptions of cell e.g. cell has shrunk / cell is crenated **MP 4 ACCEPT** water concentration inside the cell is greater than water concentration outside the cell Accept answers in terms of water / solute potential or solution Q being hypertonic	**Type: Expert** **(3)**

Question Number	Answer	Additional guidance	Mark
8(a)	1. genotype is the { combination of / pair of / two / all } alleles present (in an organism) e.g. MM ; 2. phenotype is the observable feature which is the concentration of alpha-1-antitrypsin (in the blood) ;	MP1 ACCEPT the alleles of the gene if qualified with suitable example e.g. MM IGNORE M, S, Z unqualified.	**Type: Expert** **(2)**

Question Number	Answer	Additional guidance	Mark
8(b)	1. all the alleles have an effect on the phenotype ; 2. **M** produces the highest concentration (of alpha-1-antitrypsin) and **Z** produces the lowest concentration ; 3. none of these alleles is completely dominant or recessive (as they all have an effect) ; 4. level of reduction due to one allele quantified e.g. S equivalent to 20% reduction ;	**MP 2 ACCEPT** M is more dominant than **S** and **Z** **MP3 ACCEPT M, S** and **Z** are co-dominant	**Type: Expert** **(3)**

Question Number	Answer	Additional guidance	Mark
8(c)(i)	**The only correct answer is C** **A** is not correct because the only base change that results in an amino acid change from Glu to Lys is G to A **B** is not correct because the only base change that results in an amino acid change from Glu to Lys is G to A **D** is not correct because the only base change that results in an amino acid change from Glu to Lys is G to A	C G to A	**Type: Computer** **(1)**

Question Number	Answer	Additional guidance	Mark
8(c)(ii)	 ;;	**ACCEPT** NH_2 and COOH on either side **ACCEPT** Fully displayed structures **DO NOT ACCEPT** --C-O-O-H or O-H-C— (ie if bond structure is shown it must be correct) **ACCEPT** one or both groups charged e.g. $-NH_3^+$ $-COO^-$	**Type: Graduate** **(2)**

Question Number	Answer	Additional guidance	Mark
8(c)(iii)	1. primary structure is the sequence of amino acids ; 2. idea that amino acids each have different R groups ; 3. idea that bonds form between R groups 4. (bonding) determines the folding of the polypeptide ;		**Type: Expert** **(3)**

Question Number	Answer	Additional guidance	Mark
8(d)	1. correct genotypes of offspring **MM**, **2MZ** and **ZZ** ; 2. genotypes giving blood concentration below parents' AAT identified – **ZZ** ; 3. correct probability {0.25 / 25% / 1/4} ;	Annotated diagram gains MP 1 and 2 **MP 1 and 2** Accept other letters with suitable key e.g A = M and a = Z **MP 2 ACCEPT ZZ** circled or underlined **MP 2 ACCEPT** correct concentrations written alongside genotypes	**Type: Expert** **(3)**

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