

Mark Scheme (Result)

October 2019

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

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October 2019
Publications Code WBI11_01_1910_MS
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General Marking Guidance

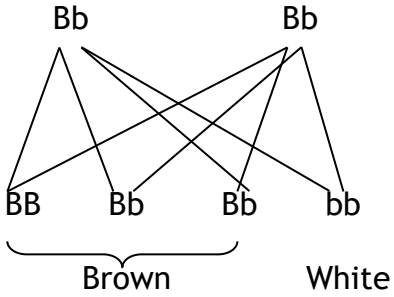
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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(a)(i)	A description that includes the following points: • smoking increases the risk of developing CVD (1) • age increases the risk of developing CVD (1)	 **ACCEPT** a higher chance, positive correlation, smoking higher than not smoking **ACCEPT** a higher chance, positive correlation	**(2)**

Question number	Answer	Additional guidance	Mark
1(a)(ii)	An explanation that includes two of the following points: • smokers still have greater risk because cigarettes still contain same chemicals / smokers have lower risk than before because people smoking {e cigarettes / fewer cigarettes} (1) • risk lower because people more aware of other risk factors / risk higher because of other named risk factor (1) • risk lower as improvements in health care (1)	 Accept no change if supported by an explanation **ACCEPT** more aware of their health e.g. poor diet, junk food, high fat, high salt, less exercise, obesity	**(2)**

Question number	Answer	Mark

1(b)	**C** 57.1×10^6 The only correct answer is **C**. ***A*** *is incorrect because (17.7 million ÷ 31) × 100* = 57.1×10^6 ***B*** *is incorrect because (17.7 million ÷ 31) × 100* = 57.1×10^6 ***D*** *is incorrect because (17.7 million ÷ 31) × 100* = 57.1×10^6	**(1)**

Question number	Answer	Additional guidance	Mark
2(a)	A diagram that shows the following: • genotype of parents / alleles in the gametes (1) • genotypes of offspring as BB, Bb and bb (1) • corresponding phenotypes shown as brown (BB and Bb) and white (bb) (1)	**Accept** other letters used for alleles  **ACCEPT** if clear from any ratios or percentages given CE throughout	**(3)**

Question number	Answer	Additional guidance	Mark
2(b)	An answer that includes the following points: • number of homozygous brown rabbits shown (1) • number of heterozygous brown rabbits shown (1) • number of white rabbits shown (1)	CE from part (a) BB = 71 Bb = 142 bb = 71 **ACCEPT** 1 2 1 for 1 mark	**(3)**

Question number	Answer	Additional guidance	Mark

3(a)

Name	Role	Property
thromboplastin	(catalyses the) conversion of prothrombin into thrombin (1)	soluble
thrombin (1)	catalyses the conversion of fibrinogen into fibrin	soluble (1)
fibrin	Any two of the following points: • form a network of fibres / mesh (1) • trap {platelets / blood cells} (1) • form a scab to {seal the wound / stop bleeding} (1) • form a scab to prevent the entry of bacteria (1)	insoluble (1)

IGNORE reference to calcium ions / vitamin K

ACCEPT unsoluble

ACCEPT two points made in one sentence
DO NOT ACCEPT completely wrong statements

(6)

Question number	Answer	Additional guidance	Mark

3(b)	An explanation that includes the following points: • because {gene / (defective) allele} located on the X chromosome (1) • because defective allele is recessive (1) • therefore, males with {defective / haemophilia} **allele** will only have that **allele** (1)	**ACCEPT** X-linked disease / sex-linked disease / inherited on the X chromosome **ACCEPT** {mutated / affected} allele / {haemophilia / disease} is recessive **ACCEPT** males will not carry a {healthy / normal} allele females need {both defective alleles / to be homozygous for defective alleles} to have haemophilia	**(3)**

Question number	**Answer**	**Mark**
4(a)(i)	**B** 2 | 3 The only correct answer is **B** ***A*** *is incorrect because glucose and fructose are monosaccharides and lactose, maltose and sucrose are disaccharides* ***C*** *is incorrect because glucose and fructose are monosaccharides and lactose, maltose and sucrose are disaccharides* ***D*** *is incorrect because glucose and fructose are monosaccharides and lactose, maltose and sucrose are disaccharides*	**(1)**

Question number	Answer	Mark
4(a)(ii)	**B** glycosidic The only correct answer is B. ***A*** *is incorrect because ester bonds join organic acids and alcohols together* ***C*** *is incorrect because hydrogen bonds do not join two monosaccharides together* ***D*** *is incorrect because phosphodiester bonds join phosphate group to an organic alcohol*	**(1)**

Question number	Answer	Additional guidance	Mark
4(a)(iii)	An answer that includes two of the following points: • monosaccharides are not more or less sweet than disaccharides (1) • a disaccharide is the least sweet and a monosaccharide is the sweetest (1) • sucrose is the sweetest disaccharide and fructose is the sweetest monosaccharide (1)	**ACCEPT** lactose is the least sweet disaccharide and glucose is the least sweet monosaccharide	**(2)**

Question number	Answer	Additional guidance	Mark
4(a)(iv)	An answer that includes three of the following points: • {sugars / sugar solutions} are tasted (1) • sugars should be the same concentration (1) • mouth is rinsed out between each sugar (1) • the (relative) sweetness is compared to sucrose (1) **OR** If students describe Benedict's test, allow the following two marks: • add Benedict's solution and heat (1) • rank sugar by {described colour changes / time taken to reach specific colour} (1)	**ACCEPT** sampled **IGNORE** amount **ACCEPT** the sugars are {compared against each other / given a rating}	**(3)**

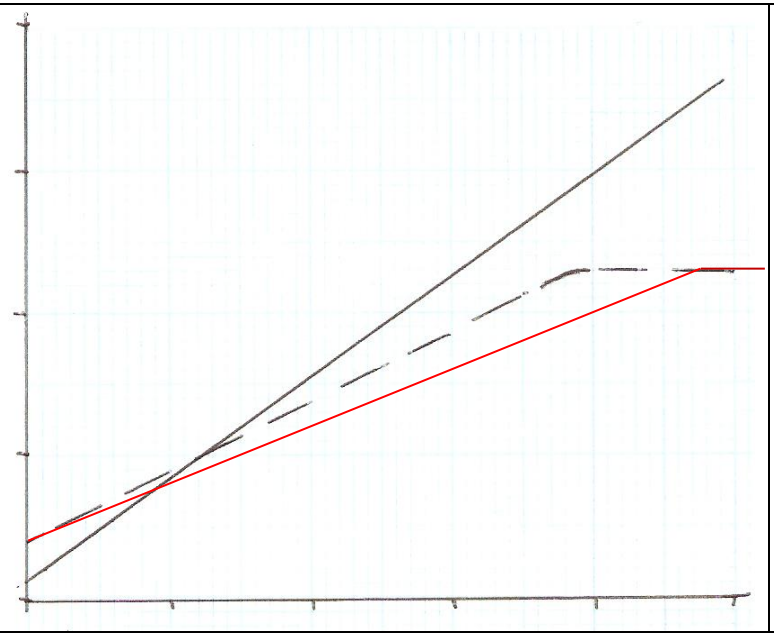
Question number	Answer	Additional guidance	Mark
4(b)	An answer that includes the following points: similarities: • both (polymers) composed of α glucose (1) • both contain 1 - 4 glycosidic {bonds / links} (1) differences: • amylose has {1 - 4 glycosidic bonds (only) / no 1 - 6 glycosidic bonds} and amylopectin has (1 - 4 and) 1 - 6 glycosidic bonds (1)	**DO NOT** piece together unless in same sentence or two linked adjacent sentences **ALLOW** composed of glucose if α glycosidic bonds are given **ACCEPT** amylose is {a chain / helical / linear / unbranched} and amylopectin is branched **NB** 'amylose has 1 - 4 glycosidic bonds and amylopectin has 1 - 4 and 1 - 6 glycosidic bonds' scores mark points 2 and 3	**(3)**

<table>
<tr><th>Question number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>5(a)</td><td>
<table>
<tr><th rowspan="2">Feature</th><th colspan="4">Cell transport mechanism</th></tr>
<tr><th>active transport only</th><th>facilitated diffusion only</th><th>both active transport and facilitated diffusion</th><th>not true for either active transport or facilitated diffusion</th></tr>
<tr><td>passive process</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td>membrane proteins involved</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td>direction of transport can be up the concentration gradient</td><td>X</td><td></td><td></td><td></td></tr>
</table>
</td><td>(3)</td></tr>
</table>

Question number	Answer	Additional guidance	Mark
5(b)(i)	An explanation that includes the following points: • substance K is taken up by active transport because active transport {works against / not affected by} the concentration gradient (1) • substance L is taken up by diffusion until {the concentration on the inside of the cell is equal to the concentration on the outside of the cell / no net movement / equilibrium reached} (1)	**NB ACCEPT** references to concentration of substances for uptake **ACCEPT** facilitated diffusion for diffusion throughout **ACCEPT** substance K continuously taken up by diffusion {and equilibrium has not been reached /as there is a concentration gradient} **NB** Accept substance K by {active transport / diffusion} and substance L by diffusion for 1 mark if no other	**(2)**

		mark points awarded	

Question number	Answer	Additional guidance	Mark
5(b)(ii)	An answer that includes the following points: • a line that starts at the same point (1) • less steep and levels off at same concentration as L / meets original line at 5 hours / lower than substance L at 5 hours (1)		

			**(2)**

Question number	Answer	Additional guidance	Mark
5(c)(i)	An explanation that includes two of the following points: • the membrane is fluid (1) • phospholipids (and proteins) can move (within the membrane) (1) • (presence of) cholesterol contributes to fluidity (1)	**DO NOT ACCEPT** flexible / strong **IGNORE** unqualified references to fluid mosaic structure / model **ACCEPT** more phospholipids added to the membrane	**(2)**

Question number	Answer	Additional guidance	Mark
5(c)(ii)	An explanation that includes the following points: • (more pseudopodia would) increase the surface area (of the pseudopodia / amoeba / cell / membrane) (1) • therefore {uptake / diffusion} would be faster (1)	**ACCEPT** 'it' as meaning uptake rate increases **IGNORE** uptake {increases / greater} references to active transport	**(2)**

Question number	Answer	Additional guidance	Mark
6(a)	• methionine leucine isoleucine tyrosine (1)	**ACCEPT** met leu iso tyr combinations of names and abbreviations	**(1)**

Question number	Answer	Additional guidance	Mark
6(b)(i)	Base number 3 becomes cytosine (C) substitution Base number 6 becomes number 5 in the sequence deletion	All three correct = 2 marks Any one or two correct = 1 mark **IGNORE** point mutation throughout **IGNORE** swapping mutation **IGNORE** elimination / frameshift	**(2)**

	Base number 9 becomes number 10 in the sequence insertion	**IGNORE** addition / frameshift	

Question number	Answer
***6(b)(ii)**	Indicative content: Substitution: • only affects one triplet codon • may not change the amino acid • e.g. number 6 becomes A, would still code for leucine • may change amino acid • e.g. number 1 becomes G, resulting in valine • may result in a stop codon • e.g. number 12 becomes G Deletion: • one base removed will shift the reading frame back one place • all amino acids after the mutation will be affected • closer to the start of the gene the greater the affect • fewer amino acids coded for • e.g. remove base 4 and sequence becomes methionine serine phenylalanine threonine Insertion: • one base added will shift the reading frame forward one place • all amino acids after the mutation will be affected • closer to the start of the gene the greater the affect • e.g. add C between numbers 9 and 10 and sequence becomes leucine proline serine

	Aspects to comment on: 1. Substitution changing the amino acid 2. Deletion changing sequence 3. Insertion changing sequence 4. Stop codons appearing shortening the sequence 5. Substitution may have no effect 6. Position of {insertion / addition} significant **Level 1** 1 mark : correct statement about mutations 2 marks : 1 aspect commented on with a corresponding illustration **OR** 2 or more aspects commented on but no illustrations **Level 2** 3 marks : 2 aspects commented on with corresponding illustrations **OR** 3 or more aspects commented but only 1 or 2 illustrations 4 marks : 3 aspects commented on with corresponding illustrations **Level 3**

	5 marks : 4 aspects commented on with corresponding illustrations 6 marks : 5 aspects commented on with corresponding illustrations

Question number	Answer	Additional guidance	Mark
7(a)(i)	An answer that includes the following points: • difference between systolic and diastolic pressure is 5.3 (kPa) (1) • person is healthy (because pulse pressure is greater than 3.75 kPa) (1)	 **ALLOW** 35 / 35.3 **ALLOW** (because {35 /35.3} % is higher than 25%) **CE applied** to second point and comparison adjusted accordingly	**(2)**

Question number	Answer	Additional guidance	Mark
7(a)(ii)	An answer that includes the following points: • suitable estimated values chosen (1) • answer calculated (1)	 **ACCEPT** values in range of (diastolic) 9.5 to 9.7 and (systolic) 14.8 to 15.0 to **OR** (systolic) 15 and (Diastolic) 10 11 / 11.2 / 11.3 / 11.4 / 11.5 **OR** 11.7 Correct answer with no working gains 2 marks	**(2)**

Question number	Answer	Additional guidance	Mark
7(a)(iii)	An explanation that includes the following points: • insufficient {oxygen / glucose} delivered to the {cells / tissues} (1) • credit an appropriate consequence (1)	**ACCEPT** oxygenated blood e.g. breathless, lack of energy, stroke, hypoxia, decrease in respiration, dizziness **IGNORE** death **NB** eg lack of oxygenated blood for cell respiration = 2 marks	**(2)**

Question number	Answer	Mark
7(b)(i)	**D** $\frac{8\eta\lambda}{\pi r^4}$ The only correct answer is D. ***A*** *is incorrect because ΔP cancels out* ***B*** *is incorrect because ΔP cancels out* ***C*** *is incorrect because the equation is upside down*	**(1)**

Question number	Answer	Mark
7(b)(ii)	**C** radius of the blood vessel lumen The only correct answer is **C** ***A*** *is incorrect* because ΔP *cancels out* ***B*** *is incorrect because length is only to the power 1 and radius is to the power 4 and vessels can change their diameter* ***D*** *is incorrect because the thickness of the wall is not part of the calculation.*	**(1)**

Question number	Answer	Additional guidance	Mark
7(b)(iii)	An explanation that includes the following points: • (inside of arteries lined with layer of unfolded) {flattened / smooth} {endothelial cells / endothelium} (1) • to reduce {friction / surface in contact with blood} (1)		**(2)**

Question number	Answer	Additional guidance	Mark
7(c)(i)	An explanation that includes the following points: • because elastic fibres (in wall of arteries) can {stretch / expand} (1) • therefore {widening the lumen / increasing the diameter (of the artery)} (1) • wall contains collagen to increase the strength (1)	**IGNORE** recoil **DO NOT ACCEPT** recoil	**(2)**

Question number	Answer	Additional guidance	Mark
7(c)(ii)	An explanation that includes the following points: • (if compliance is reduced) damage to the endothelium lining (1) • therefore, {cholesterol / (cholesterol) plaque} can build up (1) • therefore {narrowing / blocking} the blood vessel (1) • reducing {flow of blood / oxygen} to the heart {cells / tissues / muscle} (1)	**N.B** A reference to an artery must be made for 3 marks to be awarded **ACCEPT** atheroma **IGNORE** by clots	**(3)**

Question number	Answer	Additional guidance	Mark
8(a)	A diagram that shows: • COOH group and NH_2 group (1) • H and the aspartate R group (1) • all attached to a central C (1)	**Accept** charged groups	**(3)**

Question number	Answer	Additional guidance	Mark
8(b)	An explanation that includes the following points: • because (the urea cycle has) many {stages / steps / reactions} (1) • therefore, the product of one stage is the substrate of the next stage (1) • and enzymes are **specific** to one substrate (1)	**ACCEPT** each stage has {new / different} substrate / different substrates (in the process)	**(3)**

	• substrates {bind / attach / fit} to (specific) active site / credit reference to lock and key theory / credit reference to induced fit (1)	**ACCEPT** if active site is referred to in the context of an enzyme-substrate complex	

Question number	Answer	Additional guidance	**Mark**
8(c)(i)	An answer that includes three of the following points: • genetic screening / named screening method / looking for a mutation • biochemical test / blood test / description of named molecule whose level would be different • family history / pedigree analysis	**IGNORE** where the molecules maybe found	**(3)**

Question number	**Answer**

***8(c)(ii)**	Indicative content: Table of results: • OTC mRNA treatment reduces the levels of ammonia back to nearly normal (Diagram of urea cycle: • ammonia levels will build up if carbamyl phosphate is not combined with ornithine • OTC deficiency will result in carbamyl phosphate not combining with ornithine Diagram of particle: • particle targets liver and this is where the urea cycle takes place • the phospholipids will fuse with the liver cells to enable the mRNA to enter the cells • because the phospholipids can move • the phospholipids will protect the mRNA • from hydrolytic enzymes • the mRNA will be translated inside the liver cells • producing functional OTC • the OTC will combine carbamyl phosphate with ornithine • reducing the levels of urea

	Aspects to cover : D_d - description of data E_d - explanation of data : ammonia converted to urea because ornithine cycle functioning D_r - recognition of mRNA involved in translation E_r - explanation that functional OTC can be produced D_p - comment on role of particle E_p - explanation of phospholipid particle **Level 1** 1 mark : one description 2 marks : one description and one explanation or two descriptions **Level 2** 3 marks : two descriptions and one explanation or three descriptions 4 marks : two descriptions and two explanations **Level 3** 5 marks : three descriptions and two explanations

	6 marks : three descriptions and three explanations

GradeMax

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