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Mark Scheme (Results)

October 2020

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

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October 2020
Publications Code IAL_2010_WBI11_01
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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.

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Question number	Answer	Additional guidance	Mark
1(a)	peptide (1) amino / NH_2 / NH_3^+ / amine (1) carboxyl / COOH / CO_2H / COO^- / carboxylic (acid) (1) condensation (1) translation (1)	**DO NOT ACCEPT** dipeptide / polypeptide / amide **ACCEPT** second and third point either way round **ACCEPT** polymerisation / addition elimination	**(5)**

Question number	Answer					Mark
1(b)						**(2)**

Structure	Hydrogen bonds only	Ionic bonds only	Both hydrogen and ionic bonds	Neither of these bond
secondary structure	**X**	☒	☒	☒
three-dimensional structure	☒	☒	**X**	☒

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Question number	Answer	Additional guidance	Mark
2(a)	• combination of alleles (1)	**IGNORE** genetic composition / combination of information carried in the genes / all genetic {information / make up} **DO NOT ACCEPT** genes	**(1)**

Question number	Answer	Additional guidance	Mark
2(b)	• 1 in 2 / 50:50 / 50% / 0.5 / ½	**ACCEPT** 2 in 4 / 1:1 / 2:2	**(1)**

Question number	Answer	Additional guidance	Mark
2(c)	An answer that makes reference to the following points: • parents shown as heterozygotes (1) • genotypes of offspring shown (1) • 3 (orange) : 1 (white) (1)	CEs throughout **ACCEPT** any pair of letters chosen to represent alleles from Punnet square **ACCEPT** 1 white : 3 orange	**(3)**

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Question number	Answer	Additional guidance	Mark
2(d)	• 1 in 30 / 0.03 / 3.3% / $\frac{1}{30}$	ACCEPT 0.03 recurring / 3.3% recurring	**(1)**

Question number	Answer	Mark
3(a)(i)	**The only correct answer is B** contracted | relaxed ***A*** *is incorrect because the ventricles are relaxed* ***C*** *is incorrect because the atria are contracted and the ventricles are relaxed* ***D*** *is incorrect because the atria are contracted*	**(1)**

Question number	Answer	Additional guidance	Mark
3(a)(ii)	An explanation that includes the following points: • because the atrioventricular valves have to close (before the ventricles contract) (1) • to prevent backflow of blood into the atria (1)	**ACCEPT** {bicuspid / mitral} valve **and** tricuspid valve **DO NOT ACCEPT** valves close during ventricular systole	**(2)**

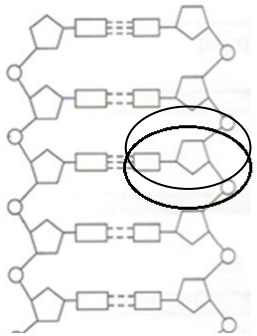
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Question number	Answer	Additional guidance	Mark
3(a)(iii)	• cardiac cycle time multiplied by proportion of cycle spent in ventricular systole (1) • 3.2×10^2 / 3.23×10^2 (1)	Example of calculation: 0.86 × ⅜ / 0.3225 / 0.32 / 0.323 Correct answer with no working gains 2 marks	**(2)**

Question number	Answer	Additional guidance	Mark
3(a)(iv)	• 63% / 5/8 / 0.63	**ACCEPT** 0.625 / 62.5% / 5 out of 8	**(1)**

Question number	Answer	Additional guidance	Mark
3(b)	• heart rate if cardiac cycle lasts 0.86 seconds (1) • heart rate if cardiac cycle last 0.46 seconds (1) • increase in heart rate = 60 / 61 beats per minute (1)	Example of calculation: 60 ÷ 0.86 = 69.76744186046512 60 ÷ 0.46 = 130.4347826 Answer in range of 60.2 to 60.7 gains 2 marks CE from calculations of heart rate Correct answer alone gains 3 marks	**(3)**

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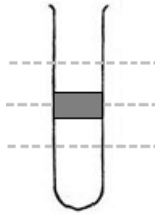
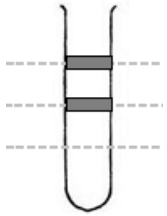
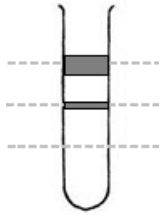
Question number	Answer	Additional guidance	Mark
4(a)(i)	• circle drawn around R, the attached sugar and a phosphate group	 **ACCEPT** the phosphate group on either C3 or C5	**(1)**

Question number	Answer	Mark
4(a)(ii)	**The only correct answer is D** phosphodiester | covalent | hydrogen ***A*** *is incorrect because S is a phosphodiester bond, T is a covalent bond and U is a hydrogen bond* ***B*** *is incorrect because S is a phosphodiester bond and U is a hydrogen bond* ***C*** *is incorrect because T is a covalent bond and U is a hydrogen bond*	**(1)**

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Question number	Answer	Mark
4(a)(iii)	**The only correct answer is C Thymine** ***A*** *is incorrect because adenine is complementary to thymine* ***B*** *is incorrect because adenine is complementary to thymine* ***D*** *is incorrect because adenine is complementary to thymine*	**(1)**

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Question number	Answer	Additional guidance	Mark
4(b)(i)	A diagram that shows the following points: • a band the same width as stage 1 in the middle of the tube (1) • bands drawn at the top and middle of tube (1) • both bands narrower than stage 1 (1) • bands drawn at the top and middle of tube (1) • top band drawn narrower than stage 1 but wider than stage 3 and lower band drawn narrower than stage 3 (1)	 DNA taken after stage 2  DNA taken after stage 3  DNA taken after stage 4	**(5)**

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Question number	Answer	Mark
4(b)(ii)	**The only correct answer is B** ***A*** *is incorrect because neither DNA molecule is made of all heavy nitrogen or light nitrogen* ***C*** *is incorrect because neither DNA molecule is made of all heavy nitrogen or light nitrogen + bands are too wide* ***D*** *is incorrect because it has only one band*	**(1)**

Question number	Answer	Additional guidance	Mark
5(a)	ACCEPT any two from : • BMI / body mass index • waist to hip ratio / hip to waist ratio • waist to height ratio / height to waist ratio • waist circumference • skin fold (thickness)	**IGNORE** risk factors **ACCEPT** mass ÷ height^2 / weight ÷ height^2	**(1)**

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Question number	Answer	Mark
5(b)(i)	**The only correct answer is B** B 1-6 only ***A*** *is incorrect because 1-4 bonds are present in straight chains only* ***C*** *is incorrect because 1-4 bonds are present in straight chains only* ***D*** *is incorrect because 1-6 bonds form the branches*	**(1)**

Question number	Answer	Additional guidance	Mark
5(b)(ii)	• makes the person feel full / prevents so much food from being in the stomach / fills up the stomach so less food needed to satisfy hunger / glucomannan takes the space of the food (1)	**IGNORE:** reduces food intake decreases volume of stomach	**(1)**

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Question number	Answer	Additional guidance	Mark
5(b)(iii)	An explanation that includes the following points: • because it contains lots of {monosaccharides / glucose / energy} (1) • therefore {energy input could be greater than energy output / (excess) glucose converted to fat} (1) • glucomannan would no longer be filling up the stomach so more food could be eaten (1)	**ACCEPT** sugar for glucose polymer of glucose lots of mannose broken down into lots of {glucose / monosaccharides / mannose} **ACCEPT** excess energy stored as fat	**(2)**

Question number	Answer	Additional guidance	Mark
5(c)(i)	An answer that includes the following points: • group on low fat diet lost 4.3 (kg) and group on very low-carbohydrate diet lost 8.1 (kg) (1) • (overall) loss of 8.1 (kg) is {1.88 / 1.9} times more weight (1) • which is slightly lower than the other studies are claiming (1) • claims are referring to low-carbohydrate diet but this one is a very low-carbohydrate diet (1)	**ACCEPT** group on low fat diet lost 3.8 (kg) more **ACCEPT** about twice as much / for low-fat diet this is 4.6% of starting weight and for very low-carbohydrate 8.9% starting weight **ACCEPT** results are at the lower end of the claim	**(3)**

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Question number	Answer	Additional guidance	Mark
5(c)(ii)	An answer that includes two of the following points: • (blood) {cholesterol / LDL} levels (1) • blood pressure (1) • heart rate (1)	**IGNORE** other named risk factors **ACCEPT** LDL : HDL	**(2)**

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Question number	Answer	Additional guidance	Mark
*6(a)	Indicative content: • triplet codon system (D) • because (at least) 20 codes needed for the amino acids (E) • e.g. AAC is code for asparagine (x) • degenerate code (D) • therefore some amino acids have more than one code (E) • e.g. threonine can be coded for by ACA, ACC, ACG or ACT (x) • non-overlapping code (D) • so each base on DNA is used in only one triplet codon (E) • e.g. AAC AGA codes for two amino acids (x)	**ACCEPT** three bases code for one amino acid **ACCEPT** each amino acid has its own code **ACCEPT** there are more codes than necessary **ACCEPT** discrete	**(6)**

Level 1 : refers to triplet codon system, degenerative code **or** non-overlapping code but no examples or explanation given
1 mark = 1 out of 3
2 marks = 2 out of 3 or 1 out of 3 + a linked example or explanation
Level 2 : refers to triplet codon system, degenerative code **or** non-overlapping code with either examples or explanation given
3 marks = at least 2 examples or 2 explanations or 1 of each
4 marks = at least 3 examples or 3 explanations or any combination of each
Level 3 : refers to triplet codon system, degenerative code **and** non-overlapping code with examples and explanation given
5 marks **=** at least 4 examples or explanations or any combination of each
6 marks **=** at least 5 examples or explanations or any combination of each

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Question number	Answer	Additional guidance	Mark
6(b)(i)	• methionine alanine cysteine proline isoleucine leucine	**ACCEPT** phonetic spelling / reasonable abbreviations / M A C P I L	**(1)**

Question number	Answer	Additional guidance	Mark
6(b)(ii)	An explanation that includes the following points: • it will have no effect (on the polypeptide) if the ninth base becomes a T as this still codes for {cysteine / same amino acid} (1) • will code for a stop codon if the ninth base becomes an A (1) • therefore the {protein / polypeptide} will be {shorter / not formed} (1) • will code for tryptophan if the ninth base becomes G (1) • this could change the bonding in the protein (1) • changing the {structure / activity} of the protein (1)	**ACCEPT** only two amino acids will join together **ACCEPT** even if tryptophan not given / given wrongly **ACCEPT** even if tryptophan not given / given wrongly	**(5)**

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Question number	Answer	Additional guidance	Mark
7(a)	A description that includes the following point: • to be present in the blood (all the time) (1) and any **TWO** of the following: • needed to make thrombin (when blood needs to clot) (1) • which is an {enzyme / catalyst} (1) • so that fibrinogen can be converted into fibrin (1)	**ACCEPT** precursor of clotting process / inactive form of thrombin / inactive enzyme / inactive plasma protein **NB** thrombin catalyses fibrinogen into fibrin = 2 marks	**(3)**

Question number	Answer	Mark
7(b)	**The only correct answer is A** A anticoagulant ***B*** *is incorrect because antihypertensives treat high blood pressure* ***C*** *is incorrect because platelet inhibitors inhibit platelets, which are involved in the cascade before prothrombin and prothrombin is made by the liver* ***D*** *is incorrect because statins treat high blood cholesterol levels*	**(1)**

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Question number	Answer	Additional guidance	Mark
7(c)(i)	An answer that includes the following points: • warfarin and vitamin K have a similar structure (1) • therefore warfarin {binds / blocks} to the {vitamin K epoxide reductase / VKOR} (1) • (as a result of warfarin binding to enzyme) {less / no} vitamin K reduced (1)	**ACCEPT** both have rings / double bond oxygen **ACCEPT** warfarin is a {competitive / active-site directed } inhibitor / description **DO NOT ACCEPT** non-competitive inhibitor / description of one binds to vitamin K	**(2)**

Question number	Answer	Additional guidance	Mark
7(c)(ii)	An answer that includes the following points: • increase in vitamin K would compete with warfarin for the active site (of vitamin K epoxide reductase / VKOR) (1) • therefore {some / more} vitamin K will be reduced (if vitamin K binds to enzyme) (1)	**ACCEPT** a description e.g. more enzyme substrate complexes	**(2)**

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Question number	Answer	Additional guidance	Mark
7(d)	An explanation that includes the following points: • large groups of people (1) • (sample size is large) for reproducibility (1) • people in both groups consume the same {mass / volume / concentration} of vitamin K (1) • people in both groups consume the same concentration of drugs (1) • (variables controlled) for validity (1)	**ACCEPT** 20 + **IGNORE** reference to control groups **ACCEPT** repeatable / reliable **IGNORE** accurate / precise / valid **IGNORE** amount **ACCEPT** other appropriate named control variable e.g. sex, age, diet, level of activity, alcohol intake **IGNORE** same number of people in each group / amount **IGNORE** accurate / precise /reproducible / repeatable / reliable	**(4)**

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Question number	Answer	Additional guidance	Mark
8(a)	An answer that includes three of the following points: Similarities **Any two from:** • both contain a glycerol (1) • both contain fatty acids (1) • both contain ester bonds (1) Differences • triglycerides have three fatty acids and phospholipids have two fatty acids (1) • triglycerides do not contain a phosphate group but phospholipids do contain a phosphate group (1)	**NB** Do not piece together from two descriptions in separate sentences **IGNORE** diagrams	**(3)**

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Question number	Answer	Additional guidance	Mark
8(b)	An explanation that includes the following points: • {protein / phosphate heads / phospholipid heads} are {soluble / hydrophilic / polar} and interact with {blood / plasma} (1) • {fatty acids / triglycerides /cholesterol} is {insoluble / non-polar / hydrophobic} (1) • therefore cholesterol is surrounded by {fatty acid tails / triglycerides} (1)		**(3)**

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<table>
<tr><th>Question number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>8(c)(i)</td><td>

• volume of sphere calculated / values substituted into the equation (1)

• volume of sphere rounded up to nearest whole number (1)

• ratio calculated (1)

</td><td>

Example of calculation

= 6912 if using π = 3
= 7142.4 if using π = 3.1
= 7234.56 if using π = 3.14
= 7239.168 if using π = 3.142
= 7241.472 if using π = 3.143
= 7238.22947387 if pressing π on calculator

= 6912 / 7142 / 7235 / 7239 / 7238 / 7241
ACCEPT 6910 / 7140 / 7240
NB Just these values given = 2 marks

14 : 1
13 : 1 if 6910 / 6912

CE apply throughout
NB mark answer in table if different from in the working eg

<table>
<tr><th>Diameter of LDL / nm</th><th>Volume of LDL / nm^3</th><th>Volume of cholesterol / nm^3</th><th>Ratio of LDL volume to cholesterol volume</th></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>7235

= 2 marks</td><td></td><td>14 : 1

= 1 mark</td></tr>
</table>

</td><td>(3)</td></tr>
</table>

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Question number	Answer	Additional guidance	Mark
***8(c)(ii)**	Indicative content: • as LDL increases, risk increases (K / G) • several factors beside LDLs can increase the risk of CVD (K) • example of a factor given e.g. high blood pressure (K) • LDLs can be different sizes (Q) • and therefore be absorbed by endothelial cells differently (Q) • and therefore get broken down at different rates (K / Q) • and therefore carry different volumes of cholesterol (Q) • level of HDL (in blood) affects risk (of CVD) (K / G) • example given from graph e.g. 0.65 a.u. has greater risk than 2.20 a.u. (G) • ratio of LDL : HDL affects risk (of developing CVD) (K / G) • the lower LDL : HDL the ratio the lower risk of CVD (K / G)		**(6)**
Own knowledge (K), information given in the graph (G), information in the question (Q) **Level 1 :** uses either (K), (G) **or** (Q) 1 mark = 1 comment, 2 marks = 2 comments **Level 2 :** uses two from (K), (G) **or** (Q) 3 marks = 3 comments, 4 marks = 4 comments **Level 3 :** uses (K), (G) **and** (Q) 5 marks = 5 comments, 6 marks = 6 comments			

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