

EDEXCEL

UNIT 1 MS

BIOLOGY

Marking Scheme

2019 - 2024

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TULIPDUST CREATION



Mark Scheme (Results)

January 2019

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

Question number	Answer	Mark
1(a)(i)	The only correct answer is B. <i>A is incorrect because it should be $C_n H_{2n} O_n$</i> <i>C is incorrect because it should be $C_n H_{2n} O_n$</i> <i>D is incorrect because it should be $C_n H_{2n} O_n$</i>	(1)

Question number	Answer	Additional guidance	Mark
1(a)(ii)	condensation (reaction)	IGNORE polymerisation	(1)

Question number	Answer	Mark
1(b)(i)	The only correct answer is C. <i>A is incorrect because amylose is a polysaccharide found in plants.</i> <i>B is incorrect because galactose is a monosaccharide.</i> <i>D is incorrect because sucrose is found in plants.</i>	(1)

Question number	Answer	Mark
1(b)(ii)	The only correct answer is C. <i>A is incorrect because amylopectin is a polysaccharide.</i> <i>B is incorrect because galactose is a monosaccharide.</i> <i>D is incorrect because sucrose contains fructose.</i>	(1)

Question number	Answer	Mark
1(b)(iii)	The only correct answer is C. <i>A is incorrect because amylose is found in plants.</i> <i>B is incorrect because fructose is a disaccharide found in plants.</i> <i>D is incorrect because sucrose is a disaccharide found in plants.</i>	(1)

Question number	Answer	Mark
1(b)(iv)	The only correct answer is B. <i>A is incorrect because amylose is not branched.</i> <i>C is incorrect because fructose is a monosaccharide.</i> <i>D is incorrect because maltose is a disaccharide.</i>	(1)

Question number	Answer	Mark
2(a)	The only correct answer is B. <i>A is incorrect because anticoagulants prevent blood clotting.</i> <i>C is incorrect because platelet inhibitors reduce blood clotting.</i> <i>D is incorrect because statins reduce cholesterol levels.</i>	(1)

Question number	Answer	Additional guidance	Mark
2(b)	An explanation that includes the following points: - because there is a link between (total) blood cholesterol levels and heart disease (1) - because {HDL is not thought to be a risk factor / LDL is associated with the development of heart disease / the {ratio / balance} of LDL : HDL determines the level of risk} (1)	ACCEPT CHD / CVD / atherosclerosis for heart disease throughout ACCEPT causes / leads / is a risk factor / correlation ACCEPT HDL reduces risk / HDL needed to get the LDL	(2)

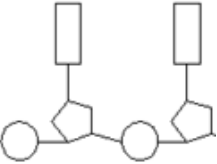
Question number	Answer	Additional guidance	Mark
2(c)	An explanation that includes the following points: • (10 year CHD risk) increases (1) • because smoking {increases blood pressure / increases heart rate / damages (endothelial) lining of arteries} (1) • damage to lining results in {atheroma / plaque} building up OR {high blood pressure / increase in heart rate} makes the heart work harder (1)	ACCEPT CVD / CHD / heart disease / atherosclerosis / throughout ACCEPT increases the chance of blood clotting / makes platelets sticky ACCEPT blood clots can block arteries	(3)

Question number	Answer	Additional guidance	Mark
2(d)(i)	• salt intake / fibre intake / alcohol intake / (body) mass / BMI / obesity / hip waist ratio / level of exercise / stress levels / family history / genetic factors / taking statins / diastolic blood pressure	IGNORE LDL / antihypertensives / blood pressure	(1)

Question	Answer	Additional guidance	Mark
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number			
2(d)(ii)	{salt / low fibre / alcohol / high BMI / obesity / little exercise / stress / family history / genetic factors / high diastolic blood pressure} increase the risk value OR {low salt / high fibre / low alcohol / suitable mass / exercise / low stress levels / taking statins / low diastolic blood pressure} decrease the risk value	ACCEPT if answer given in (i)	(1)

Question number	Answer	Additional guidance	Mark
2(d)(iii)	An explanation that includes two of the following points: - because there are other (risk) factors not included (1) - because people will underestimate {their mass / how much they smoke} (1) - because {total cholesterol / HDL / blood pressure} might be an estimate (1)	ACCEPT named factor but not those shown on the risk calculator ACCEPT {total cholesterol / HDL / blood pressure} are variable are not aware that they have diabetes	(2)

Question number	Answer	Additional guidance	Mark
3(a)	An answer that includes the following points: • two mononucleotides shown (joined in one strand only) (1) • each base bonded to C1 of pentose sugar (1) • phosphate group bonded to C3 of one sugar and C5 of the other sugar (1)	IGNORE labels including second strand if drawn / additional mononucleotides / one mononucleotide including second strand if drawn / additional mononucleotides <u>example of diagram</u> 	(3)

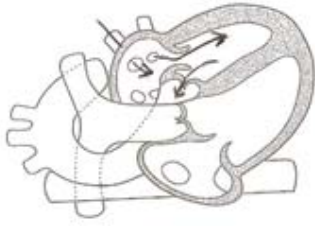
Question number	Answer	Additional guidance	Mark
3(b)(i)	• 0.38 (nm)	ACCEPT 0.4	(1)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	An explanation that includes the following points: • R (or Q) because it forms two hydrogen bonds (1) • R (or S) because it is {large / double-ring / purine} base (1)	ACCEPT not bases P and S because they form 3 hydrogen bonds ACCEPT not bases P and Q because they are {small / single-ring / pyrimidine} ACCEPT Q for correct reason or S for correct reason if neither mark points awarded	(2)

Question number	Answer	Additional guidance	Mark
3(c)	An answer that includes at least one similarity and one difference: similarities: • both contain {RNA (mono)nucleotides / ribose sugar / uracil (and adenine, cytosine and guanine) / phosphodiester bonds} (1) • both are single stranded (1) differences: • mRNA is a straight chain and tRNA is {folded / clover-leaf shaped} / mRNA does not have hydrogen bonds and tRNA does (1) • {size / length} of mRNA is variable and the {size / length} of tRNA is constant (1) • mRNA has codons and tRNA has {anticodons / amino acid binding sites} (1)	DO NOT PIECE TOGETHER ACCEPT letters for bases	(4)

Question number	Answer	Additional guidance	Mark
4(a)	An explanation that includes the following points: - because (X / coronary artery) carries {oxygen / oxygenated blood} to the heart {cells / muscle / tissue} (1) - for {(aerobic) respiration / metabolism} (in the heart) (1) - aorta is closest blood vessel carrying oxygenated blood (1)	IGNORE glucose / nutrients ACCEPT aorta supplies X blood with <u>high levels of oxygen</u>	(3)

Question number	Answer	Additional guidance	Mark
4(b)(i)	An explanation that includes the following points: - diastole / atrial systole / ventricular diastole (1) - because the {atrioventricular / AV / bicuspid / tricuspid} valves are open (1)	ACCEPT semi lunar valves are closed	(2)

Question number	Answer	Additional guidance	Mark
4(b)(ii)	An answer that includes the following points: • arrows shown on left-hand side of heart (only) (1) • arrows pointing in correct direction (1) • arrows shown entering atrium through pulmonary vein and leaving through the aorta (1)	<u>example of diagram</u> 	(3)

Question number	Answer	Additional guidance	Mark
4(c)	An explanation that includes the following points: • increase in diameter due to {high pressure / large volume / surge} of blood (leaving the left ventricle) (1) • therefore expansion of elastic fibres (1) • decrease in diameter due to recoil (of elastic fibres) (1)	ACCEPT to reduce pressure of blood	(3)

Question number	Answer	Additional guidance	Mark
5(a)(i)	A calculation in which: - substitute values correctly into the equation (1) - correct answer with units (1)	<u>Example of calculation</u> $V = \frac{4 \times \pi \times 50 \times 50 \times 50}{3}$ volume = 523 599 / 5.2 x10⁵ nm³ CE applies if 100 has been used in calculation instead of 50 ALLOW correct conversions with different units No working: e.g. 523 599 / 5.2 x10⁵ nm³ / 523 333 nm³ gains 2 marks e.g. 4 186 667 / 4.2 x10⁶ nm³ gains 1 mark	(2)

Question number	Answer	Additional guidance	Mark
5(a)(ii)	An explanation that includes the following points: - because {hydrophobic / non-polar} tails {move away from / repelled by} the {aqueous environment / water} (1) {hydrophilic / polar} heads {interact with / associate / dissolve in} the {aqueous environment / water} (1)	NB if no other marks awarded, allow 'hydrophilic heads face water and hydrophobic tails face away from water' for 1 mark	(2)

Question number	Answer	Mark
5(b)(i)	The only correct answer is B. <i>A is incorrect because the liposome has no protein and cannot generate ATP.</i> <i>C is incorrect because liposomes cannot take up molecules by endocytosis.</i> <i>D is incorrect because water only moves by osmosis.</i>	(1)

Question number	Answer	Additional guidance	Mark
5(b)(ii)	A description that includes the following points: • increase in temperature increases membrane permeability (1) • increase in cholesterol decreases membrane permeability (1) • cholesterol has a greater effect on membrane permeability at higher temperatures (1)	ACCEPT converse throughout	(3)

Question number	Answer	Additional guidance	Mark
5(b)(iii)	An explanation that includes the following points: • because an increase in temperature increases the movement of phospholipids (1) • because the cholesterol decreases fluidity (of the membrane) (1)	ACCEPT fills the gaps between the phospholipid tails / acts as a barrier / reduces movement of phospholipids	(2)

Question number	Answer	Additional guidance	Mark
6(a)(i)	9 : 1	ACCEPT 6 : 1 / 5 : 1	(1)

Question number	Answer	Additional guidance	Mark
6(a)(ii)	A description that includes the following points: - will not have any effect on the total membrane phospholipids (1) - the inner layer will have a relatively higher content of the other phospholipids / the outer layer will have a relatively lower content of the other phospholipids (1)	ACCEPT increase phospholipid content in outer layer and decrease content in inner layer	(2)

Question number	Answer	Additional guidance	Mark
6(a)(iii)	A description that includes the following points: - will alter membrane {properties / permeability / fluidity} (1) - so that platelets will release thromboplastin (1) - thromboplastin is {an enzyme / a catalyst} (1) - that converts prothrombin into thrombin (1)	NB thromboplastin catalyses prothrombin into thrombin = 2 marks	(4)

Question number	Answer	Additional guidance	Mark
6(b)	An explanation that includes the following points: • thrombin is an <u>enzyme</u> (1) • because the inhibitor will change the shape of the active site (of thrombin) (1) • therefore thrombin cannot bind to fibrinogen (1) • therefore {less / no} fibrinogen will be converted into fibrin (1) • therefore there is {less / no} {mesh / fibrin / fibres} to trap {blood cells / platelets} (1)	ACCEPT inhibitor blocks the active site / fewer active sites available ACCEPT {less / no} thrombin to bind to fibrinogen / fewer collisions / fewer enzyme substrate complexes formed ACCEPT slower conversion	(4)

Question number	Answer	Additional guidance	Mark
7(a)	An answer that includes two of the following points: • because it would be {unethical / wrong} to {kill / harm} the insects (1) • because the insects would contain {protein / amino acids} (1)		(2)

	it would give an {incorrect / higher} value (for the {protein / amino acid} content of the galls) (1)	
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Question number	Answer	Mark
7(b)(i)	The only correct answer is B. <i>A is incorrect because aspartate is the most polar molecule.</i> <i>C is incorrect because aspartate is the most polar molecule.</i> <i>D is incorrect because aspartate is the most polar molecule.</i>	(1)

Question number	Answer	Additional guidance	Mark
7(b)(ii)	A calculation in which: - solubility of leucine calculated (1) - solubility comparison with histidine calculated (1)	Example of calculation: 5.5g in 250 cm³ = 22.0 (g dm⁻³) 43.5 ÷ 22 = 1.98 / 2.0	(2)

Question number	Answer	Mark
*7(c)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material indicated as relevant. Additional content included in the response must be scientific and relevant. Indicative content • there is a high concentration of protein in the galls • because the saliva stimulates protein synthesis • so there is a store of protein for the insect • there is a high concentration of amino acids in the galls • because the amino acids are needed for protein synthesis	(6)

	• because the enzymes in the saliva were breaking proteins down • for use by the insects • {alanine / arginine / histidine} are very abundant in the galls • because these amino acids are abundant in the protein in the galls • none of the amino acids are abundant in the tissues of the leaf with galls • because they have moved into the gall • leucine and tryptophan are not abundant in the galls • as they have been used by the insects	
Level	Marks	
	0	No awardable content.
1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information and with a focus on mainly just one piece of scientific information. The explanation will contain basic information, with some attempt made to link knowledge and understanding to the given context.
2	3-4	An explanation will be given, with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure.
3	5-6	An explanation is made that is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows a well-developed and sustained line of scientific reasoning, which is clear and logically

		structured.	
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Question number	Answer	Additional guidance	Mark
8(a)	A calculation in which: • actual height of elephant • how many times taller the elephant is than the mouse	Example of calculation: $4.5 \div 0.02 = 225 / 230 / 235 \text{ (cm)}$ $75 / 76.67 / 76.7 / 77 / 78 / 78.3 / 78.33$ IGNORE units	(2)

Question number	Answer	Additional guidance	Mark
8(b)	A description that includes the following points: • attachment of lungs to {chest cavity / diaphragm} {increases volume / decreases pressure} (1) Any two from: • <u>alveoli</u> provide a large surface area for faster diffusion (1)	ACCEPT to {take in / hold} large volume of air ACCEPT thin walls	(3)

	• <u>alveoli</u> formed from {one cell layer / flattened / squamous} epithelial cells for small diffusion distance (1) • concentration gradient maintained by {ventilation / blood flow / good blood supply} (1)	ACCEPT large network of capillaries	
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Question number	Answer	Mark
*8(c)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material indicated as relevant. Additional content included in the response must be scientific and relevant.	(6)

	Indicative content • oxygen dissociation curve for the mouse is shifted to the right • mouse haemoglobin has a lower affinity for oxygen than the elephant haemoglobin • therefore haemoglobin can supply oxygen to the tissues at lower pp of oxygen • because the rate of respiration in the mouse is higher • a mouse has a higher mass-specific metabolic rate than the elephant • because the mouse loses more body heat • because it has a larger surface area to volume ratio • because the mouse is more active • because it has to escape predators • the rate of respiration of the mouse is going to be greater than the elephant • therefore pp of oxygen in mouse tissues will be lower • therefore haemoglobin needs to be releasing oxygen • when blood cannot supply oxygen at a fast enough rate	
Level	Marks	
	0	No awardable content.

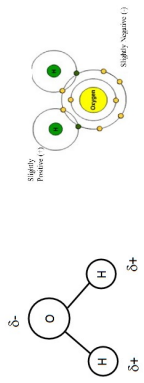
1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information and with a focus on mainly just one piece of scientific information. The explanation will contain basic information, with some attempt made to link knowledge and understanding to the given context.
2	3-4	An explanation will be given, with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure.
3	5-6	An explanation is made that is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows a well-developed and sustained line of scientific reasoning, which is clear and logically structured.



Mark Scheme (Results)

Summer 2019

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

Question number	Answer	Additional guidance	Mark
1(a)	A diagram that includes the following: 2 hydrogens joined to an oxygen (by covalent bonds) (1) - the charge distribution (1)	 e.g. lines, overlapping circles, shared electrons	(2)

Question number	Answer	Additional guidance	Mark
1(b)(i)	A description that includes the following points: - for F increase in temperature increases solubility (1) - for G increase in temperature increases up to 30°C and then decreases the solubility (1) - for H temperature has no effect (on solubility) (1)	ACCEPT 'lt' for solubility throughout ACCEPT positive correlation Do not piece together ACCEPT solubility {remains constant / does not change} with an increase in temperature	(3)

Question number	Answer	Mark
1(b)(ii)	The only correct answer is B 1.67 <i>A is incorrect because $50 \div 30 = 1.67$</i> <i>C is incorrect because $50 \div 30 = 1.67$</i> <i>D is incorrect because $50 \div 30 = 1.67$</i>	(1)

Question number	Answer	Mark
2(a)(i)	The only correct answer is B 1 : 3 <i>A is incorrect because triglycerides are composed of one glycerol molecule and three fatty acids</i> <i>C is incorrect because triglycerides are composed of one glycerol molecule and three fatty acids</i> <i>D is incorrect because triglycerides are composed of one glycerol molecule and three fatty acids</i>	(1)

Question number	Answer	Mark
2(a)(ii)	$\begin{array}{c} \text{O} \\ \parallel \\ -\text{C}-\text{O}-\text{C}- \\ \quad \end{array}$ The only correct answer is C. <i>A is incorrect because this shows a peptide bond</i> <i>B is incorrect because an ester bond does not contain a nitrogen</i> <i>D is incorrect because there should be a double O on the carbon</i>	(1)

Question number	Answer	Additional guidance	Mark
2(a)(iii)	An explanation that includes the following points: • palmitoleic and linoleic (acid) (1) • because they {are unsaturated fatty acids / have double bonds (between carbon atoms)} (1) OR • linoleic (acid) (1) • because it has {two / the most} double bonds (between carbon atoms) (1)	ACCEPT converse in the context of butyric acid and stearic acid having the lowest risk IGNORE chain length ACCEPT polyunsaturated IGNORE chain length	(2)

Question number	Answer	Additional guidance	Mark
2(b)(i)	An explanation that includes the following points: • because thrombin would not be able to bind to fibrinogen (1) • therefore fibrin is not formed (1)	ACCEPT fits active site / thrombin – fibrinogen complexes ACCEPT less fibrin formed	(2)

Question number	Answer	Additional guidance	Mark
2(b)(ii)	An explanation that includes the following points: • because the platelets would not be able to bind to fibrin (1) • therefore the {mesh / clot} would not be formed (1) OR • and therefore do not release thromboplastin (if not binding to each other / endothelium) (1)	ACCEPT not able to bind to {blood cells / other platelets / endothelium} less sticky	(2)

Question number	Answer	Additional guidance	Mark
2(b)(iii)	An explanation that includes the following points: • therefore plasmin {hydrolyses} fibrin / breaks the peptide bonds in fibrin} (1) • because {without fibrin / with less fibrin} there is {nothing / less} to trap the {platelets / blood cells} (1)	ACCEPT {no / less} mesh formed	(2)

Question number	Answer	Additional guidance	Mark					
3(a)(i)	<table><tr><td>tryptophan</td><td>serine</td><td>serine</td><td>lysine</td><td>tryptophan</td></tr></table>	tryptophan	serine	serine	lysine	tryptophan	ACCEPT trp for tryptophan ser for serine lys for lysine	(1)
tryptophan	serine	serine	lysine	tryptophan				

Question number	Answer	Additional guidance	Mark
3(a)(ii)	An explanation that includes the following points: - because {three bases form one code (for one amino acid) / there are 5 codons} (1) - because {there is no stop codon in this sequence / it is a non-overlapping (genetic) code} (1)	ACCEPT triplet {codon / code} IGNORE three bases make an amino acid DO NOT ACCEPT degenerate	(2)

Question number	Answer	Additional guidance	Mark
3(b)	An explanation that includes three of the following points: • because it is a degenerate code (1) • which means that there are more codes than {needed / number of amino acids} (1) • (arranging the four bases in triplets gives) 64 possible combinations and there are 20 amino acids to code for (and stop codons) (1) • minimises the effect of mutations (1)	DO NOT ACCEPT non-overlapping ALLOW from a description	(3)

Question number	Answer	Additional guidance	Mark
3(c)(i)	• 95.31 (1)		(1)

Question number	Answer	Additional guidance	Mark
3(c)(ii)	An explanation that includes the following points: • (remaining codes are) stop {codons / codes} (on RNA / DNA) (1) • therefore no more amino acids can be added to the {polypeptide chain / protein} (1)	DO NOT ACCEPT start codons ACCEPT ends translation / signals end of (m)RNA	(2)

Question number	Answer	Mark		
3(d)	The only correct answer is B. <table><tr><td>ACC</td><td>UGG</td></tr></table> A is incorrect because T binds to A and C to G on mRNA and U binds to T and G binds to C on tRNA C is incorrect because T binds to A and C to G on mRNA and U binds to T and G binds to C on tRNA D is incorrect because T binds to A and C to G on mRNA and U binds to T and G binds to C on tRNA	ACC	UGG	(1)
ACC	UGG			

Question number	Answer	Additional guidance	Mark
4(a)(i)	An answer that includes the following points: • an increase in the number of (DNA) {molecules / double helices} (1) • each (new molecule) consists of one {parent / original / old} strand and one new strand (1)	ACCEPT {two / new} molecules are made (from one molecule)	(2)

Question number	Answer	Additional guidance	Mark
4(a)(ii)	(DNA) helicase / polymerase / ligase (1)	ACCEPT swivelase / untwistase / topoisomerase	(1)

Question number	Answer	Additional guidance	Mark
4(a)(iii)	An explanation that includes the following points: • because it results in genetically identical (daughter) cells (1)	ACCEPT same {genetic information /	

	that will have the same {structure / function} (as the parent cell) (1)	genotype / alleles / DNA sequence}	(2)
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Question number	Answer	Additional guidance	Mark																			
4(b)	<table border="1"> <thead> <tr> <th rowspan="2">Stage</th><th colspan="3">Percentage of the DNA molecules containing</th></tr> <tr> <th>heavy nitrogen only</th><th>light nitrogen only</th><th>both heavy and light nitrogen</th></tr> </thead> <tbody> <tr> <td>1</td><td>100</td><td>0</td><td>0</td></tr> <tr> <td>2</td><td>0</td><td>0</td><td>100</td></tr> <tr> <td>3</td><td>0</td><td>50</td><td>50</td></tr> </tbody> </table>	Stage	Percentage of the DNA molecules containing			heavy nitrogen only	light nitrogen only	both heavy and light nitrogen	1	100	0	0	2	0	0	100	3	0	50	50	N.B. mark the rows not the columns DO NOT ACCEPT empty boxes	(3)
Stage	Percentage of the DNA molecules containing																					
	heavy nitrogen only	light nitrogen only	both heavy and light nitrogen																			
1	100	0	0																			
2	0	0	100																			
3	0	50	50																			

Question number	Answer	Mark		
5(a)(i)	The only correct answer is C. <table><tr><td>fructose and glucose</td><td>sucrose only</td></tr></table> A is incorrect because glucose is also a monosaccharide not a disaccharide B is incorrect because fructose is also a monosaccharide and not a disaccharide D is incorrect because sucrose is not a monosaccharide and fructose is not a disaccharide	fructose and glucose	sucrose only	(1)
fructose and glucose	sucrose only			

Question number	Answer	Mark
5(a)(ii)	The only correct answer is B glycosidic	

	A is incorrect because ester bonds join organic acids and alcohols together C is incorrect because peptide bonds join amino acids together D is incorrect because phosphodiester bonds joins mononucleotides together	(1)
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Question number	Answer	Additional guidance	Mark
5(b)(i)	A calculation showing the following steps: - the mean calculated (1) - the mean converted to g dm⁻³ (1)	Example of calculation : $(1.22 + 1.02 + 1.00) \div 3 = 1.08$ $0.00108 / 0.0011 = 1.08 \times 10^{-3}$ Correct answer with no working shown gains both marks.	(1)

Question number	Answer
*5(b) (ii)	Indicative content: • sugar solution with a lower water potential than the cytoplasm of the cell (D) • sugar solution should be hypertonic (D) • so that water will pass out of the cytoplasm by osmosis (E) • concentration of sugar solution should be the same as the cytoplasm (D) • so that sugars will not diffuse out (E) • each individual sugar concentration should be the same as the cytoplasm (D) • mean concentration of sugars stated (fructose = 1.52, glucose = 1.08, sucrose = 8.55) (D) • range of sugar concentrations stated (from table) (D)

	• so that concentration of each sugar remains the same (E) • another solute needs to be used (D) • so that the sugar concentration remains the same but the water passes out (E) Level 1 : description of conditions needed for osmosis and maintaining sugar concentration 1 mark = a description of one condition 2 marks = a description of each condition or an explanation of one condition Level 2 : explanation of conditions needed for both osmosis and maintaining sugar concentration 3 marks = a description of one condition and an explanation of the other condition 4 marks = an explanation of each condition Level 3 : indicates that concentration of each sugar needs to be the same as in the pineapple and another solute needs to be included. 5 marks = and includes one of the above 6 marks = and includes both of the above
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Question number	Answer	Additional guidance	Mark
6(a)	An explanation that includes the following points: • because antioxidants reduce free radicals (1) • free radicals cause {cell damage / oxidative stress} (1) • (antioxidants) reduce {plaque / atheroma} formation (1)	ACCEPT neutralise / stabilise / donate electrons ACCEPT antioxidants {prevent cell damage / reduce oxidative stress} ACCEPT reduces cholesterol build up	(3)

Question number	Answer	Additional guidance	Mark
6(b)(i)	An explanation that includes the following points: • dark chocolate contains more flavenoids (than milk chocolate per 100g) (1) • and therefore more antioxidants to reduce the risk of CVD (1) • dark chocolate contains less energy (per unit mass) than milk chocolate (1) • so is less likely to cause obesity which {is a risk factor / decreases the risk} of CVD (1)	ACCEPT matching converse points ACCEPT description of what antioxidants do IGNORE incorrect descriptions ACCEPT calories ACCEPT overweight	(4)

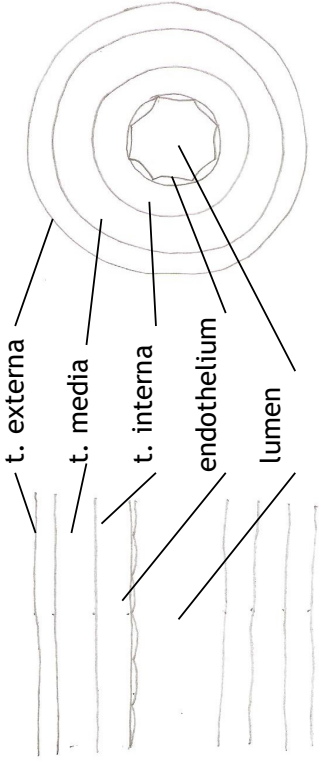
Question number	Answer	Mark
6(b)(ii)	The only correct answer is A cocoa mass B is incorrect because both types of chocolate contain similar % of milk fat C is incorrect because both types of chocolate contain similar % of sugar D is incorrect because milk chocolate contains more whole milk powder than dark chocolate	(1)

Question number	Answer	Additional guidance	Mark
6(b)(iii)	An answer that includes three of the following points: - two groups of people one eating chocolate and one {control / not eating chocolate} (1) - who {have no (known) risk of / do not have} CVD (1) - credit description of control variable - incidence of heart disease recorded (over a period of time, at least a year) (1)	ACCEPT 3 groups if one has no chocolate, one has milk chocolate and one has dark chocolate ACCEPT healthy e.g. same sex, similar {size / age / lifestyle} ACCEPT same mass of chocolate if comparing dark with milk chocolate IGNORE amount ACCEPT monitor risk factors / examples e.g. blood pressure,	

		cholesterol levels, BMI	(3)
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Question number	Answer	Additional guidance	Mark
7(a)	answer to no more than one decimal place in the range of 1.3 to 2.4 (m)		(1)

Question number	Answer	Additional guidance	Mark
7(b)	An explanation that includes two of the following points: • because blood has to be pumped under high pressure (from the heart) (1) • so that the blood can reach the { brain / head} (1) • pump blood against (the force of) gravity (to the upper parts of the body) (1)		(2)

Question number	Answer	Additional guidance	Mark
7(c)(i)	A drawing that shows : {3 layers / 3 layers and endothelium} + lumen (1) Any two from: - lumen (1) - endothelium / epithelium (1) - tunica {interna / intima} (1) - tunica media (1) - tunica {externa / adventitia} (1)	 ACCEPT inside line labelled if 2 layer diagram with no endothelium labelled IGNORE smooth muscle ACCEPT (smooth) muscle (cells) and elastic fibres ACCEPT collagen fibres N.B. If one incorrect label, max of 1 label mark If two incorrect labels then no label marks can be awarded	(3)

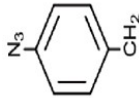
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Question number	Answer	Additional guidance	Mark
7(c)(ii)	An explanation that includes the following points: - the blood is under high pressure so that the {arteries need to widen / elastic fibres need to stretch} (1) - elastic recoil necessary to maintain the high blood pressure (1)	N.B. need to stretch and recoil to {maintain / accommodate} high pressure = 1 mark if no other mps awarded	(2)

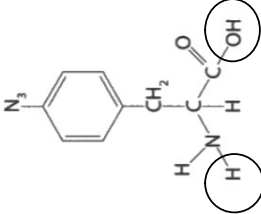
Question number	Answer	Additional guidance	Mark
7(d)(i)	An explanation that includes the following points: - because there will be less blood flowing (near the surface of the skin at any one time) (1) - therefore blood clot will form {more easily / faster} (1)	ACCEPT blood at {lower / low} pressure ACCEPT clotting will be {faster / easier} less blood lost whilst clot forming	(2)

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Question number	Answer	Additional guidance	Mark
7(d)(ii)	An explanation that includes the following points: - because (the smaller red blood cells will have) a greater surface area (1) - and therefore oxygen will be able to diffuse (into / out of the RBCs) faster (1)	IGNORE easier to diffuse / more can diffuse	(2)

Question number	Answer	Mark
8(a)	The only correct answer is B.  A is incorrect because the R group does not include the central carbon C is incorrect because the R group should have a CH₂ group D is incorrect because the H and central carbon and only part of the R group shown	(1)

Question number	Answer	Additional guidance	Mark
8(b)(i)	peptide / amide (bond)	DO NOT ACCEPT dipeptide / polypeptide (bond)	(1)

Question number	Answer	Additional guidance	Mark
8(b)(ii)	A drawing that shows : - a circle around one H on the N (1) - a circle around only the OH group on the C (1)		(2)

Question number	Answer	Additional guidance	Mark
8(b)(iii)	An explanation that includes three of the following points : • because AzPhe is not a naturally-occurring amino acid (1) • therefore there is no {DNA / mRNA} codon for AzPhe (1) • therefore there is no tRNA (that can bind to the AzPhe) (1) • therefore AzPhe not held in position for peptide bond to form (1)		(3)

Question number	Answer	Additional guidance	Mark
8(c)(i)	A calculation showing the following steps: • the percentage of AzPhe are calculated (1) • ratio calculated (1)	Example of calculation : 16% of 1% of 1 100 = 1.76 5.25 : 1 / 21 : 4 ACCEPT 1 : 0.19 Correct answer with no working shown gains both marks.	(2)

Question number	Answer	Additional guidance	Mark
8(c)(ii)	An answer that includes four of the following points: • properties of a protein is dependent on the structure of a protein (1) • AzPhe could affect the {secondary structure / folding / 3D shape} (of the silk) (1) • because different bonds (between R groups) could form (1) • new bonds might make the {silk / fibres / molecule / protein} stronger (1) • larger R groups will make the protein insoluble (1) OR • larger R groups will make the {silk / fibres / molecule / protein} weaker (1) • because {fibres / molecule / protein} not held so closely together (1)	ACCEPT tertiary structure IGNORE quaternary structure ACCEPT named example of bond changing	(4)



Mark Scheme (Result)

October 2019

Pearson Edexcel International Advanced
Level

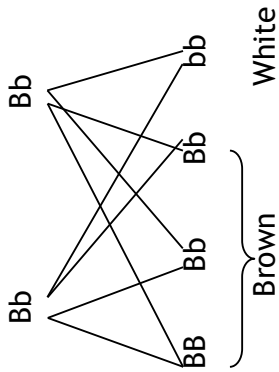
In Biology (WBI11) Paper 01

Molecules, Diet, Transport and Health

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
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1(b)	C 57.1×10^6 The only correct answer is C. A is incorrect because $(17.7 \text{ million} \div 31) \times 100 = 57.1 \times 10^6$ B is incorrect because $(17.7 \text{ million} \div 31) \times 100 = 57.1 \times 10^6$ D is incorrect because $(17.7 \text{ million} \div 31) \times 100 = 57.1 \times 10^6$	(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)	<table border="1"> <thead> <tr> <th data-bbox="212 1574 276 1832">Name</th><th data-bbox="212 981 276 1574">Role</th><th data-bbox="212 701 276 981">Property</th></tr> </thead> <tbody> <tr> <td data-bbox="276 1574 467 1832">thromboplastin</td><td data-bbox="276 981 467 1574">(catalyses the) conversion of prothrombin into thrombin (1)</td><td data-bbox="276 701 467 981">soluble</td></tr> <tr> <td data-bbox="467 1574 683 1832">thrombin (1)</td><td data-bbox="467 981 683 1574">catalyses the conversion of fibrinogen into fibrin</td><td data-bbox="467 701 683 981">soluble (1)</td></tr> <tr> <td data-bbox="683 1574 986 1832">fibrin</td><td data-bbox="683 981 986 1574"> 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) </td><td data-bbox="683 701 986 981">insoluble (1)</td></tr> </tbody> </table>	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 insoluble ACCEPT two points made in one sentence DO NOT ACCEPT completely wrong statements (6)
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)												

Question number	Answer	Additional guidance	Mark
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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)
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Question number	Answer	Mark		
4(a)(i)	B <table><tr><td>2</td><td>3</td></tr></table> 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	2	3	(1)
2	3			

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)

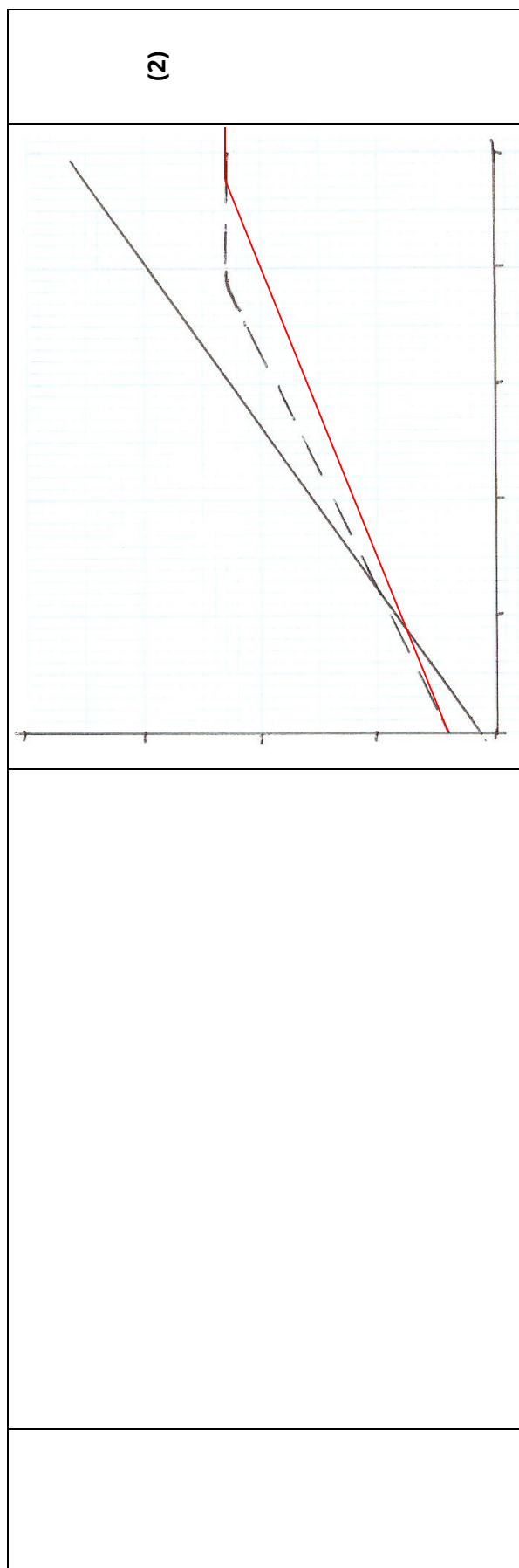
Question number	Answer	Additional guidance	Mark
4(b)	An answer that includes the following points: similarities: • both (polymers) composed of α glucose (1) • both contain 1 - 4 glycosidic {bonds / links} (1) differences: • amylose has {1 - 4 glycosidic bonds (only) / no 1 - 6 glycosidic bonds} and amylopectin 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)

Question number	Answer	Cell transport mechanism				Mark
5(a)		active transport only	facilitated diffusion only	both active transport and facilitated diffusion	not true for either active transport or facilitated diffusion	(3)
	passive process		X			
	membrane proteins involved			X		
	direction of transport can be up the concentration gradient	X				

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	
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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)		



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

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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)

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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 NH₂ 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	
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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
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*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
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	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
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6 marks : three descriptions and three explanations

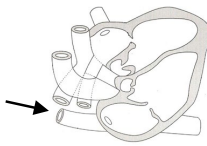


Mark Scheme (Results)

January 2020

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

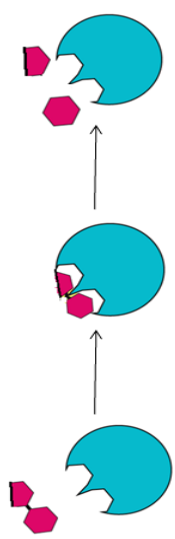
Question number	Answer	Additional guidance	Mark
1	A description that includes the following points: DNA only • deoxyribose • thymine DNA and mRNA accept two from • phosphate (group) • cytosine • guanine • adenine mRNA only • ribose • uracil	Items should not be written in “both” space as well as “mRNA” or “DNA” space Names of bases should be written in full (not just letter abbreviations) and broadly correct IGNORE nitrogenous base, pentose sugar, purine, pyrimidine	(6)

Question number	Answer	Mark
2(a)	A  The only correct answer is A. B is incorrect because the arrow is pointing down the pulmonary vein C is incorrect because the flow of blood is in the wrong direction D is incorrect because the flow of blood is out through the pulmonary artery	(1)

Question number	Answer	Mark		
2(b)	A <table><tr><td>deoxygenated blood flowing away from the heart</td><td>oxygenated blood flowing towards the heart</td></tr></table> The only correct answer is A. B is incorrect because the pulmonary artery carries blood away from the heart and the pulmonary vein carries blood towards the heart C is incorrect because the pulmonary artery carries deoxygenated blood and the pulmonary vein carries oxygenated blood D is incorrect because the pulmonary artery carries deoxygenated blood and the pulmonary vein carries oxygenated blood	deoxygenated blood flowing away from the heart	oxygenated blood flowing towards the heart	(1)
deoxygenated blood flowing away from the heart	oxygenated blood flowing towards the heart			

Question number	Answer					Mark
2(c)	Stage of the cardiac cycle	AV valves open and SL valves open	AV valves open and SL valves closed	AV valves closed and SL valves open	AV valves closed and SL valves closed	(3)
	atrial systole		X			
	ventricular systole			X		
	diastole		X			

Question number	Answer	Additional guidance	Mark
2(d)	A description that includes the following points: • <u>cardiac cycle</u> is {shorter / faster / completed more frequently} • <u>ventricles</u> contract more forcefully (during ventricular systole)	Answers must be comparative ACCEPT cardiac cycles happens more often ACCEPT {diastole is getting shorter / gets through diastole quicker} ACCEPT cardiac cycle occurs at a higher rate IGNORE {heart rate increases / heart pumps blood faster / heart pumps more strongly / reference to number of heart beats} IGNORE Systole {faster / shorter} ACCEPT ventricles pump blood at higher pressure	(2)

Question number	Answer	Mark
3(a)(i)	B  The only correct answer is B. A is incorrect because it shows the substrate unchanged C is incorrect because it shows lactose being made not broken down D is incorrect because the two substrates have not been bonded together	(1)

Question number	Answer	Mark
3(a)(ii)	B galactose and glucose The only correct answer is B. A is incorrect because sucrose is not a monosaccharide C is incorrect because glucose and fructose are the monomers of sucrose D is incorrect because sucrose is not a monosaccharide	(1)

Question number	Answer	Mark
3(b)	C reaction without enzyme Q The only correct answer is C. A is incorrect because line P shows the reaction without enzyme B is incorrect because line P shows the reaction without enzyme D is incorrect because R is the activation energy with the enzyme not the decrease	(1)

Question number	Answer	Additional guidance	Mark
3(c)(i)	An explanation that includes the following points: • as the concentration (of substrate) increases there are more (substrate) molecules / particles (1) • (therefore) a greater chance of {collisions with active site / enzyme substrate complexes forming} increasing the rate of reaction (1) • {rate/graph} levels off when {all active sites are filled (at any one time) / enzyme is saturated} (1)	ACCEPT converse for mp1 and 2 Piece together ACCEPT substrate concentration is limiting factor in the first part of the graph ACCEPT {greater frequency of collisions / collisions more likely to occur} etc ACCEPT enzyme for active site / "successful collisions" for collisions with active site} IGNORE {more collisions / more enzyme-substrate complexes forming} ACCEPT {rate / graph} levels off {when enzyme becomes rate limiting / as enzyme is limiting factor} IGNORE idea of substrate being used up as reaction proceeds	(2)

Question number	Answer	Additional guidance	Mark
3(c)(ii)	An answer that includes the following points: • correct values for $V_{\max}$ and K read from the graph (1) • correct answer for values substituted into the formula (1)	$V_{\max} = 50$ $K = 1.9$ $V = \frac{50 \times 4}{1.9 + 4} = 33.898 / 34$ (ignore units) ACCEPT 33.9 IGNORE 33.90 / 33.89 Correct answer gets 2 marks ecf for mp2 if wrong values read from graph	(2)

Question number	Answer	Additional guidance	Mark
4(a)(i)	An answer that includes the following points: Similarities: - the solubility of both sodium chloride and glucose increase with (increasing) temperature (1) Differences: - sodium chloride solubility increases linearly with (increasing) temperature but glucose {does not increase linearly / increases exponentially} (1) (increasing) temperature has a greater effect on solubility of glucose than sodium chloride (1)	Piece within same / adjacent sentences, but not outside this Statement “temperature has no effect on solubility of sodium chloride” followed by “solubility of NaCl increases slightly” negates mp1 IGNORE references to dissolving faster with increasing temperature IGNORE attempts to describe glucose solubility unless compared to {linear / constant} increase for sodium chloride ACCEPT converse ACCEPT solubility of glucose increases more than solubility of sodium chloride ACCEPT manipulation if a direct comparison is made	(3)

Question number	Answer	Additional guidance	Mark
4(a)(ii)	An answer that includes the following points: • six carbons, twelve hydrogens and six oxygens used in calculation (1) • molecular mass calculated (1)	ACCEPT formula written down $(6 \times 12) + (12 \times 1) + (6 \times 16) = 180$ Correct answer gets 2 marks CE if wrong formula for glucose used (as long as formula is written)	(2)

Question number	Answer	Additional guidance	Mark
4(a)(iii)	• correct answer (1)	CE from 4(a)(ii) applies $180 \div 58.44 = 3.08$ ACCEPT 3 / 3.1	(1)

Question number	Answer	Additional guidance	Mark
4(a)(iv)	An answer that includes the following points: • (glucose is a larger molecule than sodium chloride therefore) glucose can be surrounded by more water molecules (1) • glucose has {(many) hydroxyl groups / (more) polar groups} (1) • (therefore) glucose forms (more) hydrogen bonds with water molecules (1) • strength of bonding (between particles) is lower in glucose compared to sodium chloride (1)	ACCEPT converse for all marking points IGNORE glucose is {more polar / a polar molecule} ACCEPT increase in entropy is greater when glucose dissolves (for either mp1 or mp2)	(2)

Question number	Answer	Additional guidance	Mark
4(b)	An explanation that includes the following points: • water is a polar solvent (1) • fatty acids have {hydrophobic / non-polar} tails (1) • {fatty acids / non-polar molecules} {do not form hydrogen bonds / do not dissolve in polar liquids / repel polar liquids} (1)	ACCEPT water is dipolar ACCEPT fatty acids are {hydrophobic / non-polar} ACCEPT fatty acids {stick together / aggregate / form micelles} ACCEPT {water/blood/ plasma} for polar liquids only in context of repulsion IGNORE fatty acids are too big to dissolve	(2)

Question number	Answer	Additional guidance	Mark																		
5(a)(i)	An explanation that includes the following points: • pond water has a higher water potential than {cytoplasm / Paramecium} (1) • (therefore water moves by) osmosis (1)	ACCEPT converse for all points ACCEPT symbol for water potential (Ψ) ACCEPT inside of cell for {cytoplasm / Paramecium} and outside of cell for pond water <table><tr><th colspan="3">Acceptable alternative terms</th></tr><tr><td></td><td>Cytoplasm / inside cell</td><td>Pond water / outside cell</td></tr><tr><td>Water potential</td><td>lower</td><td>higher</td></tr><tr><td></td><td>hypertonic</td><td>hypotonic</td></tr><tr><td>Solute potential / osmotic potential</td><td>lower</td><td>higher</td></tr><tr><td>Conc of solute molecules</td><td>higher</td><td>lower</td></tr></table> All statements must be comparative eg hypertonic to / higher than... ACCEPT water moves {from an area of high to low water potential / down a water potential gradient / from low to high solute concentration}	Acceptable alternative terms				Cytoplasm / inside cell	Pond water / outside cell	Water potential	lower	higher		hypertonic	hypotonic	Solute potential / osmotic potential	lower	higher	Conc of solute molecules	higher	lower	(2)
Acceptable alternative terms																					
	Cytoplasm / inside cell	Pond water / outside cell																			
Water potential	lower	higher																			
	hypertonic	hypotonic																			
Solute potential / osmotic potential	lower	higher																			
Conc of solute molecules	higher	lower																			

Question number	Answer	Additional guidance	Mark
5(a)(ii)	An explanation that includes the following points: • paramecium does not have a cell wall (1) • (therefore) cannot stop the entry of water (1) • (therefore if the water is not pumped out) {the cell will swell / pressure will increase} (1) • cell will burst (1)	ACCEPT cell for paramecium in all marking points ACCEPT paramecium is surrounded by (only) a cell membrane ACCEPT Cell will (continue to) fill with water ACCEPT cell membrane breaks	(3)

Question number	Answer	Additional guidance	Mark
*5(b)	Indicative content: O marking point (credit once for correct reference, anywhere) reference to {osmosis / concentration gradient / concentration gradient of water molecules / area of high and low water potential} Pond water - E contractile vacuole pumping out water to prevent cell from swelling - C acting as a control to compare to solutions A and B Solution A - D contractile vacuole is not pumping so frequently (than in pond water) / less water is pumped out - E (therefore) less water entering the cell - C because the water potential of solution A is lower than that of the pond water - C water potential of {solution A / outside the cell} is higher than that of {the cytoplasm / inside the cell} so water is still entering - D refers to delay at start	IGNORE reference to isotonic ACCEPT correct statement including: hypertonic / hypotonic; solute potential; solute concentration; concentration of water; ACCEPT converse in all cases IGNORE reference to isotonic	(6)

	Solution B • D contractile vacuole is pumping more often (than in pond water) • E (therefore) more water entering the cell • C because the water potential of solution B is greater than that of the pond water • C water potential of Solution B is (much) higher than the cytoplasm so water is still entering the cell • C water potential of solution B > solution A • D refers to delay at start • E delay in increase is due to time to produce sufficient energy	ACCEPT correct statement including: hypertonic / hypotonic; solute potential; solute concentration; concentration of water; ACCEPT converse in all cases IGNORE reference to isotonic	
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Level	Mark	
	0	No awardable content
1	1-2	Level 1: correct description of graphs with some reference to idea of osmosis 1 mark: one D or one O marking point 2 marks: second D marking point
2	3-4	Level 2: correct comparison of Solutions A and B with pond water or cytoplasm 3 marks: one C marking point 4 marks: second C marking point
3	5-6	Level 3: correct explanation of graphs 5 marks: one E marking point 6 marks: second E marking point

Question number	Answer	Additional guidance	Mark
6(a)	An answer that includes the following points: • high salt intake increases the {hazard ratio / risk of death} for all causes of death (1) • high salt intake increases the {hazard ratio / risk of death} the most for CAD (1)	Allow piecing together for mp1 Allow CHD for CAD throughout Both marking points must be about increased {risk of death / hazard ratio} not increased risk of getting disease ACCEPT a description for all causes of death eg CAD, CVD and all other causes ACCEPT from a comparative calculation. ACCEPT high salt intake has the {hazard ratio / <u>risk of death</u>} for CAD	(2)

Question number	Answer	Additional guidance	Mark
6(b)(i)	An explanation that includes the following points: • age and smoking both increase the {risk of death / hazard ratio} (1) • credit an explained example (1) • the study would not be {valid / reproducible / repeatable} if either or both of these factors were not controlled (1)	Piece together for mp1 This can be for either factor e.g. smoking increases blood pressure, with increasing age arteries lose elasticity IGNORE references to reliability	(3)

Question number	Answer	Additional guidance	Mark
6(b)(ii)	An answer that includes two of the following points: • gender / sex (1) • blood pressure (1) • blood cholesterol levels (1) • level of exercise / activity (1)	ACCEPT; Obesity / BMI Level of {fat / cholesterol / sugar} in diet Type 2 diabetes Stress levels Ratio of LDL to HDL Genetic factors Level of alcohol consumption IGNORE : diet / unhealthy diet (unqualified) / lifestyle / exercise (unqualified) / level of salt in diet	(2)

Question number	Answer	Additional guidance	Mark
6(c)	An answer that includes the following points: - needed a means of comparison (1) - the (increased) risk of death due to high salt intake is compared to the risk of death (from a low salt intake) (1)	Accept reference point / baseline IGNORE control If they get MP 2 will also get MP 1 Risk of death is eq. to hazard ratio	(2)

Question number	Answer	Additional guidance	Mark
6(d)(i)	A measure of the (linear) relationship between 2 (quantitative) {variables / factors} (1)	ACCEPT a change in one variable is reflected by a change in another variable ACCEPT link between two variables ACCEPT a technique to show {if / how strongly} pairs of variables are related ACCEPT positive / negative correlation described eg as one variable increases another increases, or an example of this DO NOT ACCEPT {causes / is caused by / leads to}	(1)

Question number	Answer	Additional guidance	Mark
6(d)(ii)	An answer that includes the following points: • {difficult / impossible} to control all the {variables / risk factors} (1) • unreliable estimate of risk factors e.g. number of cigarettes smoked (1)	ACCEPT too many {factors / variables} to control IGNORE examples of variables ACCEPT no clear definition of {low / high} salt intake ACCEPT people may lie about data / self-reporting not reliable IGNORE reference to low sample size	(2)

Question number	Answer	Additional guidance	Mark
7(a)(i)	pressure exerted by one (type of) gas in a mixture of gases (1)	ACCEPT pressure exerted by oxygen in a mixture of gases/air ACCEPT is a measure of concentration of a gas / concentration of oxygen (ignore location) IGNORE amount of oxygen / amount of gas / % of gas / proportion of gas	(1)

Question number	Answer	Additional guidance	Mark
7(a)(ii)	An explanation that includes three of the following points: • haemoglobin is composed of four sub-units (1) • binding of the first oxygen molecule is difficult (1) • binding of the other molecules becomes easier (1) • due to a conformational change (1) • as Hb becomes saturated less oxygen can bind (so the curve flattens out) (1)	ACCEPT context of release of oxygen from Hb for mp 2, 3 and 4 ACCEPT 4 haem groups / 4 polypeptide chains / 4 iron ions IGNORE slow binding ACCEPT cooperative binding ACCEPT increased affinity for other molecules IGNORE faster binding ACCEPT due to a change in the {3D / tertiary} structure IGNORE change of shape	(3)

Question number	Answer	Additional guidance	Mark
7(b)(i)	An explanation that includes one of the following points: • {water vapour / carbon dioxide} is added to the air (1) • oxygen {used by cells / used in respiration} (1) • oxygen moves into {capillaries / blood} (1)	ACCEPT idea of carbon dioxide diffusing into the alveoli ACCEPT oxygen transported by blood IGNORE "to maintain a gradient for oxygen to diffuse"	(1)

Question number	Answer	Additional guidance	Mark
7(b)(ii)	An explanation that includes the following points: • arteries take blood to {tissues / cells}, veins take blood away from {tissues / cells} (1) • oxygen diffuses (out of the capillaries) into {the tissues / cells} (1) • because there is a lower {partial pressure / concentration} in tissues / cells (1) • carbon dioxide is {increasing in / entering} (the blood) (1)	ACCEPT arteries take blood away from the heart and veins take it towards the heart. Can be pieced together. ACCEPT oxygen diffuses out of the blood ACCEPT oxygen {unloaded / released / dissociates} from haemoglobin ACCEPT because the {tissues / cells} are respiring (aerobically)	(3)

Question number	Answer	Additional guidance	Mark
7(b)(iii)	Correct value for percentage saturation given (1)	81 ACCEPT 80 - 82	(1)

Question number	Answer	Additional guidance	Mark
7(b)(iv)	An explanation that includes four of the following points: - partial pressure of oxygen (in the atmosphere) at high altitudes is low / lower (than at sea level)} (1) (therefore) the partial pressure of oxygen in the alveoli will be lower (1) - the concentration gradient between the alveoli and the blood will be smaller (1) (therefore) the rate of diffusion of oxygen into the blood will be slower (1) (therefore) the haemoglobin will not be able to bind to as much oxygen (1)	ACCEPT converse for all marking points ACCEPT {concentration of oxygen / level of oxygen} for partial pressure in all marking points ACCEPT less oxygen (available) at high altitude ACCEPT difference in concentration of oxygen between the alveoli and the blood IGNORE less diffusion, this is about rate ACCEPT lower partial pressure of oxygen in the blood ACCEPT less oxyhaemoglobin produced IGNORE saturation of Hb is low	(4)

Question number	Answer	Additional guidance	Mark
8(a)(i)	An answer that includes the following points: • decrease in diameter measured and calculated (1) • percentage decrease calculated (1)	ACCEPT (4.6 – 2.9) or 1.7 $(1.7 \div 4.6) \times 100 = 36.96 / 37$ IGNORE 37.0 Correct answer gets 2 marks. ACCEPT correctly calculated and rounded answer from wrong measurements for one mark	(2)

Question number	Answer	Mark
*8(a)(ii)	Indicative content: Descriptions of diagrams (D points) • reduced diameter of lumen (in person with CF) • thicker or inflamed muscle layer (in person with CF) • more mucus (in person with CF) Cystic fibrosis (C points) • CF results in the production of very {sticky / thick} mucus (credit this point only once) • CF is due to a {mutation in the CFTR gene / faulty CFTR allele} • (resulting in) {the CFTR protein not functioning properly / abnormal or defective CFTR protein / abnormal channel proteins / CFTR channel blocked} • this affects transfer of chloride ions out of cells • (Cl⁻ accumulate in cells so) {water moves out of mucus / water remains in cytoplasm} / mucus is dehydrated } Change in lumen diameter (L points) • CF results in the production of very {sticky / thick} mucus (credit this point only once) • diameter of lumen in patient with CF is reduced • because the mucus builds up • (because the) cilia cannot move / beat (idea of cilia normally clearing mucus) • (because the) cilia cannot move mucus away (it is too thick) (credit this only once) • Inflammation of muscle (narrows lumen) (credit this only once) Inflammation (I points) • cilia cannot move mucus away (it is too thick) (credit this only once) • mucus (is very sticky and) traps bacteria • bacteria have ideal growth conditions (in mucus) • bacteria can cause (chest) infections • CF characterised by coughing {to remove mucus / as a result of infection} • {coughing / infection} damages {cells / tissues} (lining airways) • (leading to) inflammation of muscle (credit this only once)	(6)

Level	Marks	
	0	No awardable content
1	1 - 2	Level 1: description of diagrams 1 mark: one D or one C point 2 marks: second D or C point
2	3 - 4	Level 2: explanation of either change in diameter of lumen or inflammation linked to CF 3 marks: three L points or 3 I points 4 marks: as 3 marks plus additional C point
3	5 - 6	Level 2: explanation of both change in diameter of lumen and inflammation linked to CF 5 marks: three L points and 3 I points 6 marks: as 5 marks plus additional C point

Question number	Answer	Additional guidance	Mark
8(b)(i)	An explanation that includes the following points: - because parents (who are carriers) may decide {not to have a child / to adopt a child} (1) - because parents (who are carriers) may choose {IVF / PIGD} (1) - because embryos identified as having cystic fibrosis may be aborted (1)	ACCEPT screening allows choice of unaffected partner Not just "make an informed choice" ACCEPT idea that affected foetus can be identified by CVS / amniocentesis / pre-natal screening (leading to abortion) ACCEPT only healthy embryos implanted (after IVF/ PIGD) IGNORE references to CVS / amniocentesis except in context of mp3	(3)

Question number	Answer	Additional guidance	Mark
8(b)(ii)	An answer that includes three of the following points: - screening may result in {an abortion /taking a human life} that is {unethical / against religious or cultural beliefs of some people} (1) - spare embryos from IVF are destroyed which is taking a human life (1) - individuals who are genetically linked may be {exposed to unwanted facts / disadvantaged} following testing (1) - screening may produce false results or {CVS / amniocentesis} increases risk of miscarriage (which results in death of foetus)	ACCEPT foetus for embryo ACCEPT embryo has a right to life (in context of abortion) / embryo cannot give consent / parents can make informed choice (after test)/ comment on perceived worth of (affected) child ACCEPT embryo has a right to life in context of IVF / comment on potential selection of traits of embryo in IVF (not just "designer babies") IGNORE references to foetus / baby in this context ACCEPT reference to family members IGNORE violation of privacy (too vague)	(3)



Mark Scheme (Results)

October 2020

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

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)	

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 / $\frac{1}{2}$	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 Punnett square ACCEPT 1 white : 3 orange	(3)

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)

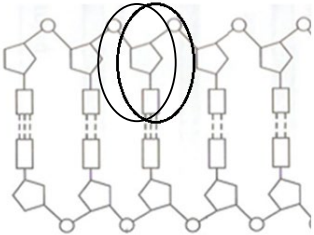
Question number	Answer	Mark
3(a)(i)	The only correct answer is B contracted relaxed <i>A is incorrect because the ventricles are relaxed</i> <i>C is incorrect because the atria are contracted and the ventricles are relaxed</i> <i>D is incorrect because the atria are contracted</i>	(1)

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)

Question number	Answer	Additional guidance	Mark
3(a)(iii)	- cardiac cycle time multiplied by proportion of cycle spent in ventricular systole (1) $3.2 \times 10^2 / 3.23 \times 10^2$ (1)	Example of calculation: $0.86 \times \frac{3}{8} / 0.3225 / 0.32 / 0.323$ Correct answer with no working gains 2 marks	(2)

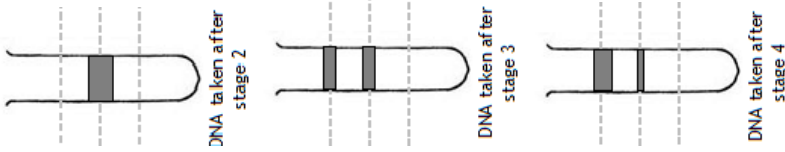
Question number	Answer	Additional guidance	Mark
3(a)(iv)	63% / 5/8 / 0.63	ACCEPT 0.625 / 62.5% / 5 out of 8	(1)

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: $60 \div 0.86 = 69.76744186046512$ $60 \div 0.46 = 130.4347826$ 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)

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 <table border="1"> <tr> <td>phosphodiester</td><td>covalent</td><td>hydrogen</td></tr> </table> 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	phosphodiester	covalent	hydrogen	(1)
phosphodiester	covalent	hydrogen			

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

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)

Question number	Answer	Mark
4(b)(ii)	The only correct answer is B <i>A is incorrect because neither DNA molecule is made of all heavy nitrogen or light nitrogen</i> <i>C is incorrect because neither DNA molecule is made of all heavy nitrogen or light nitrogen + bands are too wide</i> <i>D is incorrect because it has only one band</i>	(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 ÷ height² / weight ÷ height²	(1)

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

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)

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)

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 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 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 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			

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)

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)

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)

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)

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)

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)

Question number	Answer	Additional guidance	Mark																
8(c)(i)	• volume of sphere calculated / values substituted into the equation (1) • volume of sphere rounded up to nearest whole number (1) • ratio calculated (1)	Example of calculation = 6912 if using $\pi = 3$ = 7142.4 if using $\pi = 3.1$ = 7234.56 if using $\pi = 3.14$ = 7239.168 if using $\pi = 3.142$ = 7241.472 if using $\pi = 3.143$ = 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 e.g. <table border="1"> <thead> <tr> <th>Diameter of LDL / nm</th><th>Volume of LDL / nm³</th><th>Volume of cholesterol / nm³</th><th>Ratio of LDL volume to cholesterol volume</th></tr> </thead> <tbody> <tr> <td></td><td></td><td></td><td></td></tr> <tr> <td></td><td>7235</td><td></td><td>14 : 1</td></tr> <tr> <td></td><td colspan="2">= 2 marks</td><td>= 1 mark</td></tr> </tbody> </table>	Diameter of LDL / nm	Volume of LDL / nm ³	Volume of cholesterol / nm ³	Ratio of LDL volume to cholesterol volume						7235		14 : 1		= 2 marks		= 1 mark	(3)
Diameter of LDL / nm	Volume of LDL / nm ³	Volume of cholesterol / nm ³	Ratio of LDL volume to cholesterol volume																
	7235		14 : 1																
	= 2 marks		= 1 mark																

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			



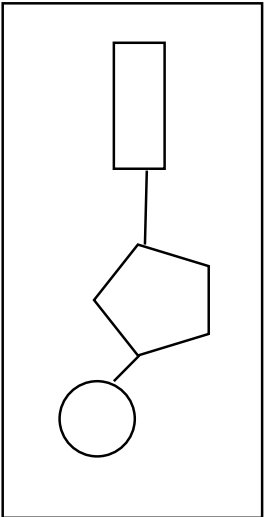
Mark Scheme (Results)

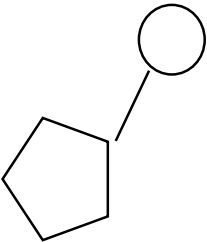
January 2021

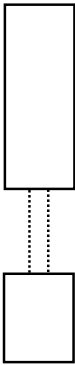
Pearson Edexcel International Advanced Level
In Biology (WBI11)

Paper 01

Molecules, Diet, Transport and Health

Question number	Answer	Mark
1(a)(i)	B  <i>A is incorrect because the phosphate should be joined to C4</i> <i>C is incorrect because the base should be attached to C1</i> <i>D is incorrect because the phosphate should be joined to C4 and the base should be attached to C1</i>	(1)

Question number	Answer	Mark
1(a)(ii)	B  <i>A is incorrect because a phosphate is attached to the sugar not the base</i> <i>C is incorrect because a phosphodiester joins a sugar with a phosphate, not two phosphates</i> <i>DC is incorrect because the phosphate is joined to the sugar not the base</i>	(1)

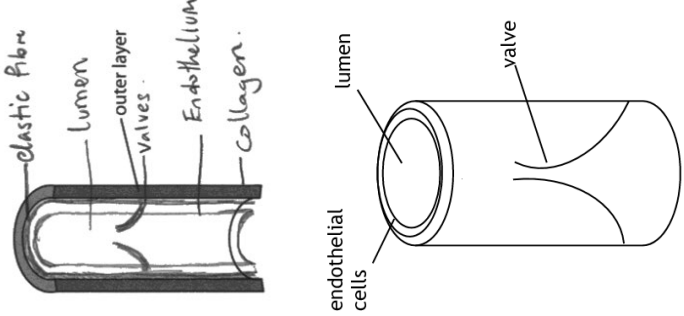
Question number	Answer	Mark
1(a)(iii)	C  <i>A is incorrect because complementary bases are joined by hydrogen bonds</i> <i>B is incorrect because one large base and one small base are joined together by hydrogen bonds</i> <i>D is incorrect because one large base and one small base are joined together</i>	(1)

Question number	Answer	Mark																								
1(b)(i)	<table><tr><th rowspan="2">Statement</th><th colspan="4">Correct statement about</th></tr><tr><th>both strands</th><th>only the complementary DNA strand</th><th>only the mRNA strand</th><th>neither strand</th></tr><tr><td>The number of guanines will be the same as in the template strand</td><td></td><td></td><td></td><td>X</td></tr><tr><td>The number of thymines will be the same as the number of adenines in the template strand</td><td></td><td>X</td><td></td><td></td></tr><tr><td>There will be no adenine present</td><td></td><td></td><td></td><td>X</td></tr></table>	Statement	Correct statement about				both strands	only the complementary DNA strand	only the mRNA strand	neither strand	The number of guanines will be the same as in the template strand				X	The number of thymines will be the same as the number of adenines in the template strand		X			There will be no adenine present				X	(3)
Statement	Correct statement about																									
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The number of thymines will be the same as the number of adenines in the template strand		X																								
There will be no adenine present				X																						

Question number	Answer	Additional guidance	Mark
1(b)(ii)	transcription (1)	IGNORE {post-transcription modification /protein synthesis} DO NOT ACCEPT {translation / reverse transcription}	(1)

Question number	Answer	Additional guidance	Mark
2(a)	An answer that includes the following points: • number of minutes in one day calculated (1) • volume in 24 hours given in standard form (1) OR • volume in one hour calculated (1) • volume in 24 hours given in standard form (1)	$1 \times 60 \times 24 = 1440$ 7.2×10^3 (litres) $5 \times 60 = 300$ 7.2×103 (litres) Correct answer with no working (2) Correct answer not in standard form = 1 mark	(2)

Question number	Answer	Additional guidance	Mark
2(b)	An answer that includes one similarity and one difference: Similarities: • both have walls containing {muscle cells / elastic fibres / an endothelial cell lining / an (outer) collagen layer} (1) • both have a valve (at the point they leave the heart) (1) Differences: • aorta has a {lumen with a wider diameter / thicker wall / more elastic tissue / more muscle tissue / more collagen} (1) • aorta has branches to more organs (1)		(2)

Question number	Answer	Additional guidance	Mark
2(c)	An answer that includes three of the following points: • addition to diagram {additional one or two layers of wall / valves}. If valves, must be correct orientation (1) Any two from: • {endothelial cell / tunica intima} lining labelled (1) • valve labelled (1) • {(smooth) muscle / elastic fibres / tunica media} labelled (1) • lumen labelled (1)		(3)

Question number	Answer	Mark
3(a)(i)	A a glucose molecules join together by a condensation reaction B is incorrect because bonds form by condensation reactions C is incorrect because a glucose molecules join together D is incorrect because a glucose molecules join together by condensation reactions	(1)

Question number	Answer	Additional guidance	Mark
3(a)(ii)	glycosidic (bond / link)	Accept covalent (bond) Ignore any numbers eg 1,4 glycosidic	(1)

Question number	Answer	Additional guidance	Mark
3(a)(iii)	An explanation that includes the following points: • {polymer of glucose / polysaccharide} therefore has a high energy content (1) • {large molecule / polymer / polysaccharide} therefore {insoluble / has no osmotic effect} (1) • branched structure therefore {broken down / energy released / hydrolysis is} faster (1) • compact therefore has a high energy density (1)	Accept {large molecule / polymer} so does not diffuse Accept branched so can be broken down from several points at the same time Ignore easier to break down Accept compact so {high energy stored in a small space / many glucose molecules stored in a small space}	(3)

Question number	Answer	Additional guidance	Mark
3(b)(i)	Answer that includes the following points: • estimate of number of babies with GSD (1) • estimate of mean number of babies with Von Gierke disease (1)	Accept any value between 150 and 200 Accept any value between 38 and 50 Accept non-whole numbers eg 38.5 Correct answer with no working (2)	(2)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	An answer that includes the following points: • because allele for Von Gierke disease may be recessive (1) • therefore (both) parents may be heterozygous (1) • because individuals with Von Gierke disease are less likely to have babies (1)	Accept disease caused by two recessive alleles Do not accept {gene / disease} is recessive Accept parents may be carriers (of the allele) Ignore mutation	(2)

Question number	Answer	Additional guidance	Mark
4(a)(i)	bind to an {oxygen (molecule) / O₂} (1)	Do not accept O Ignore binding to carbon dioxide	(1)

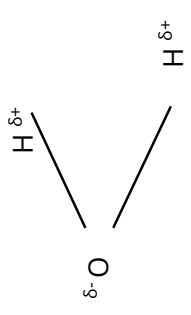
Question number	Answer	Additional guidance	Mark
4(a)(ii)	An explanation that includes the following points: - must have R groups that are {polar / hydrophilic} (1) - so that the {haemoglobin / protein} {can dissolve in (red blood cell) cytoplasm / is soluble in water} (1)	Accept they are {polar / hydrophilic} Ignore dissolve in blood / plasma	(2)

Question number	Answer	Additional guidance	Mark
4(b)(i)	An explanation that includes two of the following points: - oxygen dissociation curve for {maternal / adult} Hb is shifted to the right of curve for fetal Hb (1) - because oxygen needs to diffuse from {maternal / adult} blood into fetal blood (1) - therefore fetal haemoglobin needs to have a higher affinity for oxygen (1)	Accept shifted down for shifted to the right Accept converse Accept converse Accept because oxygen needs to dissociate from maternal haemoglobin and bind to fetal haemoglobin	(2)

Question number	Answer	Additional guidance	Mark
4(b)(ii)	An answer that includes the following points: - total number of amino acids in haemoglobin calculated (1) - percentage of amino acids that are different calculated (1)	574 / 287 14 / 13.6 / 13.59 Correct answer with no working (2)	(2)

Question number	Answer	Additional guidance	Mark
5(a)	An explanation that includes the following points: • because it shows that it is {made of two layers of phospholipid / a bilayer} (1) • the size of a phospholipid is in the range 2.05 nm to 2.65 nm (1) • therefore the width of the membrane (5 nm) is within a bilayer range (of 4.1 nm to 5.3 nm) (1)	Accept it shows two layers of phosphate heads separated by a band of lipids	(3)

Question number	Answer	Additional guidance	Mark
5(b)	An explanation that includes three of the following points: • cholesterol is a non-polar molecule (1) • fatty acid tails are non-polar (1) • cholesterol will be located within the {fatty acid tails / non-polar part} of membrane (1) • OH group will be located near the phosphate heads (1)	Accept hydrophobic for non-polar in all points Accept {hydrocarbon tail / hydrocarbon rings} are non-polar	(3)

Question number	Answer	Additional guidance	Mark
5(c)(i)	A description that includes the following points: • {small / weak / delta / partial} positive charge on hydrogen (1) • {small / weak / delta / partial} negative charge on oxygen (1)	Accept both points from a diagram  (2)	

Question number	Answer	Additional guidance	Mark
5(c)(ii)	An explanation that includes the following points: • water is small enough to move by {osmosis / diffusion} (between the phospholipids) (1) • steroid (is non-polar so) can diffuse through the {membrane / phospholipids} (1) • glucose (is polar so) passes through {protein channels / carrier proteins / by facilitated diffusion} (1) • ions (are polar so) pass through {protein channels / carrier proteins / by facilitated diffusion / active transport} (1)	Accept description of water moving through {protein channels / aquaporins} Accept steroid is not repelled by fatty acid tails Accept movement by active transport Accept ions are repelled by fatty acid tails so cannot get through membrane (4)	

Question number	Answer	Additional guidance	Mark
6(a)(i)	An explanation that includes the following points: • because both lines rise and fall (in parallel) (1) • but the line for deaths from lung cancer is a period of time after the line for cigarettes smoked (1)	Accept {delay / timelag} for deaths	(2)

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An explanation that includes the following points: • alveoli will have a smaller surface area (to volume ratio) (1) • therefore the (rate of) diffusion of oxygen into the bloodstream will be slower (1)	Accept gas exchange area will be smaller Accept gas exchange for diffusion Ignore less gas exchange / diffusion	(2)

Question number	Answer						
*6(b)	Indicative content: <table border="1"> <tr> <td>Egg points (E)</td><td> 1. {number / density of pores} 2. {width / size} of pores 3. area of pores 4. thickness of shell and membranes 5. rate of respiration of developing embryo 6. rate of blood flow of embryo 7. temperature 8. shell is impermeable / pores are permeable 9. shell supports membrane so there is a large SA for gas exchange </td></tr> <tr> <td>Theory points (T)</td><td> 10. Ficks Law of diffusion can be used to calculate diffusion rate 11. State Fick's Law (3) 12. because rate of diffusion depends on surface area / mp11 13. because rate of diffusion depends on diffusion distance / mp11 14. because rate of diffusion depends on concentration gradient / mp11 15. speed of molecules depends on temperature 16. because rate of diffusion depends on what substances oxygen is passing through eg water / air 17. diffusion coefficient through air 18. diffusion coefficient through membranes </td></tr> <tr> <td>Explanation points (X) Accept converse for all</td><td> 19. increasing SA (or any named factor increasing this) causes increase in rate of diffusion 20. increasing distance (or any named factor increasing this) causes decrease in rate of diffusion 21. increasing conc gradient (or any named factor increasing this) causes increase in rate of diffusion 22. increasing temperature increases rate of diffusion </td></tr> </table>	Egg points (E)	1. {number / density of pores} 2. {width / size} of pores 3. area of pores 4. thickness of shell and membranes 5. rate of respiration of developing embryo 6. rate of blood flow of embryo 7. temperature 8. shell is impermeable / pores are permeable 9. shell supports membrane so there is a large SA for gas exchange	Theory points (T)	10. Ficks Law of diffusion can be used to calculate diffusion rate 11. State Fick's Law (3) 12. because rate of diffusion depends on surface area / mp11 13. because rate of diffusion depends on diffusion distance / mp11 14. because rate of diffusion depends on concentration gradient / mp11 15. speed of molecules depends on temperature 16. because rate of diffusion depends on what substances oxygen is passing through eg water / air 17. diffusion coefficient through air 18. diffusion coefficient through membranes	Explanation points (X) Accept converse for all	19. increasing SA (or any named factor increasing this) causes increase in rate of diffusion 20. increasing distance (or any named factor increasing this) causes decrease in rate of diffusion 21. increasing conc gradient (or any named factor increasing this) causes increase in rate of diffusion 22. increasing temperature increases rate of diffusion
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	Level 1 Up to 4 points from anywhere; 2 points for one mark and 4 points for 2 marks Level 2 5 points or more, from two best categories; 5 points for 3 marks, 6 points for 4 marks. Must achieve 6 marks to progress to level 3 Level 3 As level 2 plus up to 2 points from third category; 7 points for 5 marks and 8 points for 6 marks
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Question number	Answer	Additional guidance	Mark
7(a)	One from - high BMI / smoking / alcohol intake / high salt intake / high cholesterol intake And one from - age / sex / gender	Accept: obesity / overweight / high waist to hip ratio high level of {fat / sugar} in diet type 2 diabetes high stress levels air pollution	(1)

Question number	Answer	Additional guidance	Mark
7(b)	A description that includes two of the following points: • increase in intensity of exercise decreases the risk of death from heart disease (1) • increase in the energy needed for exercise decreases the risk of death from heart disease (1) • for the same energy expenditure, {vigorous exercise / moderate exercise} decreases risk of death from CVD more than light exercise (1)	Accept converse throughout Accept if you expend 4000kj per week, intensity of exercise makes no difference to risk of death from CVD	(2)

Question number	Answer	Additional guidance	Mark
7(c)(i)	An explanation that includes the following points: • because antioxidants reduce free radicals (1) • free radicals cause {cell damage /tissue damage / oxidative stress / damage to endothelial lining} (1) • (antioxidants) reduce {plaque / atheroma} formation (1)	Accept neutralise / stabilise / donate electrons Accept antioxidants {prevent cell damage / tissue damage / reduce oxidative stress / prevent damage to endothelial lining} Accept reduces {cholesterol build up / blood clot formation / atherosclerosis}	(3)

Question number	Answer	Additional guidance	Mark
7(c)(ii)	An answer that includes three of the following points: • use (a large number of) {healthy individuals / individuals with no known heart condition} (1) • who have similar (lifestyle and non-lifestyle) risk factors (1) • compare group given antioxidants to a group using other preventative treatments (1) • monitor the incidence of heart disease over a (long) period of time (1)	Accept control for named factor Accept give one group antioxidants and the other group {a placebo / no antioxidants} Accept at least 6 months if time is given	(3)

Question number	Answer						
*7(d)	Indicative content: <table border="1"> <tr> <td>Outline of events (O points)</td><td> - less blood reaches the heart muscle cells, - muscle cells are not supplied with enough oxygen - muscle cells are not supplied with enough glucose - aerobic respiration decreases </td></tr> <tr> <td>Contraction stops (C points)</td><td> - anaerobic respiration produces lactic acid - lactic acid lowers pH and denatures enzymes - glycogen used as respiratory substrate - anaerobic respiration produces much less ATP / energy - therefore less / no blood is pumped by the heart - reference to effect on other organs </td></tr> <tr> <td>Use of graph / stem info (G points)</td><td> - energy released from heart cells decreases with time after blockage - reference to data from graph (not mp13 or 15) - after 8 minutes the energy released is 52 - 54 a.u. - after 8 minutes there is not enough energy for contraction - after 20 minutes the energy released is 23 - 24 a.u. - which is too low to maintain cell viability / for cells to survive - cells die as not enough ATP for vital processes eg active transport </td></tr> </table> Level 1: up to two points from anywhere; one point for 1 mark and two points for 2 marks Level 2: up to two points from each of two categories; 3 points for 3 marks, 4 points for 4 marks Must achieve 4 marks to progress to level 3 Level 3: Level 2 plus two points from the third category; five points for 5 marks and six points for 6 marks	Outline of events (O points)	- less blood reaches the heart muscle cells, - muscle cells are not supplied with enough oxygen - muscle cells are not supplied with enough glucose - aerobic respiration decreases	Contraction stops (C points)	- anaerobic respiration produces lactic acid - lactic acid lowers pH and denatures enzymes - glycogen used as respiratory substrate - anaerobic respiration produces much less ATP / energy - therefore less / no blood is pumped by the heart - reference to effect on other organs	Use of graph / stem info (G points)	- energy released from heart cells decreases with time after blockage - reference to data from graph (not mp13 or 15) - after 8 minutes the energy released is 52 - 54 a.u. - after 8 minutes there is not enough energy for contraction - after 20 minutes the energy released is 23 - 24 a.u. - which is too low to maintain cell viability / for cells to survive - cells die as not enough ATP for vital processes eg active transport
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Question number	Answer	Mark
8(a)(i)	C galactose and glucose A is incorrect because lactose consists of glucose and galactose monomers B is incorrect because lactose consists of glucose and galactose monomers Dis incorrect because lactose consists of glucose and galactose monomers	(1)

Question number	Answer	Additional guidance	Mark
8(a)(ii)	An explanation that includes three of the following points: • lactase is soluble because of its {globular shape / external polar R groups} (1) • (and therefore) lactase collides with lactose (1) • active site of lactase is complementary to the lactose (1) • Formation of enzyme-substrate complex lowers the activation energy (1)	Accept hydrophilic for polar Accept active site of lactase binds to lactose / active site allows enzyme-substrate complex to form Accept R group interactions break the glycosidic bonds	(3)

Question number	Answer	Additional guidance	Mark
8(b)(i)	• {lactase / enzyme} is reusable / milk is not contaminated with {lactase / enzyme} (1)	Accept higher enzyme activity	(1)

Question number	Answer	Additional guidance	Mark
8(b)(ii)	An explanation that includes four of the following points: • pH {below 5 / above 5} reduces lactase activity (1) • because pH affects the shape of the active site (1) • due to ionisation of the R groups (1) • immobilised lactase is active at wider range of pH values (1) • immobilisation holds the R groups in place so active site does not change shape (1)	Accept pH 5 is the optimum for both enzymes / pH 4-6 is the optimum for both enzymes Accept active site denatured by pH Accept bonds between R groups are broken	(4)

Question number	Answer	Additional guidance	Mark												
8(b)(iii)	An answer that includes the following points: • measure the decrease in concentration of lactose over time • see table for units OR • measure the increase in concentration of {glucose / galactose} over time • see table for units	Accept measure rate of loss of lactose Ignore: measure how long it takes for lactose to be fully broken down Accept measure rate of production of {glucose / galactose} Units can be expressed as: • mass per volume per time • mass volume⁻¹ time⁻¹ • amount per volume per time • amount volume⁻¹ time⁻¹ <table><tr><th>mass</th><th>volume</th><th>time</th></tr><tr><td>g / mg / µg / kg</td><td>cm⁻³ / mm⁻³ / dm⁻³ / litre⁻¹</td><td>s⁻¹ / min⁻¹ / hour⁻¹</td></tr><tr><td>amount</td><td>volume</td><td>time</td></tr><tr><td>mmol / mol / µmol</td><td>cm⁻³ / mm⁻³ / dm⁻³ / litre⁻¹</td><td>s⁻¹ / min⁻¹ / hour⁻¹</td></tr></table>	mass	volume	time	g / mg / µg / kg	cm ⁻³ / mm ⁻³ / dm ⁻³ / litre ⁻¹	s ⁻¹ / min ⁻¹ / hour ⁻¹	amount	volume	time	mmol / mol / µmol	cm ⁻³ / mm ⁻³ / dm ⁻³ / litre ⁻¹	s ⁻¹ / min ⁻¹ / hour ⁻¹	(2)
mass	volume	time													
g / mg / µg / kg	cm ⁻³ / mm ⁻³ / dm ⁻³ / litre ⁻¹	s ⁻¹ / min ⁻¹ / hour ⁻¹													
amount	volume	time													
mmol / mol / µmol	cm ⁻³ / mm ⁻³ / dm ⁻³ / litre ⁻¹	s ⁻¹ / min ⁻¹ / hour ⁻¹													

Question number	Answer	Additional guidance	Mark
8(c)	An answer that includes two of the following points: • mutation (that resulted in CLI) occurred in the {gene / DNA} (of people living in one country) (1) • people from this country (had children that) stayed in this country (1) • relatively new mutation so has not had the chance to spread (1)	Accept limited emigration from this country / reproduction with others from same country Ignore idea that mutation is caused by drinking milk / not drinking milk	(2)



Mark Scheme (Results)

Summer 2021

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

Summary of changes from Provisional Mark Scheme

A few minor changes were made to the Mark Scheme before marking on the marking service began. These have been highlighted in red in the Mark Scheme. The changes have been highlighted in the table:

Question Number	Summary of change
2(c)(i)	Another way of expressing answer has been added : 190.9 million
7(a)	Mark point amended slightly so that the 'of DNA' goes into smooth brackets

Question number	Answer	Additional guidance	Mark																
1(a)	<table border="1"> <thead> <tr> <th>Polymer</th><th>Monomer</th><th>Elements in monomer</th><th>Type of bond</th></tr> </thead> <tbody> <tr> <td>Carbohydrates</td><td>monosaccharide</td><td>carbon, hydrogen and oxygen</td><td>glycosidic</td></tr> <tr> <td>Nucleic acids</td><td>(mono)nucleotide</td><td>carbon, hydrogen, oxygen, phosphorus and nitrogen</td><td>phosphodiester</td></tr> <tr> <td>Proteins</td><td>amino acid</td><td>carbon, hydrogen, oxygen, (sulfur) and nitrogen</td><td>peptide</td></tr> </tbody> </table>	Polymer	Monomer	Elements in monomer	Type of bond	Carbohydrates	monosaccharide	carbon, hydrogen and oxygen	glycosidic	Nucleic acids	(mono)nucleotide	carbon, hydrogen, oxygen, phosphorus and nitrogen	phosphodiester	Proteins	amino acid	carbon, hydrogen, oxygen, (sulfur) and nitrogen	peptide	ACCEPT chemical symbols C, H, O ACCEPT chemical symbols C, H, O, N, S	(4)
Polymer	Monomer	Elements in monomer	Type of bond																
Carbohydrates	monosaccharide	carbon, hydrogen and oxygen	glycosidic																
Nucleic acids	(mono)nucleotide	carbon, hydrogen, oxygen, phosphorus and nitrogen	phosphodiester																
Proteins	amino acid	carbon, hydrogen, oxygen, (sulfur) and nitrogen	peptide																

Question number	Answer	Additional guidance	Mark
1(b)	A description that includes three of the following points: TWO FROM • (one) glycerol and three fatty acids (1) • joined by {condensation reaction / ester bond} (1) • by enzymes (1) AND • (at least) one fatty acid is {unsaturated / has a CC double bond} (1)		(3)

Question number	Answer	Mark
2(a)	C glycogen The only correct answer is C. A is incorrect because amylopectin is found in plant cells only B is incorrect because cellulose is found in plant cells only D is incorrect because starch is found in plant cells only	(1)

Question number	Answer	Mark
2(b)	D lactose and sucrose The only correct answer is D. A is incorrect because fructose is a monosaccharide and therefore not digested B is incorrect because fructose and galactose are both monosaccharides and therefore not digested C is incorrect because galactose is a monosaccharide and therefore not digested	(1)

Question number	Answer	Additional guidance	Mark
2(c)(i)	190 900 000 / 191 000 000 / 190.9 million / 191 million / 1.909 × 10⁸ / 1.91 × 10⁸		(1)

Question number	Answer	Additional guidance	Mark
2(c)(ii)	An explanation that includes three of the following points: • because (prenatal testing) can cause abortion (1) • because false negative or false positive results can be avoided (if patient already has diabetes) (1) • because of issues arising if another genetic condition is found (1) • because an individual could live a healthy life (as only a genetic predisposition) (1) • because of the ethics associated with destroying embryos (IVF) (1)		(3)

Question number	Answer	Additional guidance	Mark
3(a)	An explanation that includes the following points: • to widen (the lumen of) the (coronary) artery / (blood) vessel (1) • so that more blood can flow to the heart {cells / muscle} (1) • for respiration (in the heart muscle) / so that heart muscle can contract (1)	ACCEPT increase in {diameter / cross-sectional area} IGNORE larger / increase in area	(3)

Question number	Answer	Additional guidance	Mark
3(b)(i)	An answer that includes the following points: • percentage of one group developing thrombosis calculated (1) • correct difference calculated (1)	1.5% of 800 = 12 OR 1.0% of 400 = 4 difference = 8 Correct answer with no working gains two marks	(2)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	blocks the (coronary) {artery / vessel} {so the brain does not get oxygen / causing a stroke}	ACCEPT so that the heart muscle does not get oxygen / causing a heart attack	(1)

Question number	Answer	Mark
3(b)(iii)	D thrombin and thromboplastin The only correct answer is D. A is incorrect because prothrombin is inactive B is incorrect because prothrombin is inactive C is incorrect because prothrombin is inactive	(1)

Question number	Answer	Mark
3(b)(iv)	C fibrinogen and thromboplastin The only correct answer is C A is incorrect because fibrin is insoluble B is incorrect because fibrin is insoluble D is incorrect because other factors are also soluble e.g. thromboplastin	(1)

Question number	Answer	Additional guidance	Mark
3(b)(v)	anticoagulants / platelet inhibitors	ACCEPT named anticoagulants / platelet inhibitors e.g. heparin, aspirin, warfarin DO NOT ACCEPT antihypertensives / statins	(1)

Question number	Answer	Additional guidance	Mark
4(a)	7 ☐ and 8 ☐ and 9 ☐		(1)

Question number	Answer	Additional guidance	Mark
4(b)(i)	A description that includes the following points: - gene is a sequence of bases coding for a {(poly)peptide / sequence of amino acids} + gene for bitter-taste receptor (1) - allele is a {version of the gene / information coded by the gene} + {tasting / not tasting} (receptor) (1)	ACCEPT protein NB Two correct definitions but no examples = 1 mark	(2)

Question number	Answer	Additional guidance	Mark
4(b)(ii)	A description that includes the following points: - genotype is the combination of alleles + {TT / tt / Tt} (1) - phenotype is the {expressed / observable} {characteristic / trait / feature} + {taster / non-taster}	ACCEPT any pair of letters ACCEPT characteristic that can be measured {tasting / not tasting} (receptor) NB Two correct definitions but no examples = 1 mark	(2)

Question number	Answer	Additional guidance	Mark
4(c)	An explanation that includes the following points: - dominant allele is (having a receptor that) can taste bitter taste (1) - because individuals 1 and 2 were tasters who had children of both phenotypes (1)	ACCEPT children who could taste and children who could not taste	(2)

Question number	Answer	Additional guidance	Mark
4(d)	An explanation that includes the following points: - because individual 6 was a female non-taster (1) - and her father was a taster (1)		(2)

Question number	Answer	Additional guidance	Mark
5(a)	An explanation that includes the following points: • because the mutated gene results in a faulty (CFTR) protein (1) • so chloride ions do not move out of the cells (1) • decreasing the water potential inside the cell (1) • therefore water {leaves the mucus / enters the cells} by <u>osmosis</u> (1)	ACCEPT less effective ACCEPT reduced movement of chloride ions / sodium ion channel not inhibited / sodium ions not prevented from entering cell ACCEPT decreasing {osmotic potential / solute potential} / increasing solute concentration IGNORE decreasing water concentration	(3)

Question number	Answer	Additional guidance	Mark
5(b)	An explanation that includes five of the following points: • because the mucus blocks the airways (1) • therefore {air flow to lungs / gas exchange} is reduced (1) • because mucus prevents <u>pancreatic</u> enzymes from entering the small intestine (1) • therefore large food molecules not broken down (and cannot be absorbed) (1) • because the mucus prevents sperm passing through the cervix (1) • therefore sperm cannot reach the egg cell (1)	ACCEPT duodenum / gut / digestive tract named enzyme secreted by pancreas ACCEPT named large food molecule ACCEPT reach the {oviducts / fallopian tubes}	(5)

Question number	Answer	Mark
5(c)(i)	C 40 The only correct answer is C. A is incorrect because B is incorrect because D is incorrect because	(1)

Question number	Answer	Additional guidance	Mark
5(c)(ii)	An explanation that includes the following points: - because (the graph shows that) the level of CFTR protein function varies between 3 and 18% (1) - because (the graph shows that) individuals diagnosed with cystic fibrosis have a range in concentration of chloride ions in sweat (1) - therefore the CFTR protein must be affected to different extents (by different mutations) (1)		(2)

Question number	Answer	Additional guidance	Mark
6(a)(i)	100 (cm)		(1)

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An answer that includes the following points: - height² calculated (1) - equation rearranged and values substituted in (1) - answer given to {1 decimal place / 3 significant figures} (1)	2.4025 (m²) / 24025 (cm²) mass = 36 × 2.4025 / 86.49 86.5 NB CE if rounded cm² value to 865 000 Correct answer of 86.5 with no working shown should be awarded 3 marks. An answer of 86.49 or 865 000 with no working shown should be awarded 2 marks.	(3)

Question number	Answer	Additional guidance	Mark
6(a)(iii)	An answer that includes the following points: • using <u>WHR</u> the two women appear to have the same risk of developing CVD (1) • however using {mass / BMI} female K is at a greater risk (1)		(2)

Question number	Answer	Additional guidance	Mark
6(a)(iv)	An explanation that includes the following points: • by the tape being pulled tighter around the waist so the waist value is smaller (1) • by the tape being held loosely around the hips so the hip value is greater (1) • so that the waist to hip ratio is smaller (1)	ACCEPT breathing in whilst taking the measurement of the waist ACCEPT make the waist measurement smaller and the hip measurement larger NB If both methods given but no justification = 1 mark	(2)

Question number	Answer	Additional guidance	Mark
6(b)(i)	An answer that includes two of the following points: • the distribution of fat under the skin is not even (1) • exercise will replace fat under the skin with muscle (1) • the woman has had a child (1) • liposuction (1) • lipoedema (affecting the arms) (1)	ACCEPT exercising some parts of body will reduce fat / stopping exercise to some parts of body will increase fat	(2)

Question number	Answer	Additional guidance	Mark
6(b)(ii)	• moderate	DO NOT ACCEPT low / low to moderate	(1)

Question number	Answer	Additional guidance	Mark
7(a)	change in the base {sequence / order} (of DNA)	ACCEPT change in the number of chromosomes / damage to chromosome / loss of part of chromosome	(1)

Question number	Answer	Additional guidance	Mark
7(b)(i)	a change in one variable is reflected in a change in another variable	ACCEPT a description that only mentions 'change' once DO NOT ACCEPT causes / results in	(1)

Question number	Answer	Additional guidance	Mark
7(b)(ii)	A description that includes the following points: - incidence of skin cancer increases with (an increase in) age (1) - incidence of skin cancer increases with an increase in the years (1) - males have higher incidence of skin cancer than females (1)	ACCEPT converse throughout ACCEPT in either context of males or females or both ACCEPT in either context of males or females or both	(3)

Question number	Answer	Additional guidance	Mark
7(b)(iii)	An answer that includes three of the following points: • as age increase there is more time for mutations to {build up / occur} (1) • people are spending more time in the sun (1) • more UV light reaching the earth's surface (1) • more men have {jobs / hobbies} outside (1) • men have a greater genetic disposition to skin cancer (1)	ACCEPT the older you are the more exposure to risk factors / the more cell divisions the more chance of mutations ACCEPT an example of why this may happen e.g. going on more holidays in hot countries ACCEPT ozone layer depletion ACCEPT men smoke more	(3)

Question number	Answer
7(c)	Indicative content: Repeatability: • sample size is small • smokers are being studied and their sample size is very small • no statistical data available • no indication of the location of the individuals (could be a validity comment as well) Validity: • mean age at diagnosis is similar but not identical • there is a greater range of ages for males than females • no indication of the actual ages of the people • so there could be more people at the extremes in one group • no information about other lifestyle factors • e.g. working in polluted environment, living in the city • no information about non-lifestyle factors • e.g. ethnicity • no indication if individuals lived with other smokers (passive smokers) • no indication of how long people been smoking for* • no indication of how many cigarettes were smoked by the smokers each day* • no indication if the non-smokers had ever smoked previously* • no indication of severity of emphysema* • no indication if emphysema is self-diagnosed or clinical diagnosis* Level 1 : comments on the design of the study 1 mark = 1 comment 2 marks = 3 comments Level 2 : comments on the design of the study 3 marks = 4 comments, at least one of which is from each category 4 marks = 5 comments, at least one of which is from each category Level 3 : comments on the design of the study and makes at least one link correctly with repeatability or validity 5 marks = 5 comments at least one of which is linked to repeatability or validity 6 marks = 6 comments at least one of which is linked to repeatability or validity and includes a specific comment about {smoking / emphysema}* ACCEPT reproducible / reliable IGNORE accurate / precise (6)

Question number	Answer	Mark
8(a)(i)	D nm The only correct answer is D. <i>A is incorrect because cm would be 1×10^0</i> <i>B is incorrect because mm would be 1×10^{-1}</i> <i>C is incorrect because μm would be 1×10^{-4}</i>	(1)

Question number	Answer	Mark
8(a)(ii)	B Q and T The only correct answer is B. <i>A is incorrect because R is a fatty acid and only contains C, H and O</i> <i>C is incorrect because R is a fatty acid and only contains C, H and O, S is cholesterol and only contains C, H and O</i> <i>D is incorrect because S is cholesterol and only contains C, H and O</i>	(1)

Question number	Answer	Mark
8(a)(iii)	D S : T The only correct answer is D. <i>A is incorrect because</i> <i>B is incorrect because</i> <i>C is incorrect because</i>	(1)

Question number	Answer	Additional guidance	Mark
8(b)	An explanation that includes the following points: • because the sequence of amino acids determine the {tertiary / quaternary} structure of the protein (1) • by determining the {position / type} of bonds that form between the <u>R groups</u> (1) • {hydrophobic / non-polar} {(R) groups / amino acids on (the outside of) the part of the protein that is embedded in the fatty acid tails (1) • {hydrophilic / polar} {(R) groups / amino acids} (on the outside of) the part of the protein that is {amongst the phosphate heads / facing the cytoplasm / facing the aqueous environment} (1)	ACCEPT pieced together ACCEPT a named bond between R groups	(4)

Question number	Answer
*8(c)	Indicative content: Molecule E • enters by osmosis • because it is water • the number of the molecules F, G and H lower the water potential • so E moves down the water potential gradient Molecule F • enters by facilitated diffusion • down its concentration gradient • because it is polar and cannot pass through the fatty acid tails • therefore needs a protein to provide a polar channel for it to diffuse through Molecule G • enters by diffusion • because it is at a higher concentration outside the cell • and it is non-polar so can pass through the fatty acid tails Molecule H • enters by active transport • because it is at a higher concentration inside the cell • and therefore needs ATP and a protein to pump it across the membrane Level 1 : 1 mark = 1 relevant comment 2 marks = 3 relevant comments Level 2 : 3 marks = 4 relevant comments for at least two molecules 4 marks = 5 relevant comments for at least two molecules Level 3 : 5 marks = 6 relevant comments for at least three molecules 6 marks = 7 relevant comments from all four molecules (6)



Mark Scheme (Results)

October 2021

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

Question number	Answer	Mark
1(a)	C The only correct answer is C. <i>A is incorrect because amino acids are not found in DNA</i> <i>B is incorrect because a mutation is a change in DNA</i> <i>D is incorrect because there are no bases in protein</i>	(1)

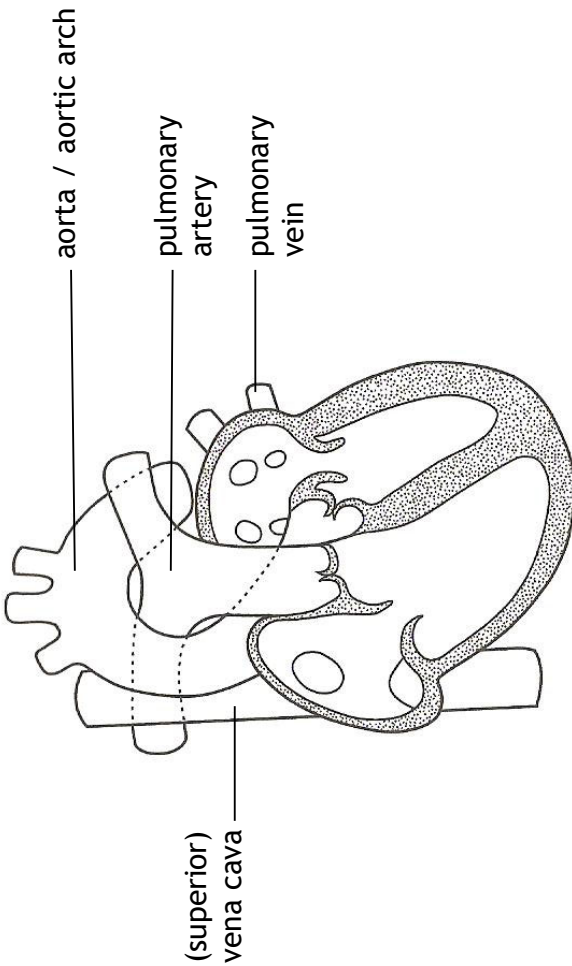
Question number	Answer	Additional guidance	Mark
1(b)	Any two from: deletion insertion substitution (1)	ALLOW {chromosome / translocation} {point / gene} and {chromosome / translocation} IGNORE subtraction / addition / swapping / frameshift / nonsense / duplication / specific examples	(1)

Question number	Answer	Additional guidance	Mark
1(c)	An answer that includes three of the following points: • as age increase the number of cases increases (in both males and females) (1) • up to 57 years of age {males and females have a similar number of cases / females have a higher incidence} (1) • above 57 the number of cases is higher in males (1) • onset of cancer is later in males than females (1)	ACCEPT converse where appropriate ACCEPT men and women throughout ACCEPT positive correlation IGNORE risk for cases ACCEPT 58 ACCEPT 58 NB penalise wrong age once IGNORE just figures quoted	(3)

Question number	Answer	Additional guidance	Mark
2(a)(i)	An answer that includes the following points: • thromboplastin (1) • active site (1) • platelets / (red / white) blood cells / erythrocytes (1)	IGNORE calcium ions / Ca^{++} IGNORE clot / scab	(3)

Question number	Answer	Mark
2(a)(ii)	A The only correct answer is A. B is incorrect because antihypertensives are used to lower blood pressure C is incorrect because platelet inhibitors affect platelets D is incorrect because statins lower blood cholesterol	(1)

Question number	Answer	Additional guidance	Mark
2(b)	- tangent drawn at 2 days (1) - correct answer up to 2 decimal places and units (1)	Example of calculation: ACCEPT straight line touching outside of curve at 2 ACCEPT in range of 2.7 to 4.5 {s day⁻¹ / s per day / s/day} ACCEPT with or without a minus sign	(2)

Question number	Answer	Additional guidance	Mark
3(a)	 (superior) vena cava aorta / aortic arch pulmonary artery pulmonary vein	IGNORE ascending / descending DO NOT ACCEPT inferior All 4 correct for 3marks 3 correct for 2 marks 1 or 2 correct for 1 mark	(3)

Question number	Answer	Mark																				
3(b)	<table><tr><th>Structures</th><th>Present in arteries only</th><th>Present in capillaries only</th><th>Present in veins only</th><th>Present in arteries, capillaries and veins</th></tr><tr><td>Lining of endothelial cells</td><td></td><td></td><td></td><td>X</td></tr><tr><td>Valves along the length of the blood vessel</td><td></td><td></td><td>X</td><td></td></tr><tr><td>Wall only one cell thick</td><td></td><td>X</td><td></td><td></td></tr></table>	Structures	Present in arteries only	Present in capillaries only	Present in veins only	Present in arteries, capillaries and veins	Lining of endothelial cells				X	Valves along the length of the blood vessel			X		Wall only one cell thick		X			(3)
Structures	Present in arteries only	Present in capillaries only	Present in veins only	Present in arteries, capillaries and veins																		
Lining of endothelial cells				X																		
Valves along the length of the blood vessel			X																			
Wall only one cell thick		X																				

Question number	Answer	Additional guidance	Mark
3(c)	An answer that includes the following points: • {velocity / (blood) flow} decreases as blood flows through the arterioles (1) • {velocity / (blood) flow} low as blood flows through the capillaries (1) • {velocity / (blood) flow} increases as blood flows through the venules (1)	NB penalise ref to blood pressure instead of blood flow once ACCEPT from arteries to capillaries IGNORE descriptions of what happens in arteries ACCEPT slight increase IGNORE constant ACCEPT from capillaries to veins IGNORE descriptions of what happens in veins	(3)
Question number	Answer		Mark
4(a)(i)	B The only correct answer is B. <i>A is incorrect because fructose is a monosaccharide</i> <i>C is incorrect because both glucose and fructose are monosaccharides</i> <i>D is incorrect because fructose is a monosaccharide</i>		(1)

Question number	Answer	Mark
4(a)(ii)	C peptide condensation The only correct answer is C. <i>A is incorrect because ester bonds are in lipids</i> <i>B is incorrect because ester bonds are in lipids and hydrolysis splits bonds</i> <i>D is incorrect because hydrolysis splits bonds</i>	(1)

Question number	Answer	Mark
4(a)(iii)	B absent lower The only correct answer is B. <i>A is incorrect because saturated fatty acids have more hydrogens than unsaturated fatty acid of same length</i> <i>C is incorrect because there are no carbon carbon double bonds in saturated fatty acids</i> <i>D is incorrect because there are no carbon carbon double bonds in saturated fatty acids</i>	(1)

Question number	Answer	Additional guidance	Mark
4(b)(i)	• volume of cylinder calculated (1) • ratio of surface area : volume to max 2 dps (1)	Example of calculation: $(3 \times 2 \times 2 \times 28 / \pi \times 2 \times 2 \times 28 / ^{22}/_7 \times 2 \times 2 \times 28) 336 / 352 \text{ (mm}^3\text{)}$ e.g 1.02 : 1 / 1.07 : 1 / 1 : 1 ACCEPT ratio given the wrong way round e.g. 1 : 09 NB ecf if {incorrect rounding from above / diameter used} for 1 mark	(2)

Question number	Answer	Additional guidance	Mark
4(b)(ii)	An explanation that includes two of the following points: • (because the insect is small) the cells will not be far from the {sinuses / blood} (1) • (so) diffusion can supply the {oxygen / nutrients / named nutrient} (from the blood) (1) • because the insect is small it does not have {double circulation / blood vessels / closed circulatory system / complex circulatory system / high pressure} OR • because the insect has a low {metabolic rate / oxygen demand} (1) • diffusion can supply the oxygen (from blood / tracheoles) / the oxygenated and deoxygenated blood <u>does not need to be kept separate</u> (1) • because the insect is small it does not have {double circulation / blood vessels / closed circulatory system / complex circulatory system / high pressure}	IGNORE ref to surface area to volume ratio ACCEPT small diffusion distance between cells and {sinuses / blood} ACCEPT remove carbon dioxide diffusion supplies oxygen to cells from the tracheoles IGNORE has an open system because this is in the question IGNORE has an open system because this is in the question	(2)

Question number	Answer	Additional guidance	Mark
4(b)(iii)	A description that includes two of the following points: • fibrous protein (1) • {triple / three stranded} helix (held with hydrogen bonds) (1) • (short) repeating sequences of amino acids / high {hydroxyproline / proline / glycine} content / every third amino acid is glycine (1)	IGNORE refs to secondary / tertiary / quaternary structure throughout NB piece together IGNORE alpha	(2)

Question number	Answer	Additional guidance	Mark
5(a)	An explanation that includes the following points: • because the rate of miscarriage increases with (increase in) age (1) • there is no evidence age is causing the miscarriage (1)	ACCEPT directly proportional to each other it shows that an increase in one variable is reflected by an increase in the other variable ACCEPT no evidence of causation	(2)

Question number	Answer	Additional guidance	Mark
5(b)(i)	An explanation that includes the following points: - aneuploidy results in miscarriage because the screened embryos result in fewer miscarriages (1) - other {factors / named factor} cause miscarriages because {screened embryos / embryos that do not have aneuploidy} are miscarried (1)	ACCEPT converse where appropriate e.g. age, mutations, the process of implanting embryos, smoking, alcohol, dietary factors IGNORE lifestyle / screening causes miscarriage	(2)

Question number	Answer	Additional guidance	Mark
5(b)(ii)	An explanation that includes three of the following points: - because no indication of sample size (1) - because no statistics presented (1) - because no idea how many of the unscreened embryos had aneuploidy (1) - other {lifestyles / factors / named factor} not {taken into account / not shown} (1) - false (negative / positive) results (1)	ACCEPT small sample size IGNORE age / sex	(3)

Question number	Answer	Additional guidance	Mark
5(c)	An answer that includes three of the following points: • (preimplantation) screened embryos still result in miscarriages so raising false hopes (1) • issues surrounding the embryos (that have aneuploidy) (1) • false (positive) results resulting in unnecessary {wastage / destruction} of embryos (1) • other (genetic) defects may be found (1)	DO NOT ACCEPT {fetus / baby} e.g. discarding the embryos is unethical ACCEPT false (negative) result leads to use of that embryo	(3)

Question number	Answer	Additional guidance	Mark
6(a)(i)	An answer that includes two of the following points: • (46 / 48 / 94 patients is) not a very large sample size (1) • {18 countries / variety of people} probably means that other variables not taken into account (1) • but AHP is a very rare disorder so not many patients available (1)	IGNORE refs to reliability, validity ACCEPT in the context of 'these' people named variable e.g. lifestyle, diet, other diseases IGNORE sex / age	(2)

Question number	Answer	Additional guidance	Mark
6(a)(ii)	• mass of drug needed for that patient (1) • $\{0.8 / 0.85 / 0.847\} \text{ cm}^3$ (1) OR • volume of drug to give 2.5 mg (1) • $\{0.8 / 0.85 / 0.847\} \text{ cm}^3$ (1)	Example of calculation: $64 \times 2.5 / 160$ IGNORE units ACCEPT cc / mls	(2)
		$2.5 \div 189 / 0.0132275$ ACCEPT cc / mls NB Bald answer of $\{0.8 / 0.85 / 0.847\} \text{ cm}^3$ = 2 marks Bald answer of $\{160 / 0.01 / 0.013 / 0.132\} = 1$ mark	
Question number	Answer	Additional guidance	Mark
6(a)(iii)	• 27% of 48 calculated (1) • 12 / 13 (1)	Example of calculation: $27 \times 48 \div 100 / 12.96$ ACCEPT 25 as an ecf for 1 mark (27% of 94)	(2)

Question number	Answer	Additional guidance	Mark
6(b)(i)	G U C U U U C	All correct = 2 marks One wrong base given OR one wrong base given consistently = 1 mark	(2)

Question number	Answer	Additional guidance	Mark
6(b)(ii)	A description that includes three of the following points: - phosphodiester bonds between (adjacent) {ribose and phosphate / (mono)nucleotides} (in each strand) (1) - covalent bonds attaching base to a {ribose (sugar) / sugar} (1) {hydrogen / H} bonds between (complementary) bases (holding two strands together) (1) {hydrogen / H} bonds holding double helix together (1)	ACCEPT sugar DO NOT ACCEPT deoxyribose ACCEPT between {C and G / U and A} DO NOT ACCEPT between {T and A / other incorrect base pairs} IGNORE incorrect number of H bonds	(3)

Question number	Answer	Additional guidance	Mark
6(b)(iii)	An answer that includes three of the following points: • {no / less / affected} translation of the mRNA (1) • (altered mRNA) affects shape of {protein / active site} (1) • {no / less / slower} haem production (1) • {no / less} (toxic) porphyrin (1)	ACCEPT a description of translation DO NOT ACCEPT transcription / description of transcription ACCEPT no {protein / enzyme} formed	(3)

Question number	Answer	Additional guidance	Mark
*7(a)	Indicative content: Graph: • HDL involved in removal of LDL from blood by liver (SE) • not just level of HDL that influences risk (D) • higher levels of LDL increase risk (D) • risk decreases with increase in HDL (D) • HDL results in uptake of cholesterol by liver (SE) • LDL forms the plaque (SE) • risk is a {combination / ratio} of HDL and LDL levels (SE) • the higher the HDL:LDL ratio the lower the risk (SE) Other risk factors: • the more cholesterol in the blood the more cholesterol to build up the atheroma (SE) • high blood pressure increases chance of damage to endothelial cell layer (SE) • smoking causes high blood pressure (SE) • smoking produces CO that binds to haemoglobin putting strain on heart (SE) • high salt in diet causes high blood pressure (SE) • obesity increases risk because of strain put on heart (SE) • age increases risk because affects heart muscle (SE) • genetic predisposition affects risk (SE) Extended explanation: • damage to the endothelial layer results in an inflammatory response • damage to the endothelial layer causes {build up of cholesterol / plaque} • plaque causes {more cholesterol to build up / blood clot to form coronary artery becomes blocked} • resulting in less oxygen reaching heart {cells / tissues} • heart attack results as <u>heart cells</u> cannot respire	Level 1: 1 mark = 1 {risk factor named / comment on graph} 2 marks = 2 {risk factor named / comment on graph} Or outline of how cholesterol causes CVD ie recall of the story Level 2: 3 marks = 2 simple explanations 4 marks = 3 simple explanations Level 3: 5 marks = as for 4 marks + 1 point from extended explanation 6 marks = as for 5 marks + 2 points from extended explanation	(6)

Question number	Answer	Additional guidance	Mark
7(b)(i)	An answer that includes three of the following points, one of which must be a similarity for full marks: Similarities • both contain ApoA-1(1) • both contain a phospholipid layer (1) Differences • altered HDL is larger (1) • altered HDL has more CE (1) • altered HDL has fewer (long-chain polyunsaturated) PC (1)	ACCEPT converse throughout DO NOT PIECE TOGETHER ACCEPT altered HDL has no {ApoM / S1P / RBP4/ CRABP1}	(3)
Question number	Answer	Additional guidance	Mark
7(b)(ii)	An explanation that includes the following points: • less reduction (in the number) of free radicals (1) • therefore {cell damage / damage to lining of blood vessels / oxidative stress} will not be reduced (1) • therefore formation of {plaque / atheroma} will not be reduced (1)	ACCEPT free radicals will not be {reduced / neutralised} IGNORE free radicals won't increase ACCEPT {cell damage / oxidative stress} will occur ACCEPT more plaques NB max 1 mark if not in context of reduced antioxidant properties	(3)

Question number	Answer	Additional guidance	Mark
8(a)(i)	A description that includes the following points: - gene is the {length of DNA / sequence of bases} coding for a (poly)peptide (1) - allele is the (different) {version / form / variation} of the gene (1) - gene for feather colour and <u>allele</u> for {white / black} feathers (1)	ACCEPT protein / sequence of amino acids NB piece together DO NOT ACCEPT speckled feathers	(3)
Question number	Answer	Additional guidance	Mark
8(a)(ii)	A description that includes the following points: - genotype is the combination of alleles (1) - phenotype is the {(observable) characteristics / appearance / traits} (1) - phenotype is the colour of the feathers <u>and</u> genotype is the presence of white and or black alleles (1)	ACCEPT mixture of alleles / the alleles present DO NOT ACCEPT genes ACCEPT feature / ref to colour of feathers IGNORE ref to environment ACCEPT phenotype is {white / black / speckled / mixture of black and white} (feathers) genotype is {WW / BB / WB} or any other letters used NB piece together	(3)

Question number	Answer	Additional guidance	Mark
8(b)	An answer that includes the following points: - parent's genotypes shown as BB and BW (1) - offspring's genotypes shown as BB and BW (1) - number of speckled chicks given as 12 or 13 (1)	ACCEPT other letters, including B and b DO NOT ACCEPT X and Y B for white and W for black ACCEPT other letters, including B and b CE from 1 CE from 2 provided whole number NB Bald answer = 1 mark	(3)

Question number	Answer	Additional guidance	Mark
8(c)(i)	Chi squared (1)	ACCEPT Chi square / X squared / x squared / X^2 / x^2 / χ^2 / χ^2 distribution (test) / chi (test) / closeness of fit / goodness of fit phonetic spellings e.g kai / cai / khi	(1)

Question number	Answer	Additional guidance	Mark																											
8(c)(ii)	An answer that includes the following points: <table border="1"> <thead> <tr> <th rowspan="2">Steps in the calculation for the statistics test</th><th colspan="3">Colour of feathers of chicks</th></tr> <tr> <th>Speckled</th><th>White</th><th>Black</th></tr> </thead> <tbody> <tr> <td>Observed number (O)</td><td>243</td><td>125</td><td>112</td></tr> <tr> <td>Expected number (E)</td><td>240</td><td>120</td><td>120</td></tr> <tr> <td>(O-E)</td><td>3</td><td>5</td><td>-8</td></tr> <tr> <td>$\frac{(O-E)^2}{E}$</td><td>0.0375 9/240</td><td>0.2083 25/120</td><td>0.5333 64/120</td></tr> <tr> <td></td><td>3/80</td><td>5/24</td><td>8/15</td></tr> </tbody> </table>	Steps in the calculation for the statistics test	Colour of feathers of chicks			Speckled	White	Black	Observed number (O)	243	125	112	Expected number (E)	240	120	120	(O-E)	3	5	-8	$\frac{(O-E)^2}{E}$	0.0375 9/240	0.2083 25/120	0.5333 64/120		3/80	5/24	8/15	All correct = 2 marks One row correct = 1 mark ACCEPT 8 DO NOT ACCEPT -3 / -5 ACCEPT 2 or 3 or 4 dps but not necessarily consistently the same number. DO NOT ACCEPT recurring	(2)
Steps in the calculation for the statistics test	Colour of feathers of chicks																													
	Speckled	White	Black																											
Observed number (O)	243	125	112																											
Expected number (E)	240	120	120																											
(O-E)	3	5	-8																											
$\frac{(O-E)^2}{E}$	0.0375 9/240	0.2083 25/120	0.5333 64/120																											
	3/80	5/24	8/15																											
8(c)(iii)	0.8 / 0.78 / 0.779 / 0.7791 (1)	CE / rounding effect from (c)(ii) DO NOT ACCEPT 0 NB 187/240 = 0.7792	(1)																											

Question number	Answer	Additional guidance	Mark
8(c)(iv)	An explanation that includes two of the following points: • {calculate / use} the number of degrees of freedom • use (a probability) value of (up to or equal to) 5%/0.05 (1) • compare (calculated) {value / result} to (critical) value (1) • if the (calculated) {value / result} is greater than (critical) value then null hypothesis is rejected (1)	ACCEPT description of how to work out degrees of freedom NB mp 4 alone = 2 marks ACCEPT the converse argument any quoted figures for the calculated value	(2)



Mark Scheme (Results)

January 2022

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

Question number	Answer	Additional guidance	Mark
1(a)	The correct answer is C A is incorrect because starch is insoluble in water and consists of amylose and amylopectin is insoluble in water B is incorrect because starch is insoluble in water and consists of amylose and amylopectin is insoluble in water D is incorrect because starch has 1-4 bonds as well as 1-6		(1)

Question number	Answer	Additional guidance	Mark
1(b)(i)	An answer that includes the following points: - glycosidic (1) (α) glucose (1) - fructose (1) - galactose (1)	IGNORE 1-4 / 1-6 IGNORE α and β IGNORE α and β	(4)

Question number	Answer	Additional guidance	Mark
1(b)(ii)	condensation (reaction) (1)	ACCEPT polymerisation	(1)

Question number	Answer	Additional guidance	Mark
1(b)(iii)	The correct answer is C A is incorrect because the molecular mass is $180 + 180 - 18 = 342$ B is incorrect because the molecular mass is $180 + 180 - 18 = 342$ D is incorrect because the molecular mass is $180 + 180 - 18 = 342$		(1)

Question number	Answer	Additional guidance	Mark
2(a)(i)	The correct answer is B A is incorrect because the aorta takes blood away from the left hand side of the heart C is incorrect because pulmonary vein returns blood to the left hand side of the heart D is incorrect because the vena cava returns blood to the right atrium		(1)

Question number	Answer	Additional guidance	Mark
2(a)(ii)	The correct answer is A B is incorrect because stage F which is ventricular systole C is incorrect because F is ventricular systole D is incorrect because F is ventricular systole		(1)

Question number	Answer	Additional guidance	Mark
2(b)(i)	- values read from the graph and subtracted to give the time for one heart beat (1) 75.0 (1)	0.8 / any pair of values that give 0.8 when subtracted DO NOT ACCEPT 75 ECF from mp 1 if values correspond to readings from graph Bald answer of 75.0 = 2 marks Bald answer of 75 = 1 mark	(2)

Question number	Answer	Additional guidance	Mark
2(b)(ii)	An answer that includes three of the following points: - graph will be {the same / similar in} {shape / position} (1) - because the left hand side and right hand side beat simultaneously (1) - peaks will be lower (1) - because pressure in right hand side is lower {as blood is only pumped to <u>lungs</u> / to prevent damage to <u>alveoli</u>} (1)	NB 'It' refers to the line for the right ventricle NB accept converse where appropriate ACCEPT line ACCEPT description e.g. both ventricles contract at the same time IGNORE graph lower down ACCEPT because right ventricle has {less muscle / thinner walls} as blood is only pumped to <u>lungs</u> less force to <u>lungs</u> NB If candidate says that there is something drawn on the graph you must send it to review	(3)

Question number	Answer	Additional guidance	Mark
3(a)	A description that includes the following points: • contain {deoxyribose / pentose / 5 carbon sugar}, phosphate and bases (1) • (mononucleotides / bases) held together by hydrogen bonds (1) • between {complementary bases / named example} (1)	NB ignore statements clearly relating to RNA ACCEPT pair contains purine and pyrimidine / (mono)nucleotide contains either purine or pyrimidine phosphate group / PO_4^{3-} DO NOT ACCEPT P / Pi / wrong formulae IGNORE stated number of H bonds ACCEPT A / T / C / G IGNORE descriptions of mononucleotides joined by phosphodiester bonds in a strand NB points can be awarded from clearly labelled diagrams	(3)

Question number	Answer	Additional guidance	Mark
3(c)(i)	An explanation that includes the following points: • bind to each strand of the DNA (to initiate replication) (1) • credit function of DNA polymerase (1) • so that the DNA can be synthesised in both directions (1)	ACCEPT works at both ends of the bubble IGNORE ref to 3' / 5' e.g. lines up nucleotides (along each strand) forms phosphodiester bonds (between adjacent nucleotides) repairs mistakes in replication IGNORE forms hydrogen bonds between nucleotides	(2)

Question number	Answer	Additional guidance	Mark
3(c)(ii)	An answer that includes the following points: • to speed up the process (of DNA synthesis) (1) • so that S phase {is shorter / lasts 8 hours and not 833 hours} (1) • so that cell division is fast enough (1)	ACCEPT wrong figures implied from a wrong calculation	(3)

Question number	Answer	Additional guidance	Mark
4(a)	the {length of DNA / sequence of (DNA) bases} that code for {amino acids / (poly)peptide / protein} (1)	ACCEPT nucleotides for bases primary structure of protein	(1)

Question number	Answer	Additional guidance	Mark
4(b)	An explanation that includes the following points: - because the mutation is in the gene coding for the CFTR (protein) (1) - therefore the CFTR (protein) does not function correctly (1) - credit details of dysfunction (resulting in very thick sticky mucus) (1) - therefore the mucus will be (very) {thick / sticky} (1)	ACCEPT mutation in CFTR gene ACCEPT change in structure e.g. reduced transport of chloride ions out of the cell sodium ions move into the cell water leaves the mucus and enters the cell	(3)

Question number	Answer	Additional guidance	Mark
4(c)	An answer that includes three of the following points: • couples (both) carrying one copy of the mutation can be identified (1) • they can then make (an informed) {decision / choice} (about having a child) (1) • credit an example of their options (1) • resulting in fewer babies being born who are homozygous (1)	ACCEPT couples who are (both) heterozygous / have a CF allele DO NOT ACCEPT choose which embryos to implant e.g not having a child / adoption / IVF DO NOT ACCEPT have an abortion ACCEPT two copies of the mutation fewer heterozygous babies born	(3)

Question number	Answer	Additional guidance	Mark
5(a)(i)	A description that includes three of the following points: • fibrous protein (1) • (protein) composed of {three polypeptide chains / three-stranded / triple} <u>helix</u> (1) • held by hydrogen bonds (between the chains) (1) • credit details of the chains (1)	e.g every third amino acid is a glycine, repeating sequences of amino acids, high content of {glycine / proline / hydroxyproline}	(3)

Question number	Answer	Additional guidance	Mark
5(a)(ii)	An explanation that includes the following points: • gives (the wall) (tensile) strength (1) • so that the aorta {does not get damaged by / can withstand} pressure (of the blood leaving the heart) (1)	IGNORE refs to elastic properties and recoil IGNORE prevents aorta from collapsing	(2)

Question number	Answer	Additional guidance	Mark
5(b)	Indicative content: Graph 1 - older male monkeys have more stiffness than younger males (D) - older female monkeys have more stiffness than younger females (D) - older males have more stiffness than older females (D) - probably significant as error bars do not overlap (C) - not much difference in stiffness between younger males and females (D) - as error bars overlap (C) - age increases aortic stiffness in both males and females (C) - age has a greater effect on aortic stiffness in males than females (C) Graph 2 - density of collagen decreases slightly with age (D) - males of all ages have (slightly) more collagen than females (C) - probably not significant as error bars overlap (C) - neither age nor sex affects density of collagen (C) - changes in stiffness do not appear to be related to the density of collagen (C) Graph 3 - higher type 1 in younger monkeys than older ones (D) - more type 1 in females than males at each age (D) - no error bars shown to judge significance (C) Graph 4 - more type 8 in older male monkeys (D) - may not be a difference in type 8 between older and younger females (D) - no error bars to judge significance (C) - the type of collagen appears to determine stiffness (C) - stiffness associated with decrease in type 1 and increase in type 8 (C)	Level 1 1 mark = description made from one graph (D) 2 marks = descriptions made from two graphs (D) Level 2 3 marks = plus one conclusion made (C) 4 marks = plus two conclusions made (C) Level 3 5 marks = two conclusions and comments on the other two graphs 6 marks = three conclusions that includes the asterisked conclusion (C*) and comments on the other two graphs Description = comparison of one variable Conclusion = summary statement that includes both age and sex interpretation of error bar and significance of data – not reliability links between 2 graphs	(6)

Question number	Answer	Mark
6(a)(i)	The only correct answer is D A is incorrect because diffusion does not use proteins B is incorrect because diffusion does not use proteins C is incorrect because diffusion does not use proteins	(1)

Question number	Answer	Mark
6(a)(ii)	The only correct answer is B A is incorrect because diffusion does not use energy C is incorrect because facilitated diffusion does not use energy D is incorrect because facilitated diffusion does not use energy	(1)

Question number	Answer	Mark
6(a)(iii)	The only correct answer is B A is incorrect because solutes can move against their concentration gradient in active transport C is incorrect because solutes can move against their concentration gradient in active transport D is incorrect because solutes can move against their concentration gradient in active transport	(1)

Question number	Answer	Additional guidance	Mark
6(b)	An explanation that includes the following points: • (free water molecules) because some water molecules are {restricted / prevented} from movement (1) • (partially permeable membrane} because membrane allows some (types of) molecules to pass through it (1) • (down a water potential gradient) because water molecules move {from a dilute solution to a more concentrated one / from a high osmotic potential to a lower one / from a high solute potential to a lower one} (1)	ACCEPT a description ACCEPT from a low concentration of solute to a high concentration of solute from hypotonic to hypertonic solution IGNORE from a high water concentration to a lower one	(3)

Question number	Answer	Additional guidance	Mark
*6(c)	Indicative content: • water content decreases when crabs first moved (D) • because water passes out of cells by {osmosis / description of osmosis} (E) • water content then increases gradually (D) • because of the increase in amino acid concentration (E) • amino acid increases (D) • sharply at first and then rate decreases (D) • because {insoluble / muscle} proteins broken down into amino acids (E) • by hydrolysis (E) • because crab eats more {protein / amino acids} (E) • which is digested into amino acids (E) • which are taken up into the cells by {active transport / facilitated diffusion} (from the blood) (E) • water content increases because the amino acid content increase (E) • which makes the cytoplasm more concentrated than the sea water (E) • therefore crabs do not die from dehydration (E)	Level 1 1 mark = simple description of one graph 2 marks = simple description of both graphs Level 2 3 marks = and a simple explanation of one graph 4 marks = and a simple explanation of both graphs Level 3 5 marks = a simple explanation of one graph and a more detailed explanation for the other graph 6 marks = a more detailed explanation for both graphs	(6)

Question number	Answer	Mark
7(a)(i)	The only correct answer is A B is incorrect because a person can modify their alcohol intake C is incorrect because a person can modify their blood pressure D is incorrect because a person can change their level of activity	(1)

Question number	Answer	Additional guidance	Mark
7(a)(ii)	An explanation that includes the following points: • because many factors cause CVD (1) • different drugs treat different conditions (1)	ACCEPT two named drugs and what they treat IGNORE wrong drugs	(2)

Question number	Answer	Additional guidance	Mark
7(b)(i)	An explanation that includes the following points: • because antioxidants reduce free radicals (1) • therefore {cell damage / damage to lining of blood vessels / oxidative stress} will be reduced (1) • therefore reducing {plaque / atheroma} formation (due to decreased free radicals) (1)	ACCEPT neutralise / donate electrons to / break down / stabilise IGNORE incorrect consequences	(3)

Question number	Answer	Additional guidance	Mark
7(b)(ii)	An explanation that includes the following points: • {study / data} will not be valid (1) • diet has an impact on CVD (1) • credit an example explained (1)	IGNORE non-dietary factors IGNORE reliability / accuracy ACCEPT {increase risk / decrease risk} in correct context e.g. high salt causes high blood pressure high fibre reduces cholesterol absorption	(3)

Question number	Answer	Additional guidance	Mark
7(b)(iii)	An explanation that includes the following points: • because diet affects a number of risk factors (1) • credit example of change in diet and the risk factor it reduces (1) • credit a second example of change in diet and the risk factor it reduces (1)	IGNORE non-dietary examples e.g. salt intake can be reduced to lower blood pressure {saturated / animal} fats can be reduced to reduce {cholesterol levels / atheroma formation} unsaturated fats can be increased to reduce {cholesterol levels / atheroma formation}	(2)

Question number	Answer	Additional guidance	Mark
8(a)(i)	• GUG	ACCEPT guanine uracil guanine / CAC / cytosine adenine cytosine IGNORE val / valine	(1)

Question number	Answer	Additional guidance	Mark
8(a)(ii)	substitution	DO NOT ACCEPT frameshift / deletion / addition / insertion IGNORE {gene / point} mutation	(1)

Question number	Answer	Additional guidance	Mark
8(a)(iii)	An answer that includes the following points: - the R groups (of these two amino acids) have different {properties / bonding} (1) - glu may have repelled polar groups on other haemoglobin molecules (1) {val / hydrophobic R group / hydrophobic part} might form other (hydrophobic) interactions (with other haemoglobin molecules) (1) (part of haemoglobin containing) val (R group) turns away from {water / cytoplasm} (1)	ACCEPT amino acids have different properties ACCEPT bonds / Van der Waals DO NOT ACCEPT incorrect named bonds ACCEPT repels water DO NOT ACCEPT blood / plasma	(3)

Question number	Answer	Additional guidance	Mark
8(b)	- number of non-affected babies calculated (1) $0.002 : 1 / 2 \times 10^{-3} : 1$ (1)	(140 million - 305 800 =) 139 694 200 0.002189 ACCEPT 0.0022 / 0.00219 / 0.002189 ACCEPT 1 : 457 / 456.8 NB 1 mark for 1 : 458 / 1 : 457.8 0.002184 : 1 (0.002 / 0.0022 / 0.0218) Bald answer = 2 marks	(2)

Question number	Answer	Additional guidance	Mark
8(c)(i)	- values read correctly from the graph (1) 3.3 / 3.4 (1)	ACCEPT 4.4 / 4.9 and 5.7 / 5.8 / 7.7 / 7.8 ACCEPT ecf for correct subtraction using {4.4 / 7.7 / 7.8} and one incorrect value Bald answer = 2 marks	(2)

Question number	Answer	Additional guidance	Mark
8(c)(ii)	An answer that includes the following points: • person without the disease has higher saturation than person with the disease (at all partial pressures of oxygen) (1) • there is {greater variability / wider range} (in the saturation) of a person with the disease than a person without the disease (at a particular partial pressure of oxygen) (1)	NB accept converse throughout but all conclusions must be comparative ACCEPT refs to affinity (for oxygen) IGNORE graph shifted	(2)

Question number	Answer	Additional guidance	Mark
8(c)(iii)	• 120 (days) (1)		(1)

Question number	Answer	Additional guidance	Mark
8(c)(iv)	An explanation that includes three of the following points: • (change in structure of haemoglobin) haemoglobin {binds / carries} less oxygen (1) • (shape of red blood cell) smaller surface area so less oxygen <u>diffuses</u> in / red blood cells get lodged in blood vessels preventing flow of blood to cells (1) • therefore less oxygen to {cells / tissues} so {less available for (aerobic) <u>respiration</u> / switch to <u>anaerobic respiration</u>} (1) • credit an example of why less oxygen to cells could be fatal (1)	NB accept converse where appropriate ACCEPT named cell / tissue e.g. heart attack, stroke, sepsis, infection	(3)

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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 <i>A is incorrect because cholesterol is not part of the wound</i> <i>B is incorrect because collagen is inside the artery wall</i> <i>D is incorrect because fibrinogen is soluble</i>		(1)

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

Question number	Answer	Additional guidance	Mark
2(c)	The correct answer is C, 3 <i>B is incorrect because fibrin is the only insoluble molecule in the list</i> <i>C is incorrect because fibrin is the only insoluble molecule in the list</i> <i>D is incorrect because fibrin is the only insoluble molecule in the list</i>		(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 <i>A is incorrect because enzymes are proteins</i> <i>B is incorrect because enzymes are proteins</i> <i>D is incorrect because enzymes are proteins</i>		(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)

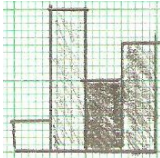
Question number	Answer	Additional guidance	Mark
3(c)(ii)	• because the {enzyme is denatured / active site to change shape / bonds to break} (1)	DO NOT ACCEPT starts to	(1)

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	1,507.9644737231007544620688239742
3. Length	42.666666666666666666666666666667 42.7	40.764331210191082802547770700637 40.8	40.743665431525205956834243423363 40.7

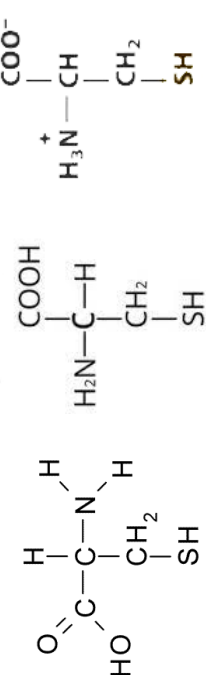
Question number	Answer	Additional guidance	Mark
4(b)	An explanation that includes the three of the following points: • blood in aorta is under higher pressure as it has just been pumped out of the {heart / (left) ventricle} (1) • aorta branches into many arteries / (blood flowing through) more vessels (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,  <i>B is incorrect because arteries have a high proportion of elastic fibres</i> <i>C is incorrect because arteries have an endothelial lining</i> <i>D is incorrect because artery walls contain collagen</i>		(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: • β {pleated / sheet} / α helix (1) • (held together by) hydrogen bonds (between amino acids) (1)	DO NOT ACCEPT {double helix / triple helix} even if β 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 than 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)

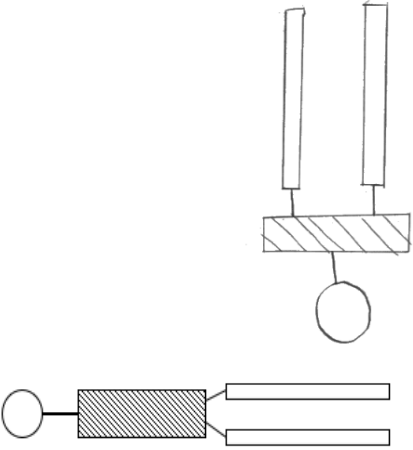
Question number	Answer	Additional guidance	Mark
6(a)(iii)	An explanation that includes three of the following points: - lifestyle can be modified (to reduce the risk / slow down progression) (1) - they could have a {blood / health} test (to assess the risk / check on the progression) (1) - medication 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 <i>A is incorrect because anticoagulants do not reduce blood pressure or blood cholesterol levels</i> <i>B is incorrect because anticoagulants do not reduce blood pressure or blood cholesterol levels</i> <i>C is incorrect because platelet inhibitors do not reduce blood pressure or blood cholesterol levels</i>	(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 <table><tr><th>Has double bonds between two carbons</th><th>Number of hydrogens</th></tr><tr><td>yes</td><td>fewer than the saturated fatty acid</td></tr></table> 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	Has double bonds between two carbons	Number of hydrogens	yes	fewer than the saturated fatty acid	(1)
Has double bonds between two carbons	Number of hydrogens					
yes	fewer than the saturated fatty acid					

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 <u>base</u> being inserted into the mRNA (during transcription) (1) - the genetic <u>code</u> 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's 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)

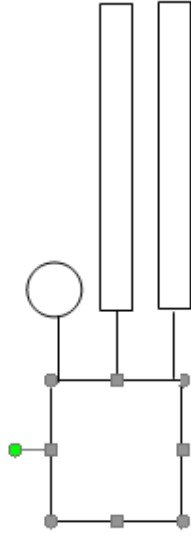
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Mark Scheme (Results)

October 2022

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

Question number	Answer	Additional guidance	Mark
1(a)(i)	A diagram that makes reference to the following points: - one glycerol (squarish / labelled), two fatty acids (rectangular / 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 two fatty acids attached to head with bonds - bonds missing but all four components are touching correctly	(2)

Question number	Answer	Mark
1(a)(ii)	The only correct answer is A (ester) <i>B is incorrect because glycosidic bonds are found in carbohydrates</i> <i>C is incorrect because there are no hydrogen bonds in phospholipids</i> <i>D is incorrect because peptide bonds are found in proteins</i>	(1)

Question number	Answer	Mark
1(b)(i)	The only correct answer is B (by diffusion) <i>A is incorrect because active transport moves polar molecules</i> <i>C is incorrect because nonpolar molecules can diffuse through the nonpolar fatty acids</i> <i>D is incorrect because only water moves by osmosis</i>	(1)

Question number	Answer	Mark
1(b)(ii)	The only correct answer is B (one) <i>A is incorrect because the second statement is the only correct one</i> <i>C is incorrect because the second statement is the only correct one</i> <i>D is incorrect because the second statement is the only correct one</i>	(1)

Question number	Answer	Mark
2(a)	The only correct answer is D (vena cava) <i>A is incorrect because the diagram shows a blood vessel bringing blood back into the right atrium</i> <i>B is incorrect because the diagram shows a blood vessel bringing blood back into the right atrium</i> <i>C is incorrect because the diagram shows a blood vessel bringing blood back into the right atrium</i>	(1)

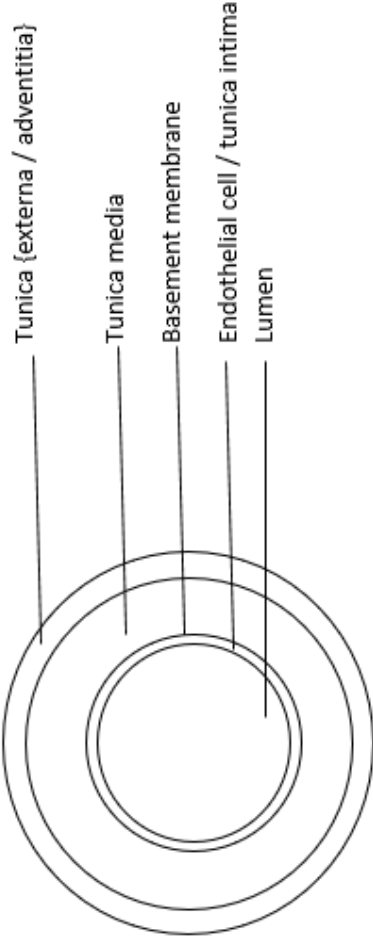
Question number	Answer	Additional guidance	Mark
2(b)(i)	• (cardiac) diastole (1)	ACCEPT (heart / complete / total / ventricular <u>and</u> atrial / atrioventricular) diastole DO NOT ACCEPT diastole / dystole / ventricular diastole / systic diastole	(1)

Question number	Answer	Additional guidance	Mark
2(b)(ii)	An answer that makes reference to the following points: - length of one heart beat calculated (1) $0.06 / 0.061 / 0.0608$ (1)	Example of calculation $0.82191780821917808219178082191781$ $6 / 6.1 / 6.08 \%$ $5/82$ Ecf if $73 \div 60$: $0.04 / 0.041 / 0.0411$ $4 / 4.1 / 4.11 \%$ $3/73$ Bald answer score two marks Bald answer with incorrect number of decimal places scores 1 mark.	(2)

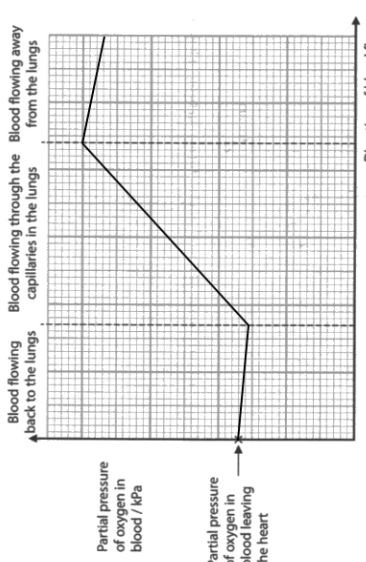
Question number	Answer	Additional guidance	Mark
2(c)(i)	$104 / 104.17 / 104.2$ (1)		(1)

Question number	Answer	Additional guidance	Mark
2(c)(ii)	An explanation that makes reference to the following points: • to delay the movement of the impulse across the (atrioventricular) septum (1) • so that the atria can finish emptying (1) • so that the atrioventricular valves can close (1)	ACCEPT to delay the contraction of the ventricles ACCEPT so that ventricles can fill NB Accept answers that refer to right atrium and right ventricle	(2)

Question number	Answer	Additional guidance	Mark
3(a)	A description that makes reference to the following points: • one structure (1) • linked function (1)	e.g. single layer of cells / pores / small diameter ACCEPT thin cells / walls e.g. (single layer) gas exchange / diffusion of gases (in the lungs) (pores) plasma forced out / WBC leave / molecules can leave (small diameter) all cells close to capillaries	(2)

Question number	Answer	Additional guidance	Mark
3(b)	A drawing that shows the following points: • lumen + {three layers / three other layers + endothelial layer / two layers + endothelial layer} (1) • one feature correctly labelled (1) • a second feature correctly labelled (1)	 ACCEPT Epithelial {layer / lining / cells} / fenestrated membrane Tunica interna Layer of (smooth) muscle <u>and</u> elastic fibres (and collagen) for 1 layer Award marks for longitudinal section NB regards mp 2 and 3 1 right + 1 wrong label = 1 mark 2 right + 1 wrong label = 1 mark 1 right + 2 wrong labels = 0 marks	(3)

Question number	Answer	Additional guidance	Mark
3(c)	An explanation that makes reference to the following points: • to prevent backflow (of blood) (1) • (as blood is usually returning) {under low pressure / (often) against gravity} (1)	ACCEPT so that blood returns to the heart blood flow is in one direction	(2)

Question number	Answer	Additional guidance	Mark
3(d)	A drawing that shows the following points: • pp of O₂ remaining constant as blood flows to lungs (1) • pp of O₂ rising as blood flows through the capillaries (1) • pp of O₂ remaining constant as blood flows away from lungs (1)	ACCEPT within 1 sm square of the verticals in each section ACCEPT slightly decreasing (within 1 large square) ACCEPT slightly decreasing (within 1 large square) 	(3)

Question number	Answer	Additional guidance	Mark
4(a)	An answer that makes reference to the following points: • {protein / found in organisms} (1) • that {decreases activation energy / speeds up (the rate of) reaction} (without being used up) (1)	ACCEPT in our {bodies / cells / cytoplasm} / in a named organism ACCEPT description of activation energy	(2)

Question number	Answer	Mark
4(b)	The only correct answer is B (Q) <i>A is incorrect because Q is the activation energy</i> <i>C is incorrect because Q is the activation energy</i> <i>D is incorrect because Q is the activation energy</i>	(1)

Question number	Answer	Additional guidance	Mark
4(c)	An explanation that includes the following points: • substrate {binds / fits / forms enzyme-substrate complex} to the <u>active site</u> of the enzyme (1) • due to the <u>shape</u> of the {active site / enzyme / substrate} (1) • which is due to the {R groups / amino acids} (forming the active site) (1) • AB <u>and</u> AC {are a different shape to A and B / do not fit into E₁} (1)	ACCEPT are not complementary to (E ₁) enzyme	(3)

Question number	Answer	Additional guidance	Mark
4(d)	A description that includes the following points: • pH 4 is the {most suitable / best} pH (1) • 30°C is the {most suitable / best} temperature (1) • pH 2 <u>and</u> 60°C (both) denature the enzyme (1)		(2)

Question number	Answer	Additional guidance	Mark
5(a)	Fick's (Law of Diffusion) (1)		(1)

Question number	Answer	Additional guidance	Mark
5(b)	The only correct answer is C (it will halve) <i>A is incorrect because the value will halve</i> <i>B is incorrect because the value will halve</i> <i>D is incorrect because the value will halve</i>		(1)

Question number	Answer	Additional guidance	Mark
5(c)	A description that includes the following points: • lots of alveoli for large surface area (1) • {single-celled / thin-walled} {alveoli / capillaries} for short diffusion distance (1) • good blood supply for high concentration gradient (1)	ACCEPT lots of capillaries for large surface area air sacs for alveoli ref to lots of alveoli <u>and</u> thin-walled <u>and</u> good blood supply = 1 mark if no other marks awarded	(3)

Question number	Answer
*5(d)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material indicated as relevant. Additional content included in the response must be scientific and relevant. Structure • salamanders have both lungs and their skin for more gas exchange • lungs allow oxygen from air and skin oxygen from water • the skin is folded to increase surface area • flattened body to increase surface area • so that gas exchange will be faster • skin has a good blood supply so that there will be high concentration gradient • skin is very permeable to gases so that they can diffuse in faster Behaviour • salamanders live in fast-flowing water which will have high levels of oxygen • shallow water will also have higher levels of oxygen • shallow water will make breathing with lungs easier • the rocking / swaying movements stir up the water • which helps to aerate the water • so that water with higher oxygen content is in contact with their skin • so that there is a higher concentration gradient • so that {gas exchange / diffusion of gases} will be faster • the rocking / swaying maintains the levels of oxygen in the blood Graph • at low levels of oxygen in the water the frequency of rocking is high • accompanied by an increase in blood pO_2 • as oxygen levels in the water increase the frequency of rocking decreases • but the blood pO_2 continues to increase • sufficient oxygen in water to diffuse into lungs and skin • to maintain levels of oxygen • rocking stops to conserve energy (6)

Level 0	0	No awardable content	Additional guidance
Level 1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context.	Simple links made between gas exchange and information given or own knowledge 1 mark = 1 comment which can include a description of data 2 marks = 3 comments which can include a description of data
Level 2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts / concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows some linkages and lines of scientific reasoning with some structure.	Extended links made between gas exchange and information given 3 marks = comments on both structure and behaviour with extended comment on one 4 marks = extended comments made on both structure and behaviour
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant biological facts / concepts. Consequences are discussed which supported throughout by sustained linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.	Understanding of graph used to support discussion 5 marks = plus some discussion of graph to support answer 6 marks = plus an understanding of the relationships shown in the graph

Question number	Answer	Mark
6(a)	The only correct answer is C (two) <i>A is incorrect because thromboplastin is an active enzyme found in the platelets but is not converted into thrombin</i> <i>B is incorrect because thromboplastin is an active enzyme found in the platelets but is not converted into thrombin</i> <i>D is incorrect because thromboplastin is an active enzyme found in the platelets but is not converted into thrombin</i>	(1)

Question number	Answer	Additional guidance	Mark
6(b)	An answer that includes the following points: • 1.8 to 3.5 (1) • below 1.8 there is a high risk of stroke (1) • above 3.5 there is an increased risk of bleeding (within the skull) (1) OR • 1.8 to 2.5 (1) • below 1.8 there is a high risk of stroke (1) • above 2.5 the risk of bleeding (within the skull) starts to increase (1) OR • 2.0 to 2.5 (1) • both risks are low / they are the lowest (combination) (1) • 3.1-3.5 has a lower risk of stroke but a higher risk of bleeding (1)	ACCEPT other ranges {have either high risk of bleeding or high risk of stroke / both risks are low} = 1 mark if mp 2 and 3 not awarded ACCEPT other ranges {have either higher risk of bleeding or high risk of stroke / both risks are low} = 1 mark if mp 2 and 3 not awarded	(3)

Question number	Answer	Additional guidance	Mark
6(c)	An explanation that includes the following points: • warfarin reduces {a blood clot forming / thrombosis} (1) • (if a blood clot does not form) it cannot block the <u>coronary artery</u> (1) • if oxygen is supplied to the heart {muscle / cells} it will continue to {contract / respire} (1)	ACCEPT no blood clots forming less blood clotting reduces blood clot (size)	(3)

Question number	Answer	Additional guidance	Mark
6(d)(i)	• 1012 / 1013 (1)		(1)

Question number	Answer	Additional guidance	Mark
6(d)(ii)	An answer that includes the following points: • select a group of patients who have had a heart attack (1) • of similar {age / sex at birth / background / lifestyle} (as in the first study) (1) • give each person the same quantity of warfarin (used in the first study) (1) • (monitor for) {the same time period / four years} (1) • use of a statistics (1)	ACCEPT other appropriate factors no other health issues ACCEPT in context of one group split into two groups ACCEPT description of double-blind trial / double-blind trial / suitable named statistics test	(4)

Question number	Answer	Mark
7(a)	The only correct answer is A (position R, position P) <i>B is incorrect because P will have a carboxyl group and R will have an amino group (Q will have a carboxyl group)</i> <i>C is incorrect because P will have a carboxyl group and R will have an amino group (Q will have a carboxyl group)</i> <i>D is incorrect because P will have a carboxyl group and R will have an amino group (Q will have a carboxyl group)</i>	(1)

Question number	Answer	Additional guidance	Mark
7(b)(i)	39 / 39.3 / 39.29 (1)		(1)

Question number	Answer	Additional guidance	Mark
7(b)(ii)	0.13 : 1 / 0.1 : 1 / 0.13 / 0.1 (1)	ACCEPT 1 : 7.5 / 1 : 8	(1)

Question number	Answer	Additional guidance	Mark
7(c)	A description that includes the following points: - hydrolysis / using enzymes (1) - of the peptide bonds between P and the connecting chain <u>and</u> R and the connecting chain (1)	ACCEPT protease ACCEPT of peptide bonds between A chain and connecting region <u>and</u> B chain and connecting region	(2)

Question number	Answer	Additional guidance	Mark
7(d)	An answer that includes the following points: Similarities : • alpha glucose (1) • contain C, H and O (only) (1) Differences : • glucose is a monosaccharide and glycogen is a polysaccharide (1) • glycogen has (1-4 / 1-6) glycosidic bonds but glucose does not (1)	DO NOT PIECE TOGETHER	(3)

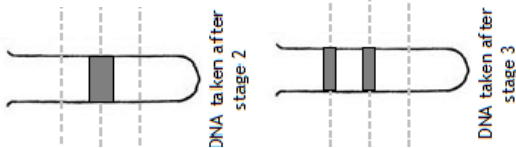
Question number	Answer	Mark
*7(e)	Indicative content: Healthy rats given water • levels of glucose {fell slightly / maintained} (D) • because the healthy rats were producing insulin (E) • so were controlling the blood glucose levels naturally (E) Healthy rats given cinnamon • levels of glucose very slightly lower (D) • as cinnamon was adding to the effect of insulin (CE) OR • levels of glucose very similar (D) • as cinnamon had no (added) effect in healthy rats (CE) Diabetic rats given water • levels of glucose rose (D) • levels of glucose were higher than healthy rats (D) • because diabetic rats had no insulin to control their blood glucose levels (E) Diabetic rats given cinnamon • unhealthy rats given cinnamon had fairly constant levels of glucose (D) • cinnamon lowered blood glucose by moving it into the liver (E) • cinnamon stimulated enzymes to convert glucose into glycogen (E) • so that it could not diffuse back into the blood (E) • levels of glucose were higher than in the healthy rats (D) • because cinnamon not as effective as insulin (CE) • possibly {not absorbed well / worked slowly / did not stimulate so many enzymes} (CE) • fluctuations in levels of glucose (D) • depending on how much glucose is used (E)	(6)

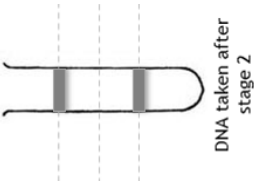
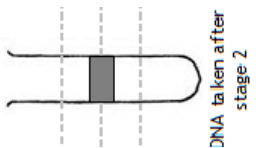
				Additional guidance
Level 0	0	No awardable content		
Level 1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information and with a focus on mainly just one piece of scientific information. The explanation will contain basic information, with some attempt made to link knowledge and understanding to the given context.		Simple descriptions of data with no real attempt of an explanation 1 mark = some description of the data 2 marks = detailed description of the data
Level 2	3-4	An explanation will be given, with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows some linkages and lines of scientific reasoning, with some structure.		Some explanation given using the information given / own knowledge (E) 3 marks = simple explanation of what {cinnamon / insulin} is doing 4 marks = more detailed explanation of how {cinnamon / insulin} decreases glucose level
Level 3	5-6	An explanation is made that is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows a well-developed and sustained line of scientific reasoning, which is clear and logically structured.		Data logically explained with extended use of information provided (CE) 5 marks = plus a comparison made of effectiveness of cinnamon compared to insulin 6 marks = data explained in detail

Question number	Answer	Additional guidance	Mark
8(a)	An explanation that includes the following points: • form base pairs to hold the two {polynucleotide / strands} together (1) • because of the number of hydrogen bonds that each type of base can form (1) • a {large base / purine} bonds with a {small base / pyrimidine} (1) • so that the strands are parallel (1)	ACCEPT adenine and thymine form two hydrogen bonds <u>and</u> guanine and cytosine form three hydrogen bonds ACCEPT single ring bonds to double ring	(3)

Question number	Answer	Additional guidance	Mark
8(b)(i)	• 6.6×10^2 (1)	ACCEPT 6.596×10^2	(1)

Question number	Answer	Additional guidance	Mark
8(b)(ii)	• mass of DNA after three divisions calculated (1) • $\{4 / 4.1 / 4.14 / 4.142\} \times 10^{-14}$ (1)	$(3.1 \times 10^9 \times 8) \ 24.8 \times 10^9$ NB Correct answer but wrong standard form = 1 mark ECF $\{2 / 1.6 / 1.55\} \times 10^{-14} = 1$ mark	(2)

Question number	Answer	Additional guidance	Mark
8(c)(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 half the width of stage 1 (1)	 NB For mp 3, if 1 band is drawn allow 1 mark if same width as the band in stage 1 level and above it	(3)

Question number	Answer	Additional guidance	Mark
8(c)(ii)	A diagram that shows the following points: • bands drawn at the top and bottom of tube (1) • both bands half the width of stage 1 (1)	 NB If 1 band is drawn allow 1 mark if same width as the band in stage 1 and above it	(2)
Question number	Answer	Additional guidance	Mark
8(c)(iii)	A diagram that shows the following points: • one band drawn in the middle (1) • of similar thickness to band in stage 1 (1)		(2)



Mark Scheme (Results)

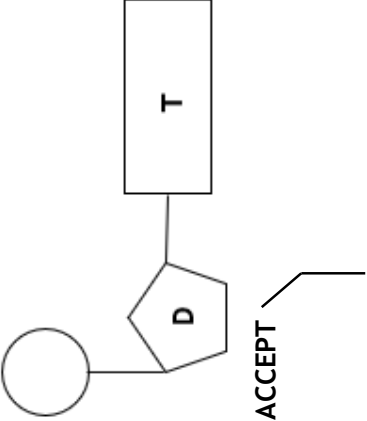
October 2023

Pearson Edexcel International Advanced
Subsidiary Level In Biology (WBI11)

Paper 01

Unit 1: Molecules, Diet, Transportation
and Health

Question number	Answer	Additional guidance	Mark
1(a)	An answer that includes the following points (in order): • phosphodiester (1) • condensation (1) • water (1) • hydrogen (1) • double helix (1)	ACCEPT covalent ACCEPT polymerisation ACCEPT H₂O ACCEPT H DO NOT ACCEPT H₂ DO NOT ACCEPT chromosome	(5)

Question number	Answer	Additional guidance	Mark
1(b)	A drawing that includes the following points: • one base, one phosphate, one sugar, two bonds (1) • all joined together correctly (1) • the base is thymine and the sugar is deoxyribose (1)	 ACCEPT for the bond joining phosphate to sugar ACCEPT phosphate and base the other way round sugar shape + T and P	(3)

Question number	Answer	Mark
2(a)(i)	The only correct answer is B <i>A is incorrect as the arrow labelled Q is the activation energy</i> <i>C is incorrect as the arrow labelled Q is the activation energy</i> <i>D is incorrect as the arrow labelled Q is the activation energy</i>	(1)

Question number	Answer	Mark
2(a)(ii)	The only correct answer is C <i>A is incorrect as monophenol is the reactant and is located at Y</i> <i>B is incorrect as monophenol is the reactant and is located at Y</i> <i>D is incorrect as monophenol is the reactant and is located at Y</i>	(1)

Question number	Answer	Mark
2(a)(iii)	The only correct answer is C <i>A is incorrect as P will stay the same and Q will get shorter as the activation energy decreases</i> <i>B is incorrect as P will stay the same and Q will get shorter as the activation energy decreases</i> <i>D is incorrect as P will stay the same and Q will get shorter as the activation energy decreases</i>	(1)

Question number	Answer	Additional guidance	Mark
2(b)(i)	- tangent drawn at 3 minutes on the outside of the curve (1) - value between 6.5 and 12.6 to max one decimal place (1)	ACCEPT with or without a minus sign Bald correct answer = 2 marks (answer / bald answer} in range but with too many decimal places = 1 mark	(2)

Question number	Answer	Additional guidance	Mark
2(b)(ii)	An explanation that includes two of the following points: • {curve / gradient / graph / fall} will be steeper and {plateau / reach zero sooner} (1) • (optimum temperature results in) more {energy / collisions / enzyme-substrate complexes} (1) • (levels off sooner) substrate will run out (1)		(2)

Question number	Answer	Additional guidance	Mark
3(a)	• 98 (g of protein per person) (1) • 686 (g) (1)	Bald answer of 686 = 2 marks Bald answer of {98 / number with the adjacent numbers 686} = 1 mark	(2)

Question number	Answer	Additional guidance	Mark
3(b)(i)	• transcription and translation (1)		(1)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	A description that includes four of the following points: mRNA • is a copy of the (genetic) {code / information / sequence / DNA / gene} (1) • mRNA {moves / carries code} {out of the nucleus / to the ribosomes} (1) tRNA • {binds to / carries} its specific amino acid (1) • (tRNA) anticodon {binds / pairs} with (mRNA) codon (1) • holds the amino acid {in place / until the peptide bonds have formed} (1)	ACCEPT appropriate / particular / a certain	(4)

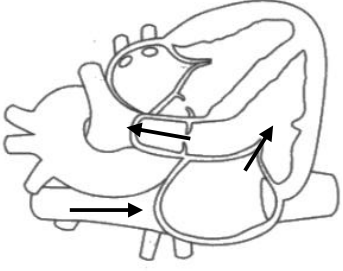
Question number	Answer	Additional guidance	Mark
4(a)	• (India) 71.76 (million) (1) • (Malaysia) 3.2 (1)		(2)

Question number	Answer	Additional guidance	Mark
4(b)(i)	• {16.75 / 16.8 / 17} : 1 (1)		(1)

Question number	Answer	Additional guidance	Mark
4(b)(ii)	An explanation that includes the following points: • because colour blindness is {sex-linked / sex-linkage} (1) • which means the {gene for colour vision / colour blind gene} is located on the X chromosome (1) • therefore males with {faulty / recessive / colour blind} allele will be colour blind (1) • whereas females need to {be homozygous recessive / have two faulty alleles} to be colour blind (1)	ACCEPT X-linked ACCEPT {genetic information / allele} for {colour vision / this disorder} if dominant and recessive alleles shown on X chromosomes in a diagram	(4)

Question number	Answer	Additional guidance	Mark
5(a)(i)	all the {components / molecules / substances} (of the blood) flow (through the vessels) together (1)	ACCEPT - when blood flows from high pressure to low pressure - movement of fluids down a pressure gradient IGNORE temperature {bulk transport of substances /all substances} move in same {direction / speed} - movement of all substances from one exchange surface to another	(1)

Question number	Answer	Additional guidance	Mark
5(a)(ii)	An explanation that includes the following points: • diffusion is too slow (to supply the cells with glucose) (1) ONE FROM THE FOLLOWING : • cells are too far away from the {gut / small intestine / digestive system} / diffusion distance is too great OR • because the concentration gradients (between cells and blood) are too low OR • glucose cannot enter without a carrier protein (1)	ACCEPT because glucose is {large / polar} glucose cannot enter without {facilitated diffusion / active transport / co transport}	(2)

Question number	Answer	Additional guidance	Mark
5(b)	A drawing that includes the following points: • arrows drawn on the RHS of heart only (1) • arrows through a vein, passing into ventricles and leaving through an artery (1)		(2)

Question number	Answer	Additional guidance	Mark
5(c)	An explanation that includes four of the following points: • pressure decreases the {further away from the blood gets from the heart / closer the blood gets to the cells / as the arteries decrease in size} (1) AND THREE OF THE FOLLOWING: • collagen needed for strength in large arteries (1) • elastin needed in large arteries for (elastic) recoil (1) • {elastin / (elastic) recoil / collagen} is needed to prevent {rupturing / damaging} arteries (1) • smooth muscle needed in small arteries to {maintain blood pressure / control blood flow / vasoconstriction} (1)	ACCEPT high pressure in large arteries / low pressure in small arteries ACCEPT elastic fibres	(4)

Question number	Answer	Mark
5(d)(i)	The only correct answer is B <i>A is incorrect as arteries decrease in diameter as they get smaller and veins increase in diameter as they get larger</i> <i>C is incorrect as arteries decrease in diameter as they get smaller and veins increase in diameter as they get larger</i> <i>D is incorrect as arteries decrease in diameter as they get smaller and veins increase in diameter as they get larger</i>	(1)

Question number	Answer	Mark
5(d)(ii)	The only correct answer is B <i>A is incorrect as only capillaries are permeable</i> <i>C is incorrect as only capillaries are permeable</i> <i>D is incorrect as only capillaries are permeable</i>	(1)

Question number	Answer	Mark																								
6(a)	<table><thead><tr><th rowspan="2">Structure</th><th colspan="4">Structure found in</th></tr><tr><th>amylose only</th><th>amylopectin only</th><th>both amylose and amylopectin</th><th>neither amylose nor amylopectin</th></tr></thead><tbody><tr><td>glycosidic bonds</td><td>[x]</td><td>[x]</td><td>☒</td><td>[x]</td></tr><tr><td>1-6 α bonds</td><td>[x]</td><td>☒</td><td>[x]</td><td>[x]</td></tr><tr><td>hydrogen bonds</td><td>[x]</td><td>[x]</td><td>☒</td><td>[x]</td></tr></tbody></table>	Structure	Structure found in				amylose only	amylopectin only	both amylose and amylopectin	neither amylose nor amylopectin	glycosidic bonds	[x]	[x]	☒	[x]	1-6 α bonds	[x]	☒	[x]	[x]	hydrogen bonds	[x]	[x]	☒	[x]	(3)
Structure	Structure found in																									
	amylose only	amylopectin only	both amylose and amylopectin	neither amylose nor amylopectin																						
glycosidic bonds	[x]	[x]	☒	[x]																						
1-6 α bonds	[x]	☒	[x]	[x]																						
hydrogen bonds	[x]	[x]	☒	[x]																						
6(b)	A description that includes the following points: - as temperature increases the loss of amylose increases (in all four sources) (1) {most amylose is lost from cassava / least amylose lost from potato} (at all three temperatures) (1)	(2)																								

Question number	Answer	Additional guidance	Mark
6(c)(i)	An answer that includes three of the following with at least one similarity and one difference: Similarities: • (an increase in temperature causes an) increase in amylose and amylopectin loss (up to 85 and then a decrease) (1) • {the same temperature / a temperature of 85 (°C) causes highest loss of amylose and amylopectin (1) • both lose same quantity at {47 / 64 (°C)} (1) Differences: • amylopectin starts to be lost at lower temperatures (1) • more amylopectin is lost than amylose (overall / above 64°C / except between 47°C and 64°C) (1)	ACCEPT positive correlation (up to 85 (°C)) ACCEPT amylopectin starts to be lost at 20 (°C) and amylose at {40 / just above 40 (°C)} amylopectin lost at greater range of temperatures a temperature of {40 / just above 40 (°C)} causes a loss of amylose but a temperature of 20 °C causes a loss of amylopectin	(3)

Question number	Answer	Additional guidance	Mark
6(c)(ii)	An answer that includes three of the following points: • (water containing) amylose had the higher hardness and (water containing) amylopectin had the higher stickiness OR • (water containing) amylose and amylopectin has the higher (overall) hardness and stickiness (1) • (water containing) amylose contributes to hardness (1) • (water containing) amylopectin contributes to stickiness (1) • no {error bars / standard deviation} so data may not be repeatable (1)	ACCEPT increases ACCEPT increases	(3)

Question number	Answer	Additional guidance	Mark
6(c)(iii)	An answer that includes the following points: • (lid on) so that {cooking fluid / water} is not lost / so more water will be absorbed by rice (1) • so that the {hardness / stickiness} is {desired / correct} (1) OR • (all liquid absorbed) no loss of amylose (1) • so that the {desired / correct} hardness is achieved (1) OR • (all liquid absorbed) no loss of amylopectin (1) • so that the {desired / correct} stickiness is achieved (1)		(2)

Question number	Answer	Additional guidance	Mark
7(a)	A description that includes the following points: • (for) as blood cholesterol levels increase (up to a point) the number of people developing heart disease increases / at high cholesterol levels more people have heart disease (1) • (against) people with low levels of cholesterol are developing heart disease (1)	ACCEPT at (very) high cholesterol levels there are {only people with heart disease / no people who do not have heart disease} ACCEPT {as cholesterol levels increase / at high levels of cholesterol} there are people without heart disease not enough information on the design of the study	(2)

Question number	Answer	Additional guidance	Mark
7(b)	A description that includes the following points: • (LDL increases so does the incidence of heart disease) the height of the bars increase at all HDL concentrations_(1) • (HDL increases the incidence of heart disease decreases) the bars get smaller at all LDL concentrations (1) • (higher the ratio of HDL to LDL the lower the incidence of heart disease) the bars are highest in the back left corner and get smaller towards the front right corner (1)	ACCEPT CVD is high when LDL high and HDL low and CVD is low when HDL is high and LDL is low	(3)

Question number	Answer	Additional guidance	Mark
7(c)(i)	An explanation that includes three of the following points: • because the LDL-R will {bind / fit} to the LDL (1) • and hold it on the {membrane / cell} (1) • membrane forms a vesicle (around the LDL) (1) • due to the fluidity of the membrane (1)	ACCEPT they are complementary ACCEPT description e.g. membrane surrounds the LDL ACCEPT because phospholipids can move (within membrane)	(3)

Question number	Answer	Additional guidance	Mark
7(c)(ii)	An explanation that includes two of the following points: • because the change in pH will change the ionisation of the R groups (1) • so the {binding site / receptor / protein / LDL} will {change shape / denatures} (1) • therefore bonds holding LDL and LDL-R break (1)	ACCEPT charges of R groups ACCEPT active site {H bonds / ionic bonds} {break / form} within {LDL / LDL-R}	(2)

Question number	Answer	Additional guidance	Mark
7(c)(iii)	An explanation that includes three of the following points: • because mutation results in a change the (tertiary) structure of the {receptor / protein / LDL-R} (1) • therefore the LDL-R will no longer {fit / bind} to LDL / endocytosis will not occur (1) • so less LDL is taken into the {cells / liver} / so LDL remains in the blood (1) • and therefore there will be more {cholesterol / LDL} (in the blood) to {bind to any damaged endothelial cells / build up in the walls of the arteries} (1)	ACCEPT {fewer / no} receptors different protein formed active site ACCEPT no longer complementary ACCEPT LDL increases in blood ACCEPT to form {plaque / atheroma} (in the walls of the arteries)	(3)

Question number	Answer	Additional guidance	Mark
8(a)(i)	• total number of deaths in one year calculated (correctly rounded) (1) • $\{6 / 5.8 / 5.77\} \times 10^7$ (1)	57.74193548387 million / $5.774193548387 \times 10^7$ Bald correct answer = 2 marks Bald answer of total number of deaths in one year correctly rounded = 1 mark	(2)

Question number	Answer	Additional guidance	Mark
8(b)(i)	An explanation that includes the following points: • because the antioxidants will reduce free radicals (1) • therefore {cell damage / damage to lining of blood vessels / oxidative stress} will be {reduced / prevented} (1) • (less cell damage / antioxidants) {reduce/ prevent} {plaque / atheroma} formation (1)	ACCEPT neutralise / donate electrons to / break down / stabilise ACCEPT reduces cholesterol build up (3)	

Question number	Answer	Additional guidance	Mark
8(b)(ii)	• not harmful / food source / already in diet (1)		(1)

Question number	Answer	Additional guidance	Mark
*8(b)(iii)	Indicative content: For repeatable data: - a large group of people (500 minimum) should be selected (D) - study could be repeated (D) - uses same methods for all {groups / trials} (D) For valid data: - people should be selected who have no underlying health risks (D) - other CVD risk factors should be controlled (D) - use of medication should be controlled (D) - as they should all have similar risk profiles (E) - e.g. shouldn't smoke as this would increase blood pressure (E) - diet should be controlled (D) - so that they are consuming the same number of free radicals (E) - so that they are consuming the same number of antioxidants (E) - so that they are consuming the same {cholesterol / HDL / LDL} - the ginger should be administered in a palatable and regular way (D) - so that everyone is getting the same mass of ginger (E) - one group of people should be given a placebo / known antioxidant (D) - to {act as a comparison to / to determine} the effect of the ginger (E) - people should be monitored for the development of CVD over a number (5 minimum) of years (D) - because CVD takes a period of time to develop (E) - use of statistical analysis / t-test / other relevant named stats test (D) - to check repeatability (E)	Level 1: Description of study design 1 mark = one appropriate description 2 marks = three appropriate descriptions Level 2: Description of study design (that will work) with some explanations 3 marks = three appropriate descriptions plus an indication that the study needs to be long term OR one description explained or linked correctly to either validity or repeatability 4 marks = two descriptions explained or linked correctly to both validity and repeatability Level 3: Descriptions with detailed explanations 5 marks = three descriptions explained 6 marks = at least three descriptions explained, including an indication that the study needs to be long-term with a reason	(6)

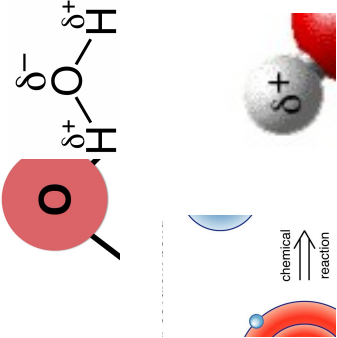
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Mark Scheme (Results)

January 2023

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

Question number	Answer	Additional guidance	Mark
1(a)	A diagram that includes the following: • 2 hydrogens joined to an oxygen (by covalent bonds) (1) • the charge distribution with a delta sign or some indication it is a small charge (1)	e.g. lines, overlapping circles, shared electrons, touching 	(2)

Question number	Answer	Mark																								
1(b)	<table><tr><th rowspan="2">Statement</th><th colspan="4">Carbohydrates</th></tr><tr><th>both monosaccharides and polysaccharides</th><th>monosaccharides only</th><th>polysaccharides only</th><th>neither monosaccharides nor polysaccharides</th></tr><tr><td>Have the general formula $C_nH_{2n}O_n$</td><td>☐</td><td>☒</td><td>☐</td><td>☐</td></tr><tr><td>Have glycosidic bonds</td><td>☐</td><td>☐</td><td>☒</td><td>☐</td></tr><tr><td>Have little effect on water potential</td><td>☐</td><td>☐</td><td>☒</td><td>☐</td></tr></table>	Statement	Carbohydrates				both monosaccharides and polysaccharides	monosaccharides only	polysaccharides only	neither monosaccharides nor polysaccharides	Have the general formula $C_nH_{2n}O_n$	☐	☒	☐	☐	Have glycosidic bonds	☐	☐	☒	☐	Have little effect on water potential	☐	☐	☒	☐	(3)
Statement	Carbohydrates																									
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Have glycosidic bonds	☐	☐	☒	☐																						
Have little effect on water potential	☐	☐	☒	☐																						
Question number	Answer	Mark																								
2(a)	A description that includes three of the following points: • fibrous (protein) (1) • composed of {three (polypeptide) chains in a helix / three-stranded helix / triple helix} (1) • held by hydrogen bonds between the chains (1) • credit details of the chains (1)	e.g. every third amino acid is glycine / repeating sequences of amino acids / high proportion of {glycine / (3)																								

		proline / hydroxyproline}	
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Question number	Answer	Additional guidance	Mark
2(b)(i)	- tangent drawn correctly at 30 mins (1) - rate given (1)	ACCEPT straight line outside of curve at 30 mins ACCEPT in the range of 2 to 3.158 up to 3 dps Bald answer within the range = 2 marks Bald answer with too many dps = 1 mark	(2)

Question number	Answer	Additional guidance	Mark
2(b)(ii)	An explanation that includes three of the following points: <u>active site</u> (of protease) {binds to / fits} the {elastin / substrate} (1) - activation energy lowered (by the protease) (1) - breaking the <u>peptide</u> bonds (1) - by hydrolysis (1)	ACCEPT forms an enzyme-substrate complex DO NOT ACCEPT other named bonds dipeptide / polypeptide bonds	(3)

Question number	Answer	Additional guidance	Mark
3(a)	An explanation that includes three of the following points: • because people with cystic fibrosis produce {thick / sticky} mucus (1) • which reduces the air {into / out of} the lungs (1) • so FEV₁ will improve if the treatment is working (1) • a mean is used to increase the <u>validity</u> of the {data / results} (1) • a mean as different people have different FEV₁ (1)	ACCEPT {blocks / narrows} the airways / builds up in the lungs ACCEPT converse	(3)

Question number	Answer	Additional guidance	Mark
3(b)	An explanation that includes two of the following points: • because the investigation does not show the results for the individual drugs (1) • so, no comparison can be made (between the effect of the combination drug and the individual drugs) (1)	ACCEPT the drugs on their own were not tested only the results for the combination are shown	(2)

	no indication of the nature of the control (1)	
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Question number	Answer	Additional guidance	Mark
3(c)	An answer that includes two of the following points: - because cystic fibrosis is caused by a number of different mutations (1) - and, therefore, affect the CFTR protein in different ways (1) - and different organs will be affected (1) OR different drugs may treat different symptoms (1)	DO NOT ACCEPT treat different mutations	(2)

Question number	Answer	Additional guidance	Mark
4(a)(i)	The correct answer is D <i>A is incorrect because the vena cava carries blood to the heart, has valves along its length and has an endothelial lining</i> <i>B is incorrect because the vena cava carries blood to the heart, has valves along its length and has an endothelial lining</i> <i>C A is incorrect because the vena cava carries blood to the heart, has valves along its length and has an endothelial lining</i>		(1)

Question number	Answer	Additional guidance	Mark
4(a)(ii)	The correct answer is C <i>A is incorrect because the direction of flow of blood away from the heart classifies a blood vessel as an artery</i> <i>B is incorrect because the direction of flow of blood away from the heart classifies a blood vessel as an artery</i> <i>D is incorrect because arteries carry blood away from the heart not towards it.</i>		(1)

Question number	Answer	Additional guidance	Mark
4(a)(iii)	The correct answer is C <i>A is incorrect because the coronary artery branches from the aorta and P is the vena cava</i> <i>B is incorrect because the coronary artery branches from the aorta and Q is the pulmonary artery</i> <i>D is incorrect because the coronary artery branches from the aorta and S is the pulmonary vein</i>		(1)

Question number	Answer	Additional guidance	Mark
4(a)(iv)	The correct answer is A <i>B is incorrect because the valve T is the bicuspid valve and is open during both atrial systole and diastole</i> <i>C is incorrect because the valve T is the bicuspid valve and is open during both atrial systole and diastole</i> <i>D is incorrect because the valve T is the bicuspid valve and is open during both atrial systole and diastole</i>		(1)

Question number	Answer	Additional guidance	Mark
4(b)(i)	• 32 (beats min⁻¹)		(1)

Question number	Answer	Additional guidance	Mark
4(b)(ii)	• 0.5 / 0.54 / 0.541 (seconds)		(1)

Question number	Answer	Additional guidance	Mark
4(b)(iii)	An answer that includes three of the following points: - atropine increases heart rate and propranolol decreases heart rate (1) - atropine increases heart rate whether given first or second (1) OR - propranolol decrease heart rate whether given first or second (1) - either regimen results in {same / similar} (overall) heart rate (1) - credit suitable comment about error bars (1)	ACCEPT propranolol decreases heart rate more when added after atropine ACCEPT order of drugs makes {little / no difference} overall both groups ended up the same e.g. these results are significant as error bars do not overlap (except in last two days) error bars are close together so drugs are having similar effects error bars for atropine (in first part) are wider so more uncertainty	(3)

Question number	Answer	Additional guidance	Mark
5(a)(i)	The correct answer is C <i>A is incorrect because high cholesterol would increase the risk</i> <i>B is incorrect because high cholesterol would increase the risk</i> <i>D is incorrect because high antioxidants help reduce the risk</i>		(1)

Question number	Answer	Additional guidance	Mark
5(a)(ii)	An answer that includes two of the following points: • salt • fibre • energy (content) • saturated fats • alcohol	NB two correct answers needed for 1 mark	(1)

Question number	Answer	Additional guidance	Mark
5(b)(i)	• investigation may not be valid / lifestyle can affect the risk (of CVD) (1)	ACCEPT named lifestyle	(1)

Question number	Answer	Additional guidance	Mark
5(b)(ii)	An answer that includes two of the following points: • they did not want to admit to how much energy they consumed (1) • they had not kept a record of the food that they had eaten (1) • they did not know the energy content of the different foods that they were eating OR they did not know {how to do it / that they could do it} (1)	ACCEPT embarrassed about how much they consumed they knew they consumed too {little / much} energy ACCEPT they did not know how much food they had eaten ACCEPT information not available nutritional content ACCEPT they guessed, if neither mp 2 nor 3 awarded	(2)

Question number	Answer	Additional guidance	Mark
5(b)(iii)	An explanation that includes two of the following points: • because the investigation was looking at the effect of this diet on the of CVD (1) • and these women were already (as they were developing the disease) (1) • therefore, the {investigation / data / conclusion} would not be valid (1)	ACCEPT more likely	(2)

Question number	Answer	Additional guidance	Mark
5(b)(iv)	• 24 / 23.8 / 23.78 / 23.780 (%) (1)		(1)

Question number	Answer	Additional guidance	Mark
5(c)	An explanation that includes three of the following points: • because this results in less cholesterol (in diet / in blood) (1) • therefore {no / less} {plaque / atheroma / blood clot} (1) • to {block / narrow} the coronary artery (1) • therefore, blood will be able to continue flowing to the {heart / cardiac} {cells / tissue / muscle} (1)	ACCEPT less LDL / lower LDL : HDL	(3)

Question number	Answer	Additional guidance	Mark
6(a)(i)	The correct answer is B <i>A is incorrect because the head is a phosphate and the tails are fatty acids</i> <i>C is incorrect because the head is a phosphate and the tails are fatty acids</i> <i>D is incorrect because the heads are hydrophilic and the tails are hydrophobic</i>		(1)

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An answer that includes four of the following points: Similarities: • both have proteins (1) • both have {phospholipid / phospholipid bilayer} (1) Differences: • FMM has proteins {embedded / intrinsic}, but DDM has proteins {outside / in a layer/ extrinsic} (1) • FMM has cholesterol but DDM does not (1) • FMM has {glycoproteins / glycolipids} but DDM does not (1)	DO NOT PIECE TOGETHER FROM TWO DESCRIPTIONS ACCEPT description of embedded proteins e.g. channel proteins DDM proteins are not embedded	(4)

Question number	Answer	Additional guidance	Mark
6(b)(i)	An answer that includes two of the following points: • there could be (uncontrolled) movement of {substances / named substances} (into / out of cell) (1) • cell cannot maintain concentration gradients of substances (1) • credit consequence of this (1) • loss of cell {recognition / adhesion} / loss of membrane-embedded molecules (1)	ACCEPT cytoplasm could leak out molecules will not be able to pass through {active transport / facilitated diffusion} could not take place bacteria / organelles ACCEPT {solute / water / osmotic} potential e.g. cannot maintain ATP levels, cell could {shrivel up / burst}, no oxygen for (aerobic) respiration	(2)

Question number	Answer	Additional guidance	Mark
6(b)(ii)	An explanation that includes the following points: • because the phospholipids (and proteins) {can move / are fluid} (within the membrane) (1) • therefore {phospholipids / fatty acids} can interact (hydrophobically) (1)	ACCEPT bond Van der Waals forces / London forces / hydrophobic interactions vesicles fusing with membrane (by exocytosis / endocytosis)	(2)

Question number	Answer	Additional guidance	Mark
6(b)(iii)	An answer that includes two of the following points: • more {membrane / phospholipid / protein / glycoprotein / glycolipid / cholesterol} needs to be made (1) • membrane needs restructuring / proteins added to membrane (1) • increase rate of {respiration / ATP synthesis / release of energy} (1)	ACCEPT {channel / carrier} proteins ACCEPT {cholesterol / glycolipids / glycoproteins} need to move into place	(2)

Question number	Answer	Additional guidance	Mark
7(a)	A description that includes the following points: • one glycerol and three fatty acids (1) • (joined together by) ester {bonds / links / groups} (1)	ACCEPT joined by esterification	(2)

Question number	Answer	Additional guidance	Mark
7(b)	An explanation that includes three of the following points: • because large lungs would have a large volume of air {in the alveoli / taken in} (1) • because there would be {more alveoli for gas exchange / large surface area for more gas exchange / larger surface area for gas exchange} (1) • because large heart could pump more blood (1) • therefore supplying cells with sufficient oxygen (1)	ACCEPT more oxygen to enter ACCEPT diffusion of {gases / oxygen / carbon dioxide} ACCEPT pump at higher pressure more warm blood ACCEPT (more warm blood) to maintain body temperature	(3)

Question number	Answer	Additional guidance	Mark
7(c)(i)	• 4.3×10^{-11}	ACCEPT 4.30×10^{-11}	(1)

Question number	Answer	Additional guidance	Mark
7(c)(ii)	• volume of sphere calculated (1) • 1 : 3 / 1 : 2.7 / 1 : 2.67 (1)	2048 2 144.66058450 ACCEPT 1 : 3 / 1 : 2.8 / 1 : 2.79 ecf 1 : 21 / 1 : 21.3 / 1 : 21.33 (if 16 used) 1 : 22 / 1 : 22.3 / 1 : 22.34 (if 16 used) Bald answer of 1 : 3 / 1 : 2.7 / 1 : 2.8 / 1 : 2.67 / 1 : 2.79 = 2 marks 1 : 21 / 1 : 21.3 / 1 : 21.33 / 1 : 22 / 1 : 22.3 / 1 : 22.34 / 2048 / 2 144.66 = 1 mark	(2)

Question number	Answer	Mark
*7(c)(iii)	Indicative content: High concentration of red blood cells: • therefore, they carry high levels of oxygen • to the tissues for (aerobic) respiration • so can meet the oxygen demands of the yaks Small red blood cells: • therefore, the surface area to volume ratio is high • so oxygen can diffuse into the cells faster • although each red blood cell probably carries less oxygen • but this will be compensated by the large number of cells • smaller red blood cells pack closer together than larger ones / more cells in small volume of blood High concentration of haemoglobin: • therefore, high levels of oxygen can be carried • as each red blood cell can carry more oxygen • as each haemoglobin molecule can bind to 4 oxygen molecules Fetal haemoglobin: • which has a higher affinity for oxygen • therefore, the haemoglobin can bind the oxygen even in low partial pressures • and therefore carry more oxygen / have a higher percentage saturation of haemoglobin with oxygen	(6)

			Additional guidance
Level 0	0	No awardable content	
Level 1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context.	Simple links made between characteristics of blood and altitude 1 mark = one comment about one characteristic 2 marks = one comment made about two characteristics
Level 2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts / concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows some linkages and lines of scientific reasoning with some structure.	Extended links made characteristics of blood and altitude 3 marks = one comment made about three characteristics 4 marks = extended comments about one characteristic + a comment about one other characteristic
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant biological facts / concepts. Consequences are discussed which supported throughout by sustained linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.	Clear discussions on all aspects of blood and altitude 5 marks = extended comments about two characteristics + a comment on the other two characteristic 6 marks = extended comments about three aspects + a comment on the other characteristic

Question number	Answer	Additional guidance	Mark
8(a)	An explanation that includes the following points: - because the {phenotype / blood group} of individual 3 is {different / combination} from that of individual 1 and 2 (1) - because neither of the alleles are dominant / both alleles are expressed (1)	ACCEPT the phenotype of the heterozygote is different from the phenotype of either homozygote MM gives you blood group M + NN gives you blood group N but MN gives you a different blood group offspring have both the blood types (in their phenotype) ACCEPT both alleles are equal / equally dominant	(2)

Question number	Answer	Additional guidance	Mark
8(b)	An answer that includes the following points: • genotypes of individuals 3 and 4 shown / alleles in gametes of individuals 3 and 4 shown (1) • possible genotypes of children shown (1) • corresponding phenotypes given (1) • 1 type M : 1 type N : 2 type MN (1)	genotypes : MN / MN gametes : M or N / M or N MM and NN and 2 × MN MM = blood group M and NN = blood group N and MN = blood group MN DO NOT ACCEPT blood group MM / NN ACCEPT in any order provided it is clear which phenotype each number relates to	(4)

Question number	Answer	Additional guidance	Mark
8(c)(i)	An explanation that includes three of the following points: - individual 3 will have both (M and N) proteins (on the surface the of the red blood cells) (1) - because individual 3 will {be heterozygous / have one allele for M and one allele for N / have the genotype MN} (1) (both) genes will be transcribed / mRNA produced for (both) genes (1) - and translated (1)	ACCEPT one gene for M and one gene for N ACCEPT {alleles / DNA} will be transcribed	(3)

Question number	Answer	Mark
*8(c)(ii)	Substitution mutation: • substitution swaps one base for another • may not alter the amino acid coded for • as the genetic code is degenerate • triplet codon codes for the same amino acid • therefore, no effect on the protein • therefore, no effect on the phenotype • amino acid could be different • therefore, shape of protein may or may not be (significantly) different • depending on significance the phenotype may stay the same • depending on the significance the phenotype may become the same as one of the parents • a stop codon could be coded for • so the protein may be {shorter / not coded for} • so the phenotype may become the same as one of the parents Insertion / deletion mutation: • deletion removes one base • insertion adds in a base • causing a frameshift • this will probably have a huge effect on protein • phenotype may become one of parents • may have little effect on protein if near the end of the gene sequence • and therefore, have very little effect on phenotype	(6)

			Additional guidance
Level 0	0	No awardable content	
Level 1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context.	Simple links made between mutation and effect on protein or phenotype 1 mark = one comment 2 marks = three comments
Level 2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts / concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows some linkages and lines of scientific reasoning with some structure.	Extended links made between mutation and effect on protein or effect on phenotype in the context of the question 3 marks = extended comments about one effect of one type of mutation 4 marks = extended comments about one effect of two types of mutations OR extended comments about two effects of one mutation
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant biological facts / concepts. Consequences are discussed which supported throughout by sustained linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.	Clear discussions on all aspects of mutations and effect on protein and effect on phenotype in the context of the question 5 marks = extended comments about one effect of one type of mutation 6 marks = extended comments about one effect of two types of mutations OR extended comments about two effects of one mutation



Mark Scheme (Final)

Summer 2023

Pearson Edexcel International Advanced
Subsidiary Level in Biology (WBI11)

Paper 01

Unit 1: Molecules, Diet, Transport and Health

Question number	Answer	Additional guidance	Mark								
1(a)(i)	<table><tr><td>U</td><td>A</td><td>C</td><td>G</td><td>G</td><td>C</td><td>A</td><td>A</td></tr></table>	U	A	C	G	G	C	A	A		(1)
U	A	C	G	G	C	A	A				

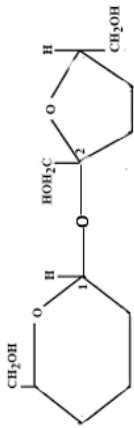
Question number	Answer	Additional guidance	Mark
1(a)(ii)	(DNA) transcription (1)	DO NOT ACCEPT translation transcription followed by translation reverse transcription	(1)

Question number	Answer	Additional guidance	Mark
1(a)(iii)	RNA polymerase (1)	ACCEPT rna polymerase mRNA polymerase DNA-directed RNA polymerase DNA-dependent RNA polymerase IGNORE abbreviations e.g. RNAP, RNAPol DO NOT ACCEPT polymerase / DNA polymerase / helicase / ligase / reverse transcriptase	(1)

Question number	Answer	Mark
2(a)	The only correct answer is C <i>A is incorrect because the valves close before ventricular systole not during it</i> <i>B is incorrect because the valves close before ventricular systole not during it</i> <i>D is incorrect because the valves close before ventricular systole not after it</i>	(1)

Question number	Answer	Additional guidance	Mark
2(b)	Accept any value up to 3 decimal places between 0.7 and 0.76 inclusive (1)	DO NOT ACCEPT any other values	(1)

Question number	Answer	Additional guidance	Mark
2(c)	An explanation that makes reference to the following points: • increase in volume {when (left) atrium contracts (squeezing its blood into ventricle) / during atrial systole} (1) • decrease in volume {during ventricular systole / when ventricles contract / when blood is pumped out (of aorta)} (1) • (some) increase in volume {during (cardiac / ventricular) diastole / when ventricle starts to fill} (1)	IGNORE time references NB candidates may put these points in a different order ACCEPT high volume during atrial systole etc ACCEPT low volume during ventricular systole etc	(3)

Question number	Answer	Additional guidance	Mark
3(a)(i)	O joined to C1 on glucose and C2 on fructose by covalent bond (1)	 ACCEPT bonds not touching carbons provided it is clear where they are supposed to be attached to solid or dotted lines for covalent bond DO NOT ACCEPT other groups added to C1 or C2 IGNORE water shown other groups added to rest of molecule	(1)

Question number	Answer	Additional guidance	Mark
3(a)(ii)	An answer that makes reference to the following points: $C_{12}H_{22}O_{11}$ (1) H_2O (1)	ACCEPT numbers that are not subscript numbers IGNORE if not written as part of the equation	(2)

Question number	Answer	Additional guidance	Mark
3(b)(i)	sucrose contains {the same number of / one } fructose (1)	ACCEPT ratio of sucrose to fructose is 1 : 1 as the concentration of sucrose increases so does the (concentration of) fructose the more sucrose there is the more fructose there will be more fructose for the chemical to bind to the same amount of chemical binds to each fructose DO NOT ACCEPT glucose	(1)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	the test is not sensitive enough / the colour intensity is too low (1)	ACCEPT a certain concentration of {fructose / sucrose} is necessary for the {colour to be visible / colour change} equipment is not sensitive enough colour change visible above concentrations $50 \mu\text{g dm}^{-3}$ sucrose DO NOT ACCEPT glucose	(1)

Question number	Answer	Additional guidance	Mark
3(b)(iii)	the chemical (only) binds to fructose / there is no fructose in either maltose or lactose (1)	ACCEPT chemical cannot bind to maltose or lactose	(1)

Question number	Answer	Mark
4(a)(i)	The only correct answer is D <i>A is incorrect because the magnification is 2.67×10^1</i> <i>B is incorrect because the magnification is 2.67×10^1</i> <i>C is incorrect because the magnification is 2.67×10^1</i> <i>Magnification = $48 \text{ mm} \div 1.8 \text{ mm} = 26.66667 = 2.67 \times 10^1$</i>	(1)

Question number	Answer	Mark
4(a)(ii)	The only correct answer is B <i>A is incorrect because the surface area is 1.8π</i> <i>C is incorrect because the surface area is 1.8π</i> <i>D is incorrect because the surface area is 1.8π</i> <i>$SA = 2\pi \times 0.5 \times 1.8 = 1.8\pi$</i>	(1)

Question number	Answer	Additional guidance	Mark
4(a)(iii)	• volume calculated (1) • 1 : 0.3 / 1 : 0.28 (1)	$\pi \times 0.6 \times 0.6 \times 1.8 = 0.648\pi$ ACCEPT 1.944 / 2.03575203952 NB if clearly used a non-calculator value for π check the rounding before awarding ACCEPT 4 : 1 / 3.5 : 1 / 3.55 : 1 (3.5493827160) DO NOT ACCEPT 3.6 : 1 ACCEPT CEs for $V = 2.592\pi$ 1 : 1.1 / 1 : 1.13 0.9 : 1 / 0.89 : 1 Correct bald answer = 2 marks Correct bald CE = 1 mark	(2)

Question number	Answer	Additional guidance	Mark
4(b)	An explanation that makes reference to three of the following points: • oxygen {dissolved / present} in the water (1) • large surface area (to volume ratio) for fast {gas exchange / diffusion (of gases)} (1) • two {layers (of cells) / cells thick} so {short diffusion distance (for gases) / fast gas exchange} (1) • {tentacles / body} move the water around to maintain (oxygen) concentration gradient (1)	IGNORE efficient and easy throughout NB penalise refs to {lungs / alveoli / blood / vessels / etc} within an awardable mp 2, 3 or 4 once ACCEPT more diffusion IGNORE hollow body / tentacles ACCEPT thin layer of cells so ACCEPT other terms which clearly refer to tentacles e.g. tails, legs, fingers	(3)

Question number	Answer	Additional guidance	Mark
5(a)	An explanation that makes reference to the following points: • because platelets {contain / release} thromboplastin (1) • thromboplastin results in the formation of thrombin from prothrombin (1)	IGNORE descriptions of plaque formation prior to release of thromboplastin by platelets IGNORE endothelial cells	(2)

Question number	Answer	Additional guidance	Mark
5(b)	• person bleeds {too easily / uncontrollably / internally / excessively} (1)	Examiners will need to check any other risks but not accept just side effects or symptoms ACCEPT (severe / frequent) bruising (prolonged / frequent) nose bleeds heavy periods (in women) liver damage kidney damage IGNORE named side effects	(1)

Question number	Answer	Mark
5(c)(i)	The only correct answer is D <i>A is incorrect because there are 96 bases for 32 amino acids plus a stop codon</i> <i>B is incorrect because there are 96 bases for 32 amino acids plus a stop codon</i> <i>C is incorrect because there are 96 bases for 32 amino acids plus a stop codon</i>	(1)

Question number	Answer	Additional guidance	Mark
5(c)(ii)	An explanation that makes reference to the following points: - because (if the active site is blocked) thrombin will not be able to convert fibrinogen into fibrin (1) - without fibrin, {platelets / blood cells} will not get trapped (forming a blood clot) (1)	NB must be an idea of what will not happen for 2 marks to be awarded ACCEPT less ACCEPT without fibrin, {mesh won't form / less mesh will form}	(2)

Question number	Answer	Additional guidance	Mark
5(c)(iii)	An explanation that makes reference to two of the following points: • variegins bind to the <u>active site</u> of thrombin / an enzyme substrate complex is formed / thrombin lowers the activation energy (1) • therefore the peptide bonds are broken (by thrombin) (1) • by hydrolysis / by a hydrolysis reaction (1)	ACCEPT ESC for enzyme substrate complex	(2)

Question number	Answer	Additional guidance	Mark
5(c)(iv)	An answer that makes reference to two of the following points: • (overall) variegin results in less (mass) blood clot than {drug H / the other anticoagulant} (1) • there is less variation in the size of the blood clot (in patients treated) with variegin (1) • cannot comment on the effectiveness of {drugs / variegin} compared with no drug as no control (1) • cannot comment on {significance / validity} of data as no statistical analysis (1)	ACCEPT converse throughout ACCEPT reduces blood clot compared to drug H prevents blood clot better than drug H more effective than drug H (in reducing blood clot) ACCEPT smaller range ACCEPT cannot comment on effectiveness of drug H as no control ACCEPT no mean <u>and</u> error bars shown not <u>valid</u> as small sample size	(2)

Question number	Answer	Mark
6(a)	The only correct answer is C <i>A is incorrect because only statement 1 is incorrect as proteins contain oxygen as well</i> <i>B is incorrect because only statement 1 is incorrect as proteins contain oxygen as well</i> <i>D is incorrect because only statement 1 is incorrect as proteins contain oxygen as well</i>	(1)

Question number	Answer	Mark
6(b)	The only correct answer is D <i>A is incorrect because there are carbon – carbon double bonds in an unsaturated fatty acid</i> <i>B is incorrect because there are carbon – carbon double bonds in an unsaturated fatty acid</i> <i>C is incorrect because the ratio is higher ie fewer hydrogens for the same number of carbons</i>	(1)

Question number	Answer	Additional guidance	Mark
6(c)	• haemoglobin (1)	Examiners will need to check any other answers ACCEPT myoglobin, leghaemoglobin, neuroglobin, transferrin, ferritin, ferredoxin, cytochrome, catalase, peroxidase IGNORE Hb haem group	(1)

Question number	Answer	Additional guidance	Mark
6(d)	An explanation that makes reference to the following points: • because antioxidants reduce free radicals (1) • therefore {cell damage / damage to lining of blood vessels / oxidative stress} will be {reduced / prevented} (1) • (less cell damage / antioxidants) {reduce/ prevent} {plaque / atheroma} formation (due to decreased free radicals) (1) • (antioxidants / less plaque) reduce {cardiovascular disease / CVD / heart disease / heart attack / atherosclerosis / stroke} (1)	NB ACCEPT converse of mps 2, 3 and 4 i.e. what free radicals do ACCEPT neutralise / donate electrons to / break down / stabilise ACCEPT reduces cholesterol build up	(4)

Question number	Answer	Additional guidance	Mark
6(e)(i)	2.9 (1)	ACCEPT $\times 2.9 / 2.9 \times / 2.9$ times DO NOT ACCEPT 2.90 or any other value	(1)

Question number	Answer	Additional guidance	Mark
6(e)(ii)	180 / 1800 / 95 / 94.7 / 94.74 (%) (1)		(1)

Question number	Answer	Additional guidance	Mark
6(e)(iii)	An answer that makes reference to three of the following points: - different organisms contain different levels of antioxidant activity (1) (overall) plant eating organisms have more antioxidant activity (than animal eating organisms) (1) (overall) insects have more antioxidant activity (than arachnids) (1) - there is more variation in the antioxidant activity in plant eating organisms (than animal-eating organisms) (1)	ACCEPT converse Accept AO ACCEPT the error bars are larger in the plant eaters	(3)

Question number	Answer	Additional guidance	Mark
7(a)	An explanation that makes reference to the following points: • because (both) parents could be {carriers of / heterozygous for} {the disorder / phenylketonuria} (1) • all possible genotypes (of offspring) {shown in diagram / stated} (1) • therefore there is the possibility that the unborn child could be {homozygous recessive / have both recessive alleles} (1) • credit a reason for parents wanting to have the test (1)	NB must be an attempt at genetic diagram for full marks to be awarded ACCEPT from a genetic diagram DO NOT ACCEPT different letters used for the different alleles unless stated sex linkage CE from mp 1 for mps 2, 3 and 4 ACCEPT if indicated on the diagram ACCEPT if indicated on the diagram e.g. do not want to risk having a child with PKU want time to prepare for a child with PKU because there is a history of PKU in the family so there is risk of the child having PKU they know that {one / both} of them are carriers so there is a risk of the child having PKU so that an unaffected embryo can be selected DO NOT ACCEPT abortion / termination / other post-natal decisions / choosing to have a child or not IGNORE making an informed decision	(4)

Question number	Answer	Mark
*7(b)	Blood tests • most women would have a blood test • similar percentage for all four disorders • probably because it would not harm the unborn child • but some women may not want to find out if they have a genetic disorder • it would not take into account the genetics of the father Amniocentesis • about two thirds of the women said that they would have amniocentesis • similar percentage for all four disorders • fewer women said yes to this question than agreed to have a blood test • probably because they wanted to find out if their unborn child was affected • so they could make a decision on whether to keep the unborn child or not • the more debilitating the disease the more women prepared to take the risk of amniocentesis causing an abortion • amniocentesis can cause abortion of the unborn child • and some women must have felt that this was {too great a risk / unethical} • amniocentesis can give false negative and false positive results Termination • fewer women said that they would have a termination than were prepared to have the other procedures • fewer said yes to disorder B and C than A and D because B and C are treatable • more women said that they would have a termination if disorder A was diagnosed as this can be lethal • the more debilitating the disease the more likely the women were to have a termination because {do not want their child to suffer / cannot afford the healthcare} • some women may say no to a termination for religious or ethical reasons	(6)

	P
Level 1 : description of the data with an attempt to discuss why responses are different 1 mark = some of the data described 2 marks = some of the data described with one discussion point made Level 2 : discussion of some of the data 3 marks = two discussion points made that may be limited to one question 4 marks = two discussion points made about two of the questions Level 3 : discussion of data 5 marks = responses to the three questions for all the procedures discussed 6 marks = plus at least one reason given for the different responses to a question depending on the disorder	

Question number	Answer	Mark
8(a)	The only correct answer is A <i>B is incorrect because age is not influenced by lifestyle = 1</i> <i>C is incorrect because age, is not influenced by lifestyle = 1</i> <i>D is incorrect because age is not influenced by lifestyle = 1</i>	(1)

Question number	Answer	Mark
*8(b)	Aspect 1 - Explanation of factors listed: • as age increases so does the risk because {arteries stiffen / increase in time for other risk factors} • high blood pressure causes damage to the endothelial lining of the arteries which triggers plaque formation • smoking raises blood pressure • the more cholesterol in the blood the more for plaque build up • HDL levels allow calculation of the HDL : LDL ratio which affects the risk of CVD Aspect 2 - Explanation of factors not listed: • high salt increases blood pressure / excessive alcohol reduces liver metabolism of cholesterol / low fibre increases stool transit time / antioxidants reduce endothelial damage so plaque not triggered • high mass / BMI increases strain on heart • lack of exercise results in a less healthy heart and may influence mass • men are at a higher risk until the woman goes through menopause • family history as {genetic predisposition / family members who have had CVD} increases risk • LDL / saturated fats increase cholesterol available to be deposited in the arteries • stress as this increases blood pressure • number of cigarettes as this affects the {damage / blood pressure} Aspect 3 – Explaining / comparing effectiveness of RAC-1 and RAC-2: • RAC-1 missing information on HDL cholesterol and RAC-2 missing information on smoking because they are both important risk factors – piece together • RAC-1 possibly more effective as it includes smoking • both are missing other important factors therefore {will not be accurate / calculation will be an underestimate} • effectiveness depends on accurate responses • people may not know their {cholesterol / HDL / blood pressure} so guess	(6)

Level 1 : some explanation for any aspect(s)

1 mark = simple description

2 marks = 1 explanation

Level 2 : explanations covering more than one of the aspects

3 marks = 2 explanations

4 marks = 3 explanations

Level 3 : detailed explanations covering all three aspects of the question

5 marks = 3 explanations

6 marks = 4 explanations

Question number	Answer	Additional guidance	Mark
8(c)(i)	An explanation that makes reference to two of the following points: - calculator does not include {number of cigarettes / how long person has smoked} - a person {may not know / have guessed} their {blood pressure / cholesterol level / HDL level} (1) (other) {risk factors / named risk factor} not on calculator (1) - their {LDL levels / LDL : HDL ratio} may be very high (1)	ACCEPT people {underestimate / guess / lie} about {the number of cigarettes they smoke / how long they have smoked} ACCEPT a person may have estimated their {blood pressure / cholesterol level / HDL level} ONLY if it is clear that the word estimate has been used as an alternative to guess	(2)

Question number	Answer	Additional guidance	Mark
8(c)(ii)	An answer that makes reference to two of the following points: • a person may not know all the information (1) • a person may have a high risk condition already (1) • person {cannot use the technology / do not have access to the internet} (1)	ACCEPT blood pressure, total cholesterol, HDL ACCEPT named condition e.g. CVD, diabetes, obesity, genetic predisposition, family history of CVD, disease that increases risk IGNORE CVD caused by genes	(2)

Question number	Answer	Additional guidance	Mark
8(c)(iii)	• CVD takes a while to develop / lifestyle may change (as the person gets older) / age affects the risk (1)	ACCEPT named example of factor that might change	(1)

Question number	Answer	Mark
9(a)(i)	The only correct answer is B <i>A is incorrect because Q is the strict osmoconformer</i> <i>C is incorrect because R is the osmoregulator</i> <i>D is incorrect because Q is the strict osmoconformer</i>	(1)

Question number	Answer	Additional guidance	Mark
9(a)(ii)	An explanation that makes reference to three of the following points: • so that {no (net) / little / not much} <u>osmosis</u> (of water) will occur (1) • (do not want water to leave) otherwise cell will {dehydrate / shrink} (1) • (do not want water to enter) otherwise cell will {swell / burst} (1) • {energy / ATP} is not used in regulating solute concentrations (1)	ACCEPT no movement (of water) as no <u>osmotic effect</u> IGNORE refs to water concentration IGNORE flaccid IGNORE turgid / plasmolysis NB. eg 'no risk of cells bursting due to <u>osmosis</u>' = 2 marks	(3)

Question number	Answer	Additional guidance	Mark
9(b)(i)	any (whole number) value from 550 to 580 (1)	NB check table if no answer given if answer in table is different to answer on the answer line then mark the answer on the answer line	(1)

Question number	Answer	Additional guidance	Mark
9(b)(ii)	- correct calculation (1) 500.00 / 142.86 / 83.33 (1)	$((54 - 9) \div 9) \times 100 = 500$ $((54 - 9) \div 54) \times 100 = 83.333333$ $(45 \div 31.5) \times 100 = 142.8571$ DO NOT ACCEPT recurring numbers Correct bald answer scores 2 marks Bald answer of any correct value but incorrect rounding scores 1 mark	(2)
Question number	Answer	Additional guidance	Mark

9(b)(iii)	An explanation that makes reference to the following points: • because the total concentration of all the ions affects the water potential (1) • (total) ion concentration (for each organism) is similar to that of the sea water (1)	ACCEPT solute concentration / solute potential / osmotic potential IGNORE water concentration	(2)
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Question number	Answer	Additional guidance	Mark
9(b)(iv)	because: - their food contains different concentrations of each ion - they eat different food - they incorporate different concentrations of each ion (into other molecules) - it depends on the requirements of the {cells / animal / body} - they absorb ions differently - they live in different areas of the sea - different parts of the sea have different ion concentrations	IGNORE refs to size of animal	(1)

Question number	Answer	Additional guidance	Mark
9(b)(v)	An explanation that makes reference to the following points: • active transport (of ions) (1) • because some of the ions have a higher concentration inside the {organisms / cells / tissues} (than in the sea water) (1)	DO NOT ACCEPT {diffusion / facilitated diffusion / osmosis} ACCEPT the converse to move the ions {against / up} the concentration gradient to move ions from a low to high concentration (of ions)	(2)



Mark Scheme (Results)

January 2024

Pearson Edexcel International Advanced
Subsidiary 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): • haemoglobin (1) • high (1) • pulmonary vein (1) • left ventricle (1) • Bohr (shift) (1)	ACCEPT haem / Hb / iron ion / Fe²⁺ ACCEPT higher / above / greater / more DO NOT ACCEPT artery / vena cava ACCEPT l. ventricle / left ventricle {wall / muscle} ACCEPT phonetic spellings e.g. Boar, Bore, Bor, Boh names with lower case	(5)

Question number	Answer	Additional guidance	Mark
2(a)	A description that includes the following points: • three {bases / nucleotides} code for one amino acid (1) • credit any amino acid and its code shown in the table or diagram (1)	e.g. AAA codes for lysine	(2)

Question number	Answer	Additional guidance	Mark
2(b)	A description that includes the following points: • each base is only used once / each base belongs to one codon / three bases are read and then the next three (1) • credit any example taken from the table or diagram (1)	ACCEPT bases are not shared between codons codons are separate but adjacent triplet / code for codon e.g. each A in AAA is only used once AAA is read and then GCA	(2)

Question number	Answer	Additional guidance	Mark
2(c)	A description that includes the following points: • amino acids have more than one {codon / code / triplet} (1) • credit any amino acid and two of its codes shown in the table (1)	ACCEPT all / some e.g. AAA and AAG codes for lysine	(2)

Question number	Answer	Additional guidance	Mark
3(a)	The correct answer is C <i>A is incorrect because active transport can move solutes against the concentration gradient</i> <i>B is incorrect because active transport can move solutes against the concentration gradient</i> <i>D is incorrect because water moves in osmosis not solutes</i>		(1)

Question number	Answer	Additional guidance	Mark
3(b)	The correct answer is A <i>B is incorrect because only active transport involves proteins</i> <i>C is incorrect because only active transport involves proteins</i> <i>D is incorrect because only active transport involves proteins</i>		(1)

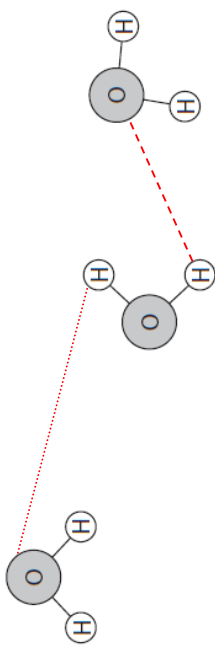
Question number	Answer	Additional guidance	Mark
3(c)	The correct answer is B <i>A is incorrect because active transport does not move large particles or bacteria</i> <i>C is incorrect because exocytosis moves matter out of the cell</i> <i>D is incorrect because facilitated diffusion does not move large particles or bacteria</i>		(1)

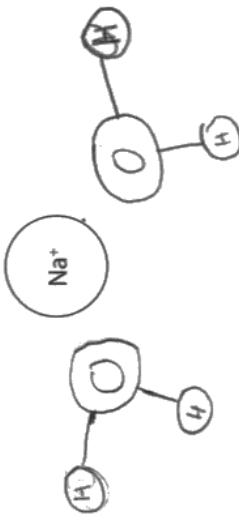
Question number	Answer	Additional guidance	Mark
3(d)	The correct answer is B <i>A is incorrect because lipid-soluble molecules can move directly through the membrane by diffusion</i> <i>C is incorrect because lipid-soluble molecules can move directly through the membrane by diffusion</i> <i>D is incorrect because osmosis is the movement of water</i>		(1)

Question number	Answer	Additional guidance	Mark
3(e)	The correct answer is B <i>A is incorrect because polar R groups cannot interact with the phospholipid tails</i> <i>C is incorrect because polar R groups cannot interact with the phospholipid tails and non-polar R groups cannot interact with the polar molecules passing through the channel</i> <i>D is incorrect because polar R groups are needed to allow polar molecules through</i>		(1)

Question number	Answer	Additional guidance	Mark
3(f)	An explanation that includes four of the following points: • (change in mass / movement of water) is due to <u>osmosis</u>. (1) • potato decreased mass in {purple / orange} solutions because the solutions were more concentrated than the {potato / cytoplasm} (1) • decrease in mass was greatest in orange solution as this was more concentrated than the purple solution (1) • potato increased in mass in the red solution as the concentration of the solution was less than that of the {potato / cytoplasm} (1) • no change in mass in blue solution as the concentration of the solution and the {potato / cytoplasm} were the same (1)	NB ACCEPT converse explanations Penalise once water concentration NB more concentrated solution = lower water potential lower solute potential lower osmotic potential less dilute hypertonic NB less concentrated solution = higher water potential higher solute potential higher osmotic potential more dilute hypotonic ACCEPT isotonic no <u>net</u> movement of water same water potential same solute potential same osmotic potential	(4)

Question number	Answer	Additional guidance	Mark
4(a)(i)	An explanation that includes the following points: - the oxygen (atom) is slightly negative and the hydrogens (atoms) are slightly positive} (1) {there is (an uneven) charge distribution (across the molecule) / uneven distribution of electrons / the oxygen pulls the electrons towards it} (1)	Penalise ref to molecules once ACCEPT δ^- / δ^+ from a diagram ACCEPT comparisons of electronegativity unbalanced charge oxygen has more {protons / more positive nucleus} electrons closer to the oxygen	(2)

Question number	Answer	Additional guidance	Mark
4(a)(ii)	a line drawn between an O of one molecule and a H of another molecule (1)	 If more than one H bond shown then they must be both correct and using different atoms on any one molecule If other water molecules draw then mark if correct	(1)

Question number	Answer	Additional guidance	Mark
4(b)	water molecules clustered around the Na^+ with the O facing the Na^+ and the Hs facing away (1)	NB if charges are shown, they must be correct and partial ACCEPT any number of water molecules but all must be correct DO NOT ACCEPT circles overlapping solid lines joining circles 	(1)

Question number	Answer	Additional guidance	Mark
4(c)	A description that includes four of the following points: • (A) (increase in temperature can) (linear) increase the solubility (1) • (B) (increase in temperature (up to 32°C) can) (exponentially) increase the solubility and then decrease it (1) • (C) (increase in temperature can have) a slight increase on the solubility (1) • (D) (increase in temperature can) decrease the solubility (1) • statement referring to different chemicals have different solubilities at different temperatures (1)	ACCEPT positive correlation ACCEPT no effect ACCEPT negative correlation	(4)

Question number	Answer	Additional guidance	Mark
5(a)(i)	• waist-to-hip ratio / skin fold thickness / waist (circumference) (1)	ACCEPT / WHR / hip to waist ratio / waist size / waist measurement / waist to hip index / percentage body fat / skin fold measurement IGNORE BMI / body mass index / pinch test / mass / weight	(1)

Question number	Answer	Additional guidance	Mark
5(a)(ii)	The correct answer is B <i>A is incorrect because 23 is this value rounded down</i> <i>C is incorrect because the mass is divided by the height² not the height</i> <i>D is incorrect because the mass is divided by the height² not the height</i>		(1)

Question number	Answer	Additional guidance	Mark
5(a)(iii)	The correct answer is B <i>A is incorrect because a person is obese if they have a BMI of 30</i> <i>C is incorrect because a person who is obese has a BMI of 30 or more not less than 30</i> <i>D is incorrect because a person who is obese has a BMI of 30 or more not less than 30</i>		(1)

Question number	Answer	Additional guidance	Mark
5(b)	- decrease {calorie / energy / fat / sugar / carbohydrate} intake AND - increase {exercise / activity} (1) - use more energy than consumed (1)	NB Answer needs to be in the form of a change ACCEPT start taking weight-reducing medications have a gastric band IGNORE {regular / daily} exercise ACCEPT calorie deficit	(1)

Question number	Answer	Additional guidance	Mark
5(c)(i)	The correct answer is C <i>A is incorrect because condensation is making bonds not splitting them</i> <i>B is incorrect because condensation is making bonds not splitting them</i> <i>D is incorrect because amylose has 1-4 glycosidic bonds and not 1-6</i>		(1)

Question number	Answer	Additional guidance	Mark
5(c)(ii)	An answer that includes the following points: • because {starch / amylose } were not broken down as well (1) • less {glucose / sugar} {to convert to fat / so fat broken down} (1)	ACCEPT not broken down hydrolysed less maltose / glucose formed ACCEPT less {glucose / sugar} absorbed (into blood) some {starch / amylose} lost in faeces DO NOT ACCEPT starch absorbed	(2)

Question number	Answer	Additional guidance	Mark
5(d)(i)	An explanation that includes the following points: • (correlation) because a change in one variable is reflected by a change in another variable (1) • (positive) because as one factor increased, so did the other (1)	NB penalise reference to 'causes' once IGNORE explanations ACCEPT pattern between the two factors ACCEPT <u>both</u> changes are increases as <u>both</u> weight loss and {replication / number of bacteria} increase	(2)

Question number	Answer	Additional guidance	Mark
5(d)(ii)	An answer that includes the following points: • {replication / bacteria} uses {energy / glucose / sugar} (in the digestive system) (1) • therefore less available {for absorption / to store as fat} (1)	ACCEPT feeding / fatty acids / glycerol / amino acids IGNORE food / nutrients ACCEPT so person breaks down fat (reserves)	(2)

Question number	Answer	Additional guidance	Mark
6(a)	fluid mosaic (model) (1)	ACCEPT mosaic fluid IGNORE phospholipid / bilayer	(1)

Question number	Answer	Additional guidance	Mark
6(b)	A description that includes the following points: - in {a bilayer / 2 layers} (1) {phosphate / heads} pointing towards {aqueous environments / inside and_outside of the cell} (1) {fatty acids / tails} pointing {into the membrane / away from the water / towards each other} (1)	ACCEPT outwards / named environments ACCEPT inwards	(3)

Question number	Answer	Additional guidance	Mark
6(c)(i)	$r^3 = 0.027$ (1) $r = 0.3$ (1) $d = 0.6$ (1)	π on calculator $r^3 = 0.0258$ π on calculator $r = 0.2954$ π on calculator $d = 0.5908 = 0.6$ Bald answer of $0.027 = 1$ mark Bald answer of $0.3 = 2$ marks Bald answer of $0.6 = 3$ marks	(3)

Question number	Answer	Additional guidance	Mark
6(c)(ii)	A description that includes three of the following points: • single-stranded (1) • (mRNA / mononucleotides) consist of <u>ribose</u>, phosphate and {a base / correctly named base} (1) • phosphodiester bonds between {(mono)nucleotides / phosphate and sugar} (1) • adenine, uracil, cytosine and guanine (1)	NB piece together DO NOT ACCEPT T / thymine	(3)

Question number	Answer	Additional guidance	Mark
6(c)(iii)	An explanation that includes three of the following points: • description of arrangement of {phospholipids / heads / tails} (1) • heads pointing outwards because they are polar and interact with water (environment) / hydrophobic fatty acids point away from the water (environment) (1) • mRNA surrounded by {phosphate / heads} as mRNA {is a polar molecule / has a phosphate group} (1) • {fatty acid / tails} (of both groups) facing each other because they are hydrophobic (1)	e.g. heads facing {out of the nanoparticle / mRNA} tails facing each other ACCEPT hydrophilic for polar DO NOT ACCEPT attraction of phosphate heads	(3)

Question number	Answer	Additional guidance	Mark
7(a)	A description that includes three of the following points: • {CFTR (protein) / (CFTR) protein} cannot function properly (1) • credit details of dysfunction (1) • mucus will be (very) {thick / sticky} (1) • gases will not be able to move through the mucus properly (1)	ACCEPT change in shape / structure / e.g. reduced transport of chloride ions out of the cell sodium ions move into the cell water leaves the mucus and enters the cell chloride ions remain in the cell ACCEPT oxygen (out of lungs) air (but not diffusion of air) mucus blocks airways (3)	
Question number	Answer	Additional guidance	Mark
7(b)(i)	• 13 / 13.0 / 12.97 (%) (1)		(1)

Question number	Answer	Additional guidance	Mark
7(b)(ii)	An explanation that includes three of the following points: • {more / improved} (genetic) screening (1) • more carriers identified (1) • because more {couples choosing IVF / (IVF) identification of affected embryos more reliable} (1) • more couple choosing not to have child (1) • as the frequency of the CF allele decreases in the population there will be a decrease in the CF phenotype (1) • more migration / change in population diversity (1)	ACCEPT named type of screening e.g. PGD ACCEPT fewer false negatives (in people) more (types of) mutations identified (in people) ACCEPT fewer false negatives (in embryo) more (types of) mutations identified (in embryo) fetus DO NOT ACCEPT baby / child ACCEPT more choosing adoption	(3)

Question number	Answer	Mark
*7(c)	Regimen outlined • before inhalation, drug A must be administered • because they are looking at pre-treatment • a placebo needs to be given to another group • to see the effect of drug A over no pre-treatment / to eliminate bias • inhalation daily • as it is unlikely to stay in the body very long • run trial for weeks (minimum 4 weeks) • as results will not be immediate Design of trial • two / three groups of patients with CF (minimum 6 per group) • one to receive drug A and the other to receive a placebo • large number of patients in each group • for repeatability • patients should be of similar {age / sex / severity of CF} • for validity • should not be receiving other medications • as these may mask the effects of drug A and inhalation • double blind trial • to avoid bias What is measured • volume / mass of mucus removed • to see if clearance of mucus has improved • lung function tests / spirometer, peak flow • to see if lung function has improved • give a questionnaire • to assess improvements in quality of life • as these are the parameters being tested • use of statistics to analyse the results • to determine the significance of the data	(6)

Level 0	0	No awardable content	Additional guidance
Level 1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information and with a focus on mainly just one piece of scientific information. The explanation will contain basic information, with some attempt made to link knowledge and understanding to the given context.	Simple descriptions of investigation 1 mark = one description 2 marks = three descriptions
Level 2	3-4	An explanation will be given, with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows some linkages and lines of scientific reasoning, with some structure.	Some explanation given of a trial 3 marks = one explanation 4 marks = two explanations
Level 3	5-6	An explanation is made that is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows a well-developed and sustained line of scientific reasoning, which is clear and logically structured.	More extensive explanation given 5 marks = three explanations 6 marks = four explanations for an investigation that will work

Question number	Answer	Additional guidance	Mark
8(a)	An answer that includes the following points: • at least one carbon-carbon double bond drawn (1) • rest of diagram correct (remaining CC single bonds and {Hs added /Lewis structures}) (1)	DO NOT ACCEPT double bond between C1 and C2 ecf from double bond between C1 and C2 ecf from saturated fatty acid	(2)
Question number	Answer	Additional guidance	Mark
8(b)(i)	• 1.1 / 1.14 / 1.136 (1)		(1)
Question number	Answer	Additional guidance	Mark
8(b)(ii)	• 1.5 : 1 / 1.45 : 1 (1)		(1)
Question number	Answer	Additional guidance	Mark
8(b)(iii)	• 0.022 (1) • 22 000 / 2.2×10^4 (1)	Bald answer of 22000 / 2.2×10^4 = 2 marks Bald answer of 22 of any magnitude or incorrect standard form format = 1 mark	(2)

Answer	
Question number	*8(b)(iv)
Graph 1 : surface area of arteries Conclusions : - arteries have lesions with both lipids - percentage of surface covered in lesions increases with time for <u>both</u> sat and unsat lipids (overall) increase is greater (over time) with sat lipid / converse - type of lipid in diet does influence the percentage of arteries covered with lesions - data may not be {valid as no experimental details / repeatable as no error bars} (only once) Graph 2 : % atherosclerosis Conclusions : - atherosclerosis occurs with both lipids - atherosclerosis is higher with sat lipids in all three ages / converse - percentage increases with age for sat lipids - age has a less clear effect with unsat lipids - data may not be {valid as no experimental details / repeatable as no error bars / significant as no stats test} (only once) Graph 3 : area of atheroma Conclusions : - atheromas are larger in <u>both</u> males and females with sat lipids than unsat lipids - males have atheromas of greater area than females whichever lipid they are given - sex is an influence on area as well - data likely to be significant because error bars do not overlap - male data more variable	

				Additional guidance
Level 0	0	No awardable content		
Level 1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context.		Simple descriptions of data 1 mark = description of data in one graph 2 marks = description of data in two graphs
Level 2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts / concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows some linkages and lines of scientific reasoning with some structure.		Extended links made 3 marks = description of data in three graphs 4 marks = conclusion for one graph
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant biological facts / concepts. Consequences are discussed which supported throughout by sustained linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.		Understanding of graphs used to comment on effect of dietary supplements 5 marks = conclusion for two graphs 6 marks = conclusion for three graphs



Mark Scheme (Results)

June 2024

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

Question number	Answer	Mark
1(a)	The only correct answer is A B is incorrect because the only elements present in all amino acids are carbon, hydrogen, oxygen and nitrogen C is incorrect because the only elements present in all amino acids are carbon, hydrogen, oxygen and nitrogen D is incorrect because the only elements present in all amino acids are carbon, hydrogen, oxygen and nitrogen	(1)

Question number	Answer	Mark
1(b)	The only correct answer is C A is incorrect because amino acids are not held together by ester bonds B is incorrect because amino acids are not held together by ester bonds D is incorrect because hydrolysis breaks bonds not forms them	(1)

Question number	Answer	Additional guidance	Mark
1(c)	A description that makes reference to three of the following points: • (chain) becomes {secondary structure / alpha-helix / (beta) pleated sheet (1) • (secondary structure) becomes {tertiary / quaternary / 3D / globular} structure (1) • with an active site (1) • with hydrophilic <u>R groups</u> arranged on the outside OR credit named bond between the <u>R groups</u> for either secondary or tertiary structure (1)	e.g. hydrogen bonds (only) for secondary structure hydrogen bonds / disulfide {bridges / bonds} / ionic bonds / hydrophobic interactions for tertiary DO NOT ACCEPT if wrongly named bonds are given	(3)

Question number	Answer	Mark
2(a)(i)	The only correct answer is A <i>B is incorrect because thymine joins with adenine in a DNA molecule</i> <i>C is incorrect because thymine joins with adenine in a DNA molecule</i> <i>D is incorrect because thymine joins with adenine in a DNA molecule</i>	(1)

Question number	Answer	Mark
2(a)(ii)	The only correct answer is D <i>A is incorrect because S is not a phosphodiester bond</i> <i>B is incorrect because R is not a hydrogen bond</i> <i>C is incorrect because R is not a hydrogen bond</i>	(1)

Question number	Answer	Additional guidance	Mark
2(b)	Any two from: substitution insertion deletion	IGNORE point / gene / frameshift / addition / subtraction / named disorders / missense / nonsense / inversion / duplication	(1)

Question number	Answer	Additional guidance	Mark
2(c)	A description that makes reference to two of the following points: • mutation rate in prosimians is the highest (1) • (overall) as the age when breeding starts increases, the mutation rate decreases (1) • age when breeding starts does not affect mutation rate in apes (only) (1) • age when breeding starts affects mutation rate in old world monkeys (only) (1) • mutation rates within each group are very close together except prosimians (1)	ACCEPT negative correlation ACCEPT no evidence of an effect ACCEPT {wide range / great variation} (of mutation rates) in prosimians (compared with others)	(2)

Question number	Answer	Additional guidance	Mark
3(a)	A description that makes reference to two of the following points: - transcription / transcribe the DNA / synthesis of RNA (1) - credit detail of role of RNA polymerase in transcription (1) - repairs mistakes in the (newly-synthesised) RNA (1)	ACCEPT mRNA / tRNA / rRNA DO NOT ACCEPT translation e.g. RNA polymerase: binds to the (DNA) promotor (region), unwinds the DNA (helix), separates the DNA strands, lines up the (RNA) nucleotides on the {DNA / template strand}, forms phosphodiester bonds between (RNA) nucleotides	(2)

Question number	Answer	Additional guidance	Mark
3(b)	An answer that makes reference to at least one similarity and one difference: Similarities: - both {consist of three bases / are three bases / are triplets} (1) Differences: - start codon start translation_and the stop codon ends translation (1) {three / more than one} possible codons for the stop codon but start codon {does not / has only one codon} (1) (first) transfer RNA binds to the start codon but there is not a tRNA for the stop codon (1) - start codon codes for {an amino acid / methionine} but a stop codon does not code for an amino acid (1)	ACCEPT an indication of one triplet and more than one triplet, one code for start but stop code is degenerate ACCEPT stop codon does not	(3)

Question number	Answer	Additional guidance	Mark
3(c)	A description that makes reference to two of the following points: - translation / synthesis of {(poly)peptide (chain) / primary structure (of protein)} (1) - hold {(two) tRNAs together (on the mRNA) / (two) tRNAs on the mRNA} (until) a peptide bond joins (two adjacent) amino acids together (1)	IGNORE protein synthesis DO NOT ACCEPT transcription	(2)

Question number	Answer	Mark
4(a)(i)	The only correct answer is B <i>A is incorrect because P is the vena cava</i> <i>C is incorrect because R is the aorta and P is the vena cava</i> <i>D is incorrect because R is the aorta</i>	(1)

Question number	Answer	Mark
4(a)(ii)	The only correct answer is A <i>B is incorrect because R is the aorta</i> <i>C is incorrect because Q is the pulmonary artery</i> <i>D is incorrect because Q is the pulmonary artery and R is the aorta</i>	(1)

Question number	Answer	Mark
4(a)(iii)	The only correct answer is C <i>A is incorrect because P is the vena cava and the coronary artery branches from the aorta</i> <i>B is incorrect because Q is the pulmonary artery and the coronary artery branches from the aorta</i> <i>D is incorrect because S is the pulmonary vein and the coronary artery branches from the aorta</i>	(1)

Question number	Answer	Additional guidance	Mark
4(b)(i)	Any two from: surface area (of diffusion surface) concentration {gradient / difference} membrane permeability temperature pressure type of molecule	ACCEPT velocity of blood flow concentration {gradient / difference} of appropriate named molecule ACCEPT size, charge	(1)

Question number	Answer	Additional guidance	Mark
4(b)(ii)	Fick's (law) (1)		(1)

Question number	Answer	Additional guidance	Mark																				
4(c)(i)	An answer that makes reference to the following points: <table border="1"> <thead> <tr> <th>Diffusion distance</th><th>Diffusion distance / μm</th><th>Time taken to diffuse the distance</th><th>Time taken to diffuse the distance / mseconds</th></tr> </thead> <tbody> <tr> <td></td><td></td><td></td><td></td></tr> <tr> <td></td><td></td><td></td><td></td></tr> <tr> <td></td><td></td><td></td><td> 5 000 / 5 000.0 / 5×10^3 </td></tr> <tr> <td></td><td> 1000 / 1000.0 / 1×10^3 </td><td></td><td> 498 000 / 498 000.0 / 4.98×10^5 / 500 000 / 5×10^5 </td></tr> </tbody> </table>	Diffusion distance	Diffusion distance / μm	Time taken to diffuse the distance	Time taken to diffuse the distance / mseconds												5 000 / 5 000.0 / 5×10^3		1000 / 1000.0 / 1×10^3		498 000 / 498 000.0 / 4.98×10^5 / 500 000 / 5×10^5	1 mark = 1 or 2 correct values 2 marks = all correct	(2)
Diffusion distance	Diffusion distance / μm	Time taken to diffuse the distance	Time taken to diffuse the distance / mseconds																				
			5 000 / 5 000.0 / 5×10^3																				
	1000 / 1000.0 / 1×10^3		498 000 / 498 000.0 / 4.98×10^5 / 500 000 / 5×10^5																				

Question	Answer	Additional guidance	Mark
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number			
4(c)(ii)	An explanation that makes reference to three of the following points: • to supply the {cells / tissues} with {oxygen / glucose} (for respiration) (1) • to remove the carbon dioxide (produced) (1) • a small (diffusion) distance results in a faster the rate of {diffusion / exchange} (1) • credit use of data (with at least one comparable unit) to support mp 3 (1)	ACCEPT named cells / tissues e.g. muscle ACCEPT correct reference to time for diffusion for rate converse IGNORE efficiently e.g. it takes 0.5 milliseconds for 1 μm but 50 milliseconds for 10 μm more than {10 / 100} μm away the rate of diffusion would not be fast enough	(3)

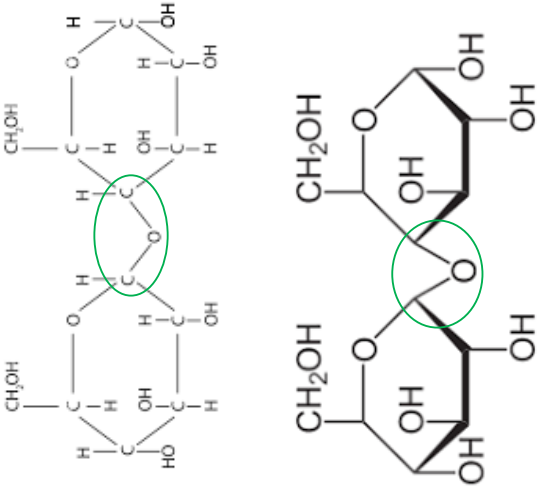
Question number	Answer	Additional guidance	Mark
5(a)	An explanation that makes reference to the following points: • because haemophilia is {sex-linked / sex-linkage} (disorder) (1) • which means the {gene for haemophilia / gene for blood clotting / gene for factor VIII} is located on the X chromosome (1) • therefore males with the {faulty / recessive / haemophilia} allele will have haemophilia (1) • whereas females need to {be homozygous recessive / have two faulty alleles} to have haemophilia (1)	NB Max 3 marks if written in context of colour-blindness and not haemophilia ACCEPT X-linked ACCEPT if dominant and recessive alleles shown on X chromosomes in a diagram NB penalise recessive gene ONCE ACCEPT if clearly indicated on a diagram mutation ACCEPT if clearly indicated on a diagram	(4)

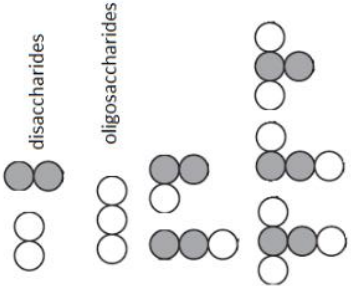
Question number	Answer	Additional guidance	Mark
5(b)(i)	• 185218 correctly divided by 37988 (1) • 4.9 (1)	e.g. 5 / 4.87 / 4.874 / 4.8744 Bald answer of 4.9 = 2 marks Bald answer not to 2 sig figs correctly rounded = 1 mark	(2)

Question number	Answer	Mark
5(b)(ii)	The only correct answer is C <i>A is incorrect because the answer is 2.35×10^{-3}</i> <i>B is incorrect because the answer is 2.35×10^{-3}</i> <i>D is incorrect because the answer is 2.35×10^{-3}</i>	(1)

Question number	Answer	Additional guidance	Mark
5(b)(iii)	credit reasonable suggestion (1)	e.g. people are {dying / being born} all the time (young) people may not be diagnosed yet / won't know not everyone can be counted not everyone is tested / has access to tests not all cases recorded not everyone will know they have haemophilia IGNORE lie / ashamed / won't admit to it / asymptomatic	(1)

Question number	Answer	Additional guidance	Mark
5(c)	An explanation that makes reference to the following points: - as thrombin is an {enzyme / catalyst / catalyses} (1) - without thrombin fibrinogen will not be converted to fibrin (by thrombin) (1) - without fibrin there will be nothing to trap {platelets / blood cells} (1)	NB max 2 marks if no context ACCEPT less fibrinogen converted to fibrin ACCEPT fewer {platelets / blood cells} trapped	(3)

Question number	Answer	Additional guidance	Mark
6(a)	An answer that makes reference to the following points: - glycosidic bond correctly shown (1) - rest of molecule drawn correctly (1) - an indication that (one molecule) water is formed (1)		(3)

Question number	Answer	Additional guidance	Mark
6(b)(i)	An answer that makes reference to the following points: • {one / two} correct diagrams (1) • correct diagrams of one disaccharide and two oligosaccharides (1)	NB diagrams must be white / grey circles touching or with lines joining them 	(2)

Question number	Answer	Additional guidance	Mark
6(b)(ii)	An explanation that makes reference to the following points: • (amylase) {is specific / is complementary / only binds / only fits} {substrates / 1 – 4 glycosidic bonds} (1) • {1 – 4 glycosidic bonds / substrate} can {fit into / bind with} the active site (1)	Must be a reference to 1 – 4 bonds for 2 marks to be awarded or the converse with 1 – 6 bonds ACCEPT (the parts of the glucoses joined by) 1 – 6 glycosidic bonds do not {fit into / bind with} the active site NB the active site (of amylase) is complementary to the 1 – 4 glycosidic bond = 2 marks	(2)

Question number	Answer	Additional guidance	Mark
6(c)(i)	An answer that makes reference to the following points: • by hydrolysis (of glycosidic bonds) (1) • (different) enzymes needed to break each type of (glycosidic) bond (1) • different enzymes needed for {disaccharides and oligosaccharides / each type of oligosaccharide / each type of sugar} (1)		(3)

Question number	Answer	Additional guidance	Mark
6(c)(ii)	An explanation that makes reference to the following points: • because it is a {polar / hydrophilic} molecule (1) • so cannot pass {through / into} the {phospholipids / fatty acids / tails} (which are non-polar) (1)		(2)

Question number	Answer	Additional guidance	Mark
7(a)	• correct calculation (1) • 7.56 (1)	$340 \div 45 = 7.55555555555556$ e.g. 8 / 7.6 / 7.556 / 7.5556 etc ACCEPT ecf 8.29 Bald answer of 7.56 = 2 marks Bald answer of 8 / 7.6 / 7.556 / 7.5556 etc / 8.29 = 1 mark	(2)

Question number	Answer
*7(b)	Table 1: • RYR decreases total cholesterol • RYR decreases LDL • studies used different doses and decreases were not consistent • which suggests other factors may be involved • no indication of sample size / information about sex at birth, age, diet /where levels were measured, when levels were measured • therefore <u>valid</u> conclusions cannot be drawn • credit effect of limitation eg if person ate more cholesterol then decrease might be higher, levels measured closer to meal might be higher • discrepancy on effects of HDL / not much data on HDL • LDL : HDL ratio cannot be calculated • and this is more significant than LDL / total cholesterol levels • no indication of repeats • so conclusions will not be <u>valid</u> • no control group • so cannot be certain that the RYR caused the changes Graph 1: • RYR lowers LDL at both doses • levels of LDL increase once RYR not taken anymore • small sample size • no indication of e.g. diet, age, sex at birth, when and where levels were measured • therefore <u>valid</u> conclusions cannot be drawn • credit effect of limitation eg if person ate more cholesterol then decrease might be higher, levels measured closer to meal might be higher • {large / overlapping} {range bars / error bars} • so conclusions will not be <u>valid</u> / RYR may have no significant effect • short term study • so don't know if effects are long term Graph 2: • taking RYR appears to decrease LDL • {large / overlapping} {range bars / error bars} • so conclusions will not be <u>valid</u> / RYR may have no significant effect • no indication what the , what the dose was, what the time scale was • credit specific effect of limitation eg if person ate more cholesterol then decrease might be higher, levels measured closer to meal might be higher, no timescale no indication of how long drop in LDL took

				Additional guidance
Level 0	0	No awardable content		
Level 1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context.		Descriptions of data 1 mark = one description 2 marks = at least two descriptions of data from two different sources of data
Level 2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts / concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows some linkages and lines of scientific reasoning with some structure.		Limitations of data 3 marks = one limitation described 4 marks = at least two limitations described from two different sources of data
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant biological facts / concepts. Consequences are discussed which supported throughout by sustained linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.		Implications of limitation 5 marks = one implication of one limitation given 6 marks = at least one implication described for two limitations described from two different sources of data

Question number	Answer	Additional guidance	Mark
7(c)(i)	credit two from: headache pins and needles hair loss acne allergic reaction / rash / hives dizziness memory loss / confusion feeling sick / nausea / vomiting feeling unusually tired / fatigue / physically weak stomach pain digestive system problems, such as constipation, diarrhoea, indigestion or farting loss of appetite (type II) diabetes impotence muscle {pain / tiredness / weakness / damage} joint {pain / swelling} tendon problems sleep problems low blood platelet count liver damage / hepatitis / yellowing of {eyes / skin} / dark-coloured urine kidney failure		(1)

Question number	Answer	Additional guidance	Mark
7(c)(ii)	A description that makes reference to four of the following points: • large group of people (1) • people who are {healthy / have no known illnesses} (1) • {control / same} {age / sex at birth / ethnicity / lifestyle / etc} (1) • one group given placebo and one given monacolin K (1) • monitored for side effects (1) • statistical analysis of data (on side effects) / T test (1)	ACCEPT minimum size of 100 ACCEPT not taking other medications DO NOT ACCEPT patients DO NOT ACCEPT contradictions ACCEPT given a control (substance) IGNORE use of different doses ACCEPT over a period of time minimum of a month ACCEPT analysis of Mann-Whitney U / Z test / standard deviation	(4)

Question number	Answer	Additional guidance	Mark
7(c)(iii)	An answer that makes reference to two of the following points: • difficult to eliminate the effects of a named factor that cannot be controlled (1) • psychological effects / placebo effect / assumption that they are taking monacolin (1) • cannot quantify the extent of the side effect (1) • different people may react differently to the drug (1) • ethics of giving someone an untested drug (1) • some side effects may {be rare / occur after a long period of time / not be detected} (1)	e.g. diet, activity levels ACCEPT assessment of side effect is subjective ACCEPT people are genetically different side effects may not affect the group of people in the study ACCEPT moral / not right for ethical side effects could be fatal	(2)

Question number	Answer	Additional guidance	Mark
8(a)	A description that makes reference to the following points: • (protein that) consists of 4 {subunits / (poly) peptides} (1) • has (four) {haem / non-protein / prosthetic} groups (1) • {iron ion / ferric iron / Fe²⁺} (attached to each subunit / haem) (1)	ACCEPT α and β, α and γ, δ and ε DO NOT ACCEPT α helix / β sheet IGNORE proteins, bonds DO NOT ACCEPT iron NB Has four haem groups that contain iron ion = 2 marks	(3)

Question number	Answer
*8(b)	Mean number of cells per dm^3 of blood • no correlation with size of mammal / some indication that as size of mammal decreases the number increases, with the exception of camels Mean mass of haemoglobin: • some indication that mass of haemoglobin per cell decreases with size of mammal, with the exception of camels / man • mammals with high numbers of red blood cells have lower mean mass of haemoglobin per cell / converse • total mass of haemoglobin decreases with size of mammal • because high number would partially compensate for less haemoglobin as the smaller mammal may require less energy • so respiration would be less • total mass of haemoglobin decreases with size of mammal Mean cell volume: • cell volume decreases with size of land mammals, except camels • possibly because their blood vessels are narrower • cell volume of camels is particularly large • possibly because their blood vessels are wider • as more heat needs to be lost in the hot temperatures Oxygen-carrying capacity: • oxygen carrying capacity of blood decreases with decrease in size of mammal • oxygen-carrying capacity decreases with total mass of haemoglobin • as the smaller mammal may require less energy • so respiration would be less Overall: • these three factors determine the oxygen-carrying capacity of the blood • but other factors would also affect oxygen-carrying capacity • e.g. affinity of haemoglobin for oxygen • beluga whales have relatively small cells but high mass of haemoglobin and high concentration enabling their high oxygen-carrying capacity • as swimming takes a lot of energy • as the water they live in is cold • and energy is needed to keep warm • therefore rate of respiration is high • and the animals have to surface to acquire their oxygen from the air

			Additional guidance
Level 0	0	No awardable content	
Level 1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information and with a focus on mainly just one piece of scientific information. The explanation will contain basic information, with some attempt made to link knowledge and understanding to the given context.	Simple descriptions of data / correct comments not related to data / attempt but not accurate description of trends 1 mark = one description / comment 2 marks = two descriptions / comments
Level 2	3-4	An explanation will be given, with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows some linkages and lines of scientific reasoning, with some structure.	Trends / lack of trends described with some explanation 3 marks = one correct trend described / an inaccurate trend explained 4 marks = one trend plus a simple explanation of data
Level 3	5-6	An explanation is made that is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows a well-developed and sustained line of scientific reasoning, which is clear and logically structured.	Explanations of data 5 marks = more than a simple explanation of a trend 6 marks = explanation that shows some linkage of data sets, that is discussed in relation to size of mammal

Question number	Answer	Additional guidance	Mark
8(c)(i)	• 26 (1) • 23 (1)	Bald answer of 23 = 2 marks Bald answer of 26 = 1 mark	(2)

Question number	Answer	Additional guidance	Mark
8(c)(ii)	A description that makes reference to the following points: - as partial pressure (of oxygen) drops from 12 to {1 / 2 / 3 / 4} (kPa) the percentage saturation of oxygen {remains at 80 to 100 % / remains fairly constant / drops slightly} (1) - partial pressure (of oxygen) drops sharply at low levels of oxygen (1) OR - percentage saturation (of oxygen) drops sharply below {1 / 2 / 3 / 4} (kPa) (1) - percentage saturation (of oxygen) {remains at 80 to 100 % / remains fairly constant / drops slightly} at high partial pressures (1)	NB Penalise reference to rate once ACCEPT converse throughout ACCEPT value within the range of 1 and 4 which lies on a grid line ACCEPT value within the range of 1 and 4 which lies on a grid line	(2)

Question number	Answer	Additional guidance	Mark
8(c)(iii)	An answer that makes reference to two of the following points: • because myoglobin has a higher affinity for oxygen (than haemoglobin) (1) • so that it will (only) release the oxygen when partial pressures are low (1) • because haemoglobin cannot supply enough oxygen to respiring muscle cells / so that myoglobin can supply <u>enough</u> oxygen to respiring muscle cells (1)	ACCEPT converse stronger {binding / association} with oxygen IGNORE easier / better ACCEPT converse ACCEPT muscle cells need <u>more</u> oxygen for respiration (than other cell types)	(2)



Mark Scheme (Results)

October 2024

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

Question number	Answer	Additional guidance	Mark
1(a)	• (the membrane is) fluid / fluidity (1)	ACCEPT the phospholipids (and proteins) can move (within the membrane) IGNORE flexible / fluid mosaic model / semipermeable / mosaic / bilayer	(1)

Question number	Answer	Mark
1(b)(i)	The correct answer is A <i>B is incorrect because the units are μm^2</i> <i>C is incorrect because the radius is 150 not 300</i> <i>D is incorrect because the radius is 150 and not 300 and the units are μm^2</i>	(1)

Question number	Answer	Mark
1(b)(ii)	The correct answer is C <i>A is incorrect because the surface area will increase not decrease</i> <i>B is incorrect because the volume will stay the same</i> <i>D is incorrect because surface area will increase not stay the same</i>	(1)

Question number	Answer	Additional guidance	Mark
1(b)(iii)	An explanation that includes two of the following points: - because there is a higher concentration (of oxygen) {outside / in the water} (than in the cytoplasm) (1) - because {all parts of the amoeba are close to the cell membrane / amoeba has a small volume / because it has a large surface area (to volume ratio)} 1) - low energy requirements / low metabolism / low respiratory rate (1)	ACCEPT converse for cytoplasm compared to water ACCEPT partial pressure ACCEPT amoeba is small / diffusion distance is small (to all parts of cell)	(2)

Question number	Answer	Additional guidance	Mark
2(a)	$1.431 \times 10^{15} / 1.43 \times 10^{15} / 1.4 \times 10^{15}$ (1)	ACCEPT $1.431 \cdot 10^{15} / 1.43 \cdot 10^{15} / 1.4 \cdot 10^{15}$	(1)

Question number	Answer	Mark
2(b)	The correct answer is D A is incorrect because haemoglobin is not fibrous, it is globular B is incorrect because haemoglobin has quaternary structure C is incorrect because haemoglobin is not fibrous	(1)

Question number	Answer	Additional guidance	Mark
2(c)(i)	A description that includes the following points: - embryonic development: α, β and γ subunits increase (1) - fetal development: constant levels of α, (constant levels and then) increase presence β, (short increase and then decreases) decreasing presence of γ (1) - baby: presence of α remains the same, increased presence of β (which levels off), decrease in γ (and then levels off) (1) OR α subunit increases during embryonic development and then remain constant (1) β subunit increases throughout embryonic and fetal development and in the baby (and then levels off) (1) γ subunit increases during embryonic development and then falls during fetal development and in the baby (and then levels off) (1)	DO NOT piece together or mix mps from both sets ACCEPT answers in weeks not stages throughout provided correct values are quoted and fall within: - embryonic : up to 8 - fetal : between 8 and 39 / 40 - baby : between 0 and 42 ACCEPT increases and then at birth increases and levels off	(3)

Question number	Answer	Additional guidance	Mark
2(c)(ii)	An explanation that includes the following points: - fetal haemoglobin has higher affinity (than adult) (1) - so that oxygen will leave the adult haemoglobin and bind to fetal haemoglobin (1) - at the same partial pressure of oxygen (1)	Penalise baby for fetus once ACCEPT converse ACCEPT stronger {binding / association} (with oxygen) γ globin has higher affinity than β globin IGNORE easier / better / faster ACCEPT so oxygen will pass from mother's blood into fetus' blood so that the fetal haemoglobin will be more saturated (with oxygen than the adult) ACCEPT same oxygen concentration	(2)
Question number	Answer		Mark
3(a)(i)	The correct answer is B <i>A is incorrect because individual 1 is not homozygous</i> <i>C is incorrect because genotype and phenotype are the wrong way round</i> <i>D is incorrect because genotype and phenotype are the wrong way round</i>		(1)

Question number	Answer	Mark
3(a)(ii)	The correct answer is D <i>A is incorrect because individual 3 is not affected but his parents are both carriers</i> <i>B is incorrect because individual 3 is not affected but his parents are both carriers</i> <i>C is incorrect because individual 3 is not affected but his parents are both carriers</i>	(1)

Question number	Answer	Mark
3(a)(iii)	The correct answer is C <i>A is incorrect because 1 in 4 CMT × 1 in 2 female = 1 in 8</i> <i>B is incorrect because 1 in 4 CMT × 1 in 2 female = 1 in 8</i> <i>D is incorrect because 1 in 4 CMT × 1 in 2 female = 1 in 8</i>	(1)

Question number	Answer	Additional guidance	Mark
3(b)(i)	6 300 / 6.3×10^3 (1)	ACCEPT $6.3 \cdot 10^3$	(1)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	An answer that includes the following points: - the {genotype / alleles present in the gametes} of parents shown (1) - possible genotypes of children shown (1) - tt is unaffected and Tt has CMT (1)	(Parent 1) tt (Parent 2) Tt T or t tt (tt) Tt (Tt) Not CMT/ no / x CMT / yes / ✓ ACCEPT from a pedigree diagram that shows the Ts and ts NB ECF if genotypes / gametes wrong for mp 1	(3)

Question number	Answer	Additional guidance	Mark
3(c)	An explanation that includes the following points: - male parent with CMT will have $\{X^c Y / X^T Y\}$ the CMT allele on the X chromosome (only) / no CMT allele on the Y chromosome} (1) (only) the Y chromosome is passed onto their sons (1)	ACCEPT mutation (for CMT) on X chromosome CMT version of the gene faulty allele (for CMT) IGNORE CMT gene / CMT / the disease ACCEPT does not pass X chromosome on	(2)

Question number	Answer	Additional guidance	Mark
4(a)(i)	The correct answer is D <i>A is incorrect because the correct answer is $(2.5 \times 10 \times 1000)/0.14 = 178\,571.42857 = 179\,000$</i> <i>B is incorrect because the correct answer is $(2.5 \times 10 \times 1000)/0.14 = 178\,571.42857 = 179\,000$</i> <i>C is incorrect because the correct answer is $(2.5 \times 10 \times 1000)/0.14 = 178\,571.42857 = 179\,000$</i>		(1)

Question number	Answer	Additional guidance	Mark
4(a)(ii)	An explanation that includes three of the following points: • (wall of) aorta has {elastic fibres / (smooth) muscle / collagen} in it (1) • because the blood is under high pressure (from the heart) (1) • capillary (wall) is only one cell thick (1) • because this is where {gas exchange takes place (in the lungs) / plasma needs to pass (out) / tissue fluid needs to pass (in)} (1)	ACCEPT (elastic fibres) for (elastic) recoil / to squeeze / pumps blood along / maintains high blood pressure ACCEPT oxygen passes in / carbon dioxide passes out (in lungs)	(3)

Question number	Answer	Additional guidance	Mark
4(b)	An answer that includes the following points: • (duration of) (ventricular) diastole and (ventricular) systole decrease with increase in heart rate (1) • manipulation of figures to illustrate one change in duration (1)	ACCEPT converse Piece together e.g. ventricular diastole decreases by 0.39 seconds / 74% ventricular systole decreases by 0.11 second / 40%	(2)

Question number	Answer	Additional guidance	Mark
4(c)	An explanation that includes three of the following points: • (peak) rate of flow in forward direction decreases with distance from heart OR • (peak) rate of flow in backward direction increases with distance from heart (1) • rate of flow decreases (with distance from heart) due to less {force / pressure} (1) • due to (increased) {resistance (between blood and vessel walls) / branching (of aorta) / friction (between blood and vessel walls)} (1) • some backflow of blood {corresponding with diastole / no valves in aorta} (1)	ACCEPT description of both atrioventricular and semilunar valves being open description of both atria and ventricles {being relaxed / having low pressure} elastic recoil	(3)

Question number	Answer	Additional guidance	Mark
5(a)	An explanation that includes the following points: • (safe / not too high a dose) to avoid {uncontrollable bleeding / named examples of uncontrollable bleeding / internal bleeding} (1) • (effective / not too low a dose) to reduce (the risk of) blood clotting (1)	IGNORE side effects / harm / toxicity ACCEPT passing blood in your urine passing blood in faeces or having black faeces severe bruising prolonged nosebleeds vomiting or coughing up blood heavy or increased bleeding during periods, or any other bleeding from the vagina jaundice ACCEPT thin the blood	(2)
Question number	Answer	Additional guidance	Mark
5(b)(i)	A description that includes the following points: • to carry a <u>copy</u> of the gene {out of the nucleus / into the cytoplasm / to the ribosomes} (1) • (used for) {(correct) ordering of the amino acids / producing amino acid sequence / formation of (poly)peptide chain} (1)	ACCEPT {(genetic) code / DNA base sequence / DNA} if <u>reference to the enzyme has been made</u> NB copy is the noun not the verb	(2)

Question number	Answer
*5(b)(ii)	(6) EXP Advantages of pharmacogenomics: • genotype {affects / determines} the dose of warfarin needed • so one dose will not be appropriate for all patients • as the two genes that have several alleles • (one / two) gene M allele that slows down breakdown means less warfarin - accept converse for other alleles • one gene V allele results in less enzyme V / mRNA so less warfarin should be prescribed - accept converse for other alleles • other genetic predispositions maybe identified e.g. high cholesterol, high blood pressure Effect of other factors: • factors other than genotype affects blood clotting so these would need to be taken into account as well • e.g. people with high cholesterol more likely to be prescribed warfarin • mass of warfarin would need to be adjusted according to body size / given at a particular dose in mgs per kg • liver function may affect the half life of the drug Issues surrounding genetic screening: • there are religious / moral / social / ethical issues relating to genetic screening • people / family may not want to find out if there are any other underlying genetic issues • possibility of false negative / positive results Blood clotting: • thromboplastin converts prothrombin into thrombin which converts fibrinogen into fibrin to trap platelets

		Additional guidance	
Level 0	0	No awardable content	
Level 1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context.	Simple points made 1 mark = 1 point made 2 marks = some attempt to comment on pharmacogenetics or factors that affect it OR description of blood clotting process
Level 2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts / concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows some linkages and lines of scientific reasoning with some structure.	Simple discussion of pharmacogenetics 3 marks = implications of genotype for either gene M or gene V on warfarin dose 4 marks = implications of genotype for both gene M and gene V on warfarin dose
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant biological facts / concepts. Consequences are discussed which supported throughout by sustained linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.	Understanding of other issues involved 5 marks = criteria for 4 marks plus links made with either blood clotting process or other factors or issues of screening 6 marks = criteria for 4 marks plus links made with two from blood clotting process / other factors / issues surrounding screening

Question number	Answer	Additional guidance	Mark
6(a)	An explanation that includes three of the following points: • (less cholesterol) so reduces {build up of cholesterol / formation of atheroma / formation of a plaque} (1) • in the (walls of the) coronary artery (1) • so flow of blood to heart {muscle / cells / tissue} would not be prevented (1) • so oxygen available for respiration for heart {muscle / cells / tissue / contraction} (1)	NB Award converses but must be in context of less cholesterol for full marks to be awarded	(3)

Question number	Answer	Additional guidance	Mark
6(b)	Any two of the following:		

	• (total) number of amino acids (in a peptide) / length of {(poly)peptide / chain} • {sequence / order / position} of amino acids • {proportion / number} of each type of amino acids (1)	ACCEPT {sequence / order / position} R groups ACCEPT (types of) amino acids present R groups for amino acids	(1)
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Question number	Answer	Additional guidance	Mark
6(c)(i)	An explanation that includes two of the following points: • because this (digestion) happens when a person eats soybeans / scientists wanted to mimic what was happening in the body (1) • to {extract / separate / release} the {proteins / glycinin and β-conglycinin / active ingredients} (1) • as enzymes needed to break (peptide) bonds (to produce the peptides) (1)	ACCEPT copies digestion ACCEPT so that the proteins are soluble	(2)

Question number	Answer	Additional guidance	Mark
6(c)(ii)	• because they (different enzymes) are {found in different parts of the digestive system / needed to break down different proteins} (1)	ACCEPT more than one type of enzyme in the body two or more named parts of digestive system different substrates	(1)

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Question number	Answer	Additional guidance	Mark
6(c)(iii)	An explanation that includes the following points: • 37°C because this is the {optimum temperature (for human enzymes) / (human) body temperature} (1) • 2 hours because {this is enough time for complete digestion to occur / this is how long the digesting food stays in each part of the digestive system / this allows all the substrate to be broken down} (1)	ACCEPT time spent in stomach / (small) intestine sufficient time for enough peptides to be produced for the investigation	(2)

Question number	Answer	Additional guidance	Mark
6(d)	An explanation that includes three of the following points:		(3)

	- as the concentration of soybean peptides increase, the inhibition of HMGCR increases and the synthesis of cholesterol decreases (1) - because soybean peptides inhibit HMGCR - because the peptides {bind to the HMGCR / compete with the substrate} (1) - as the cholesterol precursor cannot be converted into cholesterol (by HMGCR) (1)	NB Piece together ACCEPT bind to the active site ACCEPT cholesterol precursor cannot bind to HMGCR	
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Question number	Answer	Additional guidance	Mark
7(a)(i)	A description that includes the following points: - substitution mutations {swap / change / replaces} a {base / nucleotide} (1) - insertion and deletion mutations (results in a) change in the number of {bases / nucleotide} (1)	ACCEPT plural ACCEPT increases and decreases number of bases / greater or fewer number of bases / more or less bases changes length of {DNA / gene} / length of DNA gets longer or shorter IGNORE frameshift	(2)

Question number	Answer	Additional guidance	Mark
7(a)(ii)	An explanation that includes four of the following points: • substitution mutations will not affect protein function (1) • as substitution mutations may not alter the {amino acid / amino acid sequence} (1) • as the substitution mutation may occur in the non-coding region (of the DNA) (1) • substitution mutations may not affect protein function (1) • as substitution mutations may change one amino acid (only) (1)	ACCEPT {works / activity} for function ACCEPT may code for the same {amino acid / amino acid sequence} ACCEPT {works / activity} for function	(4)

	{deletion / insertion} mutations may have (large) effects on protein function (1) - as {insertion / deletion} mutations cause a frameshift (1)	ACCEPT {works / activity} for function ACCEPT description of frameshift alters the sequence of amino acids after the mutation	
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Question number	Answer	Additional guidance	Mark
7(a)(iii)	mouse: more animals sampled (1)	ACCEPT easier to control variable NB answers about sample size must be comparative	(1)

Question number	Answer	Additional guidance	Mark
7(b)(i)	An answer that includes the following points: - an appropriate line of best fit (1) - whole number between 285 and 1143 (1)	straight line (reasonable if drawn by hand) does not extend further than the left hand or right hand points touches data for all 4 age groups	(2)

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Question number	Answer	Additional guidance	Mark
7(b)(ii)	A description that includes the following points: • number (of mutations) increases with age (in all four animals) (1) • different species have different life spans (1) • different species have different number of mutations (in their cells) (1) • different species have different {mutation rates / number of mutations per cell per year} (1) • humans have the greatest variation and naked mole rats have the least variation (in the number of mutations per cell) (1)	ACCEPT different species have different frequency of mutations	(3)

Question number	Answer	Additional guidance	Mark
7(b)(iii)	An answer that includes the following points: • cells divide at different {rates / frequencies} (1) • different {repair mechanisms / DNA polymerases} (1) • exposed to different {factors (that cause mutations) / environment} 1) • different {quantities of DNA / base sequences / genes} (1)	ACCEPT named example of a cell type ACCEPT named example e.g. UV ACCEPT alleles / chromosomes genetic predisposition / genetics	(2)

Question number	Answer	Additional guidance	Mark
8(a)	An answer that includes three of the following points, with at least one similarity and one difference: Similarities: • both contain carbon and hydrogen (and oxygen) (1) • both contain covalent bonds (only) (1) Differences: • unsaturated fatty acids contain carbon-carbon double bonds but saturated fatty acids have only single carbon-carbon double bonds (1)	DO NOT PIECE TOGETHER if in two separate descriptions. ACCEPT hydrocarbon chain / COOH group DO NOT ACCEPT ester bonds ACCEPT saturated fatty acids do not contain carbon-carbon double bond C = C and C - C DO NOT ACCEPT saturated fatty acids have no double bonds	(3)

	- unsaturated fatty acids have {fewer hydrogens (for same number of carbons) / lower hydrogen to carbon ratio / higher carbon to hydrogen ratio} (1) - unsaturated fatty acids are {kinked / bent} and saturated fatty acids are {straight / linear} (1)	ACCEPT converse for saturated fatty acids	
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Question number	Answer	Additional guidance	Mark
8(b)(i)	The correct answer is A <i>B is incorrect because $41701 \div 68786 = 0.606242549355973$, so ratio is 0.6 : 1</i> <i>C is incorrect because $41701 \div 68786 = 0.606242549355973$, so ratio is 0.6 : 1</i> <i>D is incorrect because $41701 \div 68786 = 0.606242549355973$, so ratio is 0.6 : 1</i>		(1)

Question number	Answer
*8(b)(ii)	Animal products: • how much animal products / fats / cholesterol / LDL / HDL do you consume in a week? • because cholesterol increase risk of atheroma • high HDL : LDL reduces risk of CVD • has your consumption of fatty acids decreased? • because this could reduce the risk without any avocados being eaten Other dietary factors: • how much {fibre / vegetables / fruit / cereal} do you consume each week? • because fibre reduces cholesterol levels • how much food containing antioxidants do you consume? • antioxidants reduce damage to endothelial cells • how much salt do you consume? • high salt intake is linked to high blood pressure • how much alcohol do you consume in a week? • alcohol affects liver function / increase blood pressure / affects the LDL:HDL ratio • is your calorie consumption greater than your energy usage? • obesity is a risk factor for CVD Avocados: • do you eat avocados every week? • did you have adverse reactions to the avocado? • because study needed to ensure that they were being eaten on a weekly basis • have you replaced animal products with avocados?

	- because part of the benefit of eating avocados is to reduce saturated fatty acids in diet - the effects of the diet need to be compared to previously - how many avocados do you eat each week? - to see if the number of avocados affect the results Non-dietary questions: - do you smoke / how many cigarettes do you smoke / do you have high blood pressure? - because smoking increases blood pressure / damages endothelial lining - do you have diabetes / family history / BMI / age? - these increase the likelihood of CVD
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		Additional guidance
Level 0	0	No awardable content
Level 1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context. Questions suggested, relating to non-diet CVD risk factors with some justification 1 mark = 1 question suggested 2 marks = 1 question suggested which does not relate to diet with justification
Level 2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts / concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows some linkages and lines of scientific reasoning with some structure. Questions suggested that relate to diet with justification 3 marks = 1 question which relate to diet justified 4 marks = 2 questions which relate to diet justified
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant biological facts / concepts. Consequences are discussed which supported throughout by sustained linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured. Questions appropriate to this investigation with justifications 5 marks = 3 questions which relate to diet with justification justifications 6 marks = 4 questions which relate to diet with justifications

Question number	Answer	Additional guidance	Mark
8(b)(iii)	An answer that includes at least one reason for it being valid and one reason for it not being valid for full marks to be awarded: Valid because : • large sample size (1) • represents both {men and women / a range of ages} (1) Invalid because : • ran for {a long period of time / 30 years} (1) • participants had no signs of CVD or stroke (1) • no control group (1)	NB must state if the reason makes it valid or not ACCEPT converse idea for invalid IGNORE number of men and women were different ACCEPT longitudinal study IGNORE healthy	(4)

	• no indication that {lifestyles are similar / there were no (other) underlying diseases} (1) • {diets / number of avocados} not controlled (1) • responses to questionnaire {are subjective / may not be truthful} (1)	ACCEPT named lifestyle lifestyles not controlled other factors that increase risk of CVD difficult to control ACCEPT frequency of questionnaire is low / questionnaire is every 4 years	
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