Mark Scheme (Results)

January 2020

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

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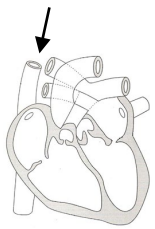
Question number	Answer	Additional guidance	Mark
1	A description that includes the following points: DNA only • deoxyribose • thymine DNA and mRNA accept two from • phosphate (group) • cytosine • guanine • adenine mRNA only • ribose • uracil	Items should not be written in "both" space as well as "mRNA" 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)**

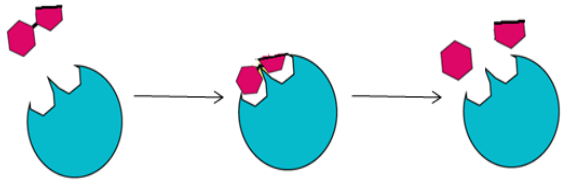
Question number	Answer	Mark
2(a)	**A**  The only correct answer is **A**. ***B*** *is incorrect because the arrow is pointing down the pulmonary vein* ***C*** *is incorrect because the flow of blood is in the wrong direction* ***D*** *is incorrect because the flow of blood is out through the pulmonary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

Question number	Answer	Mark
2(b)	**A** deoxygenated blood flowing away from the heart | oxygenated blood flowing towards the heart 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*	**(1)**

Question number	Answer	Mark
2(c)		(3)

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
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} (1) • <u>ventricles</u> contract more forcefully (during ventricular systole) (1)	**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 × 12) + (12 × 1) + (6 × 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 ÷ 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)**

<table>
<tr><th>Question number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>5(a)(i)</td><td>An explanation that includes the following points:

• pond water has a higher water potential than {cytoplasm / Paramecium} (1)

• (therefore water moves by) osmosis (1)</td><td>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><td colspan="3">Acceptable alternative terms</td></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}</td><td>(2)</td></tr>
</table>

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	

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</u> death} 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 ÷ 4.6) x 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)**

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