Mark Scheme (Results)

Summer 2023

Pearson Edexcel GCE
In Biology Spec B (8BN0)
Paper 01: Lifestyle, Transport,Genes and Health

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
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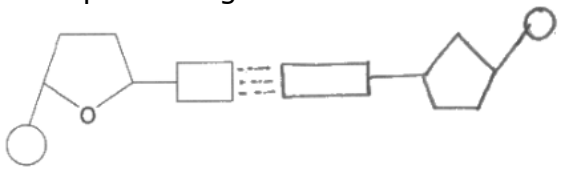
Question Number	Answer	Additional Guidance	Mark
1 (a)(i)	An answer that makes reference to the following: • inverted DNA nucleotide (1) • {2 / 3} hydrogen bonds (1)	Example of diagram: 	**(2)**

Question Number	Answer	Additional Guidance	Mark
1 (a)(ii)	An answer that makes reference to the following: • phosphodiester (1) • hydrogen (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
1 (b)	An answer that makes reference to one of the following: • DNA (nucleotide) has no double bonds whereas CeNA has a double bond (1) • DNA (nucleotide) has {pentose / deoxyribose / 5 carbon} sugar whereas CeNA does not (1)	ALLOW **only** CeNA has a double bond ALLOW DNA nucleotide has an oxygen atom in the ring whereas CeNA does not (1) ALLOW CeNA has an additional carbon atom ALLOW DNA (nucleotide) has {pentose / deoxyribose / 5 carbon} sugar whereas CeNA has {hexose / 6 carbon} (sugar) IGNORE reference to sugar in CeNA	**(1)**

Question Number	Answer	Mark
2 (a)(i)	The only correct answer is A - P *B is incorrect because the atrioventricular valve is already closed at this point* *C is incorrect because the atrioventricular valve is already closed at this point* *D is incorrect because the atrioventricular valve is opening at this point*	**(1)**

Question Number	Answer	Mark
2 (a)(ii)	The only correct answer is B - Q *A is incorrect because the atrio-ventricular valve would open at P* *C is incorrect because the semi-lunar valve would be closed* *D is incorrect because the semi-lunar valve would be closed*	**(1)**

Question Number	Answer	Additional Guidance	Mark
2 (a)(iii)	An answer that makes reference to two of the following: • atria **and** ventricles relax (1) • blood enters the atria (1) • semilunar valves close / atrioventricular valves open (1)	ALLOW {cardiac / heart / myocardium} muscle {relaxes / no longer contracts} ALLOW atrium singular ALLOW pressure inside the {atria / ventricles} decreases	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	• correct measurement of width of XY divided by magnification value (1) • correct calculation of lumen width in mm to two significant figures (1)	<u>Example of calculation</u> {99 / 100 / 101} ÷18= 5.5 or 5.6 One mark for 0.55 or 0.56 Correct answer with no working gains full marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
2 (b)(ii)	An answer that makes reference to one of the following: • (smooth) muscle (by contracting) (1) • elastic fibres (by recoil) (1)		**(1)**

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Question Number	Answer	Additional Guidance	Mark
3 (a)	An answer that makes reference to the following: • {protein / enzyme} made in {organisms / cells} (1) • that reduces activation energy (1)	ALLOW speeds up a reaction	**(2)**

Question Number	Answer	Mark
3 (b)(i)	The only correct answer is B – polysaccharide and disaccharide *A is incorrect because the substrate is a polysaccharide* *C is incorrect because the product is a disaccharide* *D is incorrect because the product is a disaccharide*	**(1)**

Question Number	Answer	Mark
3 (b)(ii)	The only correct answer is A – glycosidic *B is incorrect because it is not hydrogen* *C is incorrect because it is not ionic* *D is incorrect because it is not peptide*	**(1)**

Question Number	Answer	Mark
3 (b)(iii)	The only correct answer is D – mg dm^{-3} min^{-1} *A is incorrect because the unit is mg dm^{-3} min^{-1}* *C is incorrect because the unit is mg dm^{-3} min^{-1}* *D is incorrect because the unit is mg dm^{-3} min^{-1}*	**(1)**

Question Number	Answer	Additional Guidance	Mark
3 (c)	An explanation that makes reference to two of the following: • insoluble so has no osmotic effect (on the cell) (1) • compact so more {starch / glucose / energy} can be stored (in a small space) (1) • {branched / 1,6-glycosidic bonds} increases number of terminal ends for faster hydrolysis (1)	ALLOW does not affect the water potential (of the cell) ALLOW {starch / amylopectin} has {branches / terminal ends} for {fast / rapid} hydrolysis ALLOW break down for hydrolysis IGNORE easier	**(2)**

Question Number	Answer	Additional Guidance	Mark
3 (d)	An explanation that makes reference to the following: • molecule is not complementary shape to the active site (of amylase) (1) • therefore enzyme-substrate complex cannot be formed (1)	ALLOW amylase active site is specific to starch / amylase can only {hydrolyse / break down} starch ignore references to beta glucose ALLOW cannot {fit into / bind to} the active site (of amylase)	**(2)**

Question Number	Answer	Additional Guidance	Mark
4 (a)(i)	An answer which makes reference to the following: • alternative {form / version} of a gene (1) • found at the same {place/ locus} on a chromosome (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
4 (a)(ii)	An explanation which makes reference to the following: • {fruit flies with wide bar eye / offspring} are heterozygous (1) • (therefore) incomplete dominance occurs (1) • because both **alleles** are expressed (1)	ALLOW fruit flies inherit B and R / ALLOW correct genetic diagram ALLOW the alleles are codominant / neither the round nor the bar shape eye is dominant DO NOT ALLOW gene for allele	**(3)**

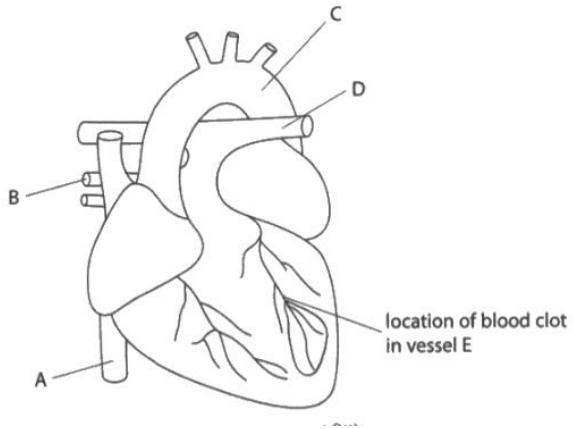
Question Number	Answer	Additional Guidance	Mark
4 (b)(i)	• correct genetic cross (1) • probability of 0.25/ 25% / $\frac{1}{4}$ (1)	<table><tr><td></td><td>T</td><td>t</td></tr><tr><td>T</td><td>TT</td><td>Tt</td></tr><tr><td>t</td><td>Tt</td><td>tt</td></tr></table>	**(2)**

Question Number	Answer	Additional Guidance	Mark
4 (b)(ii)	• pre-implantation genetic diagnosis / PGD / PIGD	ALLOW pre-implantation genetic screening / PGS / PGT	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(b)(iii)	An answer that makes reference to the following: • fewer ethical issues (with PGD) as the embryo has not been implanted / amniocentesis carried out at a later stage (1) • no risk of miscarriage from PGD / risk of miscarriage from amniocentesis (1)	e.g. embryo in earlier stage of development / PGD carried out at an earlier stage	**(2)**

Question Number	Answer	Mark
5 (a)(i)	The only correct answer is B *A is incorrect because the vena cava carries deoxygenated blood* *C is incorrect because this is the aorta* *D is incorrect because the pulmonary artery carries deoxygenated blood*	**(1)**

Question Number	Answer	Mark
5 (a)(ii)	The only correct answer is D *A is incorrect because the vena cava carries blood to the right atrium* *B is incorrect because the pulmonary vein carries blood to the left atrium* *C is incorrect because the aorta carries blood leaving the left ventricle*	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	• suitable area outlined below (and not above) the location of the blood clot (1)	Example:  	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	An explanation that makes reference to four of the following: • platelets activated / thromboplastin released (1) • thromboplastin (enzyme) converts prothrombin to thrombin (1) • thrombin converts fibrinogen to fibrin (1) • (resulting in) fibrin forms a {mesh / network of fibres} which traps (platelets and) red blood cells (1) • {calcium ions / vitamin K} involved (1)		**(4)**

Question Number	Answer	Additional Guidance	Mark
5(c)	An explanation that makes reference to the following: • treatment with {PI / platelet inhibitor} reduced the percentage of patients who had a heart attack (1) • (because) fewer blood clots were formed (in coronary arteries) (1) • (therefore) sufficient oxygen supplied to {cardiac / heart} muscle for respiration / {cardiac / heart} muscle cells did not die due to insufficient oxygen (1)	ALLOW the PI group had fewer patients who had a heart attack / converse for control group ALLOW reduced risk of blood clots forming	**(3)**

Question Number	Answer	Additional Guidance	Mark
6(a)	An explanation that makes reference to four of the following: • reduction in rate of gas exchange (1) • due to a reduced rate of diffusion (1) • because there is a smaller surface area (for diffusion) (1) • greater distance (for diffusion of gases) (1) • surface area is directly proportional to rate of diffusion / distance is inversely proportional to rate of diffusion (1)	ALLOW smaller surface area:volume	**(4)**

Question Number	Answer	
*6(b)	Answers will be credited according to candidate's 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 which is indicated as relevant. Additional content included in the response must be scientific and relevant. **Respiratory system** • {Smoking / increasing age} decreases {FEV / volume of air breathed out in one second} • Smoking decreases surface area of alveoli • Smoking reduces volume of air in {alveoli/ lungs} • {smoking / reduced surface area} reduces {gas exchange / oxygenation of blood} • Smoke contains inflammatory chemicals which damage alveolar septum • Non-smokers did not develop emphysema / smokers develop emphysema • Smokers develop symptoms of emphysema around age 70 / have severe disability due to emphysema around age 88 **Heart** • {Patient with emphysema / smoker} has larger {right ventricle (RV) / right ventricle wall} (or converse) • therefore, {reduced/ increased} volume of blood pumped to the lungs (in patients with emphysema) **Pulmonary** circulation • {Patient with emphysema / smoker} has narrower pulmonary {artery / blood vessels} (than patient without emphysema) • therefore, reduced blood flow {to lungs / in pulmonary vessels} (in patients with emphysema) **Evaluation** Increasing age may increase likelihood of other respiratory issues • Reduced blood flow to lungs reduces {the oxygenation of blood / gas exchange} • {Severe disability / heart attack} due to lack of oxygen for respiration • Linkage of reduced size of pulmonary {artery / blood vessels} with the increase in size of RV wall • Linkage of reduced size of {artery / blood vessels} with increase in {blood pressure / risk of damage to endothelium} **(6)**	

			Additional Guidance
Level 0	0	No awardable content	
Level 1	1-2	Limited scientific judgement made with a focus on mainly just one method, with a few strengths/weaknesses identified. A conclusion may be attempted, demonstrating isolated elements of biological knowledge and understanding but with limited evidence to support the judgement being made.	Reference to just one aspect – respiratory system, heart or pulmonary circulation Use of data from graph or diagrams to support answer
Level 2	3-4	A scientific judgement is made through the application of relevant evidence, with strengths and weaknesses of each method identified. A conclusion is made, demonstrating linkages to elements of biological knowledge and understanding, with occasional evidence to support the judgement being made.	Reference to two of the following aspects – respiratory system, heart or pulmonary circulation briefly, or one in in depth Use of data from graph or diagrams to support answer
Level 3	5-6	A scientific judgement is made which is supported throughout by sustained application of relevant evidence from the analysis and interpretation of the scientific information. A conclusion is made, demonstrating sustained linkages to biological knowledge and understanding with evidence to support the judgement being made.	Reference to all three aspects – respiratory system or pulmonary circulation – at least two in depth Use of data from graph and the diagrams to support answer

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	An answer that makes reference to two of the following: • glycoprotein (1) • glycolipid (1) • lipoprotein (1) • protein (1)	ALLOW channel or carrier protein	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	An explanation that makes reference to the following: • A has {single / C-C} bonds whereas B has {double / C=C} bond(s) (1) • {double / C=C} bond(s) cause a {kink/bend} (in one fatty acid chain) (1)	ALLOW A has no C=C bonds whereas B does ALLOW all single C-C bonds result in straight chains	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(b)	An answer which makes reference to three of the following: <u>Similarities</u> • (both contain) glycerol and fatty acid (chains) (1) • both contain ester bonds (1) <u>Differences</u> • triglycerides contain three fatty acids (chains) whereas phospholipids contain two (fatty acids chains) (1) • phospholipids contain a phosphate group whereas a triglyceride does not (1)		**(3)**

Question Number	Answer	Mark
7(c)	The only correct answer is A – 86.39 nm *B is incorrect because that is 2∏D* *C is incorrect because that is* $\prod r^2$ *D is incorrect because that is ∏D*	**(1)**

Question Number	Answer	Additional Guidance	Mark
7(d)(i)	A description that makes reference to the following: • the {incidence of mortality / number of deaths} increases as the LDL blood concentration increases (from <100 to 189) (1) • the {incidence of mortality / number of deaths} decreases as the LDL blood concentration increases **above {189/190}** (mg 100 cm^{-3}) (1)	ignore references to positive correlation ALLOW non-linear increase	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(d)(ii)	An answer that makes reference to four of the following: • not valid (1) • as study was only carried out on {males / people aged 25-40} (1) • (therefore) not representative of UK population / cannot apply results to {females / other age groups} (1) • no idea of {sample size / duration} of study (1) • the deaths may have been caused by other factors (1)	ALLOW study does not include {females / ages other than 25-40}	**(4)**

Question Number	Answer	Additional Guidance	Mark
8(a)(i)	• correct calculation of maximum decrease in mass for tube E (1) • correct calculation of percentage change in mass (1)	<u>Example of calculation</u> 2.83 - 1.85 = 0.98 (0.98 ÷ 2.83) × 100 = 35 / 34.6 (%) Correct answer with no working scores full marks.	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	An explanation that makes reference to the following: • potato lost mass because water was lost by osmosis / water molecules moved from higher concentration (in potato) to lower concentration (in test tube) by osmosis (1) • (E) lost the greatest {mass / water} / (potato in E) was in (a solution with) the {highest sucrose concentration / lowest concentration of (free) water molecules} (1)	ALLOW water molecules moved from {low solute concentration / dilute solution / hypotonic / high water potential} to {high solute concentration / more concentrated solution / hypertonic / low water potential} by osmosis ALLOW water molecules moved down a {concentration / water potential} gradient by osmosis ALLOW E was in a solution with the lowest water potential / greatest difference in solute concentration between potato in E and solution	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(b)	A description that makes reference to the following: • use {different sucrose concentrations / smaller increments} between **0.0 to 0.4** (mol dm^{-3}) (1) • control a named variable (1) • repeats and calculate {mean / average} (1) • description of how the precise concentration is determined (1)	ALLOW use smaller increments of concentration ignore use {more / larger range of} concentrations unqualified ALLOW test around the concentration obtained from graph analysis eg temperature ignore variables already controlled e.g. same potato /same volume / time etc eg increase concentration if previous result gained mass / plot graph with the **new** concentration intervals and find the x axis intercept	**(3)**

Question Number	Answer	Additional Guidance	Mark
8(c)(i)	• values converted to same unit and substituted into equation (1) • correct calculation of volume with appropriate unit to one decimal place (1)	<u>Example of calculation</u> $\pi \times 0.5^2 \times 0.5$ OR $\pi \times 5^2 \times 5$ 0.4 cm^3 / 392.7 mm^3 Correct answer without working gains full marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(c)(ii)	An explanation that makes reference to two of the following: • permeability of membrane increases as ethanol increases in concentration (1) • ethanol disrupts membrane (structure) (1) • (therefore) more {betalain / pigment} diffuses through membrane (1) • therefore {increases the absorbance / decreases transmission} of light (in the colorimeter) (1)	ALLOW ethanol {dissolves lipids / denatures proteins} in membrane ALLOW ethanol increases membrane fluidity ALLOW more {betalain / pigment} {moves through membrane / enters ethanol / released (into ethanol)}	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(c)(iii)	An answer that makes reference to the following: • use of {same / 5} concentration(s) for ethanol and propanol (1) • description of how an appropriate variable can be controlled (1) • valid method to measure {absorbance / colour} (1) • repeats in order to calculate {mean / average / SD} (1)	eg use same {beetroot / species / age} / use core borer to get same diameter / use water bath to maintain temperature / use stop clock to measure time / use same stated volume / use measuring cylinder to measure volume ignore same {volume / size / temperature} unqualified e.g. use colorimeter / compare against {colour standards / colour chart}	**(4)**