Mark Scheme (Results)

Summer 2024

Pearson Edexcel AS Level GCE
In Biology A Salters Nuffield (8BN0)
Paper 01: Lifestyle, Transport, Genes and Health

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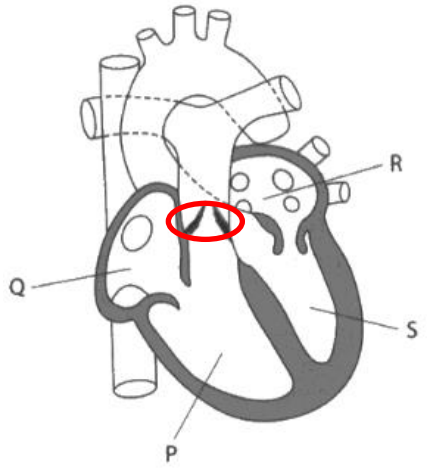
General Marking Guidance

- 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.

Question Number	Answer	Additional Guidance	Mark
1(a)(i)	B- one The only statement that is correct is that *R receives blood from the pulmonary vein* *A is incorrect because R receives blood from the pulmonary vein* *C is incorrect because the only statement that is correct is that R receives blood from the pulmonary vein* *D is incorrect because the only statement that is correct is that R receives blood from the pulmonary vein*		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	correct position of valve connected to the walls of the pulmonary artery only (1)	Example:  	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	A description that makes reference to three of the following: • closes during diastole (1) • (closes) to prevent backflow of blood (into the {heart / (right) ventricle) (1) • opens during ventricular systole (1) • opens as blood {is pumped into / enters} the artery / out of the {heart / ventricle} (1)	ignore atrial systole reject atrium	**(3)**

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	vena cava has larger lumen than aorta		**(1)**

Question Number	Answer	Mark
1(b)(ii)	B – endothelial cells *A is incorrect because collagen would not be in contact with blood* *C is incorrect because epithelial cells would not be in contact with blood* *D is incorrect because smooth muscle cells would not be in contact with blood*	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(a)	An answer that makes reference to three of the following: • incomplete dominance (1) • (the plants with pink petals have genotype) F^RF^W (1) • both the allele for red colour petals and the allele for white colour petals are expressed in the phenotype (1) • (therefore) the flower {has a colour that is intermediate between red and white / has an intermediate phenotype} (1)	ALLOW codominance ALLOW both F^R and F^W are dominant alleles ignore they are dominant alleles unqualified ALLOW both alleles shown in phenotype ALLOW both alleles are expressed ignore genes ALLOW overlap of colours producing pink flowers	**(3)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>2(b)(i)</td><td>• correct gametes in Punnett square (1)
• correct offspring genotypes (1)
• correct probabilities (1)</td><td>
<table>
<tr><td></td><td>F^R</td><td>F^W</td></tr>
<tr><td>F^R</td><td>$F^R F^R$</td><td>$F^R F^W$</td></tr>
<tr><td>F^W</td><td>$F^R F^W$</td><td>$F^W F^W$</td></tr>
</table>
<table>
<tr><th>Petal colour</th><th>Probability</th></tr>
<tr><td>Pink</td><td>{0.5 / 50% / ½}</td></tr>
<tr><td>Red</td><td>{0.25 / 25% / ¼}</td></tr>
<tr><td>White</td><td>{0.25 / 25% / ¼}</td></tr>
</table>
</td><td>(3)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	104 (1)	Example of calculation: 0.25 × 416 = 104 ALLOW ecf from 2(b)(i) using the white probability figure × 416 ALLOW whole numbers only	**(1)**

Question Number	Answer	Mark
3(a)(i)	B – Q *A is incorrect because the bond does not contain phosphorus* *C is incorrect because the pentose sugar does not contain phosphorus* *D is incorrect because the base does not contain phosphorus*	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	An answer that makes reference to the following: • (DNA) deoxyribose (mRNA) ribose (1)	ignore pentose / deoxyribonucleic / ribonucleic / sugar	**(1)**

Question Number	Answer	Mark
3(a)(iii)	D – Thymine *A is incorrect because RNA contains adenine* *B is incorrect because RNA contains cytosine* *C is incorrect because RNA contains guanine*	**(1)**

Question Number	Answer	Mark
3(b)(i)	A – amino acid and condensation reactions *B is incorrect because the polypeptide chain is formed when amino acids are joined together in condensation reactions* *C is incorrect because the polypeptide chain is formed when amino acids are joined together in condensation reactions* *D is incorrect because the polypeptide chain is formed when amino acids are joined together in condensation reactions*	**(1)**

Question Number	Answer	Mark
3(b)(ii)	B – disulfide bridge, hydrogen bond and ionic bond *A is incorrect because ester bonds are not involved in the formation of a 3° structure from 1° structure* *C is incorrect because ester bonds are not involved in the formation of a 3° structure from 1° structure* *D is incorrect because glycosidic bonds are not involved in the formation of a 3° structure from 1° structure*	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(iii)	A description that makes reference to four of the following: • mRNA leaves the nucleus (1) • mRNA binds to a ribosome (1) • anticodons of tRNA {complementary pair / bind} to codons (on mRNA) (1) • (each) tRNA molecules {carry / bind to} specific amino acids (1) • the sequence of bases on mRNA determines the sequence of amino acids (in polypeptide) (1)	ALLOW codons/anticodons determine the {sequence / order} of amino acids in the chain.	**(4)**

Question Number	Answer	Additional Guidance	Mark
4(a)	A description that makes reference to the following: • (oxygen) diffuses {from an area of high concentration to an area of low concentration / down the concentration gradient} (1) • (glucose) enters the cell {through carrier proteins / by facilitated diffusion} (1)	ALLOW oxygen enters cell by (simple) diffusion ALLOW enters cell by active transport (against concentration gradient) ignore channel proteins	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)	An answer that makes reference to three of the following: • collagen is a fibrous protein whereas haemoglobin is a globular protein (1) • collagen is composed of three polypeptide (chains) whereas haemoglobin is composed of four polypeptide (chains) (1) • collagen has (little to no) tertiary structure whereas haemoglobin has a quaternary structure (1) • haemoglobin has {prosthetic group / haem group / iron (ion) / α-helix / β-pleated sheet} whereas collagen does not (1) • hydrophilic (R) groups on (surface of) haemoglobin and hydrophobic (R) groups on (surface of) collagen (1)	collagen is {long chain/ linear} whereas haemoglobin is {spherical /compact} ALLOW repeating sequences of amino acids in collagen and not in haemoglobin ALLOW haemoglobin has {disulphide bridges / ionic bonds / quaternary structure} whereas collagen does not ALLOW haemoglobin is conjugated	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	An answer that makes reference to the following: • saline / solution with no alcohol / 0.00% alcohol solution / {solvent / saline} used to dilute alcohol solutions (1) • to calculate percentage of cells which have undergone haemolysis without alcohol being present / to see if cells undergo haemolysis in absence of alcohol (1)	ignore {(distilled) water / no alcohol} unqualified ALLOW baseline value to compare with alcohol solutions	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	An answer that makes reference to four of the following: • increasing concentration of alcohol increases the percentage of red blood cells that have haemolysed (1) • {most / largest increase in} haemolysis with butanol / least haemolysis with ethanol (1) • (due to) alcohol {dissolving / disrupting} the {cell membranes / lipids} (1) • correlation between the {size of the alcohol molecules / number of carbon (atoms)} and the percentage of red blood cells that have haemolysed (1) • relevant comment regarding methodology (1)	ALLOW increased number instead of percentage of cells ALLOW positive correlation ALLOW alcohol increases the membrane permeability ALLOW butanol is a more effective solvent for phospholipids / ethanol had least effect on cell membrane structure ALLOW highest level of haemolysis with the longest chain alcohol ALLOW larger chain has more effect on cells e.g. only 2 repeats / were anomalous results identified as some results don't fit pattern / no information regarding controlled variables such as same volume of alcohol	**(4)**

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	A description that makes reference to two of the following: • (catalyses) condensation reactions (1) • to {join / bond} DNA (mono)nucleotides together (1) • forming phosphodiester bonds (between phosphate group and deoxyribose sugar) (1)	ALLOW nucleotides unqualified reject RNA nucleotides ignore hydrogen bonds	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	An answer that makes reference to the following: • (this property of DNA polymerase) would reduce the number of {mutations / faulty alleles} (1) • (ensuring) the correct {base sequence / mRNA sequence / allele} is produced (1) • (ensuring) the correct {amino acid sequence / polypeptide / protein} is produced (1) • reducing the chance of {cancer / genetic disease} (1)	ALLOW errors in DNA replication cause {mutations / change in base sequence / changes in bases} ALLOW faulty bases are replaced ALLOW the (original) base sequence is {not changed / restored} ignore errors are corrected ALLOW incorrect base sequence can result in the production of a {polypeptide with a different primary structure / non-functioning protein} ALLOW description of change in active site shape changing {number of enzyme-substrate complexes formed / rate of reaction} ALLOW uncontrolled cell division ignore disease unqualified	**(4)**

Question Number	Answer	Additional Guidance	Mark
5(b)	An explanation that makes reference to two of the following: • {parent A / father} is {a carrier / heterozygous} / {parent B / mother} has cancer (1) • PGD allows parent to select embryo that {is not homozygous for this (faulty) allele / does not have the faulty allele / produces the functioning DNA polymerase} (1) • (PGD has) no risk of miscarriage (1)	ALLOW because some of their children have cancer ignore gene ALLOW to know if their child {has a faulty allele / is a carrier / has recessive genotype} ALLOW to reduce risk of child developing cancer ignore to choose a child without {condition / cancer / genetic disorders unqualified} ignore PGD is non-invasive ignore abortion	**(2)**

Question Number	Answer	Mark
6(a)	C – Polysaccharides containing both 1,4 and 1,6 glycosidic bonds allow a rapid release of energy *A is incorrect because amylose does not contain 1,6 glycosidic bonds* *B is incorrect because glycogen does not contain amylopectin* *D is incorrect because they are both insoluble in water*	**(1)**

Question Number	Answer
***6(b)(i)**	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. Basic • use of range of enzyme concentrations • use of given range i.e. 0-8 mmol dm^{-3} • reference to both given temperatures – 30°C and 45°C • relevant safety aspect Linkages • variables controlled e.g., volume of {amylase/starch/iodine} solution, concentration of starch solution, pH, temperature, time • explanation of how a stated variable would be controlled e.g. use of water bath to maintain temperature / stated volume of solution • replicates / repeats Sustained • method to measure rate of reaction e.g., time taken for iodine solution to remain yellow-brown / use of colour standards for comparison / reference to use of regular sampling to test with the indicator / reference to use of colorimeter • description of how to calculate rate of reaction e.g. calculate gradient, 1/t **(6)**

		Additional Guidance	
Level 1	1-2	An explanation of how the investigation should be modified may be attempted but with limited analysis, interpretation and/or evaluation of the scientific information. Generalised comments made. The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context.	A basic method described with reference to range of enzyme concentrations and use of starch and iodine solutions. Consideration of one of the following: • performed at both temperatures – 30°C and 45°C • variables to be controlled • how to control at least one variable • how to measure rate of reaction • how to calculate rate of reaction
Level 2	3-4	An explanation of how the investigation should be modified will be given with occasional evidence of analysis, interpretation and/or evaluation of the scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure.	Level 1 plus Consideration of two more of the following: • performed at both temperatures – 30°C and 45°C • variables to be controlled • how to control at least one variable • how to measure rate of reaction • how to calculate rate of reaction
Level 3	5-6	An explanation of how the investigation should be modified is given which is supported throughout by evidence from the analysis, interpretation and/or evaluation of the scientific information. The explanation shows a well-developed and sustained line of scientific reasoning which is clear, coherent and logically structured.	A detailed method for a valid investigation which also includes how to calculate rate of reaction from the dependent variable data

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	An answer which makes reference to four of the following: • the rate of reaction increases as concentration increases (1) • enzymes had a higher rate of reaction at 30°C (than at 45°C) (1) • the rate of reaction is lower at 45°C (than 30°C) because {it is above the optimum temperature for amylase / (some of) the enzyme has denatured} (1) • {at higher enzyme concentration / 30°C} more enzyme-substrate complexes form (1) • at 30°C the rate of reaction plateaus (at 100 a.u. / 7 mmol dm^{-3}) due to a named limiting factor (1)	ALLOW piece together ALLOW converse ALLOW optimum temperature closer to 30°C than 40°C ALLOW the active site of the enzyme has {been affected / changed shape} at the higher temperature ALLOW {at lower enzyme concentration / 45°C} fewer enzyme-substrate complexes form e.g. substrate concentration	**(4)**

Question Number	Answer	Additional Guidance	Mark
7(a)	• (minimum height) {1.6 / 1.616 / 1.62} (1) • (maximum height) {1.8 / 1.80} (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	An answer that makes reference to the following: • as the number of risk factors increases so does the incidence of CHD / positive correlation (1) • non-linear increase / description of steeper increase in CHD incidence with each additional risk factor (1)	ignore correlation unqualified ignore not proportional ALLOW exponential	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	An answer that makes reference to the following: • correct risk factor for CHD (1)	e.g. {genetic / family history of CHD}, stress, high cholesterol diet, low HDL:LDL, high salt diet, smoking, high blood pressure, lack of exercise / diabetes ignore diet unqualified ignore alcohol unless refer to excess ignore age – unless stated that risk increases with age	**(1)**

Question Number	Answer	Additional Guidance	Mark
7(c)	A – Axes labelled including units (1) S – Scale on y axis linear (1) P – Plotting accurate (1) B – Bar chart drawn with key / labelling of bars if no key (1)		**(4)**

Question Number	Answer	Mark
7(d)(i)	D – three *A is incorrect because all three will reduce the risk of CVD* *B is incorrect because all three will reduce the risk of CVD* *C is incorrect because all three will reduce the risk of CVD*	**(1)**

Question Number	Answer	Additional Guidance	Mark
7(d)(ii)	An answer that makes reference to four of the following: • (balloon angioplasty) widens the {lumen / coronary artery} (1) • increasing blood flow (1) • reduces {blood pressure / risk of a blood clot} (1) • (resulting in) {oxygen / oxygenated blood} supplied to {heart / cardiac muscle (cells)} (1) • to allow aerobic respiration (reducing risk of heart attack) (1)	ALLOW the {lumen / coronary artery} is no longer narrowed ALLOW heart attacks occur when heart cells {do not receive oxygen / respire anaerobically} ALLOW release of ATP for muscle contraction	**(4)**

Question Number	Answer	Additional Guidance	Mark
8(a)(i)	A description that makes reference to the following: • correct calculation by dividing width measured by magnification ±1mm (1) • correct answer with units converted correctly (1)	<u>Example of calculation</u> 13 ÷ 1300 / 13000 ÷ 1300 (13000 ÷ 1300) = 10(μm) ALLOW 9.2 to 10.8 (μm) ALLOW 1 mark for correct measurement and calculation but units not converted correctly ALLOW 1 mark for correct calculation from incorrect measurement Correct answer with no working gains full marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	An explanation that makes reference to the following: • the nematode has a large surface area to volume ratio (1) • so diffusion (through skin) can supply the needs of {(all) cells / metabolic reactions} / (all) cells are a short distance from the gas exchange surface (1)	ALLOW short diffusion distance (to cells)	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(b)(i)	An explanation that makes reference to the following: • (the blood pressure in the aorta) increases {during ventricular systole / as blood is entering the aorta} (1) • (the blood pressure in the aorta) decreases {during (ventricular) diastole / as no blood is entering the aorta (from the heart)} (1)	ALLOW blood pumped into aorta by left ventricle ALLOW increases as blood is being pumped to the body ALLOW increases due to recoil of elastic tissue ALLOW decreases {during atrial systole / as ventricles fill with blood}	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(b)(ii)	• correct subtraction using correct data from graph (1) • correct percentage decrease (1)	<u>Example of calculation</u> {32 to 36} - {13 to 14} or subtraction answer of {18 to 23} (nm) (23 ÷ 36) ×100 = (-)64 (%) ALLOW range 56 to 72 (%) correct answer to more than 2 sig fig scores one mark e.g. 63.8(%) no ecf Correct answer with no working gains full marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(c)(i)	An answer which makes reference to three of the following: <u>Similarities</u> • both contain heart and blood vessels (1) • both have a closed circulatory system (1) <u>Differences (max two)</u> • squid have {three hearts / two different types of heart / branchial and systemic hearts} whereas humans have one heart (1) • squid heart has {three chambers / one ventricle} whereas human heart has {four chambers / two ventricles} (1) • squid has single circulatory system (doesn't go through a heart twice) whereas human has double circulatory system (1)	Full marks can only be awarded if answer contains both similarities and differences. ALLOW named blood vessel ALLOW squid have more hearts (than humans)	**(3)**

Question Number	Answer	Additional Guidance	Mark
8(c)(ii)	A description that makes reference to two of the following: • vertebrates {have a more developed nervous system / may feel pain} (1) • use a non-invasive procedure (1) • select organisms which are {abundant / not endangered} / select aquatic organisms so caffeine uptake can be passive (1)	ALLOW reverse argument for invertebrates nervous system ALLOW invertebrate may feel pain ALLOW organisms may {be harmed / die} ALLOW organisms cannot give consent ALLOW description of a suitable method to measure heart rate without harm to organism e.g. use transparent organisms so heart is visible ALLOW experiment on for minimal time periods ALLOW return to their habitat (after investigation)	**(2)**

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