

Mark Scheme (Results)

Summer 2022

Pearson GCE In Biology (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.

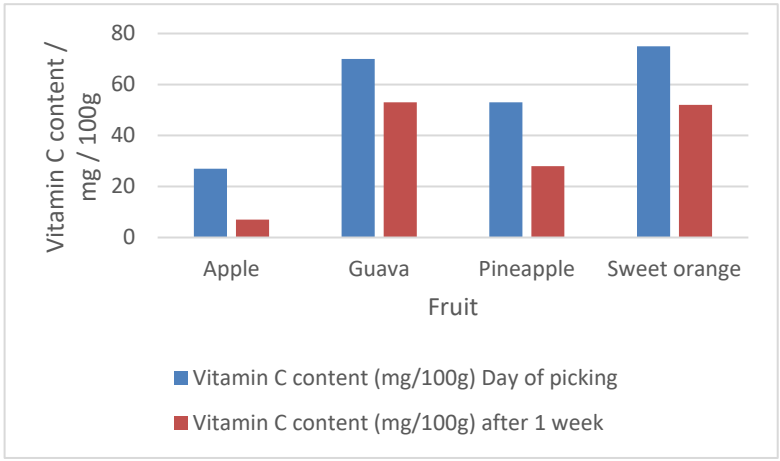
Question Number	Answer	Mark
1(a)(i)	T A C G A T ALLOW as words: thymine, adenine, cytosine, guanine, adenine, thymine	(1)

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	7 / seven		(1)

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	5 / five		(1)

Question Number	Answer	Additional Guidance	Mark
1(b)	A description that makes reference to three of the following: • (mRNA) carries the genetic code for a protein / copy of {part of the template DNA strand / gene / allele} (1) • mRNA {binds / attaches} to ribosome (1) • complementary anticodon (on tRNA) will bind to codon (on mRNA) (1) • sequence of {bases / codons (on mRNA)} determines the sequence of amino acids (1)	ALLOW (mRNA) carries part of the genetic code {out of the nucleus/ to the ribosome} ALLOW mRNA is translated at the ribosome	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	• correct calculation of percentage change in vitamin C content	<u>Example of calculation</u> 28-53=-25 (25÷53)×100= 47.2 (%)	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	A – Axes labelled including units for vitamin C (1) S – Scale on y axis linear and plots cover more than half of the grid (1) P – Plotting accurate (all 8 plots) (1) B – Bar chart drawn with key (1) **Fruit** / **Vitamin C / mg per 100 g of fruit**: **Day of picking** / **One week after picking** Apple: 27 / 7 Guava: 70 / 53 Pineapple: 53 / 28 Orange: 75 / 52	Example of graph:  ALLOW labelling of bars if no key *Line graph limited to A, S and P*	**(4)**

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	• correct named reagent (1) • correct colour change (1)	Reagent name: DCPIP — colour change observed if vitamin C present: blue to colourless Reagent name: starch/iodide solution — colour change observed if vitamin C present: yellow-brown to blue-black	**(2)**

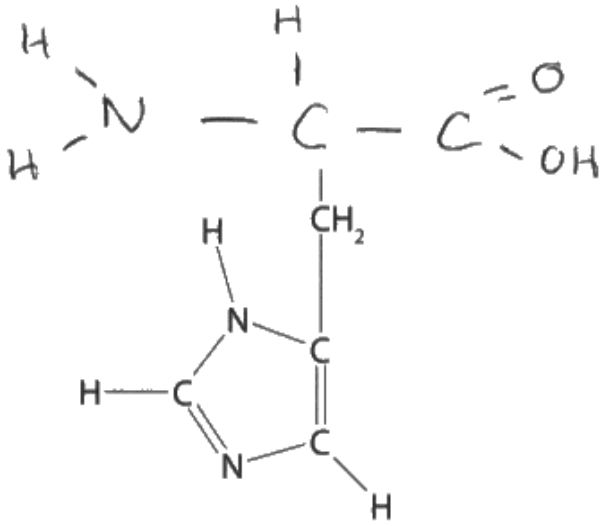
Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	An answer that makes reference to the following: • suitable variable to control (1) • correct justification (1)	e.g. temperature e.g. description of {effect on vitamin C content / how it would increase the validity of the data} e.g. temperature is a factor that can {increase / decrease} percentage of vitamin C	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	C - glucose *A is incorrect because fructose is not a component of glycogen* *B is incorrect because galactose is not a component of glycogen* *D is incorrect because ribose is not a component of glycogen*		**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	C - maltose *A is incorrect because galactose is a monosaccharide* *B is incorrect because lactose is comprised of two types of monosaccharide* *D is incorrect because sucrose is comprised of two types of monosaccharide*		**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	A - amylose *B is incorrect because it also contains 1,6 glycosidic bonds* *C is incorrect because it also contains 1,6 glycosidic bonds* *D is incorrect because it also contains 1,6 glycosidic bonds*		**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	D - four *A is incorrect because disulfide, hydrogen, ionic and peptide bonds are formed* *B is incorrect because disulfide, hydrogen, ionic and peptide bonds are formed* *C is incorrect because disulfide, hydrogen, ionic and peptide bonds are formed*		**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	• central carbon attached to CH_2 of the R group provided and to a H atom (1) • carboxylic acid group correct and attached to central carbon (1) • amine group correct and attached to central carbon (1)	Example of diagram 	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(c)(i)	54.2	ALLOW 54 / 54.23 / 54.228 / 54.2278	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(c)(ii)	An explanation that makes reference to the following: • the BMI of female 1 would decrease, the BMI of female 2 would stay the same and the BMI of female 3 would increase (1) • (because) excess energy intake would lead to an increase in {mass / BMI} / low energy intake would lead to a decrease in {mass / BMI} (1)	ALLOW positive correlation (between consistent daily energy intake and BMI)	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	B – 26% *A is incorrect because that is the percentage of bases P and Q* *C is incorrect because that is the total percentage of bases P and Q* *D is incorrect because that is the total percentage of base R and the non-labelled base*		**(1)**

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	A *B is incorrect because S and T are phosphodiester bonds, U is glycosidic and V are hydrogen bonds* *C is incorrect because S and T are phosphodiester bonds, U is glycosidic and V are hydrogen bonds* *D is incorrect because S and T are phosphodiester bonds, U is glycosidic and V are hydrogen bonds*		**(1)**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	D – 4240 *A is incorrect because that is not 212 × 10 × 2* *B is incorrect because that is not 212 × 10 × 2* *C is incorrect because that is 212 × 10*		**(1)**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	• correct calculation of length of whole DNA molecule (1) • correct conversion to μm and given to two significant figures (1)	<u>Example of calculation</u> 212 × 3.4 =720.8 (nm) 720.8÷1000 = 0.72 (μm) Correct answer with no working gains full marks.	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(c)	An answer which makes reference to four of the following: <u>Similarities</u> • both contain {nucleotides / phosphate group, pentose sugar and (organic) base} (1) • both contain {phosphodiester bonds/ hydrogen bonds between bases} (1) <u>Differences</u> • DNA is {double stranded/ a double helix} whereas tRNA is {single stranded /folded} (1) • DNA contains {deoxyribose sugar / thymine} whereas tRNA contains {ribose / uracil} (1) • tRNA has a (specific) amino acid binding site (1)	ALLOW both contain A,C,G ALLOW DNA is {double stranded/ a double helix} whereas tRNA has a clover leaf shape ALLOW tRNA forms hydrogen bonds within the strand whereas DNA forms hydrogen bonds with another strand ALLOW tRNA has some unpaired bases whereas DNA does not	**(4)**

Question Number	Answer	Additional Guidance	Mark
5 (a)	digestive (system) / reproductive (system)		**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	An explanation that makes reference to the following: Basal cell membrane • chloride ions move by {active transport / are pumped} (into the cell) (1) • against the concentration gradient / using energy from ATP (1) Apical cell membrane • chloride ions move (out of cell) by {facilitated diffusion / diffusion} (1) • (through an open CFTR protein channel) down the {concentration / electrochemical} gradient (1)		**(4)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	An explanation that makes reference to the following: • higher concentration of (chloride) ions in the mucus (than the tissue fluid) • (therefore) water would move into the mucus by osmosis (1) • from a higher concentration (of free water molecules) to a lower concentration in the mucus (1)	ALLOW solute concentration of mucus increases ALLOW reference to movement from high to low water potential ALLOW from an area of lower {chloride ion / solute} concentration to higher {chloride ion / solute} concentration	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(c)(i)	A – 3 and 4 *B is incorrect because 6 is homozygous recessive* *C is incorrect because 7 and 8 are homozygous recessive* *D is incorrect because 11 is homozygous recessive*		**(1)**

Question Number	Answer	Additional Guidance	Mark
5(c)(ii)	• correctly completed genetic diagram	<table><tr><td></td><td>a</td><td>a</td></tr><tr><td>A</td><td>Aa</td><td>Aa</td></tr><tr><td>a</td><td>aa</td><td>aa</td></tr></table>	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(c)(iii)	chorionic villus sampling	ALLOW CVS / CV biopsy / analysis of fetal DNA in maternal plasma	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(c)(iv)	An answer that makes reference to the following: • (1-2%) risk of a miscarriage (1) • risk of false positive result (1) • cystic fibrosis patients can have high {quality of life / life expectancy} due to treatments available (1)	ALLOW risk of harm to the fetus e.g. resulting in termination of pregnancy when fetus was healthy ALLOW some believe that aborting a fetus due to a genetic condition is {unethical / wrong as the foetus has the potential to become a human}	**(3)**

Question Number	Answer	Additional Guidance	Mark
6(a)	An explanation that makes reference to two of the following: • gas exchange by {skin/lungs} alone is insufficient / both surfaces are required for sufficient diffusion of oxygen (1) • (because) surface area : volume is too small (1) • metabolic reactions would not be able to occur at required rate with one surface (1)	ALLOW more diffusion of oxygen occurs in lungs than skin ALLOW {skin / lung} surface area is too small ALLOW skin diffusion distance may be too large	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	An explanation that makes reference to two of the following: • opens as blood pumped into aorta (1) • valve closes {during diastole / start of diastole} (1) • prevents backflow of blood (from aorta back) into the (left) ventricle (1)	ALLOW opens to allow blood to flow into aorta	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	An explanation that makes reference to the following: • allows stretch and recoil (of aorta) (1) • in order to maintain blood pressure (1)	ALLOW in order to prevent damage of aorta	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(c)(i)	An explanation that makes reference to the following: • transparent body / translucent skin means) heart is visible / monitoring of heart rate is non-invasive (1) • (aquatic animal therefore) caffeine can diffuse (from solution into frog) through the skin (1)	ALLOW large surface area: volume for fast diffusion (of caffeine)	**(2)**

Question Number	Answer	Additional Guidance	Mark
6 (c)(ii)	An answer that makes reference to the following: • conclusion is not valid (1) • cannot be confident that 0.1 mg cm^{-3} caused the largest increase in heart rate of this frog (1) • as no repeats were performed / result could have been anomalous (1) • investigation was on one species / investigation not representative of {this frog species / all frog species} (1)	ALLOW the largest heart rate could result from a concentration between 0-0.2 mg cm^{-3} / too few concentrations tested for this conclusion to be valid / need to test intermediate concentrations ALLOW only performed on one frog (from that species) ALLOW different species hearts' may be affected differently	**(4)**

Question Number	Answer	Additional Guidance	Mark
7(a)	• correct subtraction of values read from graph (1) • correct calculation of initial rate of reaction (1)	<u>Example of calculation</u> (2.5-1.85±0.05) = 0.65 ±0.05 = 1.2 or 1.3 Full marks for correct answer with no working.	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(b)	An answer that makes reference to six of the following: • range of at least five sucrose concentrations used between 1 and 8 (mmol dm^{-3}) (1) • volumes of sucrase and sucrose solutions controlled (1) • detail of how another relevant variable could be controlled (1) • method to detect glucose presence (1) • method to determine glucose concentration (1) • description of how initial rate calculated (1)	e.g. use of water bath, buffers to control pH, 2% sucrase e.g. use of indicator strip or Benedict's reagent e.g. standardise test strip colour / refer to chart for indicator strip / convert colour into concentration	**(6)**

Question Number	Answer	Additional Guidance	Mark
7 (c)	An explanation which makes reference to the following: • decreased due to fewer enzyme-substrate complexes being formed (per second) (1) • as (some) {sucrase / enzyme} active sites are no longer complementary to the {sucrose / substrate} (1)	ALLOW substrate no longer able to {fit into / bind to} active site	**(2)**

Question Number	Answer	Additional Guidance	Mark
8 (a)(i)	An answer which includes the following: • when the atria and ventricles are relaxed (1)	ALLOW heart (muscle) relaxes	**(1)**
Question Number	**Answer**	**Additional Guidance**	**Mark**
8(a)(ii)	An answer which makes reference to the following: • correct order of effectiveness of the two drugs compared with placebo (1) • B and H together were the most effective at reducing blood pressure (1) • combination increases (percentage of patients with required blood pressure) by {18% for B alone / 36% for H alone} (1)	ALLOW correct order of effectiveness in terms of groups 3>2>1 ALLOW only 5% difference between placebo and drug H ALLOW drug B is 18% more than drug H	**(3)**

Question Number	Answer	Additional Guidance	Mark
*8(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. Basic benefits • anticoagulants reduce the number of patients with no further strokes • antihypertensives reduce blood pressure • (graph A shows) use of statins reduces the incidence of stroke • quantitative data used to evidence points Risks • risk of anticoagulants use e.g. bleeding, nausea, • risk of antihypertensive use e.g. low blood pressure, fainting • risk of statin use e.g. liver damage, muscle pain, headache, low blood platelet count, nausea, dizzy Linkage • description of how anticoagulants would reduce risk of stroke e.g. reduce blood clotting therefore reducing risk of strokes • description of how antihypertensives would reduce risk of stroke – ie lowering blood pressure reduces chances of damage to blood vessels in the brain • description of how statins would reduce risk of CVD e.g. statins lower {LDL / blood cholesterol} which reduces risk of {atherosclerosis / blockage of artery}		**(6)**

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.	Some benefits and/or risks for at least one of the types of drug.
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.	Benefits and/or risks for at least two of the types of drug.
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant knowledge of biological facts/concepts. Consequences are discussed which are supported throughout by sustained linkage to a range of scientific ideas, processes, techniques or procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.	Benefits and risks discussed for all three types of drug, including linkages between the mode of action of the drug and the benefits.

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