Mark Scheme (Results)

Summer 2018

Pearson Edexcel GCE
In Biology Spec A (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.

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:
- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.
( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.
Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.
ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication
Questions which involve the writing of continuous prose will expect candidates to:
- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.
Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Mark
1(a)(i)	***The only correct answer is B which is two*** ***A*** *is not correct because it contains just C, H, O* ***C*** *is not correct because it contains just C, H, O* ***D*** *is not correct because it also contains N*	**(1)**

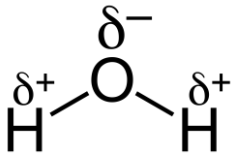
Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	would contain double bonds between the carbons (in a fatty acid chain) / C=C	ALLOW kink(s) in {fatty acid / hydrocarbon }chain	**(1)**

Question Number	Answer	Mark
1(a)(iii)	***The only correct answer is D which is an amino acid*** ***A*** *is not correct because it is not an amino acid so not transported by tRNA* ***B*** *is not correct because it is not an amino acid so not transported by tRNA* ***C*** *is not correct because it is not an amino acid so not transported by tRNA*	**(1)**

Question Number	Answer	Mark
1(a)(iv)	***The only correct answer is D which is an amino acid*** ***A*** *is not correct because it is not an amino acid so not joined together by peptide bonds* ***B*** *is not correct because it is not an amino acid so not joined together by peptide bonds* ***C*** *is not correct because it is not an amino acid so not joined together by peptide bonds*	**(1)**

Question Number	Answer	Mark
1(a)(v)	***The only correct answer is A which is glucose*** ***B*** *is not correct because it is not a glucose molecule so not a component of maltose* ***C*** *is not correct because it is not a glucose molecule so not a component of maltose* ***D*** *is not correct because it is not a glucose molecule so not a component of maltose*	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)	An answer that makes reference to three of the following: <u>Similarities</u> • both move molecules through the {phospholipid bilayer / cell surface membrane} (1) • (in both) molecules can move through proteins (1) <u>Differences</u> • diffusion occurs down a concentration gradient whereas active transport occurs against a concentration gradient (1) • diffusion is {passive / does not require ATP} whereas active transport requires ATP (1)	ALLOW { partially / semi permeable } membrane ALLOW diffusion from high to low concentration and active transport from low to high concentration ALLOW energy for ATP	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(a)	• correct symbol and charge on the oxygen atom (1) • correct symbol and charge on both hydrogen atoms (1)	e.g.  ALLOW one mark for all correct charges without symbols	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)	• hydrolysis (reaction)		**(1)**

Question Number	Answer	Additional Guidance	Mark
2(c)	An explanation that makes reference to the following: • water is a solvent (1) • because water molecules surround { polar molecules / ions } / hydrogen bonds form between water molecules and solute molecules (1) • water is liquid so has the ability to flow (1)	ALLOW allows { polar / ionic molecules / ions } to dissolve ALLOW separation of ions by water molecules ALLOW reference to cohesion between water molecules	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(a)	• correct numbers from graph • correct answer	<u>Example of calculation</u> 52, 180 (180/52)*100 = 346 / 346.2 / 346.15g Correct answer no working scores full marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)	An answer that makes reference to five of the following: • titration using DCPIP (1) • (using) {known/ same} volume of {fruit juice / DCPIP} (1) • method for controlling another relevant variable (1) • method for determining a suitable end point (1) • determine concentration of vitamin C (1) • calculation of vitamin C per 100g from concentration determined (1)	ALLOW description of titration e.g. concentration of DCPIP, age of fruit juice e.g. DCPIP changing from blue to colourless e.g. use of calibration curve / compare result with standardised vitamin C solution	**(5)**

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

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	An explanation which makes reference to the following: • (palomino / offspring) is heterozygous (1) • therefore { incomplete dominance / co-dominance } occurs (1) • because both alleles are expressed (1)	 ALLOW palomino horses have the genotype $H^C H^W$ or correct genetic diagram to show this ALLOW alleles are co-dominant	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	• dominant (allele)		**(1)**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	• both parents heterozygous (1) • correct offspring genotypes (from genetic diagram) (1) • correct probability (1) •	ALLOW from gametes in diagram ALLOW ECF 0.25/ 25% / $\frac{1}{4}$ ALLOW ECF	**(3)**

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

Question Number	Answer	Additional Guidance	Mark
4 (b)(iv)	An explanation that makes reference to two of the following: either • it may result in a choice of an abortion (1) • it is unethical to cause the death of a foetus (1) or • (risk of) {incorrect result / false positive / false negative } (1) • healthy foetus could be aborted / parents not prepared for child with {genetic disease / achondroplasia} (1)	 ALLOW can result in embryos being discarded ALLOW unethical to destroy a potential human being ALLOW can result in healthy embryos being discarded	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	• correct figures from graph • correct answer with unit	Example of calculation e.g. 120 and 1.6 or 60 and 0.8 120 ÷ 1.6 / 60 ÷ 0.8 75 bpm	**(2)**

Question Number	Answer	Mark
5 (a)(ii)	***The only correct answer is B as antihypertensives lower blood pressure*** ***A*** *is not correct because anticoagulants do not reduce blood pressure* ***C*** *is not correct because cholesterol does not reduce blood pressure* ***D*** *is not correct because platelet inhibitors do not reduce blood pressure*	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	An explanation that makes reference to the following: • right (1) • because the pressure is lower (in blood transported from heart to the lungs) (1)		**(2)**

Question Number	Answer	Mark

5(b)(ii)	***The only correct answer is A because it carries blood under high pressure away from the heart*** ***B*** *is not correct because this is shown in graph B* ***C*** *is not correct because pulmonary veins do not leave the heart* ***D*** *is not correct because the vena cava does not leave the heart*	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b)(iii)	An explanation which makes reference to the following: • from 0 s (to 0.05 s) pressure increases due to atrial systole (1) • ventricle fills with blood { from the atrium / due to atrial systole } (1) • after atrial systole finishes (from 0.05s to 0.1s) there is a fall in ventricular pressure (1) • from 0.1s (to 0.32 s) increase in pressure due to ventricular systole (1) • (from 0.32 s) ventricular pressure decreases due to (ventricular) diastole (1)	ALLOW contraction of (muscular)walls of atria ALLOW contraction of (muscular walls of) ventricle ALLOW relaxation of (muscular walls of) ventricle	**(4)**

Question Number	Answer	Additional Guidance	Mark
5(c)	An explanation which makes reference to three of the following: • aorta has {a thicker layer of / more} {collagen / elastic tissue / muscular tissue} (1) • collagen (in walls of aorta) to withstand higher blood pressure (1) • muscular tissue (in walls of aorta) to maintain higher blood pressure (1) • elastic tissue (in walls of aorta) for {(elastic) recoil / to maintain blood pressure} (1)	Accept converse argument for B ALLOW A for blood vessel in graph A instead of aorta ALLOW muscle for muscular tissue	**(3)**

Question Number	Answer	Mark
6(a)	**The only correct answer is A which is 0-5 minutes, as it decreased by 13 in 5 mins** **B** is not correct because the fluorescence did not decrease at the fastest rate in this time period / decreased by 10 in 5 mins **C** is not correct because the fluorescence did not decrease at the fastest rate in this time period / decreased by 12 in 5 mins **D** is not correct because the fluorescence did not decrease at the fastest rate in this time period / decreased by 12 in 5 mins	**(1)**

Question Number	Answer	Additional Guidance	Mark
6(b)	An explanation that makes reference to four of the following: • fluorescence { inside the cells decreases / outside the cells increases } (1) • because the amino acids were used to synthesise {proteins / lipoproteins} (1) • (the proteins are) packaged into (secretory) vesicles (1) • (the proteins are) {secreted / leave cell} by exocytosis (1) • some fluorescence remains in the cells as cellular proteins (1)	ALLOW translation occurs	**(4)**

Question Number	Answer	Additional Guidance	Mark

6(c)	An explanation that makes reference to four of the following: • mRNA (for surfactant protein) attaches to ribosome (1) • pairing between codons on mRNA and anticodons on tRNA (1) • labelled amino acids carried by tRNA (1) • amino acids joined by peptide bonds (1) • formation of {secondary / tertiary } structure (1)	ALLOW mRNA (for surfactant protein) translated on ribosome ALLOW detail of structure, e.g. alpha helix/beta pleated sheets	**(4)** **Expert**

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	An answer which makes reference to the following: • {no increase / little change } in blood pressure for {low salt diet / 3g salt / group A} (1) • {high salt diet / 9g salt / group B }increased blood pressure (1) • data manipulation to show how much blood pressure increased by (1)	e.g. an overall increase for B of 32 mmHg / 20 mmHg higher than A / 29% increase for B / at 4 months group A is 2.5% higher	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	An explanation which makes reference to five of the following: • (diet high in salt) increases risk of CVD (1) • (high salt intake causes) higher blood pressure (1) • (which increases risk of) { damage to endothelium of artery / atherosclerosis } (1) • (therefore increases risk of) inflammatory response (1) • (leading to increased risk of) { atheroma / plaque formation } (1) • narrowing of arteries { increases risk of blood clots / increases blood pressure / reduces blood flow to cardiac muscle } (1)	ALLOW increases risk of heart attack / stroke	**(5)**

Question Number	Answer	Additional Guidance	Mark
7(b)	An explanation which includes reference to the following: • equal numbers of males and females (1) • larger sample size (1) • named suitable controlled variable (1)	e.g. same starting blood pressure / body mass / diet / exercise level	**(3)**

Question Number	Answer	Additional Guidance	MGNOark
7(c)	An answer which makes reference to two of the following: • nausea (1) • muscle cramps (1) • dizziness / fainting / hypotension (1) • kidney failure (1)	ALLOW other correct side effects of antihypertensives if not listed IGNORE references to anticoagulants, platelet inhibitors and statins ALLOW vomiting	**(2)**

Question Number	Answer	Mark
8(a)	**The only correct answer is A which is deoxyribose and a phosphate group** ***B*** *is not correct because DNA does not contain ribose* ***C*** *is not correct because bonds do not form between two pentose sugars* ***D*** *is not correct because bonds do not form between two phosphate groups*	**(1)**

Question Number	Answer	Additional Guidance	Mark
8(b)	An explanation that makes reference to two of the following: • chloride ions cannot {leave the cell / enter mucus} (through CFTR protein channel) (1) • sodium ions do not move { out of the cells / into the mucus } (1) • therefore water {moves into cells / moves out of mucus} by osmosis (1)	ALLOW water does not move into mucus by osmosis	**(2)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>8(c)(i)</td><td>• percentages correctly calculated (1)</td><td>
<table>
<tr><th>Mutation</th><th>Number of people with the mutation</th><th>Percentage of people with the mutation (%)</th></tr>
<tr><td>F508del</td><td>(9030)</td><td>86</td></tr>
<tr><td>G542X</td><td>(525)</td><td>5</td></tr>
<tr><td>G551D</td><td>(420)</td><td>4</td></tr>
</table>
</td><td>(1)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
8(c)(ii)	• axes labelled and with suitable scale (1) • bar chart correctly plotted (1)	ALLOW ECF from 8(c)(i) e.g. percentage of people (with mutation) against type of mutation	**(2)**

Question Number	Answer	
8 (d)	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 information • cilia struggle to move mucus out of lungs • increased risk of lung infections • 100% chloride ion transport without mutation • all three mutations reduce chloride transport • F508del results in lower chloride transport than {the other mutations / G551D / G551S } • G551S mutation is less severe than G551D Evidence for linkages made • F508del mutation results in { no / fewer } CFTR protein channels being produced • G551D and G551S have higher chloride transport (than F508del) because { the correct number of protein channels are produced / CFTR protein present but function reduced } • {no/fewer} CFTR protein channels results in less transport of chloride ions • effects of thicker mucus on gas exchange in the respiratory system explained e.g. increased diffusion distance, reduced surface area, reduced concentration gradient Evidence for sustained scientific reasoning • with the G551D and G551S mutations the CFTR protein channels have an incorrect shape • incorrect shape of CFTR protein results in reduced function (of transporting chloride ions) • a different part of the protein structure is affected in G551S which interferes less in the transport of chloride ions • mutation may affect the tertiary structure of the CFTR protein e.g. the positioning of hydrophilic parts of the protein channel **(6)**	

			Additional guidance
Level 0	0	No awardable content	
Level 1	1-2	An answer may be attempted but with limited interpretation or analysis of the scientific information 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.	Basic description of the effects of the mutations on CFTR protein production. E.g. comparisons between mutations and no mutations on CFTR production Effects of CFTR protein problems on mucus described
Level 2	3-4	An answer 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.	Explanation of how the different types of mutation will have different effects on CFTR and chloride ion transport. Effects of CFTR protein problems on respiratory system described
Level 3	5-6	An answer is made which 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.	Explanation of effects of mutations related to shape of protein produced. Reasons for reduced function of CFTR protein related to G551S and G551D mutations.

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