Mark Scheme (Results)

Summer 2017

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.

Question Number	Answer	Additional Guidance	Mark
1(a)(i)	An answer which makes reference to one of the following: • {concentration / volume / temperature / aeration} of solution / temperature (1) **Or** (zebrafish) {time to acclimatise / age / size} (1)	ALLOW surroundings ALLOW same zebrafish	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	An answer that makes reference to the following: • caffeine increases the heart rate (of the zebrafish) (1) • the results show a calculated increase (1)	e.g. increase of at least 52 bpm / average increase of 43.8%	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	An explanation that makes reference to two of the following: • transparent body (1) • therefore heart is visible / procedure is non-invasive (1) **Or** • aquatic organism (1) • therefore can take in caffeine from solution (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
1(a)(iv)	An answer that makes reference to the following: • (zebrafish are) vertebrates therefore they are more likely to feel pain (1)	ACCEPT converse statement for *Daphnia*	**(1)**

Question Number	Answer	Mark
1(b)(i)	**1(b)(i). The only correct answer is A** ***B*** *is not correct because the blood has passed through tissues where gaseous exchange has taken place* ***C*** *is not correct because the blood has passed through tissues where gaseous exchange has taken place* ***D*** *is not correct because this would have the highest concentration*	**(1)**

Question Number	Answer	Mark
1(b)(ii)	**1(b)(ii). The only correct answer is D** ***A*** *is not correct because the pressure would have decreased as the blood passed through the gas exchange surface* ***B*** *is not correct because the blood pressure decreases with increasing distance from the heart.* ***C*** *is not correct because the blood pressure decreases with increasing distance from the heart.*	**(1)**

Question Number	Answer	Mark
2(a)(i)	**2(a)(i). The only correct answer is B 33.51cm^3** ***A*** *is not correct because volume needs cm^3* ***C*** *is not correct because volume needs cm^3* ***D*** *is not correct because the equation requires the diameter to be halved*	**(1)**

Question Number	Answer	Additional Guidance	Mark
2 (a) (ii)	A description that makes reference to two of the following: • they can rely on diffusion to {take in oxygen / remove wastes} (1) • large surface area to volume ratio (allows diffusion to occur at a sufficient rate) (1) • short diffusion distance (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)	An explanation that makes reference to the following: • many alveoli provide a large surface area (1) • {alveoli / capillaries} have walls that are one cell thick providing a short distance for diffusion (1) • high concentration gradient maintained by {circulation / ventilation} (1) • extensive capillary network around alveoli provides large surface area for gas exchange (1)	ALLOW thin walls	**(4)**

Question Number	Answer	Additional Guidance	Mark
2(c)	• correct numbers inserted into equation (1) • correct answer (1)	{104/105/106} ÷ 10 000 = 1 in 95 / 0.0104 / 0.0105 / 0.0106 / 1.04% / 1.05% / 1.06% (0.011 or 0.01 if correctly rounded) Correct answer with no working gains full marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(d)	An explanation that makes reference to two of the following: • smaller surface area of alveoli (with emphysema) (1) • therefore need a larger concentration gradient (1) • to maintain the rate of diffusion (1)	ALLOW smaller SA:vol Allow smaller surface area for gas exchange ALLOW diffusion gradient	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(a)	An explanation which includes reference to two of the following: • description of water as a {polar / dipole / dipolar} molecule (1) • water surrounds (polar) molecules allowing them to dissolve (1) • hydrogen bonds form (1)	ALLOW correct description of uneven charges	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)	A description that makes reference to the following: • carrier proteins (located in membrane) (1) • (glucose enters by) facilitated diffusion (1)	ALLOW channel proteins	**(2)**

Question Number	Answer	Additional Guidance	Mark
3 (c)	An explanation which makes reference to three of the following: • the percentage change in cell mass decreases as glucose decreases (1) • glucose is soluble / comparison between solubility (1) • higher ratio of glucose molecules has an osmotic effect (on the cell) / glycogen molecules does not have an osmotic effect (on the cell) (1) • water enters by osmosis (and increases cell mass) (1)	ALLOW converse ALLOW converse for glycogen ALLOW converse for glycogen ALLOW water molecules are not attracted to glycogen molecules ALLOW correct references to {water / osmotic / solute} potential	**(3)**

Question Number	Answer	Additional Guidance	Mark
3 (d)(i)	A description which includes reference to the following: • joining together in condensation reactions (1) • forming {1,4 and 1,6} glycosidic bonds (1)		**(2)**

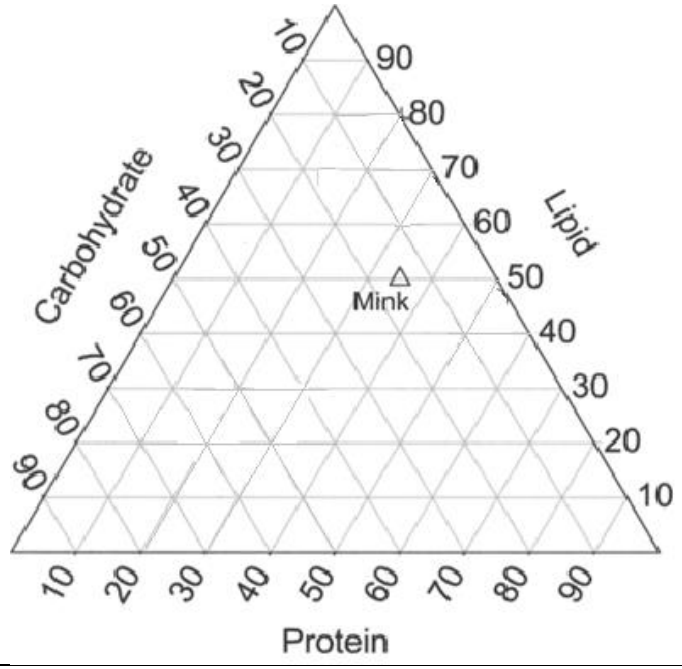
Question Number	Answer	Additional Guidance	Mark
3 (d)(ii)	A description which includes reference to the following: • branched molecule for more rapid hydrolysis (1) • compact so more can be stored (1)	ALLOW broken down ALLOW 'doesn't take up much space'	**(2)**

Question Number	Answer	Mark
4 (a)	**The only correct answer is A - carrier protein** ***B*** *is not correct because channel proteins are not involved in active transport* ***C*** *is not correct because cholesterol is not involved in active transport* ***D*** *is not correct because glycolipids are not involved in active transport*	**(1)**

Question Number	Answer	Additional Guidance	Mark
4 (b)	An answer which makes reference to the following: • at temperatures between 10ºC and 30ºC all the stain is in cells / at 40ºC and above some stain has not been taken up by cells (1) • (at temperatures between 10ºC and 40ºC) taken in against the concentration gradient (1) • (at 40ºC and above) {carrier proteins/ enzymes} are denatured (1) • reduced movement of stain into cell / (enzymes denatured) so no ATP for active transport (1)	ALLOW as the temperature increases (above 30 ºC) the number of stained cells decreases ALLOW proteins denatured ALLOW (carrier proteins denatured) changing permeability of cell surface membrane / carrier proteins cannot bind to stain	**(3)**

Question Number	Answer	Additional Guidance	Mark
4 (c)	An explanation that makes reference to the following: • One for improvement (1) - repeats at each temperature - standardised {BCB concentration / red blood cell count / immersion time} - smaller temperature intervals - use of colorimeter • And one for linked justification (1) - allowing anomalies to be identified / means to be calculated - allowing {repeatability / validity} - to determine the temperature that active transport was affected / solution became coloured - increases accuracy / provides quantitative data	Check that the justification matches the improvement suggested ALLOW not subjective /	**(2)**

Question Number	Answer	Mark
5 (a)	**The only correct answer is D - protein** ***A*** *is not correct because carbohydrates do not contain nitrogen atoms* ***B*** *is not correct because glycogen does not contain nitrogen atoms* ***C*** *is not correct because lipids do not contain nitrogen atoms*	**(1)**

Question Number	Answer	Additional Guidance	Mark
5 (b)(i)	Correct Plot  	ALLOW any shape in the correct plot area Labelling not required	**(1)**

Question Number	Answer	Mark
5 (b)(ii)	**The only correct answer is A - bear** ***B*** *is not correct because ester bonds are found in lipids and cats have a lower proportion of lipids* ***C*** *is not correct because ester bonds are found in lipids and humans have a lower proportion of lipids* ***D*** *is not correct because ester bonds are found in lipids and mice have a lower proportion of lipids*	**(1)**

Question Number	Answer	Additional Guidance	Mark
5 (c)(i)	• correct numbers from table used to calculate increase (1) • correct answer (1)	<u>Example of calculation</u> 12886-10090 or 2796 (Answer / 10090)*100 = 27.71(%) / 27.7(%) / 28(%) Correct answer without working gains full marks	**(2)**

Question Number	Answer	Mark
5 (c)(ii)	**The only correct answer is C - 2223 kcal** ***A*** *is not correct because the decimal place is in the wrong place as they have not taken into account converting kJ to joules or calories to kcal.* ***B*** *is not correct because the decimal place is in the wrong place as they have not taken into account converting kJ to joules or calories to kcal.* ***D*** *is not correct because they have not taken into account converting kJ to joules or calories to kcal.*	**(1)**

Question Number	Answer	Additional Guidance	Mark
5 (c)(iii)	An answer that makes reference to the following: • stored as {glycogen / fat / lipids} (in body cells) (1)	Answer must be in context of energy	**(1)**

Question Number	Answer
***5 (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. • mucus {thicker / stickier} than normal • (pancreatic) enzymes cannot enter intestine because pancreatic duct blocked with mucus • (high energy diet required because) digestion is less efficient • pancreatic enzymes trapped behind mucus damage pancreatic cells such as those that produce insulin • cysts form in pancreas • sperm cannot leave the testes because {sperm duct / vas deferens / tubes } blocked with mucus • sperm duct / vas deferens absent therefore sperm cannot pass through • gene mutation • (causing a) non-functioning CFTR protein channel • chloride ions cannot move out of epithelial cells • accumulation of sodium and chloride ions in the cells {causing water to move out of mucus by osmosis / preventing water moving into mucus} **(6)**

Level 0	0	No awardable content	
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.	Answers discuss at least one reason with limited reference to relevant science.
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.	Reference is made to sticky/thick mucus. Two out of the three statements are discussed with reference to relevant science.
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.	Reference is made to {gene mutation / non-functioning protein channel} and {sticky/thick} mucus. Correct and detailed science is used to explain all 3 statements in a clear and logical way

Question Number	Answer	Additional Guidance	Mark
6 (a)	An explanation that makes reference to the following: • (more) collagen provides strength (to withstand pressure) (1) • (contraction of) muscle allows constriction (of lumen / artery) (1) • elastic fibres allow (stretch and) {recoil / lumen to return to original size} (1)	ALLOW narrowing of {lumen / artery}	**(3)**

Question Number	Answer	Additional Guidance	Mark
6 (b)(i)	A description that makes reference to three of the following: • (high blood pressure) damages the endothelium of the artery (1) • causing an inflammatory response (1) • {white blood cells / cholesterol} accumulate / atheroma forms (1) • calcium salts and fibrous tissue build up / formation of a plaque (1)		**(3)**

Question Number	Answer	Additional Guidance	Mark
6 (b)(ii)	An explanation that makes reference to the following: • {plaques / atherosclerosis} narrow the lumen (1) • increasing blood pressure (further) (1)	ALLOW narrowing of artery ALLOW atheroma	**(2)**

Question Number	Answer	Mark
6 (b)(iii)	**The only correct answer is A - anticoagulant** ***B*** *is not correct because antihypertensives would reduce the blood pressure and reduce damage from a haemorrhagic stroke* ***C*** *is not correct because statins would not have an immediate effect* ***D*** *is not correct because thrombin would aid blood clotting and reduce damage from a haemorrhagic stroke*	**(1)**

Question Number	Answer	Additional Guidance	Mark
7 (a)	A description which includes two of the following: • condensation reaction (1) • phosphodiester bonds (1) • DNA polymerase (1)	Must be in context of forming a DNA strand ALLOW hydrogen bonding between bases (in context of double strand) ALLOW bonds forming between phosphate and deoxyribose	**(2)**

Question Number	Answer	Additional Guidance	Mark
7 (b)	An explanation which includes the following: • The conservative model was rejected / the semi-conservative model was accepted (1) • (due to) generation 1 has a single band which is halfway between ^{15}N and ^{14}N (1) • (because) the DNA has one strand containing ^{15}N and one strand containing ^{14}N (1) • (in semi-conservative model) further generations would have {a band which is halfway between ^{15}N and ^{14}N / no band at ^{15}N } (1)	ALLOW light band for ^{14}N and heavy band for ^{15}N ALLOW nitrogen – 14 / nitrogen – 15 ALLOW the evidence {supports semi-conservative model / does not support conservative model} ALLOW medium density ALLOW DNA contains half heavy nitrogen and half light ALLOW (in conservative model) further generations would have { no band halfway between ^{15}N and ^{14}N / a band at ^{15}N }	**(4)**

Question Number	Answer	Additional Guidance	Mark
7 (c)	An answer that that makes reference to the following: Similarity • both contain phosphate, pentose sugar and a base (1) and two of the following Differences • a DNA nucleotide contains deoxyribose whereas ATP contains ribose (1) • a DNA nucleotide could contain other bases whereas ATP contains only {adenine / one base type} (1) • a DNA nucleotide contains one phosphate whereas ATP {contains three phosphates / is a triphosphate} (1)	ACCEPT DNA could contain C, T or G whereas ATP only contains A	**(3)**

Question Number	Answer	Additional Guidance	Mark
8 (a)	An answer that makes reference to the following: • (proteins which) reduce activation energy of biological reactions (1)	ALLOW increase rate of biological reactions ALLOW references to {in cells / in living organisms}	**(1)**

Question Number	Answer	Additional Guidance	Mark
8 (b)(i)	An answer that makes reference to four of the following: Similarities • both are chains of amino acids joined by peptide bonds (1) • (both have) bonds involved in holding molecule in its three dimensional shape (1) Differences • arazyme is folded into {compact / tertiary} structure whereas collagen has long (parallel) chains with cross links (1) • arazyme has an active site whereas collagen does not (1) • arazyme has some {hydrophilic groups / amino acids} on surface whereas collagen does not (1)	ALLOW a correct named bond ALLOW arazyme is a globular protein whereas collagen is a fibrous protein ALLOW collagen only has (hydrophobic groups / amino acids} on surface whereas arazyme does not	**(4)**

Question Number	Answer	Additional Guidance	Mark
8 (b)(ii)	An answer that makes reference to the following: • at least five different concentrations of arazyme solution (1) • a controlled variable (1) • measuring of the dependent variable (1) • time taken (for phenolphthalein) to decolourise (1) • {replicates / repeats} for each arazyme concentration to allow calculation of mean values (1)	ALLOW 0% arazyme e.g. volume of enzyme / volume of substrate / concentration of substrate / temperature / volume of indicator e.g. colorimeter / compare to colour standard	**(4)**

Question Number	Answer	Additional Guidance	Mark
8 (c)	An answer that makes reference to the following: • the conclusion is not valid (1) • as pH would reduce faster {at higher substrate concentrations / in graph A} (1) • (however) rate of reaction for A did not decrease immediately (1) • lower pH would result in the denaturation of the enzyme and reduction in the rate of reaction (1)	ALLOW the product does not reduce the activity of the enzyme ALLOW converse for solution B ALLOW more product is produced in solution A, but the rate of reaction decreases slower than in solution B ALLOW converse for solution B	**(4)**

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