Biology A (Salters-Nuffield) Advanced Paper 2 (9BN0/02)

Question Number	Acceptable Answer	Additional Guidance	Mark
1(a)	antagonistic (muscles)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
1(b)(i)	contraction (of F) {flexes / bends } the arm		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
1(b)(ii)	A description that makes reference to the following: • G (tendon) attaches E to the bone (1) • as G does not stretch, the contraction of E moves the bone (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
1(c)(i)	C (amino acids joined by peptide bonds)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
1(c)(ii)	A description that makes reference to • carboxyl group / COOH (1) • amine group / NH_2 (1) • R group (1)		**(3)**

Total for Question 1 = 8 marks

Question Number	Answer	Additional Guidance	Mark
2(a)	C (phospholipid)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
2(b)(i)	rhodopsin		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
2(b)(ii)	(cis) retinal		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
2(c)	A description that makes reference to the following: • opsin released causing sodium ion channels to be blocked (1) • which causes hyperpolarisation in the rod cell (1) • causing action potential in bipolar cell (results in action potential in the optic nerve) (1)		**(3)**

Total for Question 2 = 6 marks

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	B (F and G)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
3(a)(ii)	An explanation that makes reference to: • higher systolic pressures therefore higher blood pressure (1) • high blood pressure associated with increased risk of CVD (1) • G has the lowest ratio of HDL to total cholesterol (1) • G has higher ratio of LDL associated with increased risk of CVD (1)		**(4)**

Question Number	Acceptable Answer	Additional Guidance	Mark
3(b)(i)	x axis: time AND y axis: voltage / potential difference		**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	A (P)		**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(iii)	B (Q to R)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
3(c)	An explanation that makes reference to: • length of time between T and P is variable (1) • irregular heart rate (1)		**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
3(d)	An explanation that makes reference to the following: • side effects of the drug include { weight gain / fatigue / sleepiness } (1) • being { overweight / obese } is a risk factor in developing heart disease (1) • { fatigue / sleepiness } may stop people exercising (1) • lack of exercise can lead to further weight gain (1)		**(4)**

Total for Question 3 = 14 marks

Question Number	Acceptable Answer	Additional Guidance	Mark
4 (a)	An answer that makes reference to the following: • maintenance of internal body conditions within an appropriate range		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
4(b)	• Correct selection of values from graph (1) • Correct conversion to mg (1) • Correct answer calculated (1)	7.5 and 2.5 5 x { 18 / 72 ÷ 4 } = 90 900 mg dm^{-3} Allow full marks for correct answer with no working.	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	B (hydrolysis)		**(1)**

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	B (C - O - C)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
4(d)(i)	An explanation that makes reference to the following: • low blood glucose levels (1) • less glucose for respiration (1) • less { energy / ATP } in muscle tissue (1)		**(3)**

Question Number	Acceptable Answer	Additional Guidance	Mark
4(d)(ii)	An answer that makes reference to the following: • range of enzyme concentration (1) • control of other named variables (1) • measurement of rate of glucose production (1)	e.g. temperature, pH, concentration of substrate	**(3)**

Total for Question 4 = 12 marks

Question Number	Answer	Additional Guidance	Mark
5 (a)	B (matrix)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
5(b)	An answer that makes reference to the following: <u>Similarities</u> • both contain ribosomes (1) • both contain { circular DNA / plasmids } (1) <u>Difference</u> • prokaryotes { do not have a double membrane / possess a cell wall } (1)		**(3)**

Question Number	Acceptable Answer	Additional Guidance	Mark
5(c)(i)	An explanation that makes reference to the following: • a (random) change in the sequence of bases in the DNA (1) • involving { deletion / substitution / addition } of a base (1) • this affects the triplet code / changes sequence of amino acids in the enzyme molecule (1) • change in shape of active site (1)		**(3)**

Question Number	Acceptable Answer	Additional Guidance	Mark
5(c)(ii)	An explanation that makes reference to the following: • the severity of symptoms is related to the proportion of mitochondria with damaged DNA in the mother only (1) • because (the child's mitochondria) are derived from the { oocyte / egg cell } (1) • mitochondria in sperm do not enter the egg on fertilisation (1)		**(3)**

Total for Question 5 = 10 marks

Question Number	Acceptable Answer	Additional Guidance	Mark
6(a) (i)	A description that makes reference to the following: • to absorb carbon dioxide (1) • so that the volume of oxygen used can be measured (1)		**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
6(a)(ii)	• cross-sectional area of tube correctly calculated (1) • volume of oil displaced correctly calculated (1) • correct answer (1)	Example of Calculation 3.14 x 0.35 x 0.35 or 0.385 0.385 x 8.2 or 3.157 = 0.26 mm^3min^{-1} Allow full marks for correct answer, no working	**(3)**

Question Number	Indicative content
***6(b)**	Answers will be credited according to candidate's deployment of 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. • method for setting a constant temperature • measurement of a range of temperatures • use of the syringe to reset the apparatus • using the same mass of seeds • repeating measurements at each temperature • modifying the left hand tube to have the same volume of air • adding potassium hydroxide or killed seeds to the left hand side

Level	Mark	Descriptor
	0	No awardable content
Level 1	1-2	A description of the method to investigate a range of temperatures but with limited attempt to produce valid data. Generalised comments made. The description will contain basic information with some attempt made to link knowledge and understanding to the given context.
Level 2	3-4	A description of the method to investigate a range of temperatures but with some attempt to produce valid data. The description shows some linkages and lines of scientific reasoning with some structure
Level 3	5-6	A description of the method to investigate a range of temperatures supported throughout with evidence to produce valid data. The description shows a well-developed and sustained line of scientific reasoning which is clear, coherent and logically structured.

Total for Question 6 = 11 marks

Question Number	Acceptable Answer	Additional Guidance	Mark
7(a)(i)	A description that makes reference to the following: • gene is a length of DNA that codes for a { polypeptide / protein } (1) • genome is a complete set of { DNA / introns and exons } (1)		**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
7(a)(ii)	ligase / integrase		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
7(a)(iii)	plasmid / virus		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
7(a)(iv)	A description that makes reference to the following: • transcription of DNA to mRNA (1) • { translation of mRNA / protein synthesis } on ribosomes (1)		**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
7(b)	An explanation that makes reference to the following: • no prothrombin activated so thrombin not produced (1) • thrombin needed to convert fibrinogen to fibrin (1) • fibrin needed to trap { platelets / blood cells } to form the (blood) clot (1)		**(3)**

Total for Question 7 = 9 marks

Question Number	Indicative content
***8(a)**	Answers will be credited according to candidate's deployment of 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. • if acetylcholine receptors on post synaptic membrane affected, no depolarisation of post synaptic neurone • if calcium ion channels affected, vesicles in presynaptic neurone do not fuse with presynaptic membrane • no neurotransmitter released • if sodium ion channels affected, no depolarisation of axon • if potassium ion channels affected, no repolarisation of axon • no propagation of action potential

Level	Mark	Descriptor
	0	No awardable content
Level 1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information with a focus on mainly just one variable. The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context.
Level 2	3-4	An explanation will be given with occasional evidence of analysis, interpretation and/or evaluation of both variables. The explanation shows some linkages and lines of scientific reasoning with some structure.
Level 3	5-6	An explanation 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.

Question Number	Acceptable Answer	Additional Guidance	Mark
8(b)(i)	A description that makes reference to the following: • utilitarian argument, better to test on animals than on humans (1) • the benefits to humans must outweigh harm done to other animals (1)		**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
8(b)(ii)	An explanation that makes reference to two of the following: • to determine safe dose (1) • to determine side effects (1) • to determine how the drug is metabolised (1)		**(2)**

Total for Question 8 = 10 marks

Question Number	Answer	Additional Guidance	Mark
9(a)(i)	A (complete mineral ion solution)		**(1)**

Question Number	Answer	Additional Guidance	Mark
9(a)(ii)	D (validity)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
9(a)(iii)	• Mass of one seed correctly calculated (1) • Calcium ion content for one seed calculated (1) • Correct answer (1)	<u>Example of Calculation:</u> 1 ÷ 200 = 0.005(g) (21 × 0.005) ÷ 100 or 0.00105 = 1.05 (µg) Allow full marks for correct answer with no working	**(3)**

Question Number	Acceptable Answer	Additional Guidance	Mark
9(a)(iv)	An explanation that makes reference to the following: • seedlings not deficient in magnesium ions, chlorophyll production not affected (1) • seedlings of rice deficient in calcium ions were shorter due to less calcium ions stored in the seed (1) • seedlings of fenugreek did not suffer calcium ion deficiency due to the greater content of calcium ions in the seed (1)		**(3)**

Question Number	Acceptable Answer	Additional Guidance	Mark
9(b)	An explanation that makes reference to three of the following: (1) (1) (1) (1) (1) (1) • positive phototropism • IAA diffuses away from light source • IAA accumulates in { cells / tissues } furthest from light • IAA stimulates cell elongation causing growth towards light		**(3)**

Total for Question 9 = 11 marks

Question Number	Acceptable Answer	Additional Guidance	Mark
10(a)(i)	• calculation of change in pupil size (1) • rate of change calculated (1)	Example of calculation: 5.6 − 4.4 = 1.2 mm 1.2 ÷ 4 = 0.3 Allow full marks for correct answer, no working	**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
10(a)(ii)	An explanation that makes reference to the following: • the pupil constricts with opioids (1) • the contraction of the circular muscles of iris stimulated / the contraction of the radial muscles inhibited (1) • so parasympathetic nerve pathway inhibited / sympathetic nerve pathway stimulated (1)		**(3)**

Question Number	Acceptable Answer	Additional Guidance	Mark
10(a)(iii)	An answer that makes reference to the following: • no control with neither morphine or opioids to allow comparison (1) • light conditions need to be controlled (1) • no details of how subjects selected to reduce variability in response, e.g. same gender, same age, no other medication (1) • no indication of sample size or statistical analysis to determine significance of results (1)		**(4)**

Total for Question 10 = 9 marks