OCR
Oxford Cambridge and RSA

GCE

Biology A

Unit **H020/01:** Breadth in biology

Advanced Subsidiary GCE

Mark Scheme for June 2016

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations

Annotation	Meaning
DO NOT CREDIT	Answers which are not worthy of credit
IGNORE I	Statements which are irrelevant
ALLOW or **ACCEPT**	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
AW	Alternative wording
ORA	Or reverse argument
✓	Mark is awarded
X	Answer incorrect
^	Omission mark
BOD	Benefit of doubt
BP	Blank page
CON	Statement that contradicts a correct statement
	Use to indicate when part of a mark point has been achieved
ECF	Error carried forward
GM	Mark has already been awarded (given mark)
	Horizontal wavy line to indicate incorrect statements
NBOD	Not giving the benefit of doubt

SECTION A

Question	Answer	Marks	Guidance
	Mark the letter that is in the box. Credit a letter that is clearly the intended answer if the letter in the box is crossed out. Do not credit ambiguous letters, unless the correction is clearly thicker than the original. If there is no letter in the box, credit a very clear indication of the correct answer.		
1	C	**1**	
2	B	**1**	
3	D	**1**	
4	C	**1**	
5	C	**1**	
6	D	**1**	
7	B	**1**	
8	C	**1**	
9	A	**1**	
10	A	**1**	
11	A	**1**	
12	C	**1**	
13	B	**1**	
14	B	**1**	
15	C	**1**	
16	A	**1**	
17	B	**1**	
18	B	**1**	
19	D	**1**	
20	A	**1**	
	Total	**20**	

SECTION B

Question			Answer	Marks	Guidance
21	(a)	(i)		max 2	*Mark first **two** answers only, ignoring the numbered sections* **IGNORE** mass / balance used / soak time / repeats **IGNORE** a list of variables unqualified
			1 discs same **,** size / thickness / surface area / surface area to volume ratio / diameter ✓		1 **ACCEPT** same cork borer used **ACCEPT** 'pieces of potato' etc. for 'discs' **ACCEPT** 'length' as equivalent to 'diameter' **IGNORE** same shape / similar size etc
			2 same (variety / part **,** of) potato ✓		
			3 no skin on potato ✓		
			4 *ref to* removing excess water before (re)weighing ✓		4 e.g. blotting / shaking
			5 same **,** number / amount **,** of discs (in each solution) ✓		
			6 same <u>volume</u> (sucrose) <u>solution</u> ✓		
			7 same temperature ✓		7 **ACCEPT** in context of room / environment / solution
			8 cover the tubes ✓		

Question			Answer	Marks	Guidance
21	(a)	(ii)		max 3	**ACCEPT** Ψ for water potential throughout **IGNORE** ref to solute potential / isontonic
			1 *idea that* no change of mass occurs when the water potential of (sucrose) solution = water potential of potato (tissue) ✓		
			2 ref. to no change in mass (of potato) between 0.2 and 0.3 mol dm^{-3} ✓		2 correct units must be stated once **ACCEPT** 'between 0.2 and 0.3 mol dm^{-3} the water potential of the solution and the potato will be the same'
			3 plot graph of concentration of **,** sucrose / solution **,** against (%) change in mass **and** find which (sucrose) concentration gives no change in mass of potato		3 x and y axes interchangeable When an axis has been identified it can be referred to by letter later. Needs some ref to the mass change being 0. If the change in mass axis has previously been identified, then ref to that axis value being 0 is equivalent to no change in mass e.g. '*Should draw a graph of sucrose concentration on the x axis and change in mass of potato discs on the y axis. The point where the line of best fit crosses the x axis (when the y axis = 0) is the concentration of sucrose in the potato discs.*' will get the mark '*Draw a graph with change in mass of potato discs on the y axis and concentration of sucrose solution on the x axis and draw a line of best fit. Where the line intercepts the x axis is where the change in mass of potato discs is zero.*' will get the mark
			OR carry out the experiment again with more (sucrose) concentration intervals between 0.2 and 0.3 mol dm^{-3} ✓		3 correct units must be stated once
			4 look up the water potential of the (sucrose) solution (e.g. on calibration curve or table) **,** of that concentration / of the concentration which gives no mass change ✓		

Question			Answer	Marks	Guidance
21	(b)	(i)	X (cellulose) cell wall ✓ Y cell surface membrane / plasma membrane ✓ Z vacuole membrane / tonoplast ✓	max 3	*If additional incorrect answer given, then 0 marks* Y **ACCEPT** plasmalemma Z **IGNORE** vacuole
21	(b)	(ii)	sucrose solution ✓	1	*If additional incorrect answer given, then 0 marks* **ACCEPT** sugar solution / external solution / solution placed in **DO NOT CREDIT** 'solution' unqualified
21	(c)		there is a lower water potential inside root hair (cells) ✓ actively transport / pump , (mineral) ions / salts **,** into root hair(s) (cells) **or** root hair(s) (cells) store / contain **,** (mineral) ions / salts / solutes ✓	2	**IGNORE** ref to large surface area and short diffusion path **IGNORE** ref to solute potential / isotonic **ACCEPT** Ψ for water potential 'it' or 'they' = root hairs **IGNORE** ref to roots or root cells unqualified as hairs **ACCEPT** root hair **,** has / creates **,** a lower water potential (than soil) **ACCEPT** maintains / sets up / establishes **,** a (steep) water potential gradient Look for a comparison in water potential between the cell and the soil **IGNORE** solutes / sugars / hydrogen ions **ACCEPT** named ions **ACCEPT** named ions **ACCEPT** named solutes e.g. sugars
			Total	11	

Question			Answer	Marks	Guidance
22	(a)	(i)	164 706 ✓✓	2	Correct answer with no working = **2 marks** If the answer is incorrect, look for a working mark: **either** (incorrect rounding) **ALLOW** 1 mark for seeing 164 705 **or** 164 705.88 **or** 164 705.9 anywhere **or** **ALLOW** 1 mark for any ref to 56 ÷ 34 (e.g. 5.6 ÷ 0.34 or 5600 ÷ 34)
22	(a)	(ii)	28 ✓✓	2	Correct answer with no working = **2 marks** If answer incorrect, **ALLOW** 1 mark for seeing 100 - 44 or 50 - 22
22	(b)	(i)	condensation ✓	1	*If additional incorrect answer given, then 0 marks* **ACCEPT** esterification
22	(b)	(ii)	water ✓	1	*If additional incorrect answer given, then 0 marks* **ACCEPT** H_2O (correct formula only)

Question			Answer	Marks	Guidance
22	(b)	(iii)		max 3	**IGNORE** antiparallel
			1 phosphodiester bonds in **,** backbone / described ✓		1 **ACCEPT** covalent bond in backbone
			2 hydrogen / H **,** bonds / bonding (between chains / bases) ✓		2 **DO NOT CREDIT** if other bond mentioned to connect between the two chains **DO NOT CREDIT** H^+ bonds **IGNORE** strength of bond
			3 purine to pyrimidine / A to T **and** C to G ✓		3 **DO NOT CREDIT** thiamine / cysteine / adenosine
			4 ref to correct number of bonds between base pairs (A-T & C-G) ✓		**Note:** 'Two bonds between A and T and three bonds between C and G' **= 2 marks (mp 3 and mp 4)** 'Two hydrogen bonds between A and T and three hydrogen bonds between C and G' **= 3 marks (mp 2, mp 3 and mp 4)**
			Total	**9**	

Question			Answer		Marks	Guidance
23	(a)		*Column 1* Class Order Genus ✓	*Column 2* Animalia *sumatrensis* ✓	2	*If additional incorrect answer given, then 0 marks* One mark per correct column. **ACCEPT** Animal / phonetic spelling / in lower case 'sumatrensis' must be all in lower case **DO NOT CREDIT** if the 's' is clearly upper case **DO NOT CREDIT** D. sumatrensis **DO NOT CREDIT** Sumatran / sumatran
23	(b)		universal / recognised worldwide / AW ✓ know which **,** genus / species **,** it belongs to ✓ *idea of* different common name for the same organism ✓		max 1	**ACCEPT** no language barrier **ACCEPT** ref to showing evolutionary relationships (e.g. shows common ancestry)
23	(c)	(i)	loss of **,** (rainforest) habitat / food source **or** deforestation ✓ hunting / poaching (for horn) ✓ climate change ✓		max 2	**IGNORE** disease **ACCEPT** loss of (rainforest) ecosystem **IGNORE** only lives in rainforest

Question			Answer	Marks	Guidance
23	(c)	(ii)	1 hard to find a mate / may be gender imbalance ✓ 2 (inbreeding leading to) low genetic diversity / small gene pool / genetic bottleneck ✓ 3 cannot / less likely to **,** cope with / adapt to **,** (named) environmental change ✓ 4 all wiped out by the same disease ✓ 5 more vulnerable to **,** predators / poachers ✓ 6 natural disaster could wipe out **,** one / some **,** of the small populations ✓	**max 2**	1 **ACCEPT** few individuals of reproductive maturity 2 **ACCEPT** description 3 **ACCEPT** (population) unable to cope with new selection pressures 4 **DO NOT CREDIT** that they are more susceptible to disease in general
23	(c)	(iii)	education / awareness ✓ support for / promote **,** conservation projects / research ✓	**max 1**	**IGNORE** ref to cloning In the context of educating the general public e.g. information displayed in the zoo or on website / holding education days for schools 'support' could mean: raise money / provide funds / provide technical support / provide expertise / etc. **CREDIT** in the context of an example e.g. sending people to monitor populations in the wild e.g. supporting the setting up of nature reserve **IGNORE** zoo sets up nature reserves
			Total	**8**	

Question			Answer	Marks	Guidance
24	(a)		6 600 ✓✓	2	**Correct answer = 2 marks** If answer is incorrect, **ALLOW** 1 mark for seeing 20.1 – 0.3 = 19.8 **or** (20.1 – 0.3) ÷ x **or** 19.8 ÷ x where x = any number
24	(b)	(i)	*advantages* A1 more space for / can contain more / can carry more **,** haemoglobin / oxygen ✓ A2 can squeeze through <u>capillaries</u> easily ✓ *disadvantages* D1 limited life span / cannot divide / cannot reproduce / cannot undergo mitosis ✓ D2 no **,** protein synthesis / repair ✓ D3 no respiration **,** in / by **,** mitochondria **or** no mitochondria for respiration **or** limited respiration / no aerobic respiration / only anaerobic respiration ✓	max 2	Mark **first answer** only for advantage and disadvantage. A1 **DO NOT CREDIT** in context of larger surface area **ACCEPT** 'Hb' for haemoglobin D1 max time of 120 days / 4 months D3 **DO NOT CREDIT** 'no mitochondria so no respiration' (as some respiration will still take place) **ACCEPT** **'**ATP release' or 'energy provided' instead of 'respiration' e.g. no energy being provided from mitochondria ATP is not released by mitochondria **DO NOT CREDIT** ref to producing / creating **,** energy

Question			Answer	Marks	Guidance
24	(b)	(ii)	*Virus* virus is unable to / cannot **,** replicate / reproduce **,** on its own / outside a host cell **or** virus requires host cell **,** machinery / <u>DNA</u> / RER / ribosomes **,** for protein synthesis **or** virus does not contain **,** RER / ribosomes **,** for protein synthesis ✓ - *Plasmodium* *idea that Plasmodium is* using the host cell to hide from the immune system **or** for *Plasmodium* to complete its life cycle **or** for *Plasmodium* to use as a source of food (for **,** growth / reproduction) ✓	2	**IGNORE** ref to the erythrocyte not having membrane-bound organelles without ref to the need of the virus to use them inside the cell Must be a clear statement **ACCEPT** needs / has to use **,** host cell to **,** replicate / reproduce **ACCEPT** 'malarial pathogen' for *Plasmodium* **IGNORE** eukaryotic / protoctist **IGNORE** it has its own **,** DNA / nucleus / protein synthesis apparatus **IGNORE** ref to just **,** part / stage **,** of life cycle **IGNORE** ref to organelles

Question			Answer	Marks	Guidance
24	(b)	(iii)	1 oxygen is bound to haemoglobin (while being transported) ✓ 2 lack mitochondria ✓ 3 (therefore) no <u>aerobic</u> respiration ✓ 4 (moved by mass flow so) doesn't need **,** energy / ATP **,** to move **or** needs less **,** energy / ATP (for metabolic processes) ✓	**2**	1 **ACCEPT** 'it' for 'oxygen' **ACCEPT** 'Hb' for haemoglobin 3 **ACCEPT** <u>only</u> respires anaerobically **IGNORE** ref to energy 4 **DO NOT CREDIT** **'**does not need **,** energy / ATP' unqualified **DO NOT CREDIT** **'**makes / produces **,** energy'
24	(c)	(i)	1005 ✓✓	**2**	**Correct answer = 2 marks** If answer is incorrect then **ALLOW** 1 mark for any ref to 201 x 5 (e.g. 2.01 x 5 or 2.01 x 50 or 0.201 x 0.5 etc)

Question			Answer	Marks	Guidance
24	(c)	(ii)	1 arteries / arterioles **,** have thick wall **or** capillary wall is **,** thin / one cell thick / only endothelium ✓ 2 no diffusion (through artery wall) **or** diffusion distance (too) large for artery **or** diffusion occurs (through capillary wall) **or** short diffusion distance for capillary ✓	**2**	1 **ACCEPT** artery walls have **,** elastic fibres / muscle / collagen / (more) layers **IGNORE** ref to veins / venules **DO NOT CREDIT** ref to cell wall **Note:** 'artery walls too thick for diffusion to take place' **= 2 marks**
24	(d)	(i)	Bohr (effect / shift) ✓	**1**	**Correct spelling only** **ACCEPT** bohr / Bohr's / bohr's

Question			Answer	Marks	Guidance
24	(d)	(ii)	*in actively respiring tissues* 1 more / high levels of **,** carbon dioxide (produced) **or** high pCO_2 ✓ 2 lowered affinity of haemoglobin for oxygen ✓ 3 (CO_2 results in) dissociation of carbonic acid / increase of H^+ **,** leading to the release of oxygen ✓ 4 more oxygen released at same pO_2 / suitable data quote from graph ✓	**max 2**	*If symbols used must be correct e.g. CO_2* ***not*** *CO^2* 1 **ACCEPT** ORA for resting tissue 2 **ACCEPT** 'Hb' for haemoglobin **ACCEPT** weaker affinity 4 (at **,** T / 3.2 kPa O_2) drops from 40% to 24% saturation / 16% reduction
			Total	**15**	

Question			Answer	Marks	Guidance
25	(a)		B C ✓✓	2	One mark for each correct answer e.g. B C = 2 B or C (only) = 1 B D✗= 1 If one extra incorrect letter = max1 If two extra incorrect letters = 0 marks e.g. B C D ✗= 1 B C D ✗ E ✗= 0
			A D F ✓✓	2	**If any incorrect or extra letters are written, cross each one.** e.g. A D E✗ Then look at any correct letters written. We have 1 cross so only 1 more mark available, A and D both right so gets this 1 mark) e.g. A D E✗ C✗ We have 2 crosses so 0 marks even though the correct letters have also been given **If no extra or incorrect letters are written:** Three answers written, all correct = 2 marks A, D, F = 2 Two answers written, both correct = 1 mark A, D = 1 A, F = 1 D, F = 1 One answer written and correct = 0 A = 0 F = 0 D = 0

Question			Answer	Marks	Guidance
25	(b)		1 sugar / sucrose / assimilates **,** in the <u>sieve</u> <u>tube</u> (elements) ✓ 2 (assimilates) enter **,** sieve tube / phloem (at source) **and** lowers water potential (in sieve tube) ✓ 3 water enters (sieve tube) **,** by osmosis / down water potential gradient / described **and** increases <u>hydrostatic</u> pressure ✓ 4 (assimilates) leave **,** sieve tube / phloem (at sink) **and** increases water potential (inside sieve tube) ✓ 5 water leaves (sieve tube) **,** by osmosis / down water potential gradient / described **and** lowers <u>hydrostatic</u> pressure ✓ 6 (assimilates) move **,** from high to low (hydrostatic) pressure / down pressure gradient ✓	**max 3**	2 **IGNORE** details of loading mechanism and companion cells 6 **IGNORE** 'mass flow' as given in Q
			Total	**7**	

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