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Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCE
in Biology Spec B (8BI0) Paper 02
Core Physiology and Ecology

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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	Additional Guidance	Mark
1(a)	An answer that makes reference to the following: • transport against a concentration gradient / from low to high concentration (1) • energy / ATP required (1)	IGNORE from low concentration gradient to high concentration gradient	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(b)	An explanation that makes reference to the following: • (water moves into the intestine by) **osmosis** (1) • because the concentration of {chloride ions / salt / solute} increases {in intestine / outside the cell} (1) • therefore reducing the water potential (in the intestine) (1)	ACCEPT converse for epithelial cells ACCEPT solute potential decreases {in intestine / outside the cell}	**(3)**

Question Number	Answer	Additional Guidance	Mark
1(c)	An explanation that makes reference to the following: • airways blocked / narrowed (1) • therefore less oxygen to alveoli / less air enters alveoli / less gas exchange / lower concentration gradient / less diffusion (into blood) (1)	ACCEPT less space / reduced pathway	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(d)	An explanation that makes reference to the following: • (mice / humans with) mutated alleles lose less water / more mutant alleles reduces water loss (1) • therefore survive cholera / infection (1) • pass on {allele / mutant genes} (1)	ACCEPT converse statement	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	An explanation that makes reference to the following: • prevent {air / bubbles} entering the {stem / xylem} (1) • allowing water transport (to leaves) / water uptake / transpiration stream / breaks cohesion (1)	ACCEPT oxygen IGNORE phloem Needs to be in appropriate context of transport	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	**A** (high wind speed, low humidity, high temperature)		**(1)**

Question Number	Answer	Additional Guidance	Mark
2(b)	**B** (cell wall, cell membrane, cytoplasm)		**(1)**

Question Number	Indicative content	
***2(c)**	Answers will be credited according to candidates' 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. P (Patterns) • rate of transpiration increases in the day • fluctuations in rate of transpiration could be due to environmental changes (wind speed / rain / humidity / cloud cover / dehydration) • change in pattern of xylem diameter follows the same trend as change in transpiration R (reasons) • light causes stomata to open • increase temperature increases kinetic energy • reduced humidity increases concentration gradient • increased wind speed increased / maintains concentration gradient • evaporation from leaves reduces water potential in the leaves C (cohesion tension) • water molecules are polar • cohesion is due to hydrogen bonding between water molecules • column of water is under tension as water evaporates • evaporation causes pressure to decrease, narrowing the xylem	
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. 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 ad interpretation of two pieces of evidence.
Level 3	5-6	An analysis is made, which is supported throughout by sustained application of relevant evidence of analysis, and interpretation of the information. The explanation shows a well-developed and sustained line of scientific reasoning which is clear and logically structured

Level 1	**(P or R or C)**
Level 2	**(P and R) or (P and C) or (R and C)**
Level 3	**(P and R and C)**
	For level 3 science must be correct

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	• correct numerator (13572) or denominator (2278) (1) • correct calculation of D (1)	<u>Example of Calculation</u> $N(N-1)\Sigma n(n-1)$ = 5.96 Correct answer with no working gains full marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	An explanation that makes reference to three of the following: • more species of butterfly / higher species richness / more varieties of butterfly / 9 species compared to 4 species (1) • because there are more plant species (1) • therefore more niches / food sources / breeding areas / hibernation (1) • because species are unaffected by herbicide / insecticide / fertiliser (1)	ACCEPT converse statements	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	An explanation that makes reference to four of the following: • (A) stated abiotic factor not controlled (1) • (S) sweep method not standardised (1) • (T) time not standardised / date of sampling differs / length of time spent sampling is different (1) • (R) sampling area / number of fields vary (1)	e.g. temperature / wind speed / humidity / rain / previous weather/ sunlight e.g. number of sweeps / size of nets / may not catch all species / some not caught / sampling was not random / subjective / relies on judgement when all are collected / bias / should grid areas / some not seen / some may fly away e.g. some butterflies not present at different times / hatch at different times / migrate at different times / should look at other months e.g. lots of fields needed / may be other differences between fields / sizes of fields / may differ / needs more repeats over more years IGNORE ethical issues	**(4)**

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	An explanation that makes reference to the following: • number of butterfly {species / diversity} increases then {levels off / decreases} (1) • because there are more plant {species / diversity} / positive correlation between number of butterfly species and plant species (1) • providing more {niches / food sources / nesting sites} / decrease due to competition from other organisms (1)		**(3)**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	An explanation that makes reference to the following: • number of moths is highest when creeping thistle is highest (1) • because creeping thistle is a {food source / habitat / niche / used for reproduction} (1)	ACCEPT converse statement	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	An answer that makes reference to the following: blood passes through heart twice / pumped to lungs and body separately / blood pumped (again) after going through lungs (1)	IGNORE pumped to lungs and body without qualifying that it is separate	**(1)**

Question Number	Answer	Additional Guidance	Mark
4 (a)(ii)	**C** (the pressure in the left ventricle is higher than the pressure in the left atrium)		**(1)**

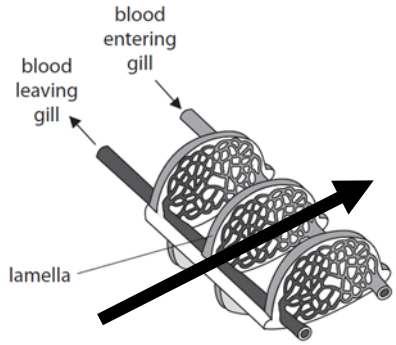
Question Number	Answer	Additional Guidance	Mark
4 (b)(i)	An explanation that makes reference to the following: • oncotic pressure is caused by (plasma) proteins (1) • hydrostatic pressure is due to heart pumping / contraction (1) • therefore when hydrostatic pressure is **higher** (than oncotic), fluid is forced out (1) • therefore when hydrostatic pressure is **lower**, fluid is drawn in (1)	ALLOW converse statement ALLOW converse statement	**(4)**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	An explanation that makes reference to two of the following: • proteins accumulate in tissue fluid (1) • therefore oncotic pressure changes (1) • therefore less {fluid / water} removed by {blood / capillary} (1)	 ACCEPT water potential decreases ACCEPT more {fluid / water} is drawn out of {blood / capillary}	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(a)	An explanation that makes reference to the following: • increase in smoking leads to more thrombin **and** fibrinogen (1) • increases are significantly higher / no overlap over standard deviations (1) • so that thrombin converts fibrinogen into fibrin (1) • therefore fibrin forms clots (1)	ACCEPT correct description of a clot	**(4)**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	**D** (monocyte, neutrophil, lymphocyte)		**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	An description that makes reference to the following: • engulf / phagocytosis (1) • {digest / breakdown} {antigen / pathogen / bacteria / virus / microbe} (1)	IGNORE kill REJECT produce antibodies ACCEPT correct references to lysosomes / phagosomes	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(a)	Line drawn from left to right (over or between one lamellae) (1)		(1)

Question Number	Answer	Additional Guidance	Mark
6(b)	**A** (0.4 s and 0.5 s)		(1)

Question Number	Answer	Additional Guidance	Mark
6(c)(i)	**B** ($10.10\ cm^2\ g^{-1}$)		(1)

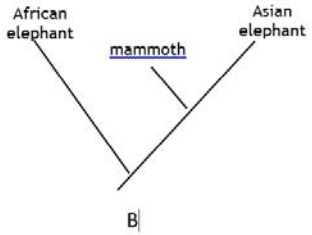
Question Number	Answer	Additional Guidance	Mark
6(c)(ii)	An explanation that makes reference to the following: • more active fish have higher surface area : mass ratio (1) • therefore they can absorb more oxygen (1) • for respiration for more muscle contraction (1)	ALLOW converse IGNORE gas exchange	(3)

Question Number	**Answer**	**Additional Guidance**	**Mark**
6(d)	An explanation that makes reference to the following: • gill lamellae {are thicker / swollen / touching / less surface area / less contact with water} / have decreased water flow (1) • therefore less gas exchange / oxygen uptake (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
7(a)	Any two correct rows for 1 mark: Domain — **Eukarya** Kingdom — Animalia Phylum — Chordata **Class** — Mammalia Order — Proboscidea Family — Elephantidae Genus — ***Loxodonta*** Species — ***africana***	ACCEPT Eukaryote / Eukaryota Upper case for *Loxodonta* Lower case for *africana*	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	An answer that makes reference to one of the following: • similar appearance (1) • have **not** observed if they could breed together / produce fertile offspring (1)	ACCEPT similar trunk / tusks IGNORE colour / size	**(1)**

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	An answer that makes reference to the following: publish in journals / presented at conferences / peer review / writing papers / other scientists repeating the work (1)		**(1)**

Question Number	Answer	Additional Guidance	Mark
7(c)	**B** 		**(1)**

Question Number	Answer	Additional Guidance	Mark
7(d)(i)	• correct reading from graph	= 10(%)	**(1)**

Question Number	Answer	Additional Guidance	Mark
7(d)(ii)	An answer that makes reference to the following: • correct subtraction of percentages • correct calculation of volume	<u>Example of Calculation</u> ECF from part (i) 100% - 10 % = 90% 1.3 – 0.13 = 1.17 (90 ÷ 100) x 1.3 = 1.2 **cm**^{3} ALLOW 1.17 **cm**^{3} no units or incorrect units gains ONE mark only correct response with no working gains full marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(d)(iii)	An explanation that makes reference to the following: • affinity of haemoglobin for oxygen does not change (1) • therefore oxygen is still released (1) • therefore heat is still produced by respiration (1)	ALLOW the converse ACCEPT haemoglobin does not bind to oxygen tightly when cold / haemoglobin binds to oxygen more weakly (than elephants) when cold	**(3)**

Question Number	Answer	Additional Guidance	Mark
8(a)	**C** (low, high, high, low)		**(1)**

Question Number	Answer	Additional Guidance	Mark
8(b)(i)	calculated mean (1)	<u>Example of Calculation</u> 200 ÷ 1.79 = 111.73 ACCEPT 111.7	**(1)**

Question Number	Answer	Additional Guidance	Mark
8(b)(ii)	An explanation that makes reference to four of the following: • change in temperature has {no / little effect} in nitrogen (1) • increase in temperature in air increases rate of transport (1) • because temperature affects enzyme activity / affects kinetic energy (of molecules) (1) • **oxygen** increases rate of transport (1) • because {transport/ loading of sucrose / translocation} is an {active process / requires respiration} (1)	ACCEPT converse statements ACCEPT no oxygen / not in air ACCEPT translocation is faster / time taken is less ACCEPT lack of **oxygen** reduces rate of transport	**(4)**

Question Number	Answer	Additional Guidance	Mark
9(a)	An explanation that makes reference to four of the following: • allopatric speciation (would occur) (1) • because tigers become geographically {isolated / separated} (1) • so that they are reproductively isolated / no longer interbreed (1) • therefore they become genetically different / accumulate different mutations (1) • due to different selection pressures / genetic drift (1)	ACCEPT reduce gene flow / change in allele frequency IGNORE references to not breeding once they have become a new species	**(4)**

Question Number	Answer	Additional Guidance	Mark
9(b)	An explanation that makes reference to the following: • decrease in genetic disorders (1) And one from: • because of increased gene pool / more alleles / less chance of two harmful alleles (1) • because of reduced inbreeding / more outbreeding (1)	ACCEPT no longer geographically isolated / tigers from different populations breed	**(2)**

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