Mark Scheme (Results)

Summer 2018

Pearson Edexcel International Advanced Level in Biology (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	An explanation that that makes reference to four of the following: • (air/oxygen) into spiracles to tracheae to tracheoles (1) • by diffusion (1) • <u>tracheoles</u> provide large surface area / <u>tracheoles</u> are thin for short diffusion pathway / <u>tracheoles</u> contain fluid to allow oxygen to dissolve / <u>tracheoles</u> supply oxygen to cells / tissues (1) • air sacs provide store of air / oxygen (1) • abdominal movements move air / ventilate / maintain concentration gradient high (1)		(4)

Question Number	Answer	Mark
2(a)(i)	The only correct answer is B *A is not correct because water does not leave the tissue* *C is not* correct because cells do not become flaccid D is not correct because *the cells will not burst*	(1)

Question Number	Answer	Mark
2(a)(ii)	The only correct answer is C *A is not correct because P will not decrease* *B is not correct because π will not decrease* *D is not correct because φ will change*	(1)

Question Number	Answer	Mark
2(a)(iii)	The only correct answer is C *A is not correct because the values are not 0 and 0* *B is not correct because the values are not -4.6 and 4.6* *D is not correct because the values are not 4.6 and 0*	(1)

Question Number	Answer	Mark
2(a)(iv)	The only correct answer is B *A is not correct because distilled water has a high water potential* *C is not correct because 0.1 molar sodium chloride does not have the lowest water potential* *D is not correct because 0.1 molar potassium chloride does not have the lowest water potential*	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	An answer that makes reference to the following: • use 50% value / use term osmotic potential (1) • 0.43 (mol dm^{-3}) (1) • -1200 (kPa) (1)	 ACCEPT 0.42 to 0.44 ACCEPT -1120 to -1280	(3)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	An explanation that makes reference to the following: • time for water to move out of the cells / time for osmosis / to complete osmosis / reach equilibrium / time for plasmolysis to occur (1) • therefore accurate value of osmotic potential (1)		(2)

Question Number	Answer	Additional Guidance	Mark
3(a)	• multiplication and conversion to dm^3	19.2	(1)

Question Number	Answer	Additional Guidance	Mark
3(b)	An explanation that makes reference to the following: • {heart rate / beats per minute} increases cardiac output (1) • stroke volume stays the same at 120 (cm^3) / stroke volume stays the same after 100 bpm / stroke volume stops increasing / stroke volume reaches maximum / stroke volume less important than heart rate (1)	IGNORE stroke volume stays the same	(2)

Question Number	Answer	Additional Guidance	Mark
3(c)(i)	An explanation that that makes reference to three of the following: • {more} (frequent) impulses (1) • from SAN to AVN to bundle of His / Purkyne fibres (1) • therefore more of the ventricles contract / greater contraction of ventricles / stronger contraction of the ventricles (1)	IGNORE frequency of contraction	(3)

Question Number	Answer	Additional Guidance	Mark
3(c)(ii)	An explanation that that makes reference to four of the following: • more heart muscle / thicker ventricle walls (1) • therefore stroke volume increases / more blood per contraction (1) • therefore same {cardiac output} with fewer beats (1) • therefore sufficient supply {oxygen / glucose} (1) • allows respiration in cells (1)	IGNORE bigger hearts / stronger	(4)

Question Number	Answer	Additional Guidance	Mark
4(a)	An explanation that that makes reference to three of the following: • (haemoglobin) {saturated / high affinity / associates} at high ppO_2 OR (haemoglobin) {less saturated / low affinity / dissociates} at low ppO_2 (1) • binding of the first oxygen molecule is difficult (1) • changes shape of haemoglobin molecule (1) • therefore facilitates binding of other oxygen molecules (1)	IGNORE concentration of oxygen	(3)

Question Number	Answer	Additional Guidance	Mark
4(b)	• correct values read from graphs (1) • subtraction for cat and for mouse (1) • difference calculated (1)	<u>example of calculation</u> cat 95 and 50 mouse 80 and 31 cat 45% mouse 49% 49 − 45 = 4 ACCEPT 2 marks if incorrect values read from graph	(3)

Question Number	Answer	Additional Guidance	Mark
4(c)	An explanation that that makes reference to three of the following: • mouse (haemoglobin) {releases more oxygen / lower affinity / dissociates more / is less saturated} at the same ppO_2 / mouse (haemoglobin) is saturated at a higher ppO_2 (1) • mice {cells / tissues} need more oxygen / mice have higher {respiration rate / metabolic rate} (1) • because mice have larger surface area to volume ratio (1) • therefore mice lose more heat (1)	ACCEPT converse for all Mps	(3)

Question Number	Answer	Additional Guidance	Mark
4(d)	• curve drawn to the left of the horse curve		(1)

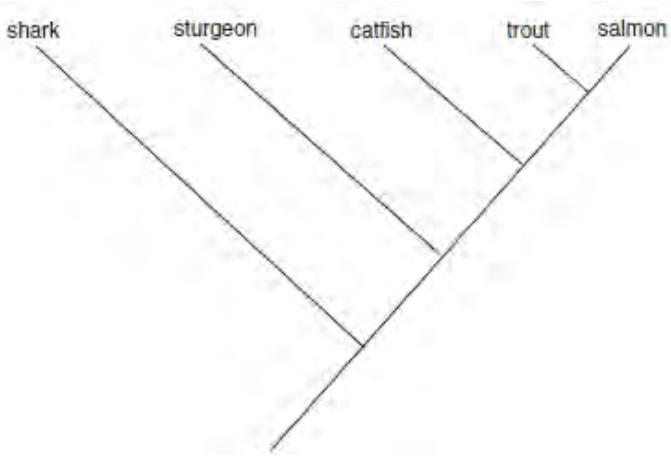
Question Number	Answer	Additional Guidance	Mark
5(a)	An explanation that that makes reference to two the following: • using current / p.d. / electrodes (1) • because molecules are charged (1) • because {larger / longer / heavier} molecules move {shorter distance / move slower} (1)	ACCEPT Mps if reference is to DNA ACCEPT converse	(2)

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	An explanation that makes reference to two of the following points: • proteins digested / hydrolysed / digestive enzyme / protease (1) • therefore {smaller lengths / components / fragments / (poly)peptides} (1) • change pH / use buffer / use detergent (1) • therefore molecules charged / denatured / unfolded (1)		(2)

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	An explanation that that makes reference to four of the following: • the banding patterns are different (1) • different species have bands in different positions / different species have bands of different thickness (1) • because different fish or species have different proteins (1) • therefore different fish or species have different genetic material (1) • because DNA / genes code for protein (1)	ACCEPT converse ACCEPT converse ACCEPT converse	(4)

Question Number	Answer	Additional Guidance	Mark
5(b)(iii)	• identify the proteins (in the fish) / compare (pure protein sample) with fish protein		(1)

Question Number	Answer	Additional Guidance	Mark
5(b)(iv)	• amount / abundance (of protein / fragment)	ACCEPT mass / weight / concentration / density REJECT heaviness / size / charge	(1)

Question Number	Answer	Additional Guidance	Mark
5(c)		all correct = 2 one or two correct =1	(2)

Question Number	Answer	Additional Guidance	Mark
6(a)	An explanation that makes reference to three of the following: • genetic variation / mutation (1) • some organisms are better adapted so survive (1) • reproduce / have offspring (1) • therefore {alleles / genes} passed on (1)	 ACCEPT converse ACCEPT converse ACCEPT converse	(3)

Question Number	Answer	Mark
6(b)(i)	The only correct answer is A *B is not correct because litter size is not a behavioural adaptation* *C is not correct because number of eggs is not a behavioural adaptation* *D is not correct because pollen production is not a behavioural adaptation*	(1)

Question Number	Answer	Mark
6(b)(ii)	The only correct answer is C *A is not correct because an alarm call is not an anatomical adaptation* *B is not correct because dominance behaviour is not an anatomical adaptation* *D is not correct because water potential is not an anatomical adaptation*	(1)

Question Number	Answer	Mark
6(b)(iii)	The only correct answer is B *A is not correct because number of stomata is not a physiological adaptation* *C is not correct because reduction of leaves is not a physiological adaptation* *D is not correct because swimming upstream is not a physiological adaptation*	(1)

Question Number	Answer	Mark
6(c)(i)	The only correct answer is D *A is not correct because anatomical differences can exist within species* *B is not correct because behavioural differences can exist within species* *C is not correct because genetic differences can exist within species*	(1)

Question Number	Answer	Additional Guidance	Mark
6(c)(ii)	• peer review / (scientific) paper / (scientific) journal / (scientific) conference		(1)

Question Number	Answer	Additional Guidance	Mark
6(d)	An answer that makes reference to four of the following: Similarities • reproductive isolation (1) • one original population / from existing species / have a common ancestor (1) • absence of gene flow / genetic differences accumulate (1) Differences • allopatric requires geographic isolation / sympatric in same geographic area (1) • sympatric caused by different food / behavioural / anatomical / physiological / seasonal / temporal isolation (1) • sympatric results from ploidy (1)	ACCEPT no longer mate ACCEPT barriers to mating ACCEPT example e.g. river ACCEPT example e.g. apple maggot fly	(4)

Question Number	Answer	Additional Guidance	Mark
7(a)	• surface area calculated (1) • volume calculated (1) • surface area to volume ratio calculated (1)	28 8 3.5 : 1 unsimplified but correct ratio with no working = 2 max allow 2 for 3.5 alone	(3)

Question Number	Answer	Additional Guidance	Mark
7(b)	• A then B then C		(1)

Question Number	Indicative content	Mark
*7(c)	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. • use different shapes / surface area / lengths • place in water • use several chips of each shape / surface area / length • leave for stated time / 10 mins minimum • control temperature • control potato / species / strain / age • measure mass / volume of potato / volume of liquid absorbed • calculate mean values • submerge in water • potato chips blotted before weighing • control mass / volume of potato • calculate rate as g min^{-1} or cm^3 min^{-1}	(6)

Level	Marks	Descriptor
0	0	No awardable content
1	1-2	An explanation of how the investigation should be conducted but with limited analysis, interpretation. Generalised comments made. The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context. L1 = 1 2 or more L1 = 2
2	3-4	An explanation of how the investigation should be conducted with occasional evidence of analysis, interpretation and/or evaluation of the scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure. 2 or more L1 + 1L2 = 3 2L1 + 2 or more L2 = 4
3	5-6	An explanation of how the investigation should be conducted is given which is supported throughout by evidence from the analysis, interpretation and/or evaluation of the scientific information. The explanation shows a well-developed and sustained line of scientific reasoning which is clear, coherent and logically structured. 2L1 + 2 or more L2 + 1L3 = 5 2L1 + 2 or more L2 + 2L3 = 6

Question Number	Answer	Additional Guidance	Mark
8(a)	A description that that makes reference to the following: • apoplastic non-living (1) • apoplastic uses cell walls / intercellular spaces (1) • apoplastic {faster / less resistance} (1) • apoplastic by diffusion / passive (1) • apoplastic blocked by Casparian strip (1)	symplastic living symplastic uses protoplast / cytoplasm / cell membrane / plasmodesmata symplastic {slower / more resistance} symplastic by osmosis / active / affected by metabolism / cytoplasmic streaming symplastic does not have to cross Casparian strip	(3)

Question Number	Answer	Additional Guidance	Mark
8(b)(i)	An explanation that makes reference to three of the following: • small (non-polar / polar) via {phospholipid / lipid bilayer} membrane (1) • large non-polar / lipid soluble via {phospholipid / lipid bilayer} membrane (1) • large / polar / ionic / charged / water soluble via protein channels (1) • large (polar) / ionic / charged use facilitated diffusion / active transport (1) • small (non-polar / polar) use diffusion (1)		(3)

Question Number	Answer	Additional Guidance	Mark
8(b)(ii)	An explanation that that makes reference to two of the following: • into roots by diffusion / active transport (1) • transport in xylem due to transpiration (stream) (1) • in phloem by {mass flow / translocation} (1)		(2)

Question Number	Answer	Additional Guidance	Mark
8(c)	An explanation that that makes reference to four the following: • summer is warmer / lighter (1) • therefore (more) evaporation / transpiration (1) • stomata open longer / open wider (1) • water molecules have more kinetic energy (1) • more leaf (area) (1)	ACCEPT converse for spring	(5)

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