

Mark Scheme (Results)

Summer 2019

Pearson GCE
In Biology Spec B (8BI0) Paper 02
Core Cellular 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.
- In questions marked with an **asterisk** (*), marks will be awarded for the ability to structure answers logically showing how the points are related or follow on from each other where appropriate.

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.

Question Number	Answer	Mark
1(a)	**The only correct answer is C** ***A*** *is not correct because it is not atrioventricular valve* ***B*** *is not correct because it is not the mitral valve* ***D*** *is not correct because it is not the tricuspid valve*	**(1)**

Question Number	Answer	Mark
1(b)	**The only correct answer is D** ***A*** *is not correct because this corresponds with atrial contraction* ***B*** *is not correct because this corresponds with ventricular excitation* ***C*** *is not correct because this corresponds with ventricular excitation*	**(1)**

Question Number	Answer	Mark
1(c)	**The only correct answer is D** ***A*** *is not correct because it is not the* atrioventricular node (*AVN)* ***B*** *is not correct because it is not the bundle of His* ***C*** *is not correct because it is not the septum*	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(d)(i)	An answer that makes reference to one of the following: • (beating / contraction) does not involve {nerve / stimulus / impulse} • (beating / contraction / impulse / depolarisation) {within muscle / initiated on its own}		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(d)(ii)	An answer that makes reference to four of the following: • exercise involves muscle contraction (1) • therefore {oxygen / glucose} needed for respiration / need to remove carbon dioxide (1) • new pacemaker can change cardiac output (1) • new pacemaker enables {activity / exercise} (1) • new pacemaker can reduce heart rate when resting (1)		**(4)**

Question Number	Answer	Mark
2(a)	**The only correct answer is A** ***B*** *is not correct because it is found in animal cells* ***C*** *is not correct because it is not made of phospholipid* ***D*** *is not correct because it is does not prevents lipid soluble molecules from entering the cell*	**(1)**

Question Number	Answer	Mark
2(b)	**The only correct answer is C** ***A*** *is not correct because it not a function of cholesterol* ***B*** *is not correct because it not a function of cholesterol* ***D*** *is not correct because it not a function of cholesterol*	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(c)	An explanation that makes reference to three of the following: • small / lipophilic / lipid-soluble / non-polar molecules enter by diffusion (1) • large / water-soluble / charged / polar molecules use transport proteins / carrier proteins / protein channels (1) • active transport / facilitated diffusion (1) • large (macro)molecules / proteins / viruses by endocytosis / exocytosis / vesicles (1)		**(3)**

Question Number	Answer	Additional Guidance	Mark
2(d)(i)	volume affects {pigment concentration / pigment dilution / absorbance}		**(1)**

Question Number	Answer	Additional Guidance	Mark
2(d)(ii)	An explanation that makes reference to the following: • temperature affects {diffusion / permeability} (1) • temperature affects {pigment release / betalain / absorbance} (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
2(d)(iii)	• determine the sum of the differences squared • calculate standard deviation 0.26 / 0.264 (2)	<u>Example of calculation</u> 0.42 ÷ 6 = 0.07 square root of 0.07 = 0.26 Correct answer with no working gains full marks **ACCEPT** one mark for 0.42 / 0.418/ 0.4184 in working	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(d)(iv)	An answer that makes reference to one of the following: • SD includes all of the data / all 7 values (1) • range only includes the highest and lowest values / only two values (1)		**(1)**

Question Number	Answer	Additional Guidance	Mark
2(d)(v)	An explanation that makes reference to the following: • increases permeability (1) • because it affects {phospholipids / lipid bilayer} (1)		**(2)**

(Total for Question 2 = 13 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	• measure cell diameter • convert mm to μm and divide by 20 450 / 500 / 550 / 600 (2)	<u>Example of calculation</u> 10mm = 10 000 μm 10 000 ÷ 20 = 500 Correct answer with no working gains full marks **ACCEPT** one mark for 9mm / 10mm / 11mm / 12mm / 0.9cm / 1.0cm / 1.1cm / 1.2cm in working	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	An answer that makes reference to the following: Similarities: • both have {all cell types / erythrocytes / neutrophils / lymphocytes / monocytes / platelets / white blood cells / leucocytes} (1) • in both erythrocytes are most abundant (1) Differences: • adult 1 has more {erythrocytes / red cells / platelets} (1) • adult 1 has fewer {neutrophils / lymphocytes / monocytes / white blood cells / leucocytes} (1)	**ACCEPT** converse for all Mps **ACCEPT** adult 1 has 2 neutrophils while adult 2 has 4	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	An explanation that makes reference to the following: • more {neutrophils / lymphocytes / monocytes / white blood cells / leucocytes / phagocytes} caused by {infection / disease / pathogen / named pathogen / bacteria / virus / allergy / immune response / leukaemia / inflammation / smoking} (1) • fewer {erythrocytes / red cells} caused by {lack of iron / anaemia / inheritance / leukaemia / cancer} (1) • fewer platelets caused by {inheritance / leukaemia / anaemia / alcohol} (1)	**ACCEPT** other valid medical conditions for all Mps **ACCEPT** adult 1 lives at altitude	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(a)(iv)	same {volume / dilution} of blood		**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)	An explanation that makes reference to the following: • fewer {erythrocytes / red cells / less haemoglobin} to transport oxygen (1) • therefore {less respiration / more anaerobic respiration} (1) • therefore less {energy / ATP} (1)		**(3)**

Question Number	Answer	Mark
4(a)	**The only correct answer is A** ***B*** *is not correct because it did not lose more water* ***C*** *is not correct because we have no information on this* ***D*** *is not correct because absorption and loss are not equal*	**(1)**

Question Number	Answer	Mark
4(b)	**The only correct answer is B** ***A*** *is not correct because bright conditions increase rate* ***C*** *is not correct because warm dry conditions increases rate* ***D*** *is not correct because warm and bright conditions increases rate*	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	An answer that makes reference to the following: Similarities: • both measure uptake of water (1) • both use seal to prevent evaporation (1) Differences: • bubble potometer uses shoot / mass potometer uses {plant with roots / plant} (1) • bubble potometer is {quicker to get results / allows repeats} / mass potometer takes longer (to get results) (1) • bubble potometer only measures water absorbed / mass potometer measures water absorbed and lost (1)		**(4)**

Question Number	Answer	Additional Guidance	Mark
4c(ii)	A description that includes four of the following: • measure distance bubble moves (1) • measure time / cm min^{-1} / cm^3 min^{-1} (1) • method described to vary wind speed (1) • use same {light / temperature / humidity / carbon dioxide} (1) • repeat readings / calculate a mean (1)	**ACCEPT** change fan speed / use fan at different distances	**(4)**

Question Number	Answer	Mark
5(a)	**The only correct answer is A** ***B*** *is not correct because it is incorrect order* ***C*** *is not correct because it is incorrect order* ***D*** *is not correct because it is incorrect order*	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	A description that makes reference to four of the following: • compare {anatomy / morphology / physical characteristics} (1) • observe behaviour / (occupy different) niches (1) • use {electrophoresis / DNA profiling / DNA sequencing / protein biochemistry molecular phylogeny / bioinformatics} (1) • unable to breed with other species and produce fertile offspring (1)	**ACCEPT** converse	**(4)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	An explanation that makes reference to two of the following: • some species can interbreed and produce fertile offspring / difficult to determine if can interbreed and produce fertile offspring (1) • species are {evolving / changing} over time (1) • there is variation within a species / sexual dimorphism / polymorphism (1)	**ACCEPT** ring species or sibling species	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(c)	An explanation that makes reference to three of the following: • sympatric (speciation) (1) • occupy different niches / competition for food / behavioural change / behavioural / ecological isolation (1) • less {breeding / reproduction / mating} with other fly (1) • reproductive isolation / no gene flow / different selection pressure / evolve separately (1)	**IGNORE** allopatric	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(d)	An explanation that makes reference to two of the following: • mutation (1) • unable to {breed / reproduce / mate / produce zygote} (1) • because {gametes} have different numbers of chromosomes (1)	**ACCEPT** non-disjunction / description of non-disjunction	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	• figures read from graph and change calculated • rate calculated 41.67 to 43.33 (2)	<u>Example of calculation</u> 1685 - 400 = 1285 1285 ÷ 30 = 42.83 / 43 Correct answer with no working gains full marks **ACCEPT** one mark for ÷ 30 in working	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	An explanation that makes reference to the following: • total number (of endangered species) increases (1) • adding new species (each year) determines the total (1) • few species coming off total (1) • rapid increase in total from 1985 to 2000/1 / little change in total between 2000/1 and 2009 / few new species between 2000/1 and 2009 (1)	**ACCEPT** no new species listed means no change in total	**(4)**

Question Number	Indicative content
***6b**	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. <u>Reasons for keeping zoos:</u> • education about endangered animals / public awareness / research • save endangered species / protect endangered species / safe environment / protect from poachers, habitat loss, starvation, predators / vaccinated / protected from disease • breeding programs • reintroduce animals into the wild • minimise inbreeding / exchange semen / exchange animals • money used for conservation <u>Reasons against zoos:</u> • animals suffer stress, boredom, confinement, change behaviour / habitat differs • certain species favoured • captive breeding programs may not successfully release animals back into the wild • removing individuals from the wild will further endanger the wild population • people can observe wildlife in the wild or visit a sanctuary • conservation more successful in situ / in a reserve

Level	Mark	Descriptor
	0	No awardable content
1	1-2	The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context. ***Explains one reason for OR one reason against = 1*** ***Explains one reason for AND explains one reasons against OR two reasons for / two reasons against = 2***
2	3-4	An explanation will be given 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. ***Explains two reasons for and one against = 3 Explains one reason for and two against = 3*** ***Explains two reasons for and two against = 4***
3	5-6	An explanation 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. ***Explains two reasons for and three against or Explains three reasons for and two against = 5*** ***Offers an opinion / summary / conclusion = 6***

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	• radius calculated • surface area calculated 0.102 / 0.1018 / 0.1017 / 0.10178 / 0.1017876 (2)	<u>Example of calculation</u> 180 ÷ 2 = 90mm = 0.09m 4 x 3.142 x $(0.09)^2$ 4 x 3.142 x 8100 = 101800.8 ÷ 1000000 = 0.1018008 4 x 3.14 x 8100 = 101736 ÷ 1000000 = 0.101736 Correct answer with no working gains full marks **ACCEPT** one mark for 0.102 expressed in different version eg. 1.02 OR 0.1018008 / 0.101736 expressed in different version eg. 101800.8 OR 1017876 expressed in different version	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	• convert dm^3 to m^3 so units are in m • surface area to volume ratio calculated 33.39 : 1 / 33.4 : 1 / 33 : 1 / 0.102 : 0.003054 / 1 : 0.03 / 1 : 0.030 / 1 : 0.0299 (1)	<u>Example of calculation</u> 0.003054 m^3 = volume 0.102 ÷ 0.003054 = 33.4 : 1	**(1)**

Question Number	Answer	Additional Guidance	Mark
7b(i)	An explanation that makes reference to the following: • increases surface area to volume ratio (1) • more oxygen into {blood / capillaries} / more carbon dioxide out of {blood / capillaries} (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	An explanation that makes reference to the following: • {alveoli / capillaries} are thin / one cell thick / close to each other} so short diffusion distance (1) • {blood supply / blood flow / capillaries} maintains {diffusion / concentration} gradient (1) • {moist / surfactant} to allow gases to dissolve / surfactant prevents collapse of alveoli (1)		**(3)**

Question Number	Answer	Additional Guidance	Mark
8	An answer that makes reference to the following: • use range of at least five carbon dioxide concentrations (1) • use same {size / age / sex / species} of locust / same locust (1) • repeat readings (1) • count abdomen contractions in stated time period (1) • allow recovery (1) • standardisation of {size of syringe / container / temperature / oxygen / light / time of day} (1)	**ACCEPT** spiracle movements in stated time period	**(6)**

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