Mark Scheme (Results)

Summer 2017

Pearson Edexcel GCE 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.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

  i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
  ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
  iii) organise information clearly and coherently, using specialist vocabulary when 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.

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	Mark
1(a)	The only correct answer is D A is not correct because the P wave shows depolarisation of the atria B is not correct because the P wave shows depolarisation of the atria and the T wave represents repolarisation of the ventricles C is not correct because the T wave represents repolarisation of the ventricles	**(1)**

Question Number	Answer	Additional guidance	Mark
1(b)	An answer that makes reference to three of the following: • heart rate is faster so person may have stress (1) • there are other reasons for an increased heart rate (1) • difference in heart rate may or may not be significant (1) • need to repeat ECG to confirm diagnosis (1)	Accept calculation of heart rates Eg: exercise / drugs / smoking / BMI / fitness / diet / atherosclerosis	**(3)**

Question Number	Answer	Additional guidance	Mark
1(c)	An answer that makes reference to four of the following: • damage to endothelium (1) • therefore inflammatory response occurs (1) • therefore formation of {atheroma / plaque / atherosclerosis} in arteries (1) • therefore arteries are narrowed which reduces {blood flow / oxygen supply / glucose supply} (1) • high blood pressure causes {heart disease / stroke} (1) or therefore arteries are narrowed which leads to (further) increase in blood pressure • therefore {heart disease / heart attack / stoke / angina / thrombosis / blood clots / aneurysm (1)	Ignore blocked	**(4)**

Question number	Answer	Mark
2(a)	The only correct answer is A B is not correct because bacteria do not have a nucleus C is not correct because archaea do not have a nucleus D is not correct because Animalia are multicellular / is a kingdom	(1)

Question Number	Answer	Additional guidance	Mark
2(b)	• measure contractile vacuole as 1.5cm / 15mm / 15000 µm (1) • understands that 1mm = 1000µm and divides by 20 to get correct answer (1)	<u>Example of calculation</u> 15000 ÷ 20 = 750 Correct answer gains full marks, with no working shown.	(2)

Question number	Answer	Mark
2(c)(i)	The only correct answer is B A is not correct because endocytosis would involve water uptake C is not correct because osmosis does not involve fusion of membranes D is not correct because facilitated diffusion does not involve the fusion of membranes	(1)

Question Number	Answer	Additional guidance	Mark
2(c)(ii)	An explanation that makes reference to the following: • as concentration increases rate decreases (1) • because (at higher concentrations) less water enters cell / less osmosis into cell (1)	Accept converse Ignore water potential is lower in solution / water potential similar	(2)

Question Number	Answer	Additional guidance	Mark
3(a)(i)	1:71	Ignore 7:497 or 28:1988 or 1/71	(1)

Question number	Answer	Mark
3(a)(ii)	The only correct answer is A B is not correct because diffusion happens down a concentration gradient C is not correct because facilitated diffusion happens down a concentration gradient D is not correct because the mineral ions are not moving in bulk	(1)

Question number	Answer	Mark
3(b)(i)	The only correct answer is B A is not correct because the symplast is also involved C is not correct because both the apoplast and symplast are involved D is not correct because the apoplast is also involved	(1)

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	An explanation that makes reference to three of the following: • water is {evaporated / lost / transpired / diffused } from {leaves / stomata} (1) • therefore leaf cells have a low water potential / water potential gradient created (1) • because of cohesion of water molecules that {are polar / form hydrogen bonds} (1) • adhesion of water molecules to xylem walls (1)	Accept osmotic potential	**(3)**

Question Number	Answer	Additional guidance	Mark
3(c)(i)	• rates calculated from gradients for wind and for still air (1) • rate in still air subtracted from rate in wind (1)	<u>Example of calculation</u> Wind = (5.0 ÷ 20) = 0.25 Still air = (2.6 ÷ 20) = 0.13 (5.0 – 2.6) ÷ 20 = 0.12 0.25 – 0.13 = 0.12 Allow calculations based on other times eg 1.9 ÷ 7.5 = 0.25 1 ÷ 7.5 = 0.13 0.25 – 0.13 = 0.12 or 1.9 ÷ 7.5 = 0.253 1 ÷ 7.5 = 0.133 0.253 – 0.133 = 0.116 Allow one mark for calculation of one rate if answer incorrect Correct answer gains full marks, with no working shown.	**(2)**

Question Number	Answer	Additional guidance	Mark
3(c)(ii)	An explanation that makes reference to the following: • control {light intensity / temperature / humidity} (1) • therefore use same {wattage bulb / lamp / distance from light source / time of day / room / thermostat / greenhouse} (1)	Ignore dark room Ignore water bath / incubator / oven Ignore plastic bag	**(2)**

Question number	Answer	Mark
4(a)(i)	The only correct answer is C A is not correct because it fails to multiply correctly B is not correct because it fails to multiply correctly D is not correct because it fails to multiply correctly	(1)

Question Number	Answer	Additional guidance	Mark
4(a)(ii)	• subtract 2500 from 12 000 (1) • divide answer by 12 000 and multiply by 100 to calculate percentage (1)	<u>Example of calculation</u> 12 000 – 2500 = 9500 ÷ 12 000 x 100 = 79 % Accept 79.2 / 79.17 / 79.167 / 79.16 recurring Correct answer gains full marks, with no working shown.	(2)

Question Number	Answer	Additional guidance	Mark
4(b)	An explanation that makes reference to four of the following: <u>Two symptoms from:</u> • infection (because white blood cell count is lowered) (1) • bleeding / failure to clot (because platelet count is lowered) (1) • tiredness / breathlessness (because red blood cells count is lowered) (1) <u>Two treatments from:</u> • have {microbe free environment / antibiotics / bone marrow transplant / stem cell transplant} (1) • transfusion of {red blood cells / platelets / blood clotting factors / bone marrow} (1) • use of {bone marrow / stem cells / transfusion of red blood cells / oxygen (therapy) / iron tablets} (1)	Ignore dizzy / faint Accept treatments if no symptoms given Allow any factor involved in blood clotting Ignore blood / iron / coagulant Ignore white cell transfusion	**(4)**

Question Number	Answer	Additional guidance	Mark
5(a)	An explanation that makes reference to the following: • increase in land protection increases species conserved (1) • because (trees) provide {niches / habitat / food / shelter} (1) • when no land protected (10 to 12%) species still exist (1) • because these species {live in soil / not in trees} (1)		**(4)**

Question Number	Answer	Additional guidance	Mark
5(b)	A description that makes reference to the following: • use of a stated sampling method (1) • (count N = total) number of organisms of all species (1) • (count n = total) number of organisms of {a particular species / each species} (1)	Eg. quadrat / sweep net / tree beating / light trap Ignore species richness / evenness / abundance	**(3)**

Question Number	Indicative content
***5(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. <u>Reasons against deforestation:</u> • conservation of biodiversity is important for medicines / wood products / sustainable products / prevent extinction / gene preservation • forests provide livelihood / homes / food for indigenous people and recreational opportunities for non-indigenous people • deforestation contributes to greenhouse effect / global warming / climate change / raised carbon dioxide • deforestation results in soil erosion / landslides / flooding / desertification <u>Reasons for deforestation:</u> • deforestation has economic implications for employment / national income • deforestation needed for wood products used in building of houses / fuel • deforestation needed for cattle farming / crop growth • deforestation results in habitat destruction / reduction of biodiversity / extinction

Level	Mark	Descriptor
	0	No awardable content
Level 1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context. ***Explains one reason for AND one reason against deforestation =2*** ***Explains two reasons for = 2 OR explains two reasons against deforestation =2***
Level 2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts/concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion 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***
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant knowledge of biological facts/concepts. Consequences are discussed which are supported throughout by sustained linkage to a range of scientific ideas, processes, techniques or procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured. ***Explains two or three reasons for and two or three against with some evidence of detail = 5*** ***Offers an opinion / summary / conclusion of which reflects evidence presented = 6***

Question Number	Answer	Additional guidance	Mark
6(a)	An explanation that makes reference to four of the following: • there have been mutations (1) • therefore each species has a different mating call (1) • so mating call not recognised / females of one species not attracted to males of another species / (1) • therefore {reproductive isolation / behavioural isolation / no interbreeding / no gene flow} occurs (1) • therefore sympatric speciation (1)	Reject geographic isolation Ignore no mating Reject allopatric	**(4)**

Question Number	Answer	Additional guidance	Mark
6(b)	An explanation that makes reference to four of the following: • use of restriction enzymes to cut DNA into fragments (1) • use of agar and electric current to {separate bands / move DNA} (1) • therefore (DNA) fragments move different distances based on {mass / size / length / charge} (1) • use {radioactive probes / dye / UV light / fluorescence / Southern blotting / autoradiograph} to see bands (1) • the species with the most similar {pattern / bands} is most closely related to the common ancestor (1)		**(4)**

Question Number	Answer	Additional guidance	Mark
7(a)(i)	to convert prothrombin to thrombin (1)	Ignore to produce thrombin alone	(1)

Question Number	Answer	Additional guidance	Mark
7(a)(ii)	An explanation that makes reference to the following: • plasma from the farmer's dog lacks vitamin K (activity) (1) • therefore less prothrombin to convert to thrombin (1) • therefore less fibrinogen converted to fibrin (1)	Allow converse for healthy dog Accept prothrombin not converted to thrombin Ignore less thrombin alone Ignore less fibrin alone	(3)

Question Number	Answer	Additional guidance	Mark
7(b)	• give {vitamin K / prothrombin / thrombin / coagulant / emetic / blood transfusion}	Ignore thromboplastin / fibrinogen / fibrin	(1)

Question Number	Answer	Additional guidance	Mark
7(c)	An explanation that makes reference to two of the following: • less {surface area / fewer alveoli} (1) • therefore less {gas exchange / oxygen uptake / diffusion / absorption} (1) • therefore dog would have {fatigue / less energy / less respiration} (1)		**(2)**

Question Number	Answer	Additional guidance	Mark
8(a)(i)	An explanation that makes reference to the following: One from: • supplies {oxygen / glucose / amino acids / fatty acids / salts / hormones} (1) • removes {carbon dioxide / urea} (1) One from: • therefore {respiration / growth / protein synthesis} can occur (1) • therefore {pH controlled / cells not poisoned} (1)	Ignore waste	**(2)**

Question Number	Answer	Additional guidance	Mark
8(a)(ii)	• calculates 12.8 as 16 percent of 80 (1) • multiplies by 1000 (1)	<u>Example of calculation</u> 16 ÷ 100 x 80 = 12.8 x 1000 = 12 800 Correct answer gains full marks, with no working shown.	**(2)**

Question number	Answer	Mark
8(b)(i)	The only correct answer is C A is not correct because the oncotic pressure cannot be lower at Y than it is at X B is not correct because the hydrostatic pressures are not the same at X and Y D is not correct because the hydrostatic and oncotic pressure at Y cannot be the same	**(1)**

Question Number	Answer	Additional guidance	Mark
8(b)(ii)	An answer that makes reference to the following: <u>One similarity from:</u> • both have low pressure (1) • both have valves (1) • both use muscle squeezing to move fluid (1) <u>One difference from:</u> • faster flow in vein (1) • heart causes {mass flow / movement} in vein (1) • flow to heart in vein but to {glands / neck} in lymph (1)	Allow converse where appropriate	**(2)**

Question number	Answer	Mark
8(c)	The only correct answer is D A is not correct because blood does not have turgor B is not correct because blood does not have turgor C is not correct because if true water would not leave the blood	(1)

Question Number	Answer	Additional guidance	Mark
8(d)	An answer that makes reference to four of the following: • effective because {large / quantified} reduction (1) • investigation that uses {large sample size / continues for many years} (1) • not completely effective as {some still remain in year 6 / recognises rise in year 5 / time period should extend beyond six years} (1) • only one area tested (1) • decrease could be due to {mosquito nets / repellent / reduction in number of mosquitoes / drug resistant worms} (1)	Ignore immune	(4)

Question Number	Answer	Additional guidance	Mark
9(a)	• via spiracles and along {tracheae / tracheoles} by diffusion	Allow trachea	**(1)**

Question Number	Answer	Additional guidance	Mark
9(b)	An explanation that makes reference to three of the following: • oxygen used in respiration (1) • oxygen in bubble may leave {by diffusion / down concentration gradient} (1) • therefore bubble {becomes smaller / has less surface area} (1) • therefore less oxygen can diffuse into bubble (1) • oxygen will diffuse into bubble when there is less oxygen in bubble than in water (1)		**(3)**

Question Number	Answer	Additional guidance	Mark
9(c)	An answer that makes reference to five of the following: • beetles kept in water at a minimum of five stated temperatures within range of 5^0C to 40^0C (1) • standardisation of beetle as biotic variable (1) • repeat readings at each temperature (1) • measure time underwater in {s / min / hr} (1) • standardisation of abiotic variable (1)	Eg. same beetle / size / age / sex / species Eg. use same oxygen concentration in water / depth of water / volume of water / pH of water / source of water / light intensity	**(5)**

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