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Mark Scheme (Results)

Summer 2019

Pearson Edexcel GCSE
Biology (1BI0) Paper 2H

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Summer 2019
Publications Code 1BI0_2H_1906_MS

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 have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.

Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.

When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		**Command Word**	
Strand	**Element**	**Describe**	**Explain**
AO1		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

Question number	Answer	Mark
1(a)(i)	**B palisade mesophyll** **A.** *is not correct because spongy mesophyll is layer B* ***B*** **The only correct answer is B** ***C*** *is not correct because the upper epidermis is at the top of the leaf* ***D*** *is not correct because the waxy cuticle is above the upper epidermis*	**(1)** AO1 1

Question number	Answer	Mark
1(a)(ii)	An explanation linking: • gas exchange / diffusion (1) • so {carbon dioxide / oxygen} can enter the cells / so {carbon dioxide / oxygen / water} can leave the cells (1)	**(2)** AO1 1

Question number	Answer	Additional guidance	Mark
1(a)(iii)	An explanation linking two from: • part C is stoma (1) • allows gas exchange (1) • allows water (vapour) to leave (1)	 accept stomata accept correct named gases being exchanged	**(2)** AO2 1

Question number	Answer	Additional guidance	Mark
1(b)	Any two from: • leaf becomes a spine / reduced surface area (1) • (waxy) cuticle is thicker (1) • stomata are sunk in pits / fewer stomata /smaller stomata (1) • leaf is rolled / curled leaves(1) • guard cells / stomata close during the day (1)	accept leaf becomes narrower / smaller / thicker	**(2)** AO2 1

Total for question 1=7 marks

Question number	Answer	Mark
2(a)(i)	2108 (g)	**(1)** AO2 1

Question number	Answer	Additional guidance	Mark
2(a)(ii)	An explanation linking: • population of earthworms will decrease (1) • because more earthworms will be eaten by hedgehogs (1)	 accept earthworms will die out accept hedgehogs have only one food source accept population of earthworms will increase as more {food/cabbages} available (2 marks)	**(2)** AO2 1

Question number	Answer	Additional guidance	Mark
2(a)(iii)	A description including: • use of quadrat / belt transect (1) • count the number of slugs in the sampled area (1) • multiplication factor to make the estimate (1)	 accept description of quadrat 1m x 1m / 1m^2 accept calculate the mean numbers of slugs from all the samples	**(3)** AO3 3a

Question number	Answer	Additional guidance	Mark
2(b)	An explanation linking three from: • {squirrels / earthworms / cabbages} release carbon dioxide (1) • from respiration (1) • cabbages take in carbon dioxide (1) • (cabbages) for photosynthesis (1) • when organisms die decomposers release carbon dioxide (1) • {squirrels/earthworms} eat {cabbages / plants} which contain **carbon** (1) • egestion releases **carbon** (into the soil) (1)	accept CO_2 reject CO^2 accept **decomposers** respire accept squirrels eat earthworms which contain carbon accept named methods of egestion	**(3)** AO2 1

Total marks for question 2 = 9 marks

Question number	Answer	Additional guidance	Mark
3(a)(i)	Any **two** from: • same concentration of indicator (1) • same mass of organisms (1) • same volume of indicator (1) • same temperature (1) • same volume/size of test tube(1) • repeat the experiment (1) • use a control (1)	 accept weight for mass accept mass/weight ignore references to time as this is in the stem of the question	**(2)** AO3 3b

Question number	Answer	Additional guidance	Mark
3(a)(ii)	A description including: • same test tube, gauze and bung with (hydrogencarbonate) indicator (1) • without any (live) organisms / with a mass of inert object e.g.stones/dead peas/glass beads(1)	 accept set up the same {apparatus/equipment}	**(2)** AO2 2

Question number	Answer	Additional guidance	Mark
3(b)(i)	An explanation linking: • germinating peas **produce** carbon dioxide (1)	 accept dried peas **did not produce** carbon dioxide	**(2)** AO3 1ab

	• because germinating peas were respiring (aerobically) (1)	accept because dried peas **do not** respire	

Question number	Answer	Mark
3(b)(ii)	**B when glucose is broken down in the presence of oxygen** **A.** *is not correct because photosynthesis uses carbon dioxide* ***B*** **The only correct answer is B** ***C*** *is not correct because in germinating peas glucose is broken down in the presence of oxygen* ***D*** *is not correct because the reaction is between glucose and oxygen*	**(1)** AO1 1

Question number	Answer	Additional guidance	Mark
3(c)	An explanation linking: • to release energy (1) • for metabolic processes / chemical reactions (1)	 accept named metabolic process e.g. movement	**(2)** AO1 1

Total for question 3 = 9 marks

Question number	Answer	Mark
4(a)	Any **two** from: • **starting** temperature of water (1) • volume of water (1) • number of layers / mass of tissue paper (1) • {size/volume} flask (1)	**(2)** AO2.2

Question number	Answer	Additional guidance	Mark
4(b)(i)	correct data selected and subtracted (98 – 22) = 76 (1) rate calculated (76÷8) = 9.5 (^{0}C per minute)	accept full marks for correct answer on the answer line accept 10	**(2)** AO2 1

Question number	Answer	Additional guidance	Mark
4(b)(ii)	An answer comparing: • flask 1 and 2 decrease in temperature (1)		**(2)** AO3 2ab

	• the temperature in flask 1 decreases faster than in flask 2 (1) OR • the temperature on flask 1 levels out after 7 minutes (1) • whereas the temperature in flask 2 keeps falling (1)	accept rate is slower for flask 2 /ORA	

Question number	Answer	Mark
4(c)	An explanation linking two from: • sweat/water is released onto the skin (1) • is evaporated (1) • transferring {thermal energy / heat} (1)	**(2)** AO1 1

Question number	Answer	Mark
4(d)	**C hypothalamus** **A.** *is not correct because the cerebellum is for autonomic reactions* ***B*** *is not correct because the medulla oblongata does not control temperature* ***C*** **The only correct answer is C** ***D*** *is not correct because the pituitary gland releases hormones*	**(1)** AO1 1

Question number	Answer	Additional guidance	Mark
4(e)	An explanation linking: • (internal) temperature is kept at the {**optimum** / best / 37°C} (1) • for enzyme action / (chemical) reactions to take place (1)	accept at high temperatures enzymes will denature (2)	**(2)** AO1 1

Total for question 4 = 11 marks

Question number	Answer	Mark
5(a)(i)	**C a large surface area and thin cell walls** **A.** *is not correct because root hair cells have a large surface area* ***B*** *is not correct because root hair cells have thin walls* ***C*** **The only correct answer is C** ***D*** *is not correct because root hair cells have thin walls*	**(1)** AO1 1

Question number	Answer	Additional guidance	Mark
5(a)(ii)	An explanation linking two from: • through the {root/cells} by osmosis (1) • (then up) the xylem (1) • by transpiration / evaporation of water (from the leaves) (1)	 ignore phloem accept by capillary action	**(2)** AO1 1

Question number	Answer	Mark
5(b)	C by translocation through the phloem **A.** *is not correct because sucrose does not move by osmosis only water does* ***B*** *is not correct because sucrose is transported through the phloem and not by osmosis* ***C*** **The only correct answer is C** ***D*** *is not correct because sucrose is transported through the phloem*	**(1)** AO1 1

Question number	Answer	Additional guidance	Mark
5(c)(i)	guard (cells)	accept phonetic spellings	**(1)** AO1 1

Question number	Answer	Additional guidance	Mark
5(c)(ii)	A description including: • the stomata openings increase in size until 8am (1) • then decreases (until 6pm) (1)	 accept size of stomata peak at 8am / 0.9 mm	**(2)** AO3 1ab

Question number	Answer	Additional guidance	Mark
5(c)(iii)	An explanation linking two from: • the stomata {get smaller / are closing} (1) • because guard cells lost water (1) • to reduce water loss (from the stomata) (1)	 accept guard cells {shrink/plasmolysed/flaccid} accept prevent evaporation	**(2)** AO2 1

Total for question 5 = 9 mark

Question number	Answer	Additional guidance	Mark
6(a)(i)	excess glucose (in the urine) / (symptom of) constant thirst / fainting	reject albumin /leukocytes	**(1)** AO3 2a

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An explanation linking: • protein levels were above the normal range (1) • indicating bacteria / pathogens present (1) OR • leukocytes were above the normal range / 40 leukocytes (1) • indicating bacteria / pathogens present (1)	 reject pH levels reject pH levels	**(2)** AO3 2b

Question number	Answer	Additional guidance	Mark
6(b)	A description including: • add Biuret {reagent / solution} / do the biuret test (1) • colour change (from blue) to purple protein is present (1)	 accept sodium hydroxide and copper sulfate accept mauve/violet for purple accept the use of an albustix (1) colour change for albustix (1)	**(2)** AO1 2

Question number	Answer	Mark
6(c)	A description including: • (travels from the kidneys) through the ureters (1) • to the bladder (where it is stored)(1) • (from the bladder) through the urethra (and out of the body)	**(3)** AO1 1

Question number	Answer	Additional guidance	Mark
6(d)	An answer including: • (breakdown of) amino acids (1) • in the liver (1)	accept: deamination in the liver for 2 marks	**(2)** AO1 1

Total for question 6 = 10 marks

Question number	Answer	Additional guidance	Mark
7(a)(i)	pituitary (gland)	accept phonetic spelling	**(1)** AO1 1

Question number	Answer	Additional guidance	Mark
7(a)(ii)	A description including: • one or more ova will start to **mature** (1) • (inside the) follicles (1) • oestrogen is released (1)	accept eggs will mature	**(2)** AO2 1

Question number	Answer	Mark
7(a)(iii)	**A LH** **A. The only correct answer is A** ***B*** *is not correct because FSH stimulates the follicles to mature oocytes* ***C*** *is not correct because it is not a hormone associate with the menstrual cycle* ***D*** *is not correct because it maintains the lining of the uterus it does not cause ovulation*	**(1)** AO1 1

Question number	Answer	Mark
7(a)(iv)	An explanation linking two from: • (day 20) is after ovulation / after the egg has been released (1) • so the corpus luteum produces progesterone (1) • to maintain the **lining** of the uterus (1)	**(2)** AO2 1

Question number	Answer	Additional guidance	Mark
7(b)	An explanation linking: • to inhibit the production of FSH (1) • to prevent eggs maturing (1) OR • to inhibit the production LH (1) • so ovulation is prevented (1)	 accept thickens mucus (1) to prevent sperm reaching the egg/ entering the uterus (1) accept thins lining of the uterus (1) so less chance of implanting (1)	**(2)** AO1 1

Question number	Answer	Additional guidance	Mark
7(c)	(32 600 000 ÷ 100) x 13.2 / 4 303 200 / 4.3 million (1) (100 – 98.8) = 1.2 (1) 51 638	accept 32.6 million x 0.132 accept any correct rounding up to 4.3 million accept 0.012 (1) accept a calculation of 98.8% accept 51 600 for 3 marks accept 51 638.4 for 2 marks	**(3)** AO2 1

		award full marks for correct answer without working accept alternative methods of calculation	

Total for question 7 = 11 marks

Question number	Answer	Additional guidance	Mark
8(a)(i)	An answer comparing two from: • the stroke volume of the person who has trained for the marathon is (always) higher / ORA (1) • as heart rate increases for the person who has trained for the marathon stroke volume increases (1) • as heart rate increases for the person who has not trained for the marathon the stroke volume {stays constant/only increases slightly} (1)	accept comparative data	**(2)** AO3 2ab

Question number	Answer	Additional guidance	Mark
8(a)(ii)	cardiac output = heart rate x stroke volume (1) Substitution 160 x 170 = 27 200 (1) unit	accept correct calculation for 2 marks as equation is implied. accept range for stroke volume of 168 -172	**(3)** AO1 1

	ml per min/ ml.min^{-1}	accept 27.2 L.min^{-1} / 27.2 dm^3.min^{-1} for 3 marks	

Question number	Indicative content	Mark
*8(b)	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 that is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 (6 marks)** • Blood flows from vena cava into the right atrium • Into the right ventricle • Through valve • And is pumped into the pulmonary artery • Through valve to the lungs • From the lungs back to the heart through the pulmonary vein • Into the left atrium • Into the left ventricle • Through valve • And is pumped into the aorta • Through valve • valves prevent backflow	**(6)** AO1 1

Level	Descriptor
	No rewardable material.
Level 1	• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • Presents an explanation with some structure and coherence.
Level 2	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. • Presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. • Presents an explanation that has a well-developed structure which is clear, coherent and logical.

Total for question 8 = 11 marks

Level	Mark	Additional Guidance	General additional guidance – the decision within levels The correct linking of one structure to another
	0	No rewardable material.	
Level 1	1–2	• A correct reference to blood flowing through a named chamber of the heart or blood vessel or what valves do • Correctly linked to the next stage either chamber or blood vessel or through a valve (sides of the heart not necessary)	<u>Possible candidate responses</u> blood flows into the (right) atrium blood flows from the right ventricle to the lungs valves prevent backflow of blood blood flows through the (right) atrium into the right ventricle blood flows from the lungs to the atria
Level 2	3–4	• A correct reference to blood flow through one side of the heart either left or right Or the correct side of the heart linked to the correct blood vessel • Correctly linked to or from the lungs	<u>Possible candidate responses</u> blood flows into the right atrium to the right ventricle blood flows into the left atrium into the left ventricle blood flows into the right atrium to the right ventricle into the lungs blood flows into the left atrium into the left ventricle through a valve from the lungs
Level 3	5–6	• A correct reference to blood flow through the heart from right to left travelling through the lungs including valves • Correctly linked to the pulmonary artery and pulmonary vein	<u>Possible candidate responses</u> Blood flows from the right atrium to the right ventricle through a valve and is pumped to the lungs then enters the left atrium through to the left ventricle and is pumped to the body through the aorta Blood flows from the right atrium to the right ventricle through a valve and is pumped through the pulmonary artery to the lungs. Leaves the lungs via the pulmonary vein then enters the left atrium through to the left ventricle and is pumped to the body through the aorta

Question number	Answer	Additional guidance	Mark
9(a)(i)	An explanation linking: • the structure shows many chambers/circles/alveoli (1) • which increase the surface area (of the alveoli) (1) • to maximise diffusion (from the alveoli into the capillaries) (1)	 accept air sacs accept surface area to volume ratio accept more efficient gas exchange accept have thin walls / membranes (1) so short diffusion distance (1)	**(3)** AO2 1

Question number	Answer	Mark
9(a)(ii)	C by diffusion **A.** *is not correct because osmosis is the passive movement of water* ***B*** *is not correct because oxygen does not need active transport to travel from high to low concentrations* ***C*** **The only correct answer is C** ***D*** *is not correct because respiration uses respiration but it is not the method of movement*	**(1)** AO2 1

Question number	Answer	Additional guidance	Mark
9(b)	A description including: • the molecules are moving from where they are in high concentration (in the extracellular fluid) to a low	 accept down a concentration gradient	**(2)** AO3 1ab

	concentration (in the cytoplasm) (1) • until there are equal concentrations of molecules on either side (1)	accept no **net** movement of molecules	

Question number	Answer	Mark
9(c)*	**AO2 (6 marks)** **Fick's law** • rate of diffusion is proportional to surface area and concentration difference • and inversely proportional to the thickness of the membrane **Surface area** • as surface area increases the rate of diffusion also increases • as there are more places for diffusion to happen faster **Concentration difference** • the larger the difference in concentration inside the cell to outside the cell • the faster the rate of diffusion **Thickness of the membrane** • the thicker the membrane • the slower the rate of diffusion as the diffusion distance is greater	**(6)** AO2 1

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. • Lines of reasoning are unsupported or unclear
Level 2	3–4	• The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question • Line of reasoning mostly supported through the application of relevant evidence
Level 3	5–6	• The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question • Line of reasoning are supported by sustained application of relevant evidence

Level	Mark	Additional Guidance	General additional guidance – the decision within levels How a named factor effects the rate of diffusion
	0	No rewardable material.	
Level 1	1–2	• A reference to one factor that effects diffusion – surface area/concentration difference/thickness of membrane • Linked to the effect of that factor on diffusion	<u>Possible candidate responses</u> a factor is the surface area affected by differences in concentration inside and outside the cell the larger the surface area the faster the rate of diffusion the thicker the membrane the slower the rate of diffusion
Level 2	3–4	• A reference to at least two factors affecting diffusion - surface area/concentration difference/thickness of membrane • Linked to at least one effect of a factor on diffusion	<u>Possible candidate responses</u> factors effecting diffusion are surface area and differences in concentration inside and outside cells concentration differences and the thickness of the membrane effect diffusion increased surface area increased the rate of diffusion and if oxygen concentration is greater outside the cell then it will move into the cell faster the thicker the membrane of alveoli the slower the diffusion but alveoli have a large surface area so diffusion rate is increased
Level 3	5–6	• All three factors effecting diffusion stated with their effects • Including one reference to proportionality according to Fick's law	<u>Possible candidate responses</u> Three factors effecting diffusion are surface area, concentration differences and the thickness of the membrane. As surface area increases the rate of diffusion increases. If the membrane is thinner then diffusion is increased. The greater the concentration difference the faster the rate of diffusion Three factors effecting diffusion are surface area, concentration differences and the thickness of the membrane. As surface area increases the rate of diffusion increases. If the membrane is thinner then diffusion is increased. The greater the concentration difference the faster the rate of diffusion Because rate of diffusion is proportional to surface area

Total for question 9 = 12 marks

Question number	Answer	Additional guidance	Mark
10(a)	carbon absorbed 120.1 + 92.8 or 212.9 (1) OR carbon released 119.6 + 90 + 6.4 or 216.0 (1) Evaluation 3.1 (gigatonnes)	award full marks for correct answer with no workings	**(2)** AO2 1

Question number	Answer	Mark
10(b)(i)	all the oxygen had been used up / no oxygen left	**(1)** AO2 2

Question number	Answer	Additional guidance	Mark
10(b)(ii)	An explanation linking: • the **plant** produced oxygen (1) • through photosynthesis (1)	ignore plant removes carbon dioxide	**(2)** AO2 1

Question number	Answer	Additional guidance	Mark
10(b)(iii)	Any two from: • light intensity (1) • temperature (1) • size of bell jar / same volume of air (1) • {size/type} of candle /length of the wick (1) • **level** of liquid/water in the container (1)	accept same volume of gas in bell jar	**(2)** AO2 2

Question number	Answer	Additional Guidance	Mark
10(c)	A description including: • decomposers break down waste matter (into ammonia) (1) • nitrifying bacteria convert ammonia / nitrifying bacteria make {nitrites / nitrates} (1) • nitrogen fixing bacteria convert nitrogen into nitrates (1) • denitrifying bacteria {convert nitrates / release nitrogen} (1)	accept dead organisms for waste matter accept nitrification for nitrifying bacteria accept ammonia/nitrogen compounds for nitrates accept denitrification releases nitrogen	**(4)** AO1 1

Total for question 10 = 11 marks

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