Pearson Edexcel

Mark Scheme (Results)

Summer 2022

Pearson Edexcel GCSE
In Biology (1BI0) Paper 2H

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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 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)	D sludgeworm **The only correct answer is D** ***A*** *is not correct because fertiliser is not an indicator species* ***B*** *is not correct because lichen is an air pollution indicator* ***C*** *is not correct because stonefly are clean water indicators*	**(1)** **AO1 1**

Question Number	Answer	Additional Guidance	Mark
1 (a)(ii)	haemoglobin binds oxygen / increases the rate of diffusion / polluted water is low in oxygen	accept allows them to get more oxygen	**(1)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
1 (a)(iii)	Any **two** from: • concentration **gradient** (1) • diffusion distance (1) • surface area (1)	 accept thickness of membrane accept temperature (1)	**(2)** **AO1 1**

Question Number	Answer	Additional Guidance	Mark
1 (b)	An explanation linking: • blackspot **fungus** present (1) • which indicates clean air / low sulfur dioxide (1)	 accept high / good air quality	**(2)** **AO3**

(Total for question 1 = 6 marks)

Question Number	Answer	Mark
2(a)(i)	B mitochondria **The only correct answer is B** ***A*** *is not correct because vacuoles do not release energy* ***C*** *is not correct because nuclei do not release energy* ***D*** *is not correct because ribosomes do not release energy*	**(1)** **AO1 1**

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	An answer including: • thick walls (1) • continuous / hollow tubes / no end walls (1)	 accept no cytoplasm accept made of lignin / made of dead cells (1)	**(2)** **AO2 1**

Question Number	Answer	Mark
2(b)(i)	An explanation including **three** from: • fan causes air to move / creates wind / increased air flow (1) • water (vapour) removed (from around leaf) (1) • **increased** {rate of diffusion / evaporation / transpiration} (of water vapour from leaf) (1) • causing the plant to take up more water (1)	**(3)** **AO2 2**

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	to compare (the effect) / as a control	accept to get a baseline measurement	**(1) AO2 2**

Question Number	Answer	Additional guidance	Mark
2(b)(iii)	68 – 52 / 16 (1) (16 ÷ 2) 8 (mm^3 per minute)	award full marks for correct answer with no working e.c.f. for incorrect graph readings for 1 mark	**(2) AO2 1**

(Total for question 2 = 9 marks)

Question Number	Answer	Additional guidance	Mark
3(a)(i)	An explanation linking: • artery has {thicker / more muscular} wall (1) • because of the (blood) pressure (higher in artery than in vein) (1)	 accept prevent the artery bursting / maintain blood pressure	**(2)** **AO2 1**

Question Number	Answer	Mark
3(a)(ii)	valve / valves	**(1)** **AO1 1**

Question Number	Answer	Additional guidance	Mark
3(b)(i)	5 x 60 = 300 (1) OR 60 ÷ 100 = 0.6 (1) (300 ÷ 100) = 3 (dm^3)	award full marks for correct answer with no working accept other correct methods of calculation which is a percentage calculation	**(2)** **AO2 1**

Question Number	Answer	Mark
3(b)(ii)	An explanation linking: • because (during exercise muscles) require **more** {oxygen / glucose} (1) • for respiration / to release energy (1) OR • to remove **more** carbon dioxide / to remove lactic acid (1) • as this is a product of respiration (1)	**(2)** **AO2 1**

(Total for question 3 = 7 marks)

Question Number	Answer	Additional Guidance	Mark
4 (a)	Any **one** from: • so the leaves are the same age (1) • so the results can be compared (1) • to control a variable (1)	accept similar for same accept so the results are valid (1)	**(1)** **AO2 2**

Question Number	Answer	Mark
4 (b)(i)	B it is an anomalous result **The only correct answer is B** ***A*** *is not correct because it is measured in millimetres* ***C*** *is not correct because it is not a repeat* ***D*** *is not correct because it is not the mode*	**(1)** **AO3 1a**

Question Number	Answer	Additional Guidance	Mark
4 (b)(ii)	An answer linking: • the leaves in the {shade / area A} are wider (1) • to give a larger surface area / to absorb more light (1)	accept reverse argument	**(2)** **AO3 2a+2b**

Question Number	Answer	Additional Guidance	Mark
4 (c)(i)	nettles → caterpillars → ladybirds → beetles → toads (3)	If food chain is incorrect allow 1 mark for each correct link up to a maximum of 2 marks.	**(3)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
4 (c)(ii)	substitution 60 ÷ 750 = 0.08 (1) x100 8 (%)	award full marks for the correct answer with no working	**(2)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
4 (c)(iii)	Any **two** from: • not all the beetle is eaten (1) • not all the beetle can be digested (1) • movement (1) • respiration (1) • (transferred to surroundings) as heat (1)	ignore maintaining body temperature	**(2)** **AO2 1**

(Total for question 4 = 11 marks)

Question Number	Answer	Mark
5 (a)(i)	D mutualism **The only correct answer is D** ***A*** *is not correct because it is not parasitism* ***B*** *is not correct because it is not indigenous* ***C*** *is not correct because it is not biodiversity*	**(1)** **AO1**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	7500 (µm)	accept 7.5×10^3 reject $7.5 \times \mathbf{10^{-3}}$	**(1)** **AO1 1**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	X – decomposers Y – nitrifying (bacteria)	accept fungi / decomposing bacteria accept named nitrifying bacteria reject denitrifying bacteria / nitrogen-fixing bacteria	**(2)** **AO1 1**

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	An explanation linking **three** from: • leguminous crops planted (1) • that have nitrogen-fixing bacteria (1) • in root (nodules) (1) • which fix nitrogen (gas) (1)	accept named leguminous crops accept use nitrogen from the air / use atmospheric nitrogen / make ammonia ignore produce nitrates	**(3)** **AO1**

Question Number	Answer	Additional Guidance	Mark
5(b)(iii)	An explanation linking: • nitrates are needed to make {protein / amino acids} (1) • which are needed for growth (1)	accept for DNA / genetic material	**(2)** **AO1**

(Total marks for question 5 = 9 marks)

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	An explanation linking: • inhibits {FSH / LH} (1) • which prevents {maturation of a follicle / ovulation} (1)	 ignore prevents production of eggs accept thickens **cervical mucus** (1) accept thickens **cervical mucus** blocks the sperm / stops them reaching the egg for 2 marks	**(2)** **AO2**

Question Number	Answer	Additional guidance	Mark
6(a)(ii)	doesn't prevent STI	Accept STDs for STIs Accept named STIs accept still a chance of pregnancy	**(1)** **AO1**

Question Number	Answer	Additional Guidance	Mark
6(b)	An explanation linking: • blood glucose levels are not regulated / high (1) • because cells are resistant to insulin (1) • (so the liver) does not convert glucose to glycogen (1)	accept blood sugar levels accept there is insulin resistance / unresponsive to insulin reject immune accept hyperglycaemia / symptoms of hyperglycaemia (1)	**(3)** **AO1**

Question Number	Answer	Additional Guidance	Mark
6(c)	An answer including **four** from: • {TSH / thyroxine} levels are higher than normal (1) • TSH stimulates the thyroid gland / TSH stimulates the release of thyroxine (1) • **increases** metabolic rate (1) • {red blood cells / glucose} are within the normal range (1) • suggesting oxygen is carried as normal (1) • the symptoms are not due to diabetes (1)	accept the hormones levels are high / above average accept digests / breaks down food faster accept hyperthyroidism / overactive thyroid accept RBC / glucose are not high accept is not anaemic	**(4)** **AO3** **1a, 1b, 2a, 2b**

(Total for question 6 = 10 marks)

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	(the gardener thought) they were experts / it was a reliable source	accept the content has been checked / peer review	**(1)** **AO2 1**

Question Number	Answer	Additional guidance	Mark
7(a)(ii)	An answer including: • to introduce microorganisms / decomposers (1) • to provide oxygen (1)	accept bacteria / worms for decomposers accept for respiration	**(2)** **AO2 1**

Question Number	Answer	Mark
7 (a)(iii)	B respiration occurred and this is an exothermic reaction **The only correct answer is B** ***A*** *is not correct because respiration is not endothermic* ***C*** *is not correct because it is not photosynthesis* ***D*** *is not correct because it is not photosynthesis*	**(1)** **AO2 1**

Question Number	Answer	Mark
7 (a)(iv)	D 0.13 kg per day **The only correct answer is D** ***A*** *is not correct because 8/60 is not 1.8* ***B*** *is not correct because 8/60 is not 0.66* ***C*** *is not correct because 8/60 is not 0.53*	**(1)** **AO2 1**

Question number	Indicative content	Mark
7 *(b)	**AO1 / AO2 6 marks** **Auxins** • used in selective weed killers • targets broad leaf plants • kills the weeds and not narrow leaf crops • rooting powder • added to the end of cuttings to stimulate the growth of roots **Gibberellins** • to stimulate germination in dormant seeds • initiate breakdown of starch • stimulate flower formation • promotes fruits formation • sprayed onto plants before pollination • stimulate development of seedless fruits **Ethene** • fruit ripening • unripe fruit is harvested • ethene is added so the fruits ripens for selling	**(6)** **AO1 1 AO1 2**

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• 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	3-4	• 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	5-6	• 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.

Additional Guidance

Level 1	1–2	• An identification of one commercial use of auxin, gibberellins or ethene in plants • The response links the use to the process involved or when it is used.
Level 2	3–4	• An identification of at least two commercial use of auxin, gibberellins or ethene in plants • The response links the use to the process involved or when it is used.
Level 3	5–6	• An identification of the commercial uses of auxin, gibberellins and ethene in plants • The response links the use to the process involved or when it is used.

Level	Marks	Possible responses
Level 1	1	• auxins act as weedkillers/gibberellins are involved in fruit formation / ethene ripens fruit
	2	• auxins act as weedkiller on broad leaf plants / gibberellins form seedless fruit which are nicer to eat / ethene ripens fruit so it can be transported unripened.
Level 2	3	• auxins act as weedkillers and rooting powders /auxins act as weedkillers and gibberellins are involved in fruit formation / ethene causes fruit to ripen and auxins are in rooting powder.
	4	• auxins act as weedkiller on broad leaf plants and gibberellins form seedless fruit which are nicer to eat / gibberellins form seedless fruit which are nicer to eat and ethene ripens fruit so it can be transported unripened.
Level 3	5	• auxins act as weedkillers and gibberellins are involved in fruit formation and ethene ripens fruit / auxins act as rooting powders and gibberellins cause flower formation and ethene is involved in the ripening of fruits.
	6	• auxins act as weedkiller on broad leaf plants and gibberellins form seedless fruit which are nicer to eat and ethene causes fruit to ripen which means they can be picked when not ripe and transported.

(Total for question 7 = 11 marks)

Question Number	Answer	Additional Guidance	Mark
8(a)(i)	multiply the number of beats (in 10 seconds) by 6	accept times by six	**(1)** **AO2**

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	Any **two** from: • use a heart rate monitor / electronic device (to measure HR) (1) • take readings more frequently than 5 minutes (1) • record the pulse for longer than 10 seconds (1) • take repeat readings / calculate a mean (1)	ignore use a stopwatch accept repeat it	**(2)** **AO3b**

Question Number	Answer	Additional Guidance	Mark
8(a)(iii)	An answer linking **three** from: • heart rate {remains relatively constant / fluctuates slightly} when walking (1) • heart rate increases when running (1) • heart rate levels off {at 15 minutes / at 180 b.p.m.} when running (1)	accept heart rate stays at 90 b.p.m.to 96 b.p.m. when walking accept heart rate is higher when running / data illustrating the difference	**(3)** **AO3**

Question Number	Answer	Additional Guidance	Mark
8(b)(i)	adrenal (glands)	ignore kidney / adrenalin glands	**(1)** **AO1**

Question Number	Answer	Additional Guidance	Mark
8(b)(ii)	An explanation linking **three** from: • binds to **receptors** (on the liver) (1) • (triggers liver cells to) convert glycogen (1) • into glucose (1) • increasing the concentration (of glucose) in the blood / which is released into the blood (1)	ignore sugar accept blood sugar	**(3)** **AO2**

Question Number	Answer	Additional Guidance	Mark
8(c)	An explanation linking: • because of lactic acid (1) • from **anaerobic** respiration (1)		**(2)** **AO2**

(Total for question 8 = 12 marks)

Question Number	Answer	Additional Guidance	Mark
9(a)(i)	substitution (12 x 18 ÷10) = 21.6 (1) whole organism (1) = 21 / 22 (50 – 21 / 22) = 28 / 29	award full marks for correct answer with no working e.c.f. from incorrect substitution **using data from the table** e.c.f. from incorrect whole organism award two marks for 28.4 or 27.9 or 22 or 21 without working	**(3)** **AO2**

Question Number	Answer	Mark
9(a)(ii)	Any **two** from: • sample at the (same) time of day (1) • sample for the (same) length of time (1) • use the (same) equipment / techniques (1) • (same) time period between first and second sample (1) • (same) marking process (1) • do not harm organisms when sampling (1)	**(2)** **AO2**

Question Number	Answer	Additional Guidance	Mark
9(b)	An explanation linking **two** from: • leaching / run off / fertilisers / dead organic matter (1) • (causes) a build up of nitrates / nitrates in the water (1)	accept {sewage / mineral ions} accept phosphates ignore nutrients	**(2)** **AO1**

Question number	**Indicative content**	**Mark**
9 *(c)	**AO1 6 marks** **Reforestation** • reforestation is planting of trees • trees take up water from the soil • prevents erosion and reduces flooding • trees can be used for renewable resources • provides habitats • increases the rate of photosynthesis • removes carbon dioxide and releases oxygen • reduces greenhouse gases / global warming • provides a source of medicines / food for consumers **Animal conservation** • increase numbers of endangered species / prevent extinction • through controlled breeding programmes /reduction in poaching /maintaining habitats • generating income to fund conservation projects through zoos / animal parks / ecotourism • improves the number of animals / range of species • maintains the food web • maintains genetic diversity • allows re-introduction of animals into the wild	**(6)**

Level	Mark	Descriptor
	0	• no rewardable material.
Level 1	1-2	• 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	3-4	• 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	5-6	• 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.

Additional Guidance

Level 1	1–2	• A brief explanation of either the benefits of reforestation OR animal conservation projects. • The response refers to changes in atmospheric gases OR photosynthesis OR **HOW** animal conservation improves biodiversity
Level 2	3–4	• A brief explanation of the benefits of reforestation AND animal conservation projects • The response refers to changes a **named** atmospheric gas **OR** photosynthesis **OR HOW** animal conservation improves biodiversity
Level 3	5–6	• A detailed explanation on the benefits of reforestation and animal conservation projects • The response refers to changes in both **named** atmospheric gases **AND HOW** animal conservation improves biodiversity including why endangered species are preserved or the impact on food webs

Level	Marks	Possible responses
Level 1	1 2	• Animal conservation protects endangered species / reforestation provides habitats for animals • Reforestation is planting trees which take in carbon dioxide / reforestation provides habitats for animals and reduces greenhouse gases
Level 2	3 4	• Animal conservation protects endangered species and reforestation provides habitats for animals / Animal conservation protects endangered species from hunting. Reforestation is the planting of trees which provides habitats for animals. • Animal conservation protects endangered species so the numbers increase and reforestation is the planting of trees. The trees take in carbon dioxide and provide habitats for animals
Level 3	5 6	• Animal conservation protects endangered species so the numbers increase by protecting them from hunting and maintaining habitats. Reforestation is the planting of trees. The trees take in carbon dioxide and provide habitats and food source for animals. • Animal conservation protects endangered species so the numbers increase by protecting them from hunting and maintaining habitats. Reforestation is the planting of trees. The trees release oxygen and take in carbon dioxide. They also provide habitats and food source for animals.

(Total for question 9 = 13 marks)

Question Number	Answer	Additional Guidance	Mark
10(a)	An answer including **three** from: • complete the same exercise (1) • in the same environmental conditions (1) • measure the change in mass for each T-shirt (1) • the {least / most} weight gain is the best for exercise (1) **OR** • wet each T-shirt (1) • with the same volume of water (1) • measure the change in mass for each T-shirt (1) • the {least / most} weight gain is the best for exercise (1)	accept the same time of day / weather / temperature	**(3)** **AO3 3a**

Question Number	Answer	Mark
10 (b)(i)	D biuret solution is used and the solution turns purple **The only correct answer is D** ***A*** *is not correct because Benedict's is not used to test for protein* ***B*** *is not correct because Benedict's is not used to test for protein* ***C*** *is not correct because biuret solution does not stay blue with protein*	**(1)** **AO1 2**

Question Number	Answer	Additional Guidance	Mark
10(b)(ii)	An explanation linking: • (Fick's law states) the rate of diffusion is proportional to surface area x concentration gradient (1) • and inversely proportional to the thickness if the membrane (1) • increased rate of diffusion (1) • because the villi increase surface area / because the membrane is thinner (1)	accept equation accept shorter diffusion distance for membrane is thinner	**(3)** **AO2 1**

Question Number	Answer	Mark
10(b)(iii)	(blood) plasma	**(1)** **AO1 1**

Question Number	Answer	Additional guidance	Mark
10(c)	An explanation linking **four** from: • because excess amino acids are broken down into urea (1) • amino acids broken down in the liver (1) • it is then transported in the blood to the kidney (1) • enter the nephron (1) • during ultrafiltration (1) • pass through the nephron / not reabsorbed back into the blood (1) • (so urine with a high concentration of urea) forms in the collecting duct (1)	accept deamination accept named blood vessels accept Bowman's capsule / renal capsule / glomerulus accept bladder for collecting duct	**(4)** **AO1 1**

(Total for question 10 = 12 marks)