Mark Scheme(Results)

Summer 2023

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

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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

*there will be situations where an AO1 question will include elements of recall of knowledge directly from the specification (up to a maximum of 15%). These will be identified by an asterisk in the mark scheme.

Question number	Answer	Additional Guidance	Mark
1(a)(i)	An answer including: • use the thermometer (1) • measure the start and end temperature (of the water) (1)	 accept temperature probe accept calculate the difference between the start and end temperature ignore measure the difference	**(2)**

Question number	Answer	Mark
1(a)(ii)	B 19 829 joules per gram **The only correct answer is B** ***A*** *is not correct because the correct substitutions have not been made.* ***C*** *is not correct because the correct substitutions have not been made.* ***D*** *is not correct because the correct substitutions have not been made.*	**(1)**

Question number	Answer	Additional guidance	Mark
1 (a)(iii)	(biscuit) contains **more** {energy / fat / protein / carbohydrate / calories} OR (biscuit) has a **high** {energy / fat / protein / carbohydrate / calories}	accept a smaller volume of water was used accept named examples of food groups e.g. sugar	**(1)**

Question number	Answer	Additional guidance	Mark
1 (b)	An explanation linking three from: • {all / most of} the heat energy is used to heat the water (1) • because there is less heat loss (1) • because the system {is sealed / is insulated / has a lid / is closed} (1) • and the stirrer distributes the heat evenly / the water has heat distributed equally (1) • {all / more of} the food burns (1)	accept reverse argument for laboratory equipment accept less energy loss accept water can't evaporate accept stirrer ensures the temperature is the same throughout accept idea of complete combustion / the food burns in oxygen	**(3)**

(Total for question 1 = 7 marks)

Question number	Answer	Additional guidance	Mark
2(a)	asexual (reproduction)	ignore mitosis reject meiosis accept cloning / binary fission	**(1)**

Question number	Answer	Additional guidance	Mark
2 (b)	One from advantages: • (fruit) will have desired qualities (1) • can be produced faster (1) **AND** One from disadvantages: • susceptible to a disease (1) • can't survive an environmental change (1) • reduced gene pool (1)	ignore genetically identical / no variation for advantages and disadvantages accept examples of characteristics e.g. all tasty / same taste ignore higher yield accept inherited / genetic diseases accept can't survive a selection pressure	**(2)**

Question number	Answer	Additional guidance	Mark
2(c)	A method including four from: • mix starch, enzyme and pH (solution) (1) • use iodine (to test for starch) (1) • (with iodine solution) blue-black means starch is present / {orange / brown} means no starch present (1) • control of one variable e.g. concentration, volume, temperature (1) • **repeat** using different pH solutions (1)	 all three solutions are required accept add iodine to a spotting tile ignore blue ignore amount unless a measurement is given	**(4)**

Question Number	Answer	Additional guidance	Mark
2(d)	An explanation linking two from: • enzyme denatures (1) • which changes the shape of the **active site** (1) • so {the enzyme cannot bind to its substrate / active site no longer complementary / no **enzyme-substrate** complexes form} (1)	 accept enzyme changes shape accept substrate {no longer fits / is no longer complementary} accept starch for substrate	**(2)**

(Total for question 2 = 9 marks)

Question number	Answer	Additional guidance	Mark
3 (a)	Calculation 300 ÷ 30 / 2^{10} / indication that there are 10 divisions (1) Evaluation 1024	award full marks for the correct answer with no working accept 512 for one mark only	**(2)**

Question number	Answer	Additional guidance	Mark
3(b)(i)	(pathogens are organisms) that **cause** disease	ignore examples of pathogens unless linked to causing disease accept **cause** disease / illness / infections	**(1)**

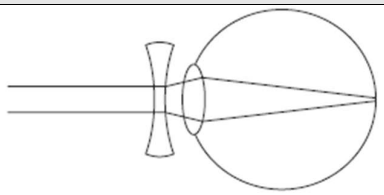
Question number	Answer	Additional guidance	Mark
3(b)(ii)	An explanation including two from: • they inhibit processes (in bacteria) (1) • so **bacteria** {are destroyed / are killed / growth stops / reproduction stops} (1) • but antibiotics {do not affect/damage} the host cell (1)	 accept named processes e.g. disrupt cell walls accept slows down for stopped	**(2)**

Question number	Answer	Additional guidance	Mark
3(b)(iii)	Substitution 80 ÷ 0.005 (1) 16 000	award full marks for the correct answer with no working	**(2)**

(Total for question 3 = 7 marks)

Question number	Answer	Additional guidance	Mark
4(a)(i)	**240** x 0.35 / 84 (1) **240** – 84 (1) 156 (people) OR 100 – 35 / 65 / 0.65 (1) 0.65 x **240** / 65 ÷ 100 x **240** (1) 156 (people) OR **240** ÷ 100 / 2.4 (1) 2.4 **x 65** (1) 156 (people)	award full marks for the correct answer with no workings ecf for an incorrect value subtracted from 240 shown in working ecf for an incorrect value multiplied by 240 shown in working ecf for an incorrect value multiplied by 65 shown in working	**(3)**

Question number	Answer	Additional guidance	Mark
4(a)(ii)	Any one from: • the eye(ball) is too long (1) • the cornea is too curved (1) • lens is too thick / too curved (1) • the {cornea / lens} refracts the light too much (1) • {light rays focus / focal point is} in front of the **retina (1)**	 ignore the eye(ball) is too big ignore image forms in front of the retina accept it is inherited / caused by genetics (1)	**(1)**

Question number	Answer	Mark
4(a)(iii)	C  **The only correct answer is C** ***A*** *is not correct because a convex lens is not used* ***B*** *is not correct because a convex lens is not used* ***D*** *is not correct because a concave lens doesn't refract light in this way*	**(1)**

Question number	Answer	Additional guidance	Mark
4(b)(i)	An answer including two from: • **protein** (has built up) (1) • (in the) lens (1) • light is dispersed (1)	 accept cloudy lens accept not all the light rays pass through ignore blurry vision	**(2)**

Question number	Answer	Additional guidance	Mark
4(b)(ii)	• (surgery to) replace the lens / use an {artificial / plastic lens}	ignore surgery / laser surgery	**(1)**

Question number	Answer	Mark
4(c)(i)	A cerebellum **The only correct answer is A** ***B*** *is not correct because structure X is not the cerebral hemisphere* ***C*** *is not correct because structure X is not the medulla oblongata* ***D*** *is not correct because structure X is not the spinal cord*	**(1)**

Question number	Answer	Additional guidance	Mark
4(c)(ii)	An answer including: • by **electrical** impulses (1) • along a motor neurone (to the effector) (1)	 accept **electrical** message / signal accept motor neurone in the correct place in a description of a reflex arc	**(2)**

(Total for question 4 = 11 marks)

Question number	Answer	Mark
5(a)(i)	C releases energy contains digestive enzymes **The only correct answer is C** ***A*** *is not correct because structure B does not contain the genetic material* ***B*** *is not correct because structure A does not produce glucose* ***D*** *is not correct because structure A does not produce glucose and structure B does not contain the genetic material*	**(1)**

Question number	Answer	Mark
5(a)(ii)	20 / twenty	**(1)**

Question number	Answer	Mark
5(b)(i)	B prophase → metaphase → anaphase → telophase **The only correct answer is B** ***A*** *is not correct because metaphase is not the first stage* ***C*** *is not correct because anaphase is not the first stage* ***D*** *is not correct because metaphase is before anaphase*	**(1)**

Question number	Answer	Additional guidance	Mark
5(b)(ii)	An answer including: • (stem cells divide) by <u>mitosis</u> (1) • cells **differentiate** / to become specialised cells (1)	 reject meiosis accept produce cells with a specific function	**(2)**

Question number	Answer	Additional guidance	Mark
5(c)(i)	so the tissues matched / to reduce the chance of rejection	accept because they are genetically similar / have similar DNA	**(1)**

Question number	Answer	Additional guidance	Mark
5(c)(ii)	they have the potential to develop into a {foetus / baby / person / life} so embryos are not {harmed / destroyed}	accept people have ethical concerns / think it is unethical / the {embryo / foetus} is alive	**(1)**

Question number	Answer	Additional guidance	Mark
5(c)(iii)	An answer including three from: • means that embryos do not need to be used / a donor is not needed (1) • they can {develop / differentiate / specialise} into any cell (1) • replace damaged {cells / tissue} (1) • they will match the tissue type of the patient / less chance of rejection (1)	accept they are easier to obtain / unlimited supply accept can develop into a named cell (type) accept specific examples of use e.g. Parkinson's ignore repair cells accept repair tissues accept no need to take immune-suppression medication (1)	**(3)**

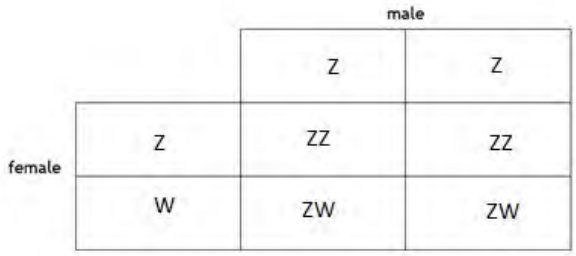
(Total for question 5 = 10 marks)

Question number	Answer	Additional guidance	Mark
6(a)(i)	subtraction 221 – 11 or 210 (1) calculation 210 ÷ 11 x 100 (1) evaluation 1909 (%)	award full marks for the correct answer without workings accept ecf from incorrect subtraction or no subtraction accept 1909.1 accept answer to any number of decimal places correctly rounded accept 19.09 for 2 marks	**(3)**

Question number	Answer	Additional guidance	Mark
6(a)(ii)	increased survival rate / hidden from predators / hidden from prey	accept camouflaged / increased chance of getting food	**(1)**

Question number	Answer	Additional guidance	Mark
6(a)(iii)	An explanation linking three from: • all **genetically** similar / there is less variation (1) • if there is a selection pressure (1) • they will {be susceptible / die} (due to the selection pressure) / **no** survival of the fittest (1) • fewer birds will be able to reproduce (1) • the species cannot evolve (1)	 accept decreased gene pool / **similar** {DNA /genes / alleles} accept examples of selection pressure e.g. disease / change in the environment accept affected for susceptible accept it's less likely there will be adapted bitterns to survive accept fewer offspring are produced	**(3)**

Question number	Answer	Additional guidance	Mark
6(b)	An answer including two of the following: • breed animals who are {not genetically similar / genetically different} (1) • repeat the process over many **generations** (1)	 animals with different characteristics accept this occurs over several **generations** accept prevent the animals inbreeding (1)	**(2)**

Question number	Answer	Additional guidance	Mark
6c	 correct parental genotypes (1) correct offspring genotypes (1)	ecf for incorrect parental genotype if Z and W used. accept WZ	**(2)**

(Total for question 6 = 11 marks)

Question number	Indicative content	Mark
*7 (a)(i)	**AO1 6 marks** **Fieldwork** • check other plants in the field or other fields / find the distribution of affected plants • examine the area around the affected plants • examine the lesions on the leaf • take a sample the soil / take a sample of the plant • eliminate an environmental factor that could be causing the symptoms e.g. pollution / contamination / pests / mineral ion deficiency / pH • use of a pesticide / fertiliser to see if this clears the lesions • compare with known plant diseases • use books / internet / apps • use drones / mapping • to determine how the disease could be spread e.g. wind, animal or water spread • clustering indicating contact or soil spread • downwind indicating airborne **Testing** • test the soil e.g. for pH / nutrient levels / mineral ion deficiency • test {swabs/samples} from the lesions / plant / cuttings • culture the pathogen • identify the {pathogen/bacteria/fungus/virus} • e.g. DNA analysis / microscope / monoclonal antibodies	**(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 description of fieldwork or testing that could be completed • The description makes a link to observed patterns, an environmental cause or identifying the pathogen
Level 2	3–4	• A brief description of fieldwork **AND** testing that could completed **OR** a detailed description of fieldwork • Response makes a link between observed patterns for distribution and why the patterns would be seen.
Level 3	5–6	• A detailed description of fieldwork **AND** some reference to testing that could be completed • Distribution analysis makes links between observed patterns and why the patterns would be seen.

Question number	Answer	Additional guidance	Mark
7(a)(ii)	One from: • wear protective footwear (1) • wear gloves (1) • {sterilise/clean} equipment (1) • avoid {trampling / touching / damage to /contact with} unaffected crops (1) • ensure all the affected plants removed (1)	ignore prevent the pathogen spreading to healthy crops / transmission of disease to humans accept make sure all the roots are removed / remove surrounding soil	**(1)**

Question number	Answer	Additional guidance	Mark
7(b)	An answer linking four from: • translation occurs (1) • mRNA {binds to the ribosome / goes to the ribosome} (1) • {three bases / triplet / codon /anticodon} codes for one amino acid (1) • tRNA transfers the amino acid (1) • peptide bond forms between amino acids / a polypeptide is formed (1) • {amino acid sequence / polypeptide/protein} **folds** into (a viral protein) (1)	accept is read by the ribosome accept tRNA has an anticodon accept tRNA {binds to / is complementary to} the codon accept the mRNA sequence determines the order of the amino acids ignore polypeptide bond / protein is synthesised accept a chain of amino acids is formed ignore amino acids fold	**(4)**

(Total for question 7 = 11 marks)

Question number	Answer	Mark
8(a)(i)	evaluation (8 x 8 x 8) = 512 (1) units mm^3 (1)	**(2)**

Question number	Answer	Additional guidance	Mark
8(a)(ii)	dry the cube / check the balance is on zero	accept use a balance accurate to 1000^{th} gram ignore repeat the investigation	**(1)**

Question number	Answer	Additional guidance	Mark
8(a)(iii)	An explanation linking three from: • mass has decreased (1) • water has moved out (of the cube) (1) • water moves by <u>osmosis</u> (1) • across a partially permeable membrane (1) • from a high water molecule concentration to a low water molecule concentration (1)	 accept the {cube / potato} has lost water accept semi-permeable membrane accept down a water potential gradient	**(3)**

Question number	Answer	Additional guidance	Mark
8(a)(iv)	An answer including three from: • (repeat with) different salt concentrations (1) • between the dilute and the concentrated solution (1) • make repeated readings **at each concentration** (1) • plot a graph to find the concentration with no mass change (1)	 accept at concentrations closest to where there is little mass change accept find an average for each concentration accept idea of finding the point where the line crosses the *x* axis accept control all variables / control an example of a variable e.g. temperature (1)	**(3)**

Question number	Answer	Additional guidance	Mark
8(b)	An explanation linking: • (potato cells) have a cell wall (1) • which provides {structure / support} / which contains cellulose (1)	 accept strong / rigid for idea of structural support accept cells become turgid (1) accept water enters the vacuole (1)	**(2)**

(Total for question 8 = 11 marks)

Question number	Answer	Additional guidance	Mark
9(a)	An answer including two from: • environmental factors (1) • diet / food intake (1) • exercise / activity (1) • if the person is affected by a disease (1)	 accept lifestyle accept calories consumed / named food groups accept calories used / metabolism accept named diseases e.g. hyperthyroidism / diabetes ignore age / sex / smoking / height	**(2)**

Question number	Answer	Additional guidance	Mark
9(b)	An answer including: • BMI is in the overweight range (1) • waist:hip is in the healthy range (1) • suggesting that the fat is not around the vital organs / the patient may have a high percentage of muscle (1) • patient is consuming too much alcohol which {affects the liver / causes liver damage} (1) • not smoking reduces the risk of {cardiovascular disease / lung disease / stroke} (1)	disease risks must be linked to measurements / data from the table accept idea that BMI does not take account of muscle / fat is evenly distributed / fat is not around their middle accept numerical comparisons accept named liver diseases e.g. cirrhosis, liver cancer or fatty liver accept other smoking related diseases e.g. cancer	**(4)**

Question number	Indicative content	Mark
9*(c)	**AO1 6 marks** **Structure** • stimulus detected by a receptor • receptor transfers the signal to the sensory neurone • sensory neurone transfers the signal to the CNS / brain / spinal cord / relay neurone • signal is transferred to a motor neurone • myelin sheath speeds up the transmission of the electrical impulse • the motor neurone transmits the signal to the effector • the effector produces the response **Function** • rapid response • to protect the body / response to danger • involuntary automatic response	**(6)**

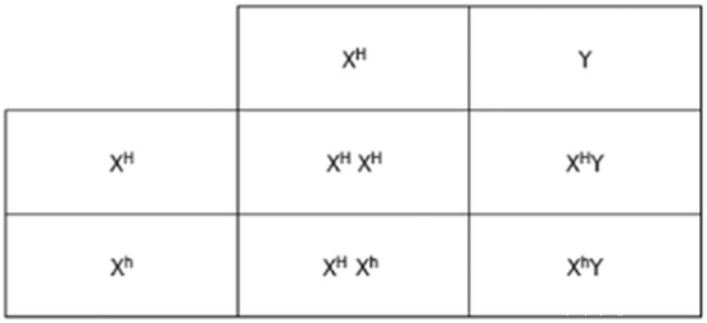
Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • Presents an explanation with some structure and coherence.
Level 2	3-4	• Demonstrates biological understanding, 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	• The answers refers to at least one structural aspect of a reflex arc • The response includes reference to the function of a reflex arc
Level 2	3–4	• The explanation links some structural components of a reflex arc • The response includes links to the function of a reflex arc as a rapid **or** protective response
Level 3	5–6	• The explanation links the structural components in a complete reflex arc • The response links this to the function of a reflex arc as a rapid **and** protective response

(Total for question 9 = 12 marks)

Question number	Answer	Additional guidance	Mark
10(a)(i)	the male is affected / has haemophilia	accept has the disorder	(1)

Question number	Answer	Mark
10(a)(ii)	 correct female parent genotype (1) correct male parent genotype (1) correct offspring (1) (ecf from incorrect parental genotype)	(3)

Question number	Answer	Additional guidance	Mark
10(b)(i)	An answer including: • <u>RNA polymerase</u> {binds less well / cannot bind} (1) • less mRNA (is produced) (1)	 accept alternative words for bind e.g. attach ignore affects the binding accept no mRNA (produced) / less transcription	**(2)**

Question number	Answer	Mark
10(b)(ii)	A a mutation in the coding region of a gene changes the sequence of the amino acids. **The only correct answer is A** ***B*** *is not correct because the mutation is not in the non-coding region* ***C*** *is not correct because it does not change the shape of the tRNA* ***D*** *is not correct because the mutation is not in the non-coding region and does not change the shape of the tRNA*	**(1)**

Question number	Answer	Additional guidance	Mark
10(c)	An answer including four from: • (pregnancy test detects) a **hormone** in **urine** (1) • (hormone/antigen) binds to the antibody (on the test) (1) • which have a coloured (bead) attached to them (1) • (a line appears because) there are immobile antibodies (in the test window) (1)	 accept hCG for hormone accept antibodies are complementary (to the hormone) accept a named colour /idea that a colour, dye or tag is attached accept there are antibodies fixed down accept the antibodies move up the strip and colour appears	**(4)**

(Total for question 10 = 11 marks)