Mark Scheme (Results)

November 2021

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

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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 cytoplasm **The only correct answer is D** ***A*** *is not correct because W is not the cell wall* ***B*** *is not correct because W is not the nucleus* ***C*** *is not correct because W is not the cell membrane*	**(1)** **AO1 1**

Question Number	Answer	Mark
1(a)(ii)	A nucleus **The only correct answer is A** ***B*** *is not correct because a tail is not found in cheek cells* ***C*** *is not correct because a middle piece is not found in cheek cells* ***D*** *is not correct because an acrosome is not found in cheek cells*	**(1)** **AO2 1**

Question Number	Answer	Mark
1(b)	cell wall	**(1)** **AO1 1**

Question Number	Answer	Mark
1(c)	An answer including: • (add) iodine (solution) (1) • (iodine solution changes from brown to) blue-black / black (1)	**(2)** **AO1 2**

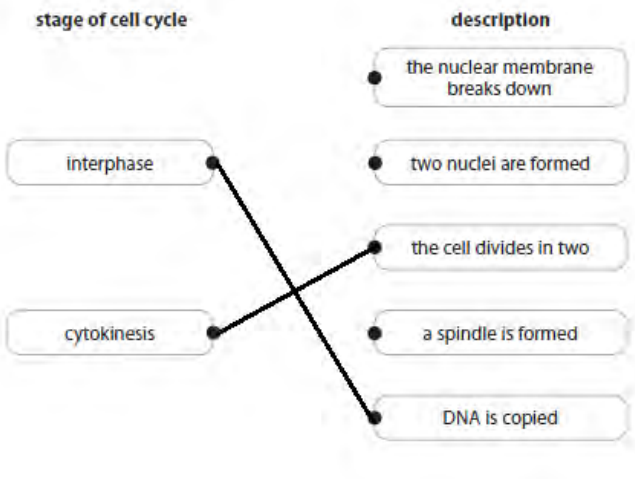
Question Number	Answer	Mark
1(d)(i)	L	**(1)** **AO2 2**

Question Number	Answer	Mark
1(d)(ii)	K	**(1)** **AO2 2**

(Total for question 1 = 7 marks)

Question Number	Answer	Mark
2(a)(i)	B chromosome **The only correct answer is B** ***A*** *is not correct because Z is not an allele* ***C*** *is not correct because Z is not the spindle* ***D*** *is not correct because Z is not the nuclear membrane*	**(1)** **AO1 1**

Question Number	Answer	Mark
2(a)(ii)	Any **two** from: • for growth (1) • for repair (of tissues / organs) (1) • for asexual reproduction (1)	**(2)** **AO1 1**

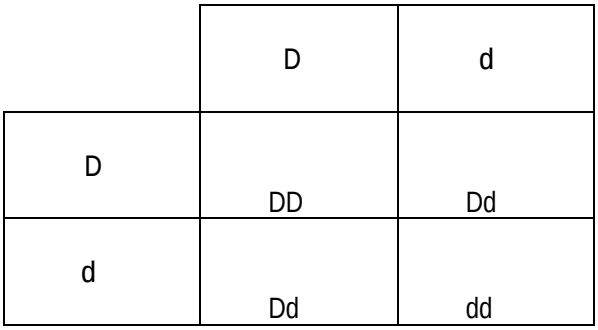
Question Number	Answer	Mark
2(a)(iii)	 Do not award mark if two lines are drawn from interphase box Do not award mark if two lines are drawn from cytokinesis box	**(2)** **AO1 1**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	use a stain / named stain	accept dye accept add a cover slip	**(1)** **AO2 2**

Question Number	Answer	Mark
2(b)(ii)	D x 400 **The only correct answer is D** ***A*** *is not correct because the total magnification is not x 4* ***B*** *is not correct because the total magnification is not x 30* ***C*** *is not correct because the total magnification is not x 50*	**(1)** **AO2 2**

Question Number	Answer	Additional guidance	Mark
2(c)	focusing wheel	accept (move the) stage / lens (up and down) accept (adjust) mirror	**(1)** **AO1 1**

(Total for question 2 = 8 marks)

Question Number	Answer	Mark
3(a)(i)	 Accept dD for Dd	**(1)** **AO3 2a**

Question Number	Answer	Mark
3(a)(ii)	25 (%)	**(1)** **AO3 2b**

Question Number	Answer	Additional guidance	Mark
3(a)(iii)	An explanation including: • all the children will have the genotype Dd / will be heterozygous (1) • but to have sickle cell disease the children must have {the genotype dd / two recessive alleles} (1)	accept children will always inherit a dominant allele / D from their mother accept a correctly completed Punnett square for this marking point	**(2)** **AO2 1**

Question Number	Answer	Mark
3(b)	A description including **two** from: • {cross / breed} Brahman cattle with Shorthorn cattle (1) • select the offspring with the desired characteristics and {cross / breed} them (1) • repeat over many generations (1)	**(2)** **AO2 1**

Question Number	Answer	Additional guidance	Mark
3(c)	Any **two** from: • (wheat) plants not damaged (1) • the spread of the fungus would be reduced (1) • greater yield / profit (1) • reduced use of fungicides / pesticides (1)	accept the (wheat) plants would live longer accept their offspring would also be resistant to fungal disease (1)	**(2)** **AO2 1**

(Total for question 3 = 8 marks)

Question Number	Answer	Additional guidance	Mark
4(a) (i)	water (1) lid (1)	answers must be in the correct order	**(2)** **AO2 2**

Question Number	Answer	Additional guidance	Mark
4(a)(ii)	interpretation (85 – 21) = 64 (1) calculation (25 x 4.2 x 64) 6720 (J)	full marks for correct answer without any working award one mark for an answer correctly calculated from an incorrect temperature change	**(2)** **AO2 1**

Question Number	Answer	Additional guidance	Mark
4(a)(iii)	An explanation including **two** from: • the {temperature change / rise in temperature} was smaller (1) • this type of cheese contained less {energy / fat} / the piece of cheese had a smaller mass / a smaller mass of the cheese burned / the cheese was held further away from the container (1) • therefore less energy was transferred to the water (1)	accept other valid variables	**(2)** **AO3 2a 2b**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	substitution 64.8 ÷ 1.8 x 1.8 (1) **OR** 64.8 ÷ 3.24 (1) 20	full marks for correct answer without any working	**(2)** **AO2 1**

Question Number	Answer	Mark
4(b)(ii)	B healthy weight **The only correct answer is B** ***A*** *is not correct because person B is not underweight* ***C*** *is not correct because person B is not overweight* ***D*** *is not correct because person B is not obese*	**(1)** **AO2 1**

Question Number	Answer	Additional guidance	Mark
4(b)(iii)	An explanation including: • do more exercise /named exercise (1) • so more energy is used up (1) **OR** • reduce fat / carbohydrate intake (1) • so energy intake is reduced (1)	accept eat less	**(2)** **AO2 1**

(Total for question 4 = 11 marks)

Question Number	Answer	Mark
5(a)	C phenotype **The only correct answer is C** ***A*** *is not correct because genotype does not describe the physical characteristics* ***B*** *is not correct because monohybrid does not describe the physical characteristics* ***D*** *is not correct because heterozygous does not describe the physical characteristics*	**(1)** **AO1 1**

Question Number	Answer	Additional guidance	Mark
5(b)(i)	Any **one** from: • a single result could be anomalous (1) • to calculate a mean (1)	 accept to see if the results are the same / similar ignore references to increasing accuracy	**(1)** **AO1 2**

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	Any **two** from: • measure the length / width of the carrot sticks (1) • cut sticks from the same carrot / same part of carrot (1) • use the same variety of carrot (1) • (surface) dry the carrot sticks before weighing (1)	accept other valid ways of improving this method, e.g. using more than three carrot sticks (1)	**(2)** **AO3 3b**

Question Number	Answer	Additional guidance	Mark
5(b)(iii)	substitution (0.8 ÷ 4.2) x 100 (1) evaluation 19.048 (1) 2 significant figures 19 (%)	full marks for correct answer without any working accept 19.0476 / 19.05 (2) award one mark for rounding an incorrectly calculated answer to 2 significant figures	**(3)** **AO2 1**

Question Number	Answer	Mark
5(b)(iv)	An explanation linking any **two** from: • the carrot sticks gained mass (1) • because water moved into the carrot (cells) (1) • by **osmosis** / description of osmosis (1)	**(2)** **AO3 2a 2b**

(Total for question 5 = 9 marks)

Question Number	Answer	Mark
6(a)	B because they speed up biological processes **The only correct answer is B** ***A*** *is not correct because enzymes do not slow down biological processes* ***C*** *is not correct because enzymes do not denature biological processes* ***D*** *is not correct because enzymes do not stop biological processes*	**(1)** **AO1 1**

Question Number	Answer	Mark
6(b)(i)	use a water bath / description of a water bath	**(1)** **AO1 2**

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	An explanation linking **three** from: • enzymes have an optimum temperature (1) • so temperature will affect the rate of enzyme activity / the time taken to produce 20cm^3 of oxygen (1) • enzyme activity increases as temperature increases (up to the enzyme's optimum temperature) (1) • {enzymes / active sites} are **denatured** / enzyme activity stops at high temperatures (1)	accept hydrogen peroxide concentration is the independent variable, so other variables (such as temperature) must be controlled (1)	**(3)** **AO2 1**

Question Number	Answer	Additional guidance	Mark
6(b)(iii)	• all 4 points plotted accurately (± half a small square) (1) • smooth curve / dot-to-dot line drawn (1)	ignore extrapolations	**(2)** **AO3 1a 1b**

Question Number	Answer	Additional guidance	Mark
6(b)(iv)	A description including: • the time taken to collect 20 cm^3 oxygen decreases as hydrogen peroxide concentration increases (1) • the curve flattens (1) • the correct use of data from the table (1)	 accept negative correlation data must be used not just quoted from the table	**(3)** **AO3 1a 1b**

(Total for question 6 = 10 marks)

Question Number	Answer	Mark
7(a)	A description including **two** from: • they have a similar arrangement of bones / five digits / pentadactyl limb (1) • evolved from a common ancestor (1) • adapted for different functions (1)	**(2)** **AO1 1**

Question Number	Answer	Mark
7(b)(i)	A biological control **The only correct answer is A** ***B*** *is not correct because this method of limiting the population of weeds is not chemical control* ***C*** *is not correct because this method of limiting the population of weeds is not tissue culture* ***D*** *is not correct because this method of limiting the population of weeds is not genetic engineering*	**(1)** **AO2 1**

Question Number	Answer	Mark
7(b)(ii)	Any **two** from: • (using insects is) safer than using {pesticides/chemicals} (1) • the insects used are specific to this weed (1) • insects do not need to be repeatedly reapplied (1) • cacti could become resistant to chemicals (1)	**(2)** **AO2 1**

Question Number	**Indicative content**	Mark
7(c)*	**Advantages** • less crop damage / spoilage • so higher yield • so more food for people • crop plants are less likely to have diseases that are spread by insects • so less pesticides / insecticides used • more profit • so more income for developing countries **Disadvantages** • concerns about the long-term effects (of genetically modified organisms) • ethical concerns / wrong to move genes between species • GM crops could contribute to the development of medical conditions in humans • GM crops could trigger allergic reactions • genes could be transferred to other species / weeds • so weeds could grow out of control / compete with crop plants • genetically modified seeds could be more expensive to buy • reliance of farmers on GM seed companies • reduced gene pool • insects will evolve so crops are no longer resistant to insect pests	**(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. • Lines 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, logical connections made between elements in the context of the question. • Lines of reasoning are supported by sustained application of relevant evidence.

Level 1	1–2	• an advantage OR a disadvantage is identified • makes an attempt to explain the advantage / disadvantage
Level 2	3–4	• an advantage AND a disadvantage is identified **OR** • more than one advantage OR more than one disadvantage is identified • clearly explains one of the advantages OR clearly explains one of the disadvantages
Level 3	5–6	• more than one advantage AND more than one disadvantage is identified • clearly explains one of the advantages AND clearly explains one of the disadvantages

(Total for question 7 = 11 marks)

Question Number	Answer	Mark
8(a)(i)	arrow showing direction of travel is from left to right	**(1)** **AO1 1**

Question Number	Answer	Mark
8(a)(ii)	K – myelin (sheath) (1) L – axon (1)	**(2)** **AO1 1**

Question Number	Answer	Additional guidance	Mark
8(b)(i)	A description including **three** from: • the impulse (in the relay neurone) triggers the release of a chemical (1) • neurotransmitter (1) • (neurotransmitter) **diffuses** (1) • across the synapse (1) • new impulse triggered in {motor neurone / next neurone} (1)	accept chemical messenger accept across the gap	**(3)** **AO1 1**

Question Number	Answer	Additional guidance	Mark
8(b)(ii)	An explanation linking **two** from: • a process that occurs in response to danger (1) • which bypasses the {brain / parts of the brain} / is an {involuntary process / subconscious process} (1) • so there is a faster transmission (of electrical impulses) / faster response / allows a quick reaction (1) • to protect the body from harm (1)	accept goes to the spinal cord accept react without thinking accept examples of actions to protect the body e.g. pulling hand away	**(2)** **AO1 1**

Question Number	Answer	Mark
8(c)(i)	C 215 milliseconds **The only correct answer is C** ***A*** *is not correct because the median is not 200 milliseconds* ***B*** *is not correct because the median is not 210 milliseconds* ***D*** *is not correct because the median is not 225 milliseconds*	**(1)** **AO2 1**

Question Number	Answer	Additional guidance	Mark
8(c)(ii)	A description including **three** from: • measure their reaction time using red squares (1) • keep everything else the same (as using blue squares) (1) • repeat measurements (for each student) (1) • calculate a mean reaction time (1) • control other variables (1)	 accept see how fast they react with red squares accept examples of other variables e.g. tiredness / environment / health	**(3)** **AO3 3a**

(Total for question 8 = 12 marks)

Question Number	Answer	Mark
9(a)	World Health Organization / WHO	**(1)** **AO1 1**

Question Number	Answer	Additional guidance	Mark
9(b)(i)	An answer including **two** from: • (communicable) is passed from **person to person** (1) • (communicable) caused by {pathogens / example of pathogen} (1) • (communicable diseases) cannot be inherited (1)	accept reverse arguments for non-communicable diseases	**(2)** **AO1 1**

Question Number	Answer	Additional guidance	Mark
9(b)(ii)	An explanation including: • {cough / sneeze} into a tissue / avoid close contact with infected people / avoid cramped living conditions (1) • because spread of TB is airborne droplets / TB is spread through the air (1) **OR** • vaccination / immunisation (1) • to provide immunity / reduces the chance of a person getting infected (1) **OR** • treat infected people with **antibiotics** (1) • reduces the number of infected people (1)	 accept regular hand washing / wear a mask / isolate an infected person accept spread by coughing / breathing it {in / out} accept reduces the chances of contact with an infected person	**(2)** **AO2 1**

Question Number	Answer	Additional guidance	Mark
9(b)(iii)	• suitable heading for each column, with country in left column (1) • all data entered accurately (1)	accept country / region / number of people / people with TB countries can be entered in any order	**(2)** **AO2 1**

Question Number	**Indicative content**	Mark
9(c)*	**Physical barriers** • mucus is produced by cells that line some surfaces of the body • mucus traps pathogens • cilia are found on epithelial / lining cells • ciliated cells line the inside of the respiratory system • cilia move mucus across the surface of cells • cilia move pathogens out of the body / into the throat • skin is a thick covering over the body • skin has dead cells on its surface • skin is waterproof • pathogens are unable to enter the body through the skin • tears wash pathogens away • ear wax traps pathogens • nasal hairs trap pathogens • blood clots / scabs cover wounds to prevent the entry of pathogens **Chemical defences** • skin has glands that secrete lysozymes • lysozymes are enzymes found in tears, saliva and mucus • lysozymes kill some bacteria • hydrochloric acid is in the stomach • hydrochloric acid has a low pH which kills many pathogens • antibodies are present on mucus linings	**(6)** **AO1 1**

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.

Level 1	1–2	• a physical barrier **OR** a chemical defence is identified • a function of the physical barrier **OR** a chemical defence is described
Level 2	3–4	• more than one physical barrier **OR** more than one chemical defence is identified • functions of the physical barriers **OR** chemical defences are described **OR** • a physical barrier **AND** a chemical defence are identified • a function of the physical barrier **AND** a function of the chemical defence are described
Level 3	5–6	• more than one physical barrier **AND** more than one chemical defence are identified • functions of most of these physical barriers **AND** chemical defences are described

(Total for question 9 = 13 marks)

Question Number	Answer	Mark
10 (ai)	C aseptic **The only correct answer is C** ***A*** *is not correct because clinical is not a technique* ***B*** *is not correct because diagnostic does not prevent contamination* ***D*** *is not correct because lysogenic describes a stage of the virus lifecycle*	**(1)** **AO1 2**

Question Number	Answer	Additional Guidance	Mark
10 (a)(ii)	Any **two** from: • keep the lid on at all possible times (1) • use sterile equipment (1) • autoclave agar (1) • wear gloves / mask (1) • work close to a Bunsen (burner) (1)	 accept a method of sterilising equipment e.g. flaming loops / disinfect the working area accept use sterile growth medium	**(2)** **AO1 2**

Question Number	Answer	Additional Guidance	Mark
10 (b)(i)	radius 4.5 mm (1) calculation (3.14 x 4.5 x 4.5 / 3.14 x 4.5^2) = 63.585 (1) evaluation 63.6 (mm^2)	award full marks for correct answer with no working accept 63.617 ecf if diameter used 254.469 / 254.34 for one mark ecf if diameter used 254.5 / 254.3 (mm^2) to 1 DP for two marks	**(3)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
10 (b)(ii)	as a control / to compare	accept to see the effect without using toothpaste / to see the effect of just saliva	**(1)** **AO2 2**

Question Number	Answer	Additional Guidance	Mark
10 (b)(iii)	Any **two** from: • the test only uses one species of bacteria (1) • there are still bacteria on the agar plate (1) • the test is not done on teeth (1) • the conditions in the mouth are different (1) • toothpaste is only used on teeth for a short time (1)	 accept temperature in the mouth may not be 37°C accept the test only uses one type of toothpaste (1)	**(2)** **AO2 2**

Question Number	Answer	Additional Guidance	Mark
10(c)	An explanation linking: • the toothpastes were not harmful to the cells (1) • because the % of healthy cells after 2 hours was similar to saliva (1)	 accept toothpaste has the same effect as saliva / accept toothpaste 2 is less harmful to cells accept a description of the data values to illustrate a similar effect	**(2)** **AO3 2a +2b**

(Total for question 10 = 11 marks)