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Mark Scheme (Results)

November 2021

Pearson Edexcel GCSE
In Combined Science (1SC0) Paper 1BH

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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	Additional guidance	Mark
1(a)(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
1(a)(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
1(b)(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
1(b)(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 1 = 9 marks)

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

Question Number	Answer	Additional guidance	Mark
2(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
2(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
2(b)(iii)	• suitable heading for each column, with country in the 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	Answer	Additional guidance	Mark
2(c)	An explanation linking the following: • HIV destroys white blood cells / HIV weakens the immune system (1) • so the body is unable to {destroy the TB pathogen / prevent the pathogen invading the body} (1)	 accept people with AIDS have fewer white blood cells accept unable to produce antibodies to TB ignore fight off the disease	**(2)** **AO1 1**

(Total for Question 2 = 9 marks)

Question Number	Answer	Mark
3(a)(i)	A metaphase anaphase **The only correct answer is A** ***B*** *is not correct because cell Q is not telophase* ***C*** *is not correct because cell R is not interphase* ***D*** *is not correct because cell R is not interphase*	**(1)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	A description including **two** from: • chromatids condense (1) • identical chromatids are joined (1) • nuclear membrane breaks down (1)	 accept chromosomes condense / coil up / become visible accept chromosomes join accept nucleus breaks down accept spindle fibres form (1)	**(2)** **AO1 1**

Question Number	Answer	Mark
3(a)(iii)	cytokinesis	**(1)** **AO1 1**

Question Number	Answer	Mark
3(a)(iv)	B 75 µm **The only correct answer is B** ***A*** *is not correct because 0.75 µm is 0.00075 mm* ***C*** *is not correct because 750 µm is 0.75mm* ***D*** *is not correct because 75 000 µm is 75 mm*	**(1)** **AO1 1**

Question Number	Answer	Additional Guidance	Mark
3(b)	An answer including: • use the x40 **objective** lens (1) and **one** from: • use the x10 **eye piece** lens (1) • use the focusing wheel (1)	 accept other combinations of x 400 lenses for two marks accept move the {stage / lens}	**(2)** **AO1 1**

Question Number	Answer	Additional Guidance	Mark
3(c)	An answer including **four** from: Benefits (maximum 2 marks): • stem cells can differentiate / become specialised (1) • replace (damage) cells (1) • reduce symptoms of arthritis (1) Risks (maximum 2 marks): • new cells do not function correctly (1) • stem cells continue to divide (1) • risk of side effects / symptoms worsen / rejecting cells (1)	accept can become {joint cells / any type of cell} accept repair damaged joints accept cell division could develop into cancer accept may have to take medication to prevent rejection / suppress immune system	**(4)** **AO2 1**

(Total marks for question 3 = 11 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	(8 x 4) = 32 (grams of alcohol) (1) 1.2 / 1.20 (x risk)	award full marks for the correct answer with no workings	**(2)** **AO3**

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	An answer including two from: • mutations in DNA (1) • cell division is uncontrolled (1) • leading to the formation of a tumour / growth / mass of cells (1)	accept change in the gene/cell mutates accept {rapid / continuous} cell division	**(2)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	Any **two** from: • wear gloves (1) • clean the area of skin where blood being removed (1) • cover the wound after (1) • use a sterile needle (1)	 accept wash hands / wear a mask accept disinfect / clean the wound ignore clean accept sit the person down (1) ignore references to removing the correct volume of blood	**(2)** **AO2 2**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	• heterozygous An explanation linking: • affected offspring must have inherited the recessive allele (1) • unaffected offspring must have inherited dominant allele (1)	accept carrier / dominant and recessive allele / Hh accept one offspring is homozygous recessive accept one / two offspring are homozygous dominant accept a **labelled** Punnett square for any mark point	**(3)** **AO3**

(Total for question 4 = 9 marks)

Question Number	Answer	Mark
5(a)(i)	C the volume of milk and the concentration of chymosin **The only correct answer is C** ***A*** *is not correct because time is being measured* ***B*** *is not correct because the temperature is being changed* ***D*** *is not correct because the temperature is being changed*	**(1)** **AO2 2**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	An explanation linking **two** from: • 40°C is the {optimum / closer to the optimum} / there is a faster **rate of reaction** (1) • because as temperature increases (kinetic) energy increases (1) • more chance of collision (between the chymosin and the milk protein) (1) • more enzyme-substrate complexes are formed (1)	accept the enzyme works faster	**(2)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
5(a)(iii)	An explanation linking: • time taken would be longer / the milk would not curdle (1) • because the enzyme is denatured / the active site has changed shape (1)	accept slow rate of reaction / a time greater than 75 seconds	**(2)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
5(a)(iv)	Any **one** from: • it is a control (1) • to confirm that the milk doesn't curdle at that temperature without chymosin (1) • allows for a comparison with the results (1)	accept to see the effect of not adding chymosin	**(1)** **AO2 2**

Question Number	Answer	Additional Guidance	Mark
5(a)(v)	Any **two** from: • use a smaller interval between the temperatures (1) • measure temperatures between the range of 35°C and 45°C (1) • controlling a variable not identified in the method (1) • keep the tubes at the required temperature after adding chymosin by using a water bath (1) • repeat the test at each temperature (1)	ignore a wider range of temperatures accept e.g. volume of milk / type of milk / enzyme concentration accept use a water bath to control temperature accept calculate a mean / identify anomalies	**(2)** **AO3b**

Question Number	Answer	Additional Guidance	Mark
5(b)	An explanation linking **three** from: • **plasmid** is cut with **restriction** enzymes/ chymosin gene is cut with a **restriction** enzyme (1) • sticky ends are complementary (1) • ligase is used to connect the chymosin gene and the plasmid (1) • recombinant plasmid is inserted back into the bacterial cell (1)	accept insert a plasmid with chymosin gene into the bacteria	**(3)** **AO2 1**

(Total for question 5 = 11 marks)

Question Number	Answer	Additional Guidance	Mark
6(a)	**Structure A** • the mitochondria {**release energy** / for respiration} (1) **Structure B** • {acrosome / contains enzymes} to digest the egg cell membrane (1)	reject produces / creates energy	**(2)** **AO1 1**

Question Number	Answer	Additional Guidance	Mark
6(b)	measurement 45 (mm) / 4.5 **cm** (1) calculation (45 ÷ 700) = 0.0643 (1) conversion into standard form and millimetres 6.43×10^{-2} / 6.4×10^{-2}	award full marks for the correct answer with no workings allow 44-46 (mm) allow ecf for incorrect measurement allow ecf for incorrect substitution accept answer to any number of decimal places	**(3)** **AO1 1**

Question Number	Indicative content	Mark
6 *(c)	**AO2 3 marks/AO3 3 marks** **Analysis of data** • the egg in the water has gained mass / water • the egg in the 5% salt has no mass change • the egg in the 10% salt has lost mass / water • mass increase is 7 g for the egg in water • mass increase is 0 g for 5% salt • the mass decrease is 2g for 10% salt • % mass change +9% / 0% / -3% **Water movement** • osmosis is the movement of water • across a partially permeable membrane • from a high concentration of water molecules to a low concentration of water molecules • 5% salt is an isotonic solution	**(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 analysis of the experimental data. • with reference to the movement of water.
Level 2	3–4	• an evaluation of the data including a calculation of mass gain or loss. • with reference to the direction of movement of the water for tap water or 10% salt.
Level 3	5–6	• a detailed evaluation of the data including a % mass change calculation. • with reference to the direction of movement of water by osmosis for tap water and 10% salt.

(Total for question 6 = 11 marks)

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