

Paper 1 B1H Mark Scheme

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---|------------|
| 1(a)(i) | <p>An answer that combines knowledge (1 mark) and understanding (1 mark) to provide a logical description:</p> <ul style="list-style-type: none"> • (scientists might look for) differences in the structural features of the fossil (1) • and <i>Ardipithecus ramidus</i> would be deeper in the rock layer than <i>Homo {habilis}/stone tools</i> (1) | e.g. <i>Ardipithecus ramidus</i> smaller cranial capacity | (2) |

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|-----------------|--|---|------------|
| 1(a)(ii) | <p>An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark):</p> <ul style="list-style-type: none"> • likely to be out-competed by <i>Homo erectus</i> (1) • {for resources essential for survival/due to the presence of a new selection pressure} (1) | accept: named resources accept: named selection pressure, e.g. climate change, environmental change, disease | (2) |

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|------------------|---|---------------------------------------|------------|
| 1(a)(iii) | <p>An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 marks):</p> <ul style="list-style-type: none"> • stone tool B because it is more {sophisticated/worked} (1) • and <i>Homo erectus</i> lived more recently than <i>Homo habilis</i> (1) | accept: data quoted from the timeline | (2) |

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|-----------------|---|------|
| 1(b) | <p>An answer that combines the following points of application of knowledge and understanding to provide a logical description:</p> <ul style="list-style-type: none"> genetic variation means that some plants will be tolerant of drought conditions and these can be selected (1) cross-pollinate these plants and grow the seeds under drought conditions (1) select offspring and repeat over several generations (1) | (3) |

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|-----------------|---|---|------|
| 2(a) | <ul style="list-style-type: none"> $830 \text{ mm} = 0.83 \text{ m}$ (1) $0.83/0.99 =$ $0.8383\dots = 0.84$ to two d.p. (1) <p>OR</p> <ul style="list-style-type: none"> $0.99 \text{ m} = 990 \text{ mm}$ (1) $830/990 = 0.8383\dots = 0.84$ to two d.p. (1) Answer must be given to two decimal places. | award full marks for correct numerical answer without working | (2) |

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|-----------------|--------|------|
| 2(b)(i) | B | (1) |

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|-----------------|---|------|
| 2(b)(ii) | <p>Any two of the following points:</p> <ul style="list-style-type: none"> similar BMI (1) same gender profile (1) similar amount (and type) of exercise (1) | (2) |

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|-----------------|--|------|
| 2(b)(iii) | <p>An answer that combines the following points to provide a plan:</p> <ul style="list-style-type: none"> weigh the 40 obese people (1) half follow the new diet and half keep their normal diet (1) after a fixed time period re-weigh the 40 people (1) | (3) |

| Question number | Answer | Mark |
|-----------------|--|------|
| 3(a)(i) | Any one variable from <ul style="list-style-type: none"> temperature amount of drying type of potato age of potato | (1) |

| Question number | Answer | Mark |
|-----------------|------------------------------------|------|
| 3(a)(ii) | to get an accurate reading of mass | (1) |

| Question number | Answer | Mark |
|-----------------|--|------|
| 3(a)(iii) | An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): any one identification point from: <ul style="list-style-type: none"> there is no change in mass at 0.3 mol dm^{-3} (check once drawn) (1) this is the isotonic salt concentration in the potato (1) Plus reasoning/justification <ul style="list-style-type: none"> because there is no net movement of water/no salt concentration gradient (1) | (2) |

| Question number | Answer | Mark |
|-----------------|---|------|
| 3(a)(iv) | <ul style="list-style-type: none"> Repeat the test using intermediate concentrations (between 0.2 and 0.4 mol dm^{-3}) | (1) |

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|-----------------|--------|------|
| 3(b) | B | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---|------|
| 3(c) | <ul style="list-style-type: none"> $68 \div 8000$ (1) 0.0085 (1) 8.5 (μm) (1) | award full marks for correct numerical answer without working | (3) |

| Question number | Answer | Mark |
|-----------------|--------|------|
| 4(a)(i) | B | (1) |

| Question number | Answer | Mark |
|-----------------|--------------|------|
| 4(a)(ii) | TACGTACATGGC | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|--|------|
| 4(a)(iii) | <ul style="list-style-type: none"> 3.33×10^{-10} equals 0.33 nm (1) $0.33 \times 250 = 82.5$ (nm) (1) | maximum one mark if no conversion to nm award full marks for correct numerical answer without working | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|--|------|
| 4(b)(i) | <ul style="list-style-type: none"> heterozygous | accept alleles showing heterozygous genotype | (1) |

| Question number | Answer | Mark | | | | | | | | | |
|-----------------|--|------|---|---|---|----|----|---|----|----|-----|
| 4(b)(ii) | <ul style="list-style-type: none"> correct Punnett square (1) <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">A</td> <td style="text-align: center;">a</td> </tr> <tr> <td style="text-align: center;">A</td> <td style="text-align: center;">AA</td> <td style="text-align: center;">Aa</td> </tr> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">Aa</td> <td style="text-align: center;">aa</td> </tr> </table> <ul style="list-style-type: none"> 75% normal fur pigmentation (1) | | A | a | A | AA | Aa | a | Aa | aa | (2) |
| | A | a | | | | | | | | | |
| A | AA | Aa | | | | | | | | | |
| a | Aa | aa | | | | | | | | | |

| Question number | Answer | Mark |
|-----------------|---|------|
| 4(c) | An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): <ul style="list-style-type: none"> both parents must be heterozygous for the recessive allele (1) so the offspring must inherit the recessive allele from each parent (1) | (2) |

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|-----------------|--|------------|
| 5(a)(i) | <p>An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark):</p> <ul style="list-style-type: none"> • fatty acids are formed when the lipids are broken down by lipase (1) • and fatty acids are acidic (so the pH decreases) (1) | (2) |

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|-----------------|---|------------|
| 5(a)(ii) | <p>An answer that combines up to a maximum of two points to provide a logical description:</p> <ul style="list-style-type: none"> • as the temperature increases from 20 °C to 37 °C the rate of lipase activity increases (from 0.2 to 0.8) (1) • the rate of lipase activity is optimal at 37 °C (1) • above 37°C the rate of lipase activity decreases (from 0.8 to 0.1) (1) | (2) |

| Question number | Answer | Mark |
|------------------|---|------------|
| 5(a)(iii) | <p>An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark):</p> <ul style="list-style-type: none"> • an increase in temperature above 40 °C causes changes in the shape of the active site of the enzyme (1) • therefore the enzyme becomes denatured and no longer functions (1) | (2) |

| Question number | Answer | Additional guidance | Mark |
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| 5(b)(i) | <ul style="list-style-type: none"> • mean= $588/5 = 117.6$ (1) • rate = $1 \div 117.6$ (1) • 0.0085 (1) | <p>award full marks for correct numerical answer without working</p> <p>accept $1000/t$ accept $10/t$</p> | (3) |

| Question number | Answer | Mark |
|-----------------|--|------------|
| 5(b)(ii) | <p>Any one variable from:</p> <ul style="list-style-type: none"> • concentration of the enzyme • volume of enzyme solution • volume of starch solution • pH of the solutions | (1) |

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| 5(c) | An explanation that makes reference to: identification – knowledge (1 mark) and reasoning /justification – knowledge (1 mark): <ul style="list-style-type: none"> the active site of an enzyme has a specific shape because of the order of the amino acids (1) the substrate must have a shape which is complementary to the active site (1) | (2) |

| Question number | Answer | Mark |
|-----------------|---|------------|
| 6(a) | An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (2 marks): <ul style="list-style-type: none"> penicillin prevents the bacteria from dividing as they cannot make a new cell wall (1) because humans cells do not have a cell wall (1) they are unaffected by penicillin (1) | (3) |

| Question number | Answer | Mark |
|-----------------|---|------------|
| 6(b) | An answer that combines knowledge (2 marks) and understanding (2 marks) to provide a logical description: <ul style="list-style-type: none"> use restriction enzymes to remove the gene and cut the plasmid (1) use of ligase to join DNA molecules together (1) cut the gene from the genome of the fungus and extract a plasmid from the bacteria (1) insert the recombinant plasmid back into the bacteria (1) | (4) |

| Question number | Indicative content | Mark |
|-----------------|---|------------|
| *6(c) | <p>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.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p style="text-align: center;">AO1 (6 marks)</p> <ul style="list-style-type: none"> • bacteria reproduce rapidly generating a large population • there is variation among a bacterial population • some bacteria develop a resistance to antibiotics through mutation • antibiotic treatment exerts a selection pressure • bacteria resistant to antibiotics survive • antibiotic resistance inherited • non-resistant bacteria do not survive • levels of antibiotic resistance in a population of bacteria increase | (6) |

| Level | Mark | Descriptor |
|---------|------|---|
| | 0 | No rewardable material. |
| Level 1 | 1–2 | <ul style="list-style-type: none"> • Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1) |
| Level 2 | 3–4 | <ul style="list-style-type: none"> • Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1) |
| Level 3 | 5–6 | <ul style="list-style-type: none"> • Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure that is clear, coherent and logical. (AO1) |

