

Paper 1 Foundation

| Question number | Answer | Mark | | | | | | | | | | | | |
|-----------------|--|------|-----|--|--|---|---|---|----|----|---|----|----|------------|
| 1(a) | <p>A completed Punnett square, including:</p> <ul style="list-style-type: none"> offspring alleles correct (1) <div style="text-align: center; margin: 10px 0;"> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td colspan="2" style="text-align: center;">man</td> </tr> <tr> <td></td> <td style="text-align: center;">B</td> <td style="text-align: center;">B</td> </tr> <tr> <td style="text-align: center;">b</td> <td style="text-align: center;">Bb</td> <td style="text-align: center;">Bb</td> </tr> <tr> <td style="text-align: center;">b</td> <td style="text-align: center;">Bb</td> <td style="text-align: center;">Bb</td> </tr> </table> </div> <p style="margin-left: 100px;">woman</p> <ul style="list-style-type: none"> phenotype of child: brown eyes (1) | | man | | | B | B | b | Bb | Bb | b | Bb | Bb | (2) |
| | man | | | | | | | | | | | | | |
| | B | B | | | | | | | | | | | | |
| b | Bb | Bb | | | | | | | | | | | | |
| b | Bb | Bb | | | | | | | | | | | | |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|--|------------|
| 1(b)(i) | <ul style="list-style-type: none"> All four columns correct (tally and total) (2) One or two correct columns (1) | blue: 9 brown: 14 green: 3 hazel: 4 | (2) |

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|-----------------|---|------------|
| 1(b)(ii) | Could be displayed as a bar chart/pie chart | (1) |

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|-----------------|--------|------------|
| 1(c)(i) | C | (1) |

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|-----------------|---|-------------------------------|------------|
| 1(c)(ii) | Any one from: <ul style="list-style-type: none"> mutation in the base sequence (1) different base sequence (1) different sequence length (1) | different amino acid sequence | (1) |

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|-----------------|------------------------------|------------|
| 1(d)(i) | To remove insoluble material | (1) |

| Question number | Answer | Mark |
|-----------------|--------|------------|
| 1(d)(ii) | D | (1) |

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|-----------------|--------|------|
| 2(a) | A | (1) |

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|-----------------|---|------|
| 2(b)(i) | 2009 bar plotted at 4800 and 2010 bar plotted at 4100 | (1) |

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|-----------------|--|--|------|
| 2(b)(ii) | An answer that combines points of interpretation/evaluation to provide a logical description: <ul style="list-style-type: none"> • overall trend increases until 2009 (1) • decrease in the number of cases in 2010/correct manipulation of the data (1) | e.g. in 2010 it decreased by 700 cases (1) | (2) |

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|-----------------|--|------|
| 2(b)(iii) | An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): <ul style="list-style-type: none"> • Chlamydia and Gonorrhoea are STI infections spread by the same mechanism (1) • individuals aren't using a barrier contraception method (1) | (2) |

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| 2(c) | An explanation that combines identification – knowledge (1 mark) and reasoning/justification – understanding (1 mark): <ul style="list-style-type: none"> • HIV destroys {white blood cells/cells of the immune system} (1) • therefore a reduced immune response makes the individual more susceptible to other communicable diseases (1) | (2) |

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|-----------------|---|------|
| 3(a) | <ul style="list-style-type: none"> • Benedict's (1) • brick red (1) <p>Answers must be in the correct order</p> | (2) |

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|-----------------|--------|------|
| 3(b)(i) | A | (1) |

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|-----------------|--|------------|
| 3(b)(ii) | An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): <ul style="list-style-type: none"> • milk does not change the mass of the enamel/milkshake reduces the mass of the enamel (1) • so therefore milk causes less tooth decay (1) | (2) |

| Question number | Answer | Mark |
|------------------|--|------------|
| 3(b)(iii) | Any two of the following points: <ul style="list-style-type: none"> • use real teeth (1) • clean the teeth (1) • expose the teeth for shorter time periods repeatedly (1) | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|------------------------------|------------|
| 3(b)(iv) | Any one from: <ul style="list-style-type: none"> • energy content • fat content • vitamin and mineral content • caffeine level • alcohol content | accept other dietary factors | (1) |

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|-----------------|--------|------|
| 4(a)(i) | C | (1) |

| Question number | Answer | Mark |
|-----------------|---------------------------------------|------|
| 4(a)(ii) | <p>One mark for each correct line</p> | (2) |

| Question number | Answer | Mark |
|-----------------|--------|------|
| 4(b)(i) | C | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--------------|---|------|
| 4(b)(ii) | 5 (µm) ± 1.5 | approximately a third of the diameter of the cell | (1) |

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|-----------------|------------|------|
| 4(b)(iii) | 0.015 (mm) | (1) |

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|-----------------|--|------|
| 4(c) | An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (2 marks): <ul style="list-style-type: none"> • higher magnification can be used (1) • so the cilia are more visible (1) • and the sub-cellular structures are visible (1) | (3) |

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|-----------------|------------------|------|
| 5(a)(i) | 23 (chromosomes) | (1) |

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|-----------------|---|---|------|
| 5(a)(ii) | 6600 million ÷ 100 (1) × 35 = 2310 million (1) | award full marks for correct numerical answer without working | (2) |

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|-----------------|--|------|
| 5(b)(i) | An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): <ul style="list-style-type: none"> • one cell produces two daughter cells for every division by mitosis (1) • two cell division steps produces four cells (1) | (2) |

| Question number | Answer | Mark |
|-----------------|--------|------|
| 5(b)(ii) | C | (1) |

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|-----------------|--|------|
| 5(c)(i) | An answer that combines knowledge (1 mark) and understanding (2 marks) to provide a logical description: <ul style="list-style-type: none"> • place the slide on the stage of the microscope and look through the eyepiece lens (1) Plus two from: <ul style="list-style-type: none"> • turning the focusing wheel/knob will obtain a clear image (when looking through the eyepiece lens) (1) • start by using the lowest objective lens magnification (1) • increase the magnification of the objective lens and refocus (1) | (3) |

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| (c)(ii) | Use a stain (1) | (1) |

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|-----------------|--------|------|
| 6(a)(i) | D | (1) |

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|-----------------|---|------|
| 6(a)(ii) | An answer that combines the following points of understanding to provide a logical description: <ul style="list-style-type: none"> (the conjunctiva)forms a physical barrier between the inside of the eye and the environment (1) and the lysozyme on the conjunctiva kills micro-organisms that enter the eye (1) | (2) |

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|-----------------|---|------|
| 6(b)(i) | An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): <ul style="list-style-type: none"> occurrence of cataracts increases with age (1) manipulation of the data, e.g. doubles between 45–59 and > 60 (1) | (2) |

| Question number | Answer | Mark |
|-----------------|--|------|
| 6(b)(ii) | $\frac{80}{256} \times 100 = 31\%$ (1) 45–59 category (1) | (2) |

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|-----------------|---|------|
| 6(c) | An answer that combines knowledge (1 mark) and understanding (1 mark) to provide a logical description: <ul style="list-style-type: none"> information is transmitted as an electrical signal (1) and the signal travels down a sensory neurone from the receptor to the brain/signal travels along the optic nerve (1) | (2) |

| Question number | Answer | Mark |
|-----------------|--|------|
| 7(a)(i) | <ul style="list-style-type: none"> 4.6 million – 4.4 million (1) 0.2 million years/200 000 years (1) | (2) |

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|-----------------|---|---|------|
| 7(a)(ii) | <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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| 7(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"> • 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) | <p>accept: named resources accept: named selection pressure, e.g. climate change, environmental change, disease</p> | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------------------------|------|
| 7(a)(iv) | <p>An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark):</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) |

| Question number | Answer | Mark |
|-----------------|--|------|
| 7(b) | An answer that combines the following points of application of knowledge and understanding to provide a logical description: <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) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---|------|
| 8(a)(i) | <ul style="list-style-type: none"> radius 10 mm \pm 1 mm (1) area = πr^2 (1) answer 314 (mm²) (1) <p>answer must be to 3 significant figures</p> | <p>if radius outside range but area calculated max 2 marks</p> <p>award full marks for correct numerical answer without working</p> | (3) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|------------------|---------------------|------|
| 8(a)(ii) | antiseptic 1 (1) | ecf from (a)(i) | (1) |

| Question number | Answer | Mark |
|-----------------|--|------|
| 8(a)(iii) | Any two of the following points: <ul style="list-style-type: none"> volume of antiseptic (1) incubation temperature (1) same type of agar (1) amount of bacteria (1) | (2) |

| Question number | Answer | Mark |
|-----------------|---|------|
| 8(b)(i) | An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): <ul style="list-style-type: none"> the Bunsen burner flame kills all microorganisms on the loop (1) so only the desired bacteria are transferred to the loop/no unwanted microorganisms spread to the agar plate (1) | (2) |

| Question number | Answer | Mark |
|-----------------|--|------|
| 8(b)(ii) | Any one from: <ul style="list-style-type: none"> keep the lids on the agar plates after growth (1) use agar sterilised in an autoclave first (1) work close to a Bunsen flame to create an uplift (1) | (1) |

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|-----------------|---|------------|
| 8(c) | An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): <ul style="list-style-type: none"> • prevents damage to the plant (1) • because the chemicals produced by garlic kills pathogens/pests (1) | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---|------------|
| 9(a) | <ul style="list-style-type: none"> • 830 mm = 0.83 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 m = 990 mm (1) • $830/990 = 0.8383\dots = 0.84$ to two d.p. (1) <p>Answer must be given to 2 decimal places</p> | award full marks for correct numerical answer without working | (2) |

| Question number | Answer | Mark |
|-----------------|--|------------|
| 9(b)(i) | Any two of the following points: <ul style="list-style-type: none"> • similar BMI (1) • same gender profile (1) • similar amount (and type) of exercise (1) | (2) |

| Question number | Answer | Mark |
|-----------------|---|------------|
| 9(b)(ii) | An answer that combines the following points to provide a plan: <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 | Indicative content | Mark |
|-----------------|--|------------|
| *9(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;">A02 (3 marks) and A03 (3 marks)</p> <p>A03: Interpretation and evaluation from the graph</p> <ul style="list-style-type: none"> • the trend is downwards • women are less likely to smoke than men • the trend for men is decreasing more steeply than for women • the decreasing trend in smoking should lead to a decrease in the occurrence of cardiovascular disease • the decrease of cardiovascular disease in men would be greater than in women <p>A02: Link between reducing smoking and cardiovascular disease:</p> <ul style="list-style-type: none"> • less damage to alveoli so reduced effect on surface area of lungs • less fatty deposits build up in arteries so less chance of a heart attack or stroke • effect of nicotine raising heart rate and blood pressure is reduced • the risk of blood clotting is reduced so lower chance of heart attack or stroke | (6) |

| Level | Mark | Descriptor |
|---------|------|---|
| | 0 | No awardable content |
| Level 1 | 1–2 | <ul style="list-style-type: none"> • Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3) • 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. (AO2) |
| Level 2 | 3–4 | <ul style="list-style-type: none"> • Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3) • 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. (AO2) |
| Level 3 | 5–6 | <ul style="list-style-type: none"> • Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3) • 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. (AO2) |

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| 10(a) | <p>An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark):</p> <ul style="list-style-type: none"> • Mendel crossed homozygous tall and homozygous short pea plants and produced all tall offspring (1) • therefore all the offspring had a heterozygous genotype, with one tall and one short allele showing that the tall allele is dominant (1) | (2) |

| Question number | Indicative content | Mark |
|-----------------|--|------------|
| *10(b) | <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;">AO2 (6 marks)</p> <ul style="list-style-type: none"> • cross the brown fruit fly and black fruit fly • identify the phenotype of the offspring • all the phenotype will be brown body • remove the parent flies • cross brown offspring • identify the phenotypes of the 2nd generation offspring • $\frac{1}{4}$ will be black body and $\frac{3}{4}$ will be brown body • the results would show the same ratio as Mendel's pea plant crosses | (6) |

| Level | Mark | Descriptor |
|---------|------|--|
| | 0 | No awardable content |
| Level 1 | 1–2 | <ul style="list-style-type: none"> • The explanation attempts to link and apply knowledge and understanding of scientific enquiry, techniques and procedures, flawed or simplistic connections made between elements in the context of the question. (AO2) • Lines of reasoning are unsupported or unclear. (AO2) |
| Level 2 | 3–4 | <ul style="list-style-type: none"> • The explanation is mostly supported through linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, some logical connections made between elements in the context of the question. (AO2) • Lines of reasoning mostly supported through the application of relevant evidence. (AO2) |
| Level 3 | 5–6 | <ul style="list-style-type: none"> • The explanation is supported throughout by linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, logical connections made between elements in the context of the question. (AO2) • Lines of reasoning are supported by sustained application of relevant evidence. (AO2) |

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| 10(c)(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"> • asexual reproduction is a rapid reproduction technique allowing the production of more plants • as there is no requirement for cross pollination/higher crop yield/increased profit) | (2) |

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|------------------|--|------------|
| 10(c)(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"> • introduces variation into the population • which allows for natural selection of fitter plants/increased chance of the population surviving | (2) |

