# Mark Scheme
# (Results)

## Summer 2019

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.

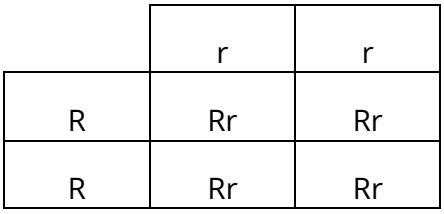
Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of 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 |

| S.S Question | Answer | Mark |
|---|---|---|
| 1(a)(i) | sexual | (1)<br>AO1 |

| Question number | Answer | Mark |
|---|---|---|
| 1(a)(ii) | B there is variation in the offspring<br>**1aii The only correct answer is B**<br>***A*** *is not correct because the offspring are different*<br>***C*** *is not correct because fertilisation occurs*<br>***D*** *is not correct because the offspring do not grow faster* | (1)<br>AO1 |

| Question number | Answer | | Mark |
|---|---|---|---|
| 1(b)(i) |  <br><br>Correct offspring (1) | Accept rR | (1)<br>AO2 |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **1(b)(ii)** | 100% (1) | accept correct percentage from incorrect Punnett square in 1bi. | **(1)**<br>AO2 |

| Question number | Answer | Mark |
|---|---|---|
| **1(b)(iii)** | D Gregor Mendel<br>**1biii The only correct answer is D**<br>***A*** *is not correct because Charles Darwin did not discover the basis of genetic inheritance*<br>***B*** *is not correct because Alfred Wallace did not discover the basis of genetic inheritance*<br>***C*** *is not correct because Louis Leakey did not discover the basis of genetic inheritance* | **(1)**<br>AO1 |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **1(c)** | Any two from:<br>• Inherit A from one parent (1)<br>• Inherit B from the other parent (1)<br>• ($I^A$ and $I^B$) are codominant (1) | accept inherit A from mother / father<br>accept inherit B from father / mother | **(2)**<br>AO1(1) |

**(Total for Question 1 = 7 marks)**

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2(a)(i)** | An answer including:<br>• (the root tip) contains {meristem / dividing} cells (1)<br>• for growth (1) | reject meiosis | **(2)**<br>AO1 1 |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2(a)(ii)** | An answer combining:<br>• switch the lamp on<br>• start with the lowest objective lens / look through the **eyepiece** lens (1)<br>• use the (focusing) wheel to obtain a clear image (1) | accept adjust the mirror<br>accept start with x4 / x10 objective lens | **(2)**<br>AO1 2 |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2(a)(iii)** | use a stain / named stain | accept dye / iodine | **(1)**<br>AO3 3b |

| Question number | Answer | Mark |
|---|---|---|
| **2(b)(i)** | C anaphase<br>**2bi The only correct answer is C**<br>***A*** *is not correct because the chromosomes are arranged differently in prophase*<br>***B*** *is not correct because the chromosomes are arranged differently in metaphase*<br>***D*** *is not correct because the chromosomes are arranged differently in telophase* | **(1)**<br>A<br>O<br>1 |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2(b)(ii)** | A description including:<br>• spindle (fibres) (1)<br>• are pulling the chromosomes (1)<br>• to either side of the cell / poles (1) | accept chromatids | **(3)**<br>AO 1.1 |

**(Total for Question 2 = 9 marks)**

| Question number | Answer | Mark |
|---|---|---|
| 3(a)(i) | C sexual intercourse<br>**3ai The only correct answer is C**<br>***A*** *is not correct because insect vectors do not transmit Chlamydia*<br>***B*** *is not correct because Chlamydia is not transmitted by sneezing*<br>***D*** *is not correct because Chlamydia is not transmitted by contaminated food* | **(1)**<br>AO1 1 |

| Question number | Answer | Mark |
|---|---|---|
| 3(a)(ii) | A bacterium<br>**3aii The only correct answer is A**<br>***B*** *is not correct because Chlamydia is not caused by a fungus*<br>***C*** *is not correct because Chlamydia is not caused by a protist*<br>***D*** *is not correct because Chlamydia is not caused by a virus* | **(1)**<br>AO1 1 |

| Question number | Answer | Mark |
|---|---|---|
| 3(b)(i) | An answer that links the following:<br>• number of cases increases (1)<br>• and **then** decreases (1)<br>• correct reference to data from graph (1) | **(2)**<br>AO3 1a b |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **3(b)(ii)** | graph reading 1 800 (1) | | **(1)**<br>AO1 1 |
| **3(b)(iii)** | 64 000 000 ÷ 100 000 = 640 (1)<br>(640 x 1 800 =) 1 152 000 (cases) | award full marks for correct answer with no working<br>allow ecf from 2bii | **(2)** |

**(Total for Question 3 = 7 marks)**

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(a)** | An answer linking:<br>• waxy cuticle / (physical) barrier (1)<br>• to prevent entry to pathogens (1) | accept waxy layer / waterproof surface | **(2)**<br>AO1(1) |

| Question number | Answer | Mark |
|---|---|---|
| **4(b)(i)** | A aseptic technique<br><br>**4bi The only correct answer is A**<br><br>***B*** *is not correct because the technique shown is not cloning*<br>***C*** *is not correct because the technique shown is not genetic engineering*<br>***D*** *is not correct because the technique shown is not selective breeding* | **(1)**<br>AO2(2) |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(b)(ii)** | An answer that links the following:<br>• Bunsen burner creates {a convection current/uplift} (1)<br>• prevents microorganisms in the air falling onto the agar plate / contamination (1)<br><br>OR<br><br>• to sterilise the loop / spreader (1)<br><br>• to prevent transfer of unwanted microorganisms / contamination (1) | accept kill bacteria on the loop / spreader /metal wire | **(2)**<br>AO2(2) |

| Question number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(c)(i)** | substitution<br>3.14 x 12 x 12 (1)<br><br>452.16 | 2 marks for correct answer without any working<br>accept π x $12^2$ / 3.14 x $12^2$ /<br>3.14 x 144<br><br>accept any answer between 452 and 452.4 | **(2)**<br>AO1(2) |

| Question number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(c)(ii)** | Any two from:<br>• species / type of bacteria (on both plates) (1)<br>• volume of chemical (1)<br>• concentration of chemical (1)<br>• (incubation) temperature (1)<br>• (incubation) time (1)<br>• nutrient agar (1)<br>• size of filter disc (1) | accept strength of chemicals | **(2)**<br>AO1(2) |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(d)** | An answer that links the following:<br>• kills insects /pests / pathogens (which feed on the crops) (1)<br>• less damage to the crops / increased crop yield (1)<br>• no need to use insecticides / pesticides (1) | accept fungicides | **(2)**<br>AO1(1) |

**(Total for Question 4 = 11 marks)**

| Question number | C.S. Question | Answer | Additional guidance | Mark |
|---|---|---|---|---|
| **5(a)(i)** | **3(a)(i)** | An answer including:<br>• reference to enzyme activity (1)<br>• (the enzyme activity) increases from pH 5.8 to pH 8 (1)<br>• optimum (activity) at pH 8 (1)<br>• (enzyme activity) decreases between pH 8 and pH 9.8 (1) | accept a range of pH 5.6 to 6 for pH 5.8<br>accept activity peaks at pH 8<br>accept reference to range of pH 9.6 to 10 for pH9.8 | **(4)**<br>**expert**<br>AO3 1a b |

| Question number | C.S. Question | Answer | Additional guidance | Mark |
|---|---|---|---|---|
| **5(a)(ii)** | **3(a)(ii)** | (pH) 2 | accept (pH) two / 2 pH | **(1)**<br>AO3 1a |

| Question number | Answer | Mark |
|---|---|---|
| **5(a)(iii)** | Two from:<br>• conditions in the stomach are pH 2 / acidic / low pH (1)<br>• (The stomach secretes) hydrochloric acid (1) | **(2)**<br>AO1 |

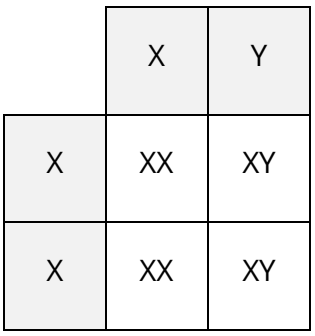
| Question number | Answer | Mark |
|---|---|---|
| **5(b)** | B denatured<br><br>**5b The only correct answer is B**<br><br>***A*** *is not correct because the enzyme is not specific when it changes shape*<br><br>***C*** *is not correct because the enzyme is not digested when it changes shape*<br><br>***D*** *is not correct because the enzyme is not dead when it changes shape* | **(1)**<br><br>AO1 (1) |

| Question number | C.S. Question | Answer | Mark |
|---|---|---|---|
| **5(c)** | **3(c)** | amino acids | **(1)**<br><br>AO1 1 |

**(Total for Question 5 = 9 marks)**

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(a)(i)** | Any two from:<br>• this karyogram contains pairs of chromosomes / 46 chromosomes (1)<br>• gametes only have 23 chromosome / chromosomes are not in pairs (1)<br>• because it has an X and a Y chromosome (1) | accept diploid<br>accept haploid | **(2)**<br>AO2 |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(a)(ii)** | male | accept boy / man<br>accept other valid responses | **(1)**<br>AO3 2a 2b |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(a)(iii)** |  | 1 mark for gametes<br>1 mark for correct offspring genotypes<br>allow ecf for correct genotypes in Punnett square from incorrect male and female gametes | **(2)**<br>grad<br>AO2 |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(a)(iv)** | 0.5 / 50% / ½ / 1 in 2 / | accept 2/4<br>/ 2 in 4<br>50 : 50 is a ratio, not a probability and should score 0 | **(1)**<br>AO2 |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(b)(i)** | acrosome | Reject achromosome / chromosome / head | **(1)**<br>AO1 (1) |

| Question number | Answer | Mark |
|---|---|---|
| **6(b) (ii)** | Any three from:<br>• (middle section) contains mitochondria (1)<br>• so has **more** mitochondria (in middle piece of sperm B) (1)<br>• (sperm B can) release more energy / has a faster rate of respiration (1)<br>• (sperm B) swims faster / greater distance (1) | **(3)**<br>AO2 1 |

**(Total for Question 6 = 10 marks)**

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(a)** | amylase (1) | accept carbohydrase | **(1)**<br>1.12 AO1 |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(b)(i)** | starch is present / iodine reacts with starch (1) | accept starch hadn't reacted / hadn't been broken down (by liquids from mouth and stomach) | **(1)**<br>1.12 AO1 |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(b)(ii)** | An answer linking three from:<br>• in test tube 1 starch has been broken down (1)<br>• in test tube 2 starch has not been broken down (1)<br>• because amylase is present in the mouth / no amylase in the stomach (1) | Accept reverse argument for both marking points in test tube two<br>accept starch is still present in tube 2<br>accept carbohydrase | **(3)**<br>A03 2a+2b |

| Question number | Indicative content | Mark |
|---|---|---|
| **7(c)*** | **AO3**<br><br>**Using the equipment**<br><br>• add water to the boiling tube<br>• place food/named food on mounted needle<br>• take the starting temperature of the **water**<br>• ignite / burn the food<br>• take the temperature of the water when the food stops burning /record the highest temperature of the water<br>• repeat the test using the other food<br><br>**AO2**<br><br>**Controlling variables**<br><br>• mass of food measured with a balance<br>• volume of water measured with a measuring cylinder<br>• starting temperature of water measured with a thermometer<br>• distance of food from boiling tube measured with a ruler<br>• burning time measured with a stopwatch<br>• external temperature/draughts prevented by placing a screen around the apparatus | AO3 3a + AO2 2<br><br>**(6)** |

| Level | Mark | Descriptor |
|---|---|---|
| | 0 | • No awardable content |
| 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.<br>• Lines of reasoning are unsupported or unclear. (AO2) |
| 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.<br>• Lines of reasoning mostly supported through the application of relevant evidence. (AO2) |
| 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.<br>• Lines of reasoning are supported by sustained application of relevant evidence. (AO2) |

| Level | Mark | Additional Guidance | General additional guidance<br><br>The detail and workability of the method drives the level. The information about variables and how to control them determines the mark within the level |
|---|---|---|---|
| | 0 | No rewardable material. | |
| Level 1 | 1–2 | A simple plan including at least one aspect of using the equipment (AO3)<br><br>A reference to at least one variable (AO2) | <u>Possible candidate responses</u><br><br>Burn the food under the tube. Keep the mass of food the same. |
| Level 2 | 3–4 | A plan including more than one aspect of using the equipment (AO3)<br><br>A reference to two or more variables (AO2)<br><br>OR<br><br>A reference to one variable and how it is controlled (AO2) | <u>Possible candidate responses</u><br>Put water in the boiling tube. Stick food onto mounted needle and burn it under the tube. Keep the mass of food and the volume of water the same.<br><br>Stick the food on the mounted needle. Measure the temperature of the water at the start, then burn the food. Measure the temperature of the water at the end. Keep the mass of food the same by weighing it on a balance. |
| Level 3 | 5–6 | A detailed, workable plan including several aspects of using the equipment (AO3)<br><br>A reference to at least two variables and an explanation of how to control at least one variable (AO2) | <u>Possible candidate responses</u><br><br>Put water in the boiling tube and measure it's temperature. Stick the food on the mounted needle, light it and hold it under the tube. When the food burns out measure the temperature again. Keep the distance from the food to the tube the same by measuring it with a ruler. Repeat with the second food, using the same volume of water that has been measured with a measuring cylinder. |

| Question number | Answer | Mark |
|---|---|---|
| **8(a)(i)** | A each pair of bases is joined by hydrogen bonds<br><br>**8ai The only correct answer is A**<br><br>***B*** *is not correct because phosphate groups are not joined by hydrogen bonds*<br><br>***C*** *is not correct because nucleotides consist of a sugar, a phosphor group and a base*<br><br>***D*** *is not correct because bases are not joined to phosphate molecules* | **(1)**<br><br>AO1(1) |

| Question number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **8(a)(ii)** | An answer that combines points of interpretation/evaluation to provide a logical description:<br><br>• amount of C and G is equal/amount of A and T is equal<br>• A pairs with T and C pairs with G | | **(2)**<br><br>AO3(1a+1b) |

| S.S. number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **8(b)** | division<br>0.0062 ÷ 2 / 6.2 ÷ 2 (1)<br><br>**OR**<br><br>unit conversion<br>0.0031 x 1000 / 0.0062 x 1000 (1)<br><br>3.1 (picograms) | award full marks for correct answer with no working<br><br>accept 6.2/ 0.0031 for 1 mark with no working | **(2)**<br>AO2(1) |

| Question number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **8(c)(i)** | to precipitate the DNA | accept so the DNA is visible / so the DNA is not soluble (in ethanol) / | AO1 (2)<br>**(1)** |

| Question number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **8(c)(ii)** | Any two from:<br>• mass of fruit (1)<br>• volume of buffer (1)<br>• crushing method /crushing time / crushed evenly (1)<br>• volume of ethanol (1)<br>• temperature (1)<br>• pH /same buffer solution (1) | accept amount of fruit / number of fruit cells /size of fruit<br>ignore amount of buffer<br>accept idea of incubation time<br>ignore amount of ethanol<br>accept fully filtered (1)<br>accept same concentration of ethanol (1) | **(2)**<br>A02 (2) |

| Question number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **8(c)(iii)** | Any one from:<br><br>• to obtain more data (1)<br>• to identify anomalies (1)<br>• see if the results are {the same / reliable/correct} (1)<br>• to calculate a {mean/average} (1) | accept to be sure their {results are valid / conclusion is valid} (1)<br><br>ignore accuracy/precision | **(1)**<br><br>AO2(2) |

| Question number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **8(d)** | Any three from:<br>• mitosis produces 2 cells and meiosis produces 4 cells (1)<br>• mitosis produces **genetically** identical cells and meiosis produces **genetically** different cells (1)<br>• mitosis produces diploid cells and meiosis produces haploid cells (1)<br>• mitosis produces body cells and meiosis produces {gametes /sex cells} (1) | accept offspring for cells<br>mitosis is involved in asexual reproduction and meiosis is involved in sexual reproduction (1) | AO1 1<br>**(3)** |

**(Total for question 8 = 12 marks)**

| Question number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **9(a)** | An explanation linking three of the following:<br>• they are immune (to *Clostridium tetani*) (1)<br>• because the vaccination contained an antigen / bacteria have antigens (1)<br>• **memory lymphocytes** (1)<br>• leading to the production of antibodies (1)<br>• leading to a **secondary** (immune) response (1) | accept idea of inactive/dead bacteria in the vaccine<br>accept bacteria killed {faster/ quicker/ quickly} | AO2(1)<br>**(3)** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **9(b)** | An explanation linking four of the following:<br><br>• people do not finish their course (of Colistin) (1)<br><br>• natural selection /evolution (occurs) (1)<br><br>• some bacteria have a mutation/ (genetic) variation (1)<br><br>• (these) resistant bacteria survive /resistant bacteria reproduce (1) | <br><br>accept overuse / repeated exposure (to the antibiotic)<br><br>accept they have evolved<br><br>accept some bacteria have a {**gene/allele**} for resistance<br><br>accept the non-resistant bacteria die / the fittest bacteria survive<br><br>ignore immune bacteria | **AO2 1**<br><br>**(4)** |

| Question number | Indicative content | Mark |
|---|---|---|
| 9(c)* | **Indicative content**<br><br>**AO2 (6 marks)**<br><br>**Indicative content**<br><br>**Area 1 - Age of tools**<br><br>• Younger rock layers towards top / older rock layers lower down<br>• C is older than B which is older than A<br>• Tools can be compared with other fossils from known time period<br>• Rocks can be dated, e.g. radiometric dating<br><br>**Area 2 - Quality of tools**<br><br>• A is the most sophisticated / most finely worked / more specialised / more refined / more symmetrical<br>• B shows some evidence of being worked / is rough<br>• C most basic / most simple / less sophisticated / unworked<br><br>**Area 3 – Skills and intelligence**<br><br>• tools show evidence of greater human manipulation / greater skill (between C and A)<br>• higher intelligence in more recent (species of) humans | **(6)**<br><br>AO2 1 |

**(Total for Question 9 = 13 marks)**

| Level | Mark | Descriptor |
|---|---|---|
| | 0 | • No awardable content |
| 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.<br>• Lines of reasoning are unsupported or unclear. (AO2) |
| 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.<br>• Lines of reasoning mostly supported through the application of relevant evidence. (AO2) |
| 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.<br>• Lines of reasoning are supported by sustained application of relevant evidence. (AO2) |

| Level | Mark | Additional Guidance | General additional guidance –<br><br>The level is determined by the number of areas covered within the response.<br><br>The mark within the band is determined by the presence of **linkage** between areas. |
|---|---|---|---|
| | 0 | No rewardable material. | |
| Level 1 | 1–2 | A simple observation **with** a brief explanation from one of the three areas of indicative content. | <u>Possible candidate responses</u><br><br>The deeper the rock the older it is.<br><br>Tool B is older than tool A. Tool C is just a rock but tool B has been made.<br><br>Tool C is older than B/A because it is found in deeper rock. |
| Level 2 | 3–4 | A simple explanation from at least two areas of indicative content. | <u>Possible candidate responses</u><br><br>Tool B is older than tool A. Tool C is older than tool B. Tool B has been shaped by a more intelligent human.<br><br>Tool C is older than tool B and tool A is more sophisticated than tool B showing that the brain of the human who made tool A is more developed. |
| Level 3 | 5–6 | <u>Additional guidance</u><br><br>A detailed explanation linking ideas from all three areas of indicative content. | <u>Possible candidate responses</u><br><br>Tool C is older than tool B which is older than tool A. Older rocks are found further down. The person who made / used tool A was more intelligent.<br><br>Tool A was found in younger rock because it is higher up in the cliff. Tool A is more sophisticated which suggests the person who made it is more intelligent than the person who made tool A or B.<br>Production of tool A suggests more skilled / intelligent humans when compared with tools B and C which were found in deeper rocks. |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **10(a)(i)** | (292 + 301 + 297) = 890 (1)<br><br>(890÷3) 296.7 (1)<br><br>given to 3 s.f. (1)<br><br>297 | full marks for correct answer with no working<br><br>ecf from mp1<br><br>allow 296.67 or answers correct to any number of decimal places for 2 marks including the dot to show recurring numbers<br><br>ecf from mp2<br><br>accept 296 for 2 marks<br><br>award 1 mark for 296.6/ 296.66 | **(3)**<br><br>AO2 |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **10(a)(ii)** | Any one from:<br><br>• as age increases focusing distance increases /ORA (1)<br><br>• as age increases people {become more long-sighted / cannot see objects close up clearly} / ORA (1)<br><br>• different people of the same age have different focusing distances (1) | accept a conclusion that links age group to a focus distance<br><br>ignore cannot see objects in the distance | **(1)**<br><br>AO3 2a |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **10(a)(iii)** | Any two from:<br>• use more people /repeat the test (with more people) (1)<br>• use more ages (1)<br>• repeat the test for each person (1)<br>• controlling a variable in the people selected (1)<br>• reference to no other eye defect / health issues (1)<br>• controlling {external environment / test used} (1) | accept named variable e.g. sex<br>ignore defects in distance vision<br>accept named factors e.g. light levels / same book / same font | **(2)**<br>AO3/3b |

| Question number | Answer | Mark |
|---|---|---|
| **10(b)** | C cones<br>**4b. The only correct answer is C**<br>***A*** *is not correct because the iris controls the size of the pupil*<br>***B*** *is not correct because the lens focuses the light rays onto the retina*<br>***D*** *is not correct because the cornea refracts light* | **(1)**<br>AO1 (1) |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **10(c)(i)** | An answer including:<br><br>• light rays {refracted / bent} {at the cornea /by the lens} (1)<br><br>• (light rays) {converge / focus} on the retina / focal point is on the retina (1) | reject for references to light going through/refracted by the iris<br><br>accept (refracted) onto the retina<br><br>accept rods / cones for retina<br><br>ignore back of the eye/optic nerve | **(2)**<br><br>AO1 |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **10(c)(ii)** | An explanation linking two from:<br><br>• lens X which is a {diverging/concave lens} (1)<br><br>• {lens X/a diverging lens/a concave lens} will {diverge/spread} out the light rays (1) | accept a {concave /diverging} lens<br><br>reject lens Y | **(2)**<br><br>AO2 |

**(Total for Question 10 = 11 marks)**

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