

## **GCSE**

### **Biology B**

Unit **B732/02**: Modules B4, B5, B6 (Higher Tier)

General Certificate of Secondary Education

### **Mark Scheme for June 2017**

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations used in scoris

| Annotation                                                                        | Meaning                               |
|-----------------------------------------------------------------------------------|---------------------------------------|
|  | correct response                      |
|  | incorrect response                    |
| <b>BOD</b>                                                                        | benefit of the doubt                  |
| <b>NBOD</b>                                                                       | benefit of the doubt <b>not</b> given |
| <b>ECF</b>                                                                        | error carried forward                 |
|  | information omitted                   |
| <b>I</b>                                                                          | ignore                                |
| <b>R</b>                                                                          | reject                                |
| <b>CON</b>                                                                        | contradiction                         |

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

- / = alternative and acceptable answers for the same marking point
- (1) = separates marking points
- allow** = answers that can be accepted
- not** = answers which are not worthy of credit
- reject** = answers which are not worthy of credit
- ignore** = statements which are irrelevant
- ( ) = words which are not essential to gain credit
- = underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
- ecf = error carried forward
- AW = alternative wording
- ora = or reverse argument

| Question   | Answer                                                                                                                                                                                                                               | Marks    | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 a</b> | photosynthesis (1)                                                                                                                                                                                                                   | 1        | <b>allow</b> phonetic spelling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>b</b>   | Priestley (1)                                                                                                                                                                                                                        | 1        | <b>allow</b> answer ringed, underlined or ticked<br>more than one answer = 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>c</b>   | (oxygen levels) rises during the day as <b>more</b> (Sun) light / <b>more</b> photosynthesis (1)<br><br>(oxygen levels) decreases over night as <b>no</b> or <b>less</b> / (Sun) light / <b>no</b> or <b>less</b> photosynthesis (1) | 2        | <b>allow</b> more oxygen in early evening as <b>more</b> (Sun) light / <b>more</b> photosynthesis (during the day) (1)<br><br><b>allow</b> less oxygen in early morning as <b>no</b> or <b>less</b> (Sun) light / <b>no</b> or <b>less</b> photosynthesis (during the night) (1)<br><b>allow</b> (oxygen levels) decreases as it gets darker (1)<br><br><b>ignore</b> rate of photosynthesis is highest in early evening<br><b>ignore</b> references to water and carbon dioxide<br><b>ignore</b> references to respiration<br><br>if both changes are explained but with no direct link to time then = 1<br>e.g. (oxygen levels) rises <b>as more</b> photosynthesis then decreases as <b>no</b> photosynthesis (1) |
|            | <b>Total</b>                                                                                                                                                                                                                         | <b>5</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Question     | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Marks    | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 a          | <p><b>[Level 3]</b><br/>States the effects are due to osmosis<br/><b>AND</b><br/>Explain the results in terms of direction of movement<br/><b>AND</b><br/>uses the terms lysis and crenation correctly<br/>Quality of written communication does not impede communication of the science at this level.<br/>(5 – 6 marks)</p> <p><b>[Level 2]</b><br/>States the effects are due to osmosis<br/><b>and</b> attempts to explain the results in terms of direction of movement<br/><b>OR</b><br/>States the effects are due to osmosis<br/><b>and</b> uses the terms lysis <b>and</b> crenation correctly<br/><br/>Quality of written communication partly impedes communication of the science at this level.<br/>(3 – 4 marks)</p> <p><b>[Level 1]</b><br/>States the effects are due to osmosis.<br/><b>OR</b><br/>uses the terms lysis <b>or</b> crenation correctly<br/><br/>Quality of written communication impedes communication of the science at this level.<br/>(1 – 2 marks)</p> <p><b>[Level 0]</b><br/>Insufficient or irrelevant science. Answer not worthy of credit.<br/>(0marks)</p> | 6        | <p><b>This question is targeted at grades up to A*</b><br/><b>Indicative scientific points at that may be include:</b></p> <ul style="list-style-type: none"> <li>• effects are due to osmosis</li> <li>• at low concentrations / cells burst / liquid goes clear due to <b>lysis / haemolysis</b><br/><b>not turgid</b></li> <li>• high concentrations / cells shrivel / liquids remain cloudy due to <b>crenation</b><br/><b>not plasmolysis / flaccid</b></li> </ul> <p><b>direction of movement</b></p> <ul style="list-style-type: none"> <li>• at low concentrations / cells burst / liquid goes clear because water moves into cells when <b>salt</b> concentration of solution is <b>lower</b> (than <b>salt</b> concentration inside cells)<br/><b>or</b><br/>at low concentrations / cells burst / liquid goes clear because water moves into cells when <b>water</b> concentration of solution is <b>higher</b> ( than <b>water</b> concentration inside cells)<br/><b>or</b><br/>at low concentrations / cells burst / liquid goes clear because water moves into cells when solution is <b>hypotonic</b></li> <li>• at high concentrations / cells do not burst / liquid stays cloudy because water moves out of cells when <b>salt</b> concentration of solution is <b>higher</b> (than <b>salt</b> concentration inside cells)<br/><b>or</b><br/>at high concentrations / cells do not burst / liquid stays cloudy because water moves out of cells when <b>water</b> concentration of solution is <b>lower</b> (than <b>water</b> concentration inside cells)<br/><b>or</b><br/>at high concentrations / cells do not burst / liquid stays cloudy because water moves out of cells when solution is <b>hypertonic</b></li> </ul> <p><b>allow</b> reverse arguments for each direction of movement<br/><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p> |
| <b>Total</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>6</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                        | Marks | Guidance                   |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------|
| 3 a      | 37 (2)<br><br><b>But if incorrect</b><br><br>$\frac{17 \times 11}{5}$ or $\frac{187}{5}$<br>(1)                                                                                                                                                                                                                                                                                                                               | 2     | allow 37.4 (1)             |
| b i      | <b>Any two from</b><br><br>(overall) decrease in population (1)<br><br>numbers remained steady for first 4 years / at start (1)<br><br>population is <b>starting</b> to fall in year 5 or at end /<br>idea that <b>largest</b> decrease is in year 5 or at end (1)                                                                                                                                                            | 2     |                            |
| b ii     | <b>Any one from:</b><br><br>limited set of results (1)<br><br>idea that there is only one set of data from each year (1)<br><br>need to sample at different times of the year /<br>population may vary over (a single) year (1)<br><br>need monitor for more years to see if trend continues (1)<br><br>idea that populations may change due to migration /<br>immigration / less birth / more death / effects of marking (1) | 1     | allow small sample size(1) |

|          |                                                                                                           |          |                                                                                                                                                                                                                                                                                     |
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| <b>c</b> | population is the (number) of one species or organism while community is all the species or organisms (1) | 1        | <b>allow</b> population is the (number) of newts while community is all the species or organisms (1)<br><br><b>allow</b> population is the (number) of one species or organism while community is the number of populations (1)<br><b>ignore</b> community is the number of animals |
|          | <b>Total</b>                                                                                              | <b>5</b> |                                                                                                                                                                                                                                                                                     |

| Question | Answer                                                                                                                                                                                                                                              | Marks | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 a      | <p>as air movement increases so does the rate of transpiration / ora(1)</p> <p>(rate increases) due to increase in diffusion (through the stomata) /ora (1)</p> <p>identifies valid reason for not increasing further (1)</p>                       | 3     | <p><b>allow</b> idea that increasing speed of fan increases transpiration rate / ora (1)</p> <p><b>allow</b> idea that increasing wind speed increases transpiration rate / ora (1)</p> <p><b>allow</b> as air movement increases so does the uptake of water /ora (1)</p> <p><b>ignore</b> movement of air bubble</p> <p><b>allow</b> (rate increases) due to increase in evaporation /ora(1)</p> <p><b>allow</b> idea that increasing wind speed decreases humidity/ora (1)</p> <p><b>allow</b> more or faster water loss from diffusion / evaporation (1)</p> <p>e.g. limited by number of stomata / temperature / humidity (1)</p> <p><b>allow</b> limited by another factor / no longer the limiting factor (1)</p> <p><b>ignore</b> stomata close</p> |
| b        | <p><b>Any two from:</b></p> <p>less stomata would reduce surface area (1).</p> <p>stomata are on lower surface so are protected from air movement /(direct) light / heat (1)</p> <p>stomata are <b>small</b> which reduces the surface area (1)</p> | 2     | <p><b>allow</b> stomata are on lower surface so are shaded(1)</p> <p><b>allow</b> stomata are on lower surface so less (direct)Sun (1)</p> <p><b>allow</b> other mechanisms for extra marking point</p> <p><b>increasing humidity</b> by having...</p> <p>rolled leaves with stomata on the inside /</p> <p>stomata surrounded by leaf hairs /</p> <p>stomata sunk in pits (1)</p> <p><b>ignore</b> waxy cuticle / spines instead of leaves and other ideas not linked to stomata</p>                                                                                                                                                                                                                                                                       |

|          | Total                                                                                                                                                                                                                       | 5     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question | Answer                                                                                                                                                                                                                      | Marks | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 5 a      | <p><b>advantage</b><br/>(better) control of mineral levels<br/>/ control of disease (1)</p> <p><b>disadvantage</b><br/><br/>lack of support for plant<br/><br/>/ idea that (inorganic) fertilisers need to be added (1)</p> | 2     | <p><b>allow answers linked to example in question</b><br/>e.g. can be grown in shade away from intense heat (1)<br/><b>allow</b> reduces competition (1)<br/><b>ignore</b> references to increased yield<br/><b>ignore</b> no soil needed<br/><b>ignore</b> nutrients / fertilisers</p> <p><b>allow</b> uses fertilisers (1)<br/><b>ignore</b> minerals added<br/><b>ignore</b> reference to pollution / pesticides</p> <p><b>ignore</b> references to cost unqualified<br/><b>but allow</b> expensive to buy / set up / run (1)</p> |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <b>b</b> | <p><b>Any two from:</b></p> <p>UK can afford to grow (more expensive) organic crops / Africa needs food grown cheaply (1)</p> <p>in Africa crops <b>more</b> likely to fail /<br/>in UK crops <b>less</b> likely to fail (1)</p> <p>high(er) demand for food in Africa (due to increased population) (1)</p> <p>idea that in Africa it is important to control the amount of water /<br/>UK control of water not as important(1)</p> <p>poor soil (conditions) in Africa / UK has better soil (condition) (1)</p> | 2        | <p><b>allow</b> in UK we can afford to import food / ora (1)</p> <p><b>allow</b> may get famines in Africa (1)<br/><b>ignore just</b> 'crops grow better in UK'<br/><b>ignore</b> plants in Africa die</p> <p><b>allow</b> there is a shortage of food in Africa (1)<br/><b>allow</b> more people to feed in Africa / less people to feed in UK(1)<br/><b>ignore</b> just Africa has a higher population</p> <p><b>ignore</b> just drought in Africa</p> <p><b>allow</b> soil in UK more fertile/ ora (1)<br/><b>allow</b> barren soil in Africa (1)<br/><b>ignore</b> dry soil</p> |
|          | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>4</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Question   | Answer                                                                                               | Marks | Guidance                                                                                             |
|------------|------------------------------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------------------------|
| <b>6 a</b> | <p><b>Any two from:</b></p> <p>less industrial disease / accidents (1)</p> <p>healthier diet (1)</p> | 2     | <p><b>allow</b> better health and safety (1)</p> <p><b>allow</b> better diet / balanced diets(1)</p> |

|               |                                                                                                                                                        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | <p>healthier life style (1)</p> <p>better medical treatments / healthcare / cures for disease (1)</p> <p>better housing / sanitation / hygiene (1)</p> |          | <p><b>allow</b> more exercise / less smoking (1)</p> <p><b>allow</b> better lifestyle (1)</p> <p><b>ignore</b> less pollution</p> <p><b>ignore</b> better standard of living</p> <p><b>ignore</b> just better technology</p>                                                                                                                                                                                                     |
| <b>b (i)</b>  | <p>life expectancy continues to rise (1)</p> <p>life expectancy for males and females will become the same / converge / get closer together (1)</p>    | 2        | <p><b>allow</b> people will live longer (1)</p> <p><b>allow</b> answers that match their lines drawn<br/>e.g. life expectancy for females remains higher than males(1)</p> <p><b>allow</b> marks for age quoted for 2030 that matches line drawn<br/>e.g. women may live till they are 90 (1)<br/>e.g. women may live till they are 90 and males 86 (2)<br/>e.g. people will live longer women may live till they are 90 (2)</p> |
| <b>b (ii)</b> | <p>idea that line of the graphs may not rise at the same gradient</p> <p>/ other factors could stop the age reaching the predicted level (1)</p>       | 1        | <p>e.g. slope of graph may change / rise more steeply / level off (1)</p> <p>e.g. trend may change (1)</p> <p><b>ignore</b> no evidence / no data</p> <p>e.g. such as <b>new</b> diseases / epidemics/ outbreak of disease / increased resistance of bacteria to antibiotic / increased pollution levels / natural disasters (1)</p> <p><b>ignore</b> illnesses can occur / the future is uncertain</p>                          |
|               | <b>Total</b>                                                                                                                                           | <b>5</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Question | Answer                                                                                                                                                                                                                                                                                 | Marks | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7 a      | gills work in water / gills do not work in air (1)<br><br><b>But</b><br><br>gills work by forcing water over gill <b>filaments</b> (2)                                                                                                                                                 | 2     | <b>allow</b> (gills) take oxygen out of water / (gills) can't take oxygen from air(1)<br><b>allow</b> gills stick together out of water (1)<br><b>allow</b> need water for gas exchange / gas exchange does not take place in air (1)<br><br><b>ignore</b> fish breathe through gills<br><b>ignore</b> just 'won't get any oxygen'                                                                                                                               |
| b        | <b>any two from:</b><br>causes inflammation (1)<br><br>causes scarring (1)<br><br>idea that gas exchange is less efficient (1)                                                                                                                                                         | 2     | <b>ignore</b> damages the lungs<br><br><b>allow</b> less gas exchange (1)<br><b>allow</b> reduces surface area for gas exchange (1)<br><b>allow</b> less oxygen taken in (1)<br><b>allow</b> example of a symptom e.g. shortness of breath / hard to breathe / breathlessness / wheezing / fatigue / chest pains / (lung) cancer / lower lung capacity (1)<br><br><b>ignore</b> the idea that the asbestos blocks the gases<br><b>ignore</b> references to mucus |
| c i      | <b>Any three but max two from either argument</b><br><br><b>reasons against using NHS</b><br><br>idea that damage to lungs is a result of life style (not illness) (1)<br><br>money used could be better spent on saving lives of those that are ill through no fault of their own (1) | 3     | <b>ignore</b> just money could be spent on other patients                                                                                                                                                                                                                                                                                                                                                                                                        |

|             |                                                                                                                                                                                                                                                                                                                                                                                                                   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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|             | <p>takes up hospital space / resources from people that are ill through no fault of their own (1)</p> <p>idea that the money could be spread around to save more lives (1)</p> <p>idea that NHS cannot afford to treat everyone (1)</p> <p><b>reasons for using NHS</b></p> <p>idea that the saving of a life is more important than the cost (1)</p> <p>idea that the lung damage may not be their fault (1)</p> |          | <p><b>allow</b> idea that it would take money from other services(1)</p> <p><b>ignore</b> just 'cost too much' / might bankrupt the NHS</p> <p><b>ignore</b> idea that it could promote smoking as it is an easy fix</p> <p><b>allow</b> idea that anyone who needed the treatment would get it / would be available to all / available to those that can't afford it (1)</p> <p><b>ignore</b> just 'it is free' / saves lives</p> <p>e.g. damage to lung may be caused by passive smoking (1)</p> |
| <b>c ii</b> | <p>to separate the oxygenated and deoxygenated blood (1)</p>                                                                                                                                                                                                                                                                                                                                                      | 1        | <p><b>allow</b> one side or two chambers have oxygenated and other side or two chambers deoxygenated blood (1)</p> <p><b>allow</b> idea that one side pumps blood to lungs and other side pumps blood to body (1)</p> <p><b>ignore</b> just to pump blood to lungs and body</p> <p><b>allow</b> idea of blood being at a high(er) pressure (1)</p>                                                                                                                                                 |
|             | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                      | <b>8</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Question | Answer                                                                                                                                                                                                                                                               | Marks | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8        | <p><b>[Level 3]</b></p> <p>Makes more than two comparison between the two graphs</p> <p><b>AND</b></p> <p>explains in detail how the pill prevents pregnancy</p> <p>Quality of written communication does not impede communication of the science at this level.</p> | 6     | <p><b>This question is targeted at grades up to A*</b></p> <p><b>Indicative scientific points that may be included</b></p> <p><b>detailed explanation</b></p> <ul style="list-style-type: none"> <li>the pill prevents the <b>release</b> of <b>FSH</b></li> <li><b>FSH</b> needed for egg development / no egg development as no or low levels of <b>FSH</b></li> <li>the pill <b>or</b> lack of <b>FSH</b> prevents the <b>release</b> of <b>LH</b></li> </ul> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>(5 – 6 marks)</p> <p><b>[Level 2]</b><br/>Makes at least two comparison between the two graphs<br/><b>AND</b><br/>attempts to explains in detail how the pill prevents pregnancy<br/>Quality of written communication partly impedes communication of the science at this level.</p> <p>(3 – 4 marks)</p> <p><b>[Level 1]</b><br/>Makes at least one comparisons between the two graphs <b>and</b> one simple explanation of how pill works<br/><b>OR</b><br/>Attempts to explains in detail how the pill prevents pregnancy<br/>Quality of written communication impedes communication of the science at this level.<br/>(1 – 2 marks)</p> <p><b>[Level 0]</b><br/>Insufficient or irrelevant science. Answer not worthy of credit.<br/>(0marks)</p> |          | <ul style="list-style-type: none"> <li>• <b>LH</b> controls <b>ovulation</b> / no <b>ovulation</b> as no or low levels of <b>LH</b></li> <li>• idea that <b>oestrogen</b> peak needed for ovulation / as there is no <b>oestrogen</b> peak there is no ovulation</li> <li>• <b>ignore</b> reference to uterus wall</li> </ul> <p><b>if no other explanation for FSH and LH identified then allow</b><br/>FSH and LH are needed for egg development and ovulation as a single detailed explanation</p> <p><b>simple explanation</b></p> <ul style="list-style-type: none"> <li>• pill mimics pregnancy</li> <li>• pill prevents ovulation / no egg develops/ no egg released</li> </ul> <p><b>comparing the graphs</b></p> <ul style="list-style-type: none"> <li>• <b>FSH</b> constant in graph <b>B</b> / peaks in <b>A</b></li> <li>• <b>FSH</b> levels low or no <b>FSH</b> in graph <b>B</b> / high in graph <b>A</b></li> <li>• <b>LH</b> constant in graph <b>B</b> / peaks in <b>A</b></li> <li>• <b>LH</b> levels low or no <b>LH</b> in graph <b>B</b> / high in graph <b>A</b></li> <li>• <b>progesterone</b> rises remains high then falls in <b>B</b> / fluctuates in <b>A</b><br/>/ <b>progesterone</b> level in <b>B</b> constant / varies in <b>A</b><br/>/ <b>progesterone</b> levels high in graph <b>B</b> / low in <b>A</b></li> <li>• <b>oestrogen</b> constant in <b>B</b> / fluctuates in <b>A</b><br/>/ <b>oestrogen</b> no peak in <b>B</b> / has (two) peaks in <b>A</b><br/><b>allow</b> pill for graph <b>B</b> and 'normal' for graph <b>A</b></li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p> |
|  | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>6</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| Question    | Answer                                                                                                                                                                  | Marks    | Guidance                                                                                                                                                                                                                                                         |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>9 a</b>  | skeleton starts out as mostly cartilage (1)<br><br>bone is ossified / ossification takes place (1)<br><br>idea that calcium (and phosphorus) is added (to the bone) (1) | 3        | <b>allow</b> cartilage turns to bone / cartilage replaced by bone (1)<br><b>ignore</b> skeleton is 'all cartilage' at start<br><br><b>allow</b> increase in bone mass is because bones contains more calcium (and phosphorus)(1)                                 |
| <b>b i</b>  | 33.3% (2)<br><br>But if incorrect<br><br>$\frac{1200-800}{1200} \times 100$ or $\frac{400}{1200} \times 100$ (1)                                                        | 2        | <b>allow</b> 33 / 33.33 / 33.3 recurring (2)<br><b>allow</b> 33.4 (1)                                                                                                                                                                                            |
| <b>b ii</b> | Females,<br>as percentage difference is higher /<br>bone mass decrease is quicker /<br>bone mass decrease is more (1)                                                   | 1        | <b>allow ecf from 9bi</b><br><b>allow</b> Females, bone deteriorates quicker in females (1)<br><b>allow</b> Females, more bone mass deterioration in females (1)<br><b>allow</b> Females, bigger change in bone mass (1)<br><b>ignore</b> just the values quoted |
|             | <b>Total</b>                                                                                                                                                            | <b>6</b> |                                                                                                                                                                                                                                                                  |

| Question | Answer                                                                                                                                                                                                                                                       | Marks    | Guidance                                                                                                                                                                                                                                                                                                     |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 a     | suspect 2<br><b>AND</b><br>idea that the pattern is the same (1)                                                                                                                                                                                             | 1        | <b>allow</b> bands / stripes / lines / fingerprint / sequences match (1)<br><br><b>ignore</b> idea that the pattern is similar<br><b>ignore</b> just the same DNA as at the crime scene                                                                                                                      |
| b        | <b>Any three from:</b><br><br>extraction of DNA (from sample) (1)<br><br>fragmentation (of DNA) using <b>restriction</b> enzymes (1)<br><br>separation using electrophoresis (1)<br><br>using a radioactive probe / fluorescence (so pattern is visible) (1) | 3        | <b>allow</b> DNA is taken from hair / blood / saliva (1)<br><b>allow</b> gene is extracted (from sample) (1)<br><br><b>allow</b> (DNA) is cut into (smaller) lengths using <b>restriction</b> enzymes (1)<br><b>not</b> ligase cuts the DNA<br><br><b>allow</b> a correct description of electrophoresis (1) |
|          | <b>Total</b>                                                                                                                                                                                                                                                 | <b>4</b> |                                                                                                                                                                                                                                                                                                              |

| Question | Answer                                                                                                                                                                                                                                                                                                                   | Marks    | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 a     | <p><b>Any two from</b></p> <p>damage to sewage systems / water supplies (1)</p> <p>damage to electrical supplies causing rapid food decay (1)</p> <p>idea of overcrowding (in camps) (1)</p> <p>idea of disruption to health services (1)</p>                                                                            | 2        | <p><b>allow</b> water becomes contaminated (1)</p> <p><b>allow</b> poor sanitation (1)</p>                                                                                                                                                                                                                                                                                                                                       |
| b        | <p><b>Any two from:</b></p> <p>make sure there is plenty of food available (1)</p> <p>(control) pH (1)</p> <p>remove (waste) products (1)</p>                                                                                                                                                                            | 2        | <p><b>ignore</b> temperature</p> <p><b>allow</b> control food availability (1)</p> <p><b>ignore</b> water / moisture</p> <p><b>allow</b> remove alcohol / toxins (that is produced) /(1)</p> <p><b>ignore</b> control levels of alcohol</p> <p><b>extra marking points</b></p> <p><b>allow</b> remove oxygen / maintain anaerobic conditions (1)</p> <p><b>allow</b> maintain aseptic conditions / prevent contamination (1)</p> |
| c        | <p><b>Any two from</b></p> <p>strain <b>B</b> produces alcohol faster / strain <b>B</b> produces more alcohol / ora (1)</p> <p>strain <b>A</b> is less tolerant (to alcohol) /ora (1)</p> <p>increases in alcohol levels result in a slowdown of production / fermentation rate slows as alcohol levels increase (1)</p> | 2        | <p><b>allow</b> faster fermentation for strain <b>B</b>/ora (1)</p> <p><b>ignore</b> references to specific gravity</p> <p><b>allow</b> strain <b>A</b> is less resistant (to alcohol) /ora (1)</p> <p><b>allow</b> yeast is killed in <b>higher</b> levels of alcohol (1)</p>                                                                                                                                                   |
|          | <b>Total</b>                                                                                                                                                                                                                                                                                                             | <b>6</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Question | Answer                                                                                                                                                                                                                                      | Marks    | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12       | <p><b>Any three from</b></p> <p>toxin concentration is higher in the whale /ora (1)</p> <p>idea that toxins are persistent / not broken down (1)</p> <p>bioaccumulation (1)</p> <p>(toxins) have a greater effect on the whale /ora (1)</p> | 3        | <p><b>allow</b> concentrations of toxins increase further up the food chain (1)</p> <p><b>allow</b> concentration builds up in whale (1)</p> <p><b>ignore</b> more toxins in the whale / whale consumes more toxins</p> <p><b>allow</b> body can't remove toxins (1)</p> <p><b>ignore</b> takes a long time to remove toxins</p> <p><b>allow</b> accumulation (1)</p> <p><b>allow</b> more harm to the whale / ora (1)</p> |
|          | <b>Total</b>                                                                                                                                                                                                                                | <b>3</b> |                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Question     | Answer                                                                                                                                               | Marks    | Guidance                                                                                                                                               |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13 a i       | 11.8 (2)<br>But if incorrect<br>$\frac{2200}{18689} \times 100$<br>(1)                                                                               | 2        | <b>accept</b> 12 / 11.7 / 11.77 / 11.77163 (1)                                                                                                         |
| a ii         | value for Brazil is higher / ora (1)<br><br><b>any one from:</b><br><br>Brazil may not have supply of oil (1)<br><br>Brazil grows a lot of sugar (1) | 2        | <b>allow</b> ecf<br><br><b>ignore</b> have not got any petrol<br><br><b>ignore</b> grow more crops                                                     |
| b            | (Oliver)<br><br>alcohol production is increasing(1)<br>deforestation is decreasing (1)                                                               | 2        | <b>If they choose Mia then no marks</b><br><br><b>allow</b> when alcohol production is at its <b>highest</b> deforestation is at its <b>lowest</b> (2) |
| <b>Total</b> |                                                                                                                                                      | <b>6</b> |                                                                                                                                                        |

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Marks    | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14       | <p><b>[Level 3]</b><br/>Identifies all three soils correctly with an explanation linked to data <b>AND</b> particle size for each.</p> <p>Quality of written communication does not impede communication of the science at this level for each.<br/>(5 – 6 marks)</p> <p><b>[Level 2]</b><br/>Identifies all three soils correctly with an explanation linked to water content <b>or</b> particle size.</p> <p>Quality of written communication partly impedes communication of the science at this level.<br/>(3 – 4 marks)</p> <p><b>[Level 1]</b><br/>Identifies at least one of the soils correctly with an explanation linked to water content <b>or</b> particle size.<br/><b>OR</b><br/>Identifies all three soils.<br/>Quality of written communication impedes communication of the science at this level.<br/>(1 – 2 marks)</p> <p><b>[Level 0]</b><br/>Insufficient or irrelevant science. Answer not worthy of credit.<br/>(0marks)</p> | 6        | <p><b>This question is targeted at grades up to A*</b></p> <p><b>Matches soil types:</b></p> <ul style="list-style-type: none"> <li>• A = sandy</li> <li>• B = clay</li> <li>• C= loam</li> </ul> <p><b>Indicative scientific points may be included include for explanations:</b></p> <p><b>Sandy soils</b></p> <ul style="list-style-type: none"> <li>• has <b>lowest</b> water content / <b>lowest change</b> in mass after <b>drying</b> / <b>highest</b> mass after <b>drying</b></li> <li>• large particle size so drains easier / more permeable</li> </ul> <p><b>Clay soils</b></p> <ul style="list-style-type: none"> <li>• has <b>highest</b> water content / <b>highest change</b> in mass after <b>drying</b> / <b>lowest</b> mass after <b>drying</b></li> <li>• small particle size so holds onto water / less permeable</li> </ul> <p><b>Loam soil</b></p> <ul style="list-style-type: none"> <li>• has the <b>highest</b> humus content / changes the <b>most</b> after <b>burning</b></li> <li>• mixed particle size</li> </ul> <p><b>Look for matches on table but answer lines take precedence</b></p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p> |
|          | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>6</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Question | Answer                                                                                                                                                              | Marks | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15 a i   | <p><b>any two from</b><br/> as body mass increases, brain mass increases /ORA (1)</p> <p>as body mass increases, <b>relative</b> brain mass decreases / ORA (1)</p> | 2     | <p><b>ignore</b> high or low must be comparative<br/> <b>ignore</b> references to 'larger'</p> <p>body mass and brain mass increases as <b>relative</b> brain mass decreases = 2</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| ii       | <p>(no)</p> <p>idea that brain mass is higher than expected (1)</p> <p>idea that <b>relative</b> brain mass is higher than expected (1)</p>                         | 2     | <p>if yes answer then award zero marks</p> <p><b>allow</b> have an abnormally high brain mass (1)<br/> <b>allow</b> comparison e.g. have a lower body mass than gorilla/elephant but higher brain mass (1)<br/> <b>allow</b> ratio of brain mass to body mass is higher (1)<br/> <b>allow</b> ratio of body mass to brain mass is lower (1)</p> <p><b>ignore</b> just 'humans have a high(er) brain mass'</p> <p><b>allow</b> have an abnormally high <b>relative</b> brain mass (1)<br/> <b>allow</b> comparison e.g. has a higher body mass than chimpanzee but higher <b>relative</b> brain mass (1)</p> <p><b>ignore</b> just 'humans have a high(er) <b>relative</b> brain mass'<br/> <b>ignore</b> just 'they don't fit the pattern'</p> |

|            |                                                                                                                                                                                                                     |   |                                                                                                                                                                                                                                                                                                                                       |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>b i</b> | as time goes on, brain volume increases /ORA (1)<br><br>idea of rapid increase about 2 million years ago (1)<br><br><b>BUT</b><br><br>as time goes on, brain volume increases at an increasing <b>rate</b> / AW (2) | 2 | <b>allow</b> humans evolve their brain volume increased (1)<br><b>ignore</b> the higher the years the lower the volume<br><br><b>allow</b> idea of rapid increase after Homo habilis (1)<br><br><b>allow</b> the brain volume increasing exponentially (over time) (2)                                                                |
| <b>ii</b>  | (Ben)<br><br>(Ann is wrong because) the graph <b>only</b> shows volume (1)<br><br><br><br>(Clare is wrong because) we have no evidence for the future (1)                                                           | 2 | <b>No marks if they choose Ann or Clare</b><br><br><b>allow</b> graph does not show how <b>brain</b> changes or develops / no evidence of ways <b>brain</b> changes or develops (1)<br><b>allow</b> graph shows change in volume <b>not</b> just 'changes' or development (1)<br><b>ignore</b> brain could have changed in other ways |

|   |                                                                                                                                                                           |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| c | <p>(no) the points are scattered (1)</p><br><p>(no) at any particular brain size there are people with a range of IQs / ora (1)</p><br><p>(yes) lots of anomalies (1)</p> | 2         | <p><b>allow</b> (no) as no pattern / no correlation (1)</p> <p><b>allow</b> (yes) there is a (slight) positive correlation (1)</p> <p><b>allow</b> (yes) the higher the brain size the higher the IQ / ora (1)</p><br><p><b>allow</b> (no) some people with small brains have higher IQ (than those with large brains) (1)</p> <p><b>allow</b> (no) some brains are larger but IQ isn't as high (as expected) (1)</p><br><p><b>allow</b> the higher the brain size the higher the IQ for large brain sizes only (2)</p> |
|   | <b>Total</b>                                                                                                                                                              | <b>10</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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