

**Biology B**

General Certificate of Secondary Education

Unit **B731/02**: Modules B1, B2, B3 (Higher Tier)

# **Mark Scheme for January 2012**

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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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For answers marked by levels of response:

- a. **Read through the whole answer from start to finish**
- b. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor
- c. **To determine the mark within the level**, consider the following:

| Descriptor                           | Award mark                   |
|--------------------------------------|------------------------------|
| A good match to the level descriptor | The higher mark in the level |
| Just matches the level descriptor    | The lower mark in the level  |

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

### Annotations

Annotations used in scoris

| Annotation                                                                          | Meaning                               |
|-------------------------------------------------------------------------------------|---------------------------------------|
|   | correct response                      |
|  | incorrect response                    |
|  | benefit of the doubt                  |
|  | benefit of the doubt <b>not</b> given |
|  | error carried forward                 |
|  | information omitted                   |
|  | ignore                                |

| Annotation | Meaning       |
|------------|---------------|
| <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                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | (a) | <p><b>any two from:</b></p> <p>could cause hypothermia / exposure / (1)</p> <p>could lead to frostbite / unconsciousness / death (1)</p> <p>could slow / stop enzymes working / chemical reactions (in body) (1)</p>                                                                                   | 2        | <p><b>allow</b> reverse arguments e.g. must stay warm so do not get hypothermia</p> <p><b>not</b> hyperthermia</p> <p><b>allow</b> (could cause) poor circulation</p> <p><b>ignore</b> stop body / organs working</p> <p><b>ignore</b> feel weak / shivering / pneumonia</p> <p><b>ignore</b> enzymes denaturing when cold</p>                                                                                 |
|          | (b) | idea that there is <b>less blood</b> near <b>skin</b> surface (so less heat loss) (1)                                                                                                                                                                                                                  | 1        | <p><b>allow</b> less heat loss by radiation (1)</p> <p><b>ignore</b> blood flows away from skin</p> <p><b>ignore</b> blood vessels constrict / narrow</p> <p><b>ignore</b> no blood near skin surface</p> <p><b>ignore</b> blood not flowing as close to the skin surface</p> <p><b>not</b> blood vessels move (further) away from skin / surface</p>                                                          |
|          | (c) | <p>lowers (blood) glucose / sugar levels</p> <p>OR</p> <p>removes <b>excess</b> glucose / sugar (from blood) (1)</p> <p>by converting glucose / sugar into <b>glycogen</b></p> <p>OR</p> <p>by storing (glucose / sugar) in the liver / muscles</p> <p>OR</p> <p>by increasing uptake by cells (1)</p> | 2        | <p><b>allow</b> keeps glucose / sugar levels low</p> <p><b>allow</b> stops glucose / sugar levels getting too high</p> <p><b>ignore</b> just 'removes sugar from blood'</p> <p><b>but</b> converts <b>excess</b> glucose / sugar to glycogen = (2)</p> <p><b>ignore</b> (glucose / sugar level falls) because glucose / sugar is broken down</p> <p><b>ignore</b> sends glucose / sugar to liver / muscles</p> |
|          |     | <b>Total</b>                                                                                                                                                                                                                                                                                           | <b>5</b> |                                                                                                                                                                                                                                                                                                                                                                                                                |

| Question     |     | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Marks    | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2            | (a) | <p><b>[Level 3]</b><br/>           Answer gives a correct explanation of how Deflex may reduce transmission across synapses in terms of its effect on (neuro)transmitters or receptors.<br/>           Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b><br/>           Answer indicates reduction of transmission across synapses OR reduced activity of (neuro)transmitters. Mechanism unclear.<br/>           Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b><br/>           Suggests that Deflex is a depressant or reduces transmission of impulses.<br/>           Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p><b>[Level 0]</b><br/>           Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p> | 6        | <p><b>This question is targeted at grades up to A*</b></p> <p><b>Indicative scientific points at level 3 may include:</b></p> <ul style="list-style-type: none"> <li>• Deflex binds with receptors in synapses</li> <li>• transmitter can no longer bind to receptors</li> <li>• binds with the neurotransmitter once released</li> <li>• breaks down the released neurotransmitter</li> </ul> <p><b>Indicative scientific points at level 2 may include:</b></p> <ul style="list-style-type: none"> <li>• Deflex works on synapses</li> <li>• Deflex reduces amount of transmitter substance</li> </ul> <p><b>Indicative scientific points at level 1 may include:</b></p> <ul style="list-style-type: none"> <li>• Deflex is a depressant</li> <li>• no impulse sent along second neurone</li> </ul> <p><b>ignore</b> Deflex is a sedative / sleeping tablet<br/> <b>ignore</b> Deflex affects / slows the nervous system</p> |
|              | (b) | <p>coffee contains a <b>stimulant</b> / caffeine is a stimulant / increases activity of the nervous system (1)</p> <p>so may have the opposite effect / keep you awake / alert (1)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2        | <p><b>allow</b> examples e.g increase brain activity / increase transmission across synapses<br/> <b>allow</b> speed up nerve impulses<br/> <b>ignore</b> makes it difficult to sleep<br/> <b>allow</b> caffeine / coffee inhibits Deflex (1) because it combines with it / stops it being absorbed (1)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Total</b> |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>8</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| Question |     |       | Answer                                                                                                                                                                                                                                                                                           | Marks    | Guidance                                                                                                                                                                                                                                                                                                                                           |
|----------|-----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3        | (a) |       | glycerol (1)                                                                                                                                                                                                                                                                                     | 1        | <b>allow</b> phonetic spelling                                                                                                                                                                                                                                                                                                                     |
|          | (b) |       | contain all the essential amino acids /<br>contain the amino acids the body cannot make (1)                                                                                                                                                                                                      | 1        | <b>ignore</b> of animal origin / come from meat                                                                                                                                                                                                                                                                                                    |
|          | (c) | (i)   | 26.2 (2)<br><br><b>BUT</b> $85 \div 3.24$ or $85 \div 1.8^2$ (1)                                                                                                                                                                                                                                 | 2        | <b>allow</b> 26 / 26.23 / 26.234568 (2)<br><br><b>but</b> 26.0 (incorrect rounding) max (1)                                                                                                                                                                                                                                                        |
|          |     | (ii)  | (yes)<br>his BMI is between 25-29.9 (1)                                                                                                                                                                                                                                                          | 1        | answer must include numbers from the box<br><b>allow</b> more than 25 <b>and</b> less than 30<br><b>allow</b> ecf from (i) e.g. if BMI = 32: no, because his BMI is over 30 (1)                                                                                                                                                                    |
|          |     | (iii) | (yes) (no mark)<br><br>idea that unhealthy means you have a disease (and not overweight) / ora (1)<br><br>idea that an England rugby player would need to be very fit (to be able to compete at that level) (1)<br><b>OR</b><br>idea that England rugby players have a lot of muscle not fat (1) | 2        | if no, then no marks at all<br><br>must have one idea about health-free from disease idea and one about fitness – ability to perform play rugby (at high level) <b>or</b> idea of muscle not fat<br><br>idea about fitness must relate to rugby players; idea about health need not<br><br><b>ignore</b> just 'rugby players have a lot of muscle' |
|          |     |       | <b>Total</b>                                                                                                                                                                                                                                                                                     | <b>7</b> |                                                                                                                                                                                                                                                                                                                                                    |

| Question |     | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Marks | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4        | (a) | <p>Only seedlings 1 and 2 are showing positive geotropism <input type="checkbox"/></p> <p>Only seedling 1 is showing positive phototropism. <input checked="" type="checkbox"/> (1)</p> <p>All the seedlings are responding to gravity <input checked="" type="checkbox"/> (1)</p> <p>Only seedling 3 is showing negative phototropism <input type="checkbox"/></p> <p>None of the seedlings are responding to light <input type="checkbox"/></p> <p>All of the seedlings are showing negative phototropism <input type="checkbox"/></p> | 2     | more than two ticks: deduct one mark for each incorrect answer                                                                                                                                                                                                                                                                                                                                                                                    |
|          | (b) | <p><b>any three from:</b></p> <p>(A - seedling 1 grows but seedling 2 does not:) because hormone is <b>made</b> in the tip (of seedling 1) (1)<br/>so no hormone (made) in seedling 2 (1)</p> <p>(B - seedling 1 bends but seedling 2 does not:) (more) hormone on dark side of seedling 1 / hormone moves to dark side (1)<br/>so hormone causes (more) <b>cell elongation</b> (on dark side) (1)</p> <p>(hormone is) auxin (1)</p>                                                                                                     | 3     | <p><b>to get maximum 3 marks they must have two linked ideas, i.e. at least two marks from either A or B, plus one other mark:</b></p> <p>e.g. no hormone is made in 2 because hormone is made in the tip and the hormone causes cell elongation (3)<br/><b>but</b> hormone made in the tip is auxin and it causes cell elongation (2)</p> <p><b>allow</b> hormone destroyed on light side</p> <p><b>ignore</b> just more growth on dark side</p> |
| Total    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5     |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Question |     |      | Answer                                                                                                                                                                                                                                                                                                       | Marks | Guidance                                                                                                                                                                                                                                                         |
|----------|-----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5        | (a) | (i)  | (more) tourism / generates income / more employment (1)                                                                                                                                                                                                                                                      | 1     | <b>allow</b> examples e.g. (more) safaris<br><b>ignore</b> (have more) ivory<br><b>ignore</b> uses of elephants (e.g. for transport / work)                                                                                                                      |
|          |     | (ii) | prevent or reduce poaching / hunting / killing (1)                                                                                                                                                                                                                                                           | 1     | <b>ignore</b> less elephants dying<br><b>ignore</b> less harm to elephants                                                                                                                                                                                       |
|          | (b) |      | <b>any two from</b><br>allows sun's rays / radiation / IR / heat pass through atmosphere (1)<br><br>(carbon dioxide) stops / reduces the (re-radiated) radiation / heat / IR passing out in to space (1)<br><br>because (carbon dioxide) reflects back the radiation / heat / IR (1)                         | 2     | <b>ignore</b> sunlight<br><b>ignore</b> UV<br><b>not</b> allows <b>more</b> radiation / IR / heat to enter atmosphere<br><br><b>allow</b> (carbon dioxide) traps heat (from Earth)<br><b>ignore</b> traps heat from sun<br><br><b>ignore</b> references to ozone |
|          | (c) | (i)  | <b>any two from</b><br>idea that acquired characteristics do not have a genetic basis / can not be passed on (1)<br><br>hair length is controlled by genes / DNA (1)<br><br>hair can not be grown longer by mammoths (when it's cold) (1)                                                                    | 2     | <b>allow</b> Lamarck's ideas do not have a genetic basis                                                                                                                                                                                                         |
|          |     | (ii) | (variation:) some animals were born with / have longer hair (than others) (1)<br><br>(competition:) those with longer hair (had an advantage and were) more likely to survive (1)<br><br>(inheritance:) they will reproduce and pass on the gene / long hair<br>OR pass on gene / long hair to offspring (1) | 3     | <b>allow</b> (some mammoths have) mutation for long hair<br><br><br><br><br><br><br><br><b>can allow generic natural selection statements with no reference to hair length up to max 2</b>                                                                       |
| Total    |     |      |                                                                                                                                                                                                                                                                                                              | 9     |                                                                                                                                                                                                                                                                  |

| Question |  |  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Marks    | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------|--|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6        |  |  | <p><b>[Level 3]</b><br/>Answer gives a complete explanation using all three ideas. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b><br/>Answer gives a clear explanation using at least two of the three ideas. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b><br/>Answer includes a simple explanation using one of the three ideas. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p><b>[Level 0]</b><br/>Insufficient or irrelevant science. Answer not worthy of credit.<br/>(0 marks)</p> | 6        | <p><b>This question is targeted at grades up to A*</b></p> <p><b>Indicative scientific points may include:</b></p> <ul style="list-style-type: none"> <li>Idea 1: Evolutionary relationships between organisms can be tested by using DNA analysis or by looking at similarities between multiple characteristics.</li> <li>Idea 2: Organisms can share similar characteristics due to evolutionary but also ecological reasons</li> <li>Idea 3: Members of a species can reproduce / produce fertile offspring.</li> </ul> |
|          |  |  | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>6</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Question |     |      | Answer                                                                                                                                                                                                                                                                                                                                     | Marks     | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------|-----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7        | (a) | (i)  | ticks are smaller than buffalos<br>OR<br>idea that many ticks (feed) on small number of buffalos (1)                                                                                                                                                                                                                                       | 1         | answer must refer to this example                                                                                                                                                                                                                                                                                                                                                                                               |
|          |     | (ii) | lives on / off / in a host / <b>living</b> organism (1)<br>causing it harm (1)                                                                                                                                                                                                                                                             | 2         | <b>ignore</b> feeding from it / kills it                                                                                                                                                                                                                                                                                                                                                                                        |
|          | (b) |      | (no / little benefit having or not having oxpeckers) as average (change in) number is the same for both groups (1)<br><br>reference to limitations of data: (difficult to reach a conclusion as) only three buffalos / variability of data (1)                                                                                             | 2         | <b>allow</b> (no / little benefit because overall) there is little / no difference in the (change in) numbers (of ticks)<br><b>allow</b> (no / little benefit because overall) both groups of buffalo have same (change in) number (of ticks)                                                                                                                                                                                   |
|          | (c) | (i)  | 52.9 (1)                                                                                                                                                                                                                                                                                                                                   | 1         | <b>allow</b> 52.88<br><b>allow</b> 53 but <b>not</b> 53.0                                                                                                                                                                                                                                                                                                                                                                       |
|          |     | (ii) | buffalo with oxpeckers have more wounds (in total / that do heal / that do not heal) (than buffalo without oxpeckers) / ora (1)<br><br>buffalo with oxpeckers have lower percentage of wounds that heal (than buffalo without oxpeckers) / ora (1)<br><br>birds might be causing the wounds / keeping them open / feeding on the blood (1) | 3         | <b>allow</b> ecf from (i)<br><b>allow</b> reverse arguments for with / without oxpeckers and wounds that heal / do not heal (1)<br><b>allow</b> proportion as alternative to percentage<br><br>additional marking points:<br><br><b>allow</b> more wounds heal than do not heal (regardless of whether have oxpeckers or not) (1)<br>because wounds (naturally) heal (1) (this mark is dependent on the previous marking point) |
|          | (d) |      | because they do not feed on the same thing / only one feeds on ticks / only one feeds on blood / because they do not live in the same area (1)                                                                                                                                                                                             | 1         | <b>answer must be specific to this example, e.g. ignore</b> have different roles<br><b>allow</b> only one is in a mutualistic relationship                                                                                                                                                                                                                                                                                      |
|          |     |      | <b>Total</b>                                                                                                                                                                                                                                                                                                                               | <b>10</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| Question |     |      | Answer                                                                                                                                                                                                                                                                                                                                                                                                 | Marks    | Guidance                                                                                                                                                                                                                                                                                                               |
|----------|-----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8        | (a) |      | 30 (1)                                                                                                                                                                                                                                                                                                                                                                                                 | 1        |                                                                                                                                                                                                                                                                                                                        |
|          | (b) |      | this is selective breeding / artificial selection (1)<br>which leads to inbreeding (1)<br>idea that lameness / diarrhoea are genetically controlled (1)                                                                                                                                                                                                                                                | 3        | <b>ignore</b> just lameness / diarrhoea are passed down<br><br>additional marking points:<br><b>allow</b> higher level response: reduced gene pool / reduction in variation / accumulation of harmful recessive characteristics (1) BUT there is no variation = 0                                                      |
|          | (c) | (i)  | (most) animal (cells) lose the ability to <b>differentiate</b> (at an early age)<br>OR<br>(many) plant (cells) retain the ability to differentiate (throughout their lives) (1)                                                                                                                                                                                                                        | 1        | <b>allow</b> plants retain stem cells but animals do not                                                                                                                                                                                                                                                               |
|          |     | (ii) | <b>any three from</b><br><br>other scientists can <b>build upon</b> their results (1)<br><br>so can develop ideas <b>quicker</b> (1)<br><br>other scientists can <b>repeat / test</b> the work (for validity) (1)<br><br>different teams have <b>different</b> skills / resources / ideas / approaches (1)<br><br>so that a broad <b>range of evidence</b> can be put together to develop the idea (1) | 3        | <b>allow</b> work continues even if some people are absent<br><b>allow</b> can share out work load<br><b>allow</b> can do more work<br><br><b>allow</b> can bounce ideas off each other<br><br><b>allow</b> able to get variety of results to solve a problem<br><b>allow</b> to gather more evidence to justify ideas |
|          |     |      | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                           | <b>8</b> |                                                                                                                                                                                                                                                                                                                        |

| Question |  |  | Answer                                                                                                                                  | Marks    | Guidance                                                                                                                              |
|----------|--|--|-----------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------|
| 9        |  |  | bacterial (1)<br><br><b>plus any one from</b><br>has no nucleus / animal and plant cells have a nucleus (1)<br><br>it has flagellum (1) | 2        | <b>if plant or animal then no marks</b><br><br><b>allow</b> has naked DNA / single chromosome / circular DNA<br><br><b>allow</b> tail |
|          |  |  | <b>Total</b>                                                                                                                            | <b>2</b> |                                                                                                                                       |

| Question |     |      | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Marks    | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------|-----|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10       | (a) | (i)  | mitosis (1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1        | <b>allow</b> phonetic spelling but important that “t” is in the middle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|          |     | (ii) | idea that there is the same (amount of) DNA / genetic material in each (new) cell after division (as before) (1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1        | <b>answer must refer to new cells produced after division</b><br><b>allow</b> makes a copy of chromosomes so there are two new copies, one for each cell<br><b>ignore</b> just to copy DNA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|          | (b) |      | <p><b>[Level 3]</b><br/>Comparison made between the two graphs WITH explanation in terms of collision rates OR in terms explanation of denaturing in terms of the shape of the active sites.<br/>Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b><br/>Comparison made between the two graphs with an explanation to include denaturing.<br/>Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b><br/>Comparison made between the two graphs: shape of graphs OR optimum temperatures OR when enzyme activity stops. No explanation of mechanisms.<br/>Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p><b>[Level 0]</b><br/>Insufficient or irrelevant science. Answer not worthy of credit.<br/><br/>(0 marks)</p> | 6        | <p><b>This question is targeted at grades up to A*</b></p> <p><b>Indicative scientific points at Level 3 may include:</b></p> <ul style="list-style-type: none"> <li>• more frequent successful collisions with higher temperature due to increased energy for movement</li> <li>• denaturing irreversibly changes the shape of the active site</li> </ul> <p><b>Indicative scientific points at Level 2 may include:</b></p> <ul style="list-style-type: none"> <li>• high temperatures denature enzymes</li> <li>• active site denatured by heat / “lock and key” no longer fit</li> </ul> <p><b>Indicative scientific points at Level 1 may include:</b></p> <ul style="list-style-type: none"> <li>• enzyme activity for both graphs activity increases with temperature to an optimum then decreases</li> <li>• optimum temperature is about 37°C for humans and about 55°C for bacteria</li> <li>• enzyme activity stops at about 42°C for human and about 66°C for bacteria</li> </ul> <p><b>allow</b> best / peak temperature instead of optimum</p> <p><b>must make some comparison between the two graphs to score any marks</b></p> |
|          |     |      | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>8</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Question |     | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Marks    | Guidance                                                                                                                                                                                                                                           |
|----------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11       | (a) | $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (2)                                                                                                                                                                                                                                                                                                                                                                                                               | 2        | all correct (2)<br><br>one mark formulae (1) case and subscripts must be correct<br><br>one mark balancing (1) this mark is dependent on the first<br><br>reactants and products must be on correct side of equation<br>but can be in either order |
|          | (b) | <p>arteries carry blood at low pressure away from the heart <input type="checkbox"/></p> <p>arteries carry blood at high pressure away from the heart <input checked="" type="checkbox"/></p> <p>arteries carry blood at low pressure and have valves to prevent backflow <input type="checkbox"/></p> <p>arteries carry blood at high pressure back to the heart <input type="checkbox"/></p> <p>arteries join veins to capillaries <input type="checkbox"/></p> | 1        | any additional incorrect tick loses mark                                                                                                                                                                                                           |
|          | (c) | (i) 93.6% (1)                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1        | <b>allow</b> 94 or 93.62 or 93.617<br><b>not</b> 94.0 (incorrect rounding)                                                                                                                                                                         |
|          |     | (ii) (no) (no mark)<br><br>1. his heart rate puts him in the anaerobic threshold zone / he is not within the target heart rate zone / respiring anaerobically / he's in 85-100% max heart rate zone (1)<br><br>2. builds up lactic acid / builds up oxygen debt (1)<br><br>3. so causes fatigue / cramp / pain (1)                                                                                                                                                | 3        | if have not put 'no' can still award marking point 1 only<br><br><br><br><br><br><br><br><br><br><b>allow</b> builds up lactate<br>lactic acid is toxic = 1                                                                                        |
|          |     | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>7</b> |                                                                                                                                                                                                                                                    |

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