

**MARK SCHEME for the October/November 2011 question paper  
for the guidance of teachers**

**0610 BIOLOGY**

**0610/21**

Paper 2 (Core Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

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## General notes

Do not exceed the section sub-totals or question maxima.

Symbols used in mark scheme and guidance notes.

/ separates alternatives for a marking point

; separates points for the award of a mark

MP mark point – used in guidance notes when referring to numbered marking points

ORA or reverse argument / reasoning

OWTTE or words to that effect

A accept – as a correct response

R reject – this is marked with a cross and any following correct statements do not gain any marks

I ignore / irrelevant / inadequate – this response gains no mark, but any following correct answers can gain marks.

( ) the word / phrase in brackets is not required to gain marks but sets the context of the response for credit.  
e.g. (waxy) cuticle. Waxy not needed but if it was described as a cellulose cuticle then no mark is awarded.

mitosis underlined words – this word only

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| Question    | Mark Scheme                                                                                                                                                                                                                                                                                                                     | Mark       | Guidance     |             |                 |         |                   |           |                   |     |                                   |   |               |     |                                            |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------|-------------|-----------------|---------|-------------------|-----------|-------------------|-----|-----------------------------------|---|---------------|-----|--------------------------------------------|
| 1 (a)       | <table><tr><td>arachnids</td><td></td></tr><tr><td>crustaceans</td><td>✓;</td></tr><tr><td>insects</td><td></td></tr><tr><td>myriapods</td><td></td></tr></table>                                                                                                                                                               | arachnids  |              | crustaceans | ✓;              | insects |                   | myriapods |                   | [1] | if more than 1 box ticked no mark |   |               |     |                                            |
| arachnids   |                                                                                                                                                                                                                                                                                                                                 |            |              |             |                 |         |                   |           |                   |     |                                   |   |               |     |                                            |
| crustaceans | ✓;                                                                                                                                                                                                                                                                                                                              |            |              |             |                 |         |                   |           |                   |     |                                   |   |               |     |                                            |
| insects     |                                                                                                                                                                                                                                                                                                                                 |            |              |             |                 |         |                   |           |                   |     |                                   |   |               |     |                                            |
| myriapods   |                                                                                                                                                                                                                                                                                                                                 |            |              |             |                 |         |                   |           |                   |     |                                   |   |               |     |                                            |
| (b)         | <table><tr><td>crab</td><td>name of crab</td></tr><tr><td>A</td><td><i>Cancer</i>;</td></tr><tr><td>B</td><td><i>Carcinus</i>;</td></tr><tr><td>C</td><td><i>Corystes</i>;</td></tr><tr><td>D</td><td><i>Eupagurus</i>;</td></tr><tr><td>E</td><td><i>Maia</i>;</td></tr></table> <p>any four correctly named – 1 mark each</p> | crab       | name of crab | A           | <i>Cancer</i> ; | B       | <i>Carcinus</i> ; | C         | <i>Corystes</i> ; | D   | <i>Eupagurus</i> ;                | E | <i>Maia</i> ; | [4] | two or more names in a line mark the first |
| crab        | name of crab                                                                                                                                                                                                                                                                                                                    |            |              |             |                 |         |                   |           |                   |     |                                   |   |               |     |                                            |
| A           | <i>Cancer</i> ;                                                                                                                                                                                                                                                                                                                 |            |              |             |                 |         |                   |           |                   |     |                                   |   |               |     |                                            |
| B           | <i>Carcinus</i> ;                                                                                                                                                                                                                                                                                                               |            |              |             |                 |         |                   |           |                   |     |                                   |   |               |     |                                            |
| C           | <i>Corystes</i> ;                                                                                                                                                                                                                                                                                                               |            |              |             |                 |         |                   |           |                   |     |                                   |   |               |     |                                            |
| D           | <i>Eupagurus</i> ;                                                                                                                                                                                                                                                                                                              |            |              |             |                 |         |                   |           |                   |     |                                   |   |               |     |                                            |
| E           | <i>Maia</i> ;                                                                                                                                                                                                                                                                                                                   |            |              |             |                 |         |                   |           |                   |     |                                   |   |               |     |                                            |
|             |                                                                                                                                                                                                                                                                                                                                 | [Total: 5] |              |             |                 |         |                   |           |                   |     |                                   |   |               |     |                                            |

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|                                 |            |       |                                                                                                                                                                                                                                                                                                     |                                 |                                                        |          |  |             |  |       |   |       |    |     |  |
|---------------------------------|------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------------------------------------------|----------|--|-------------|--|-------|---|-------|----|-----|--|
| 2                               | (a)        | (i)   | (valves) prevent backflow (of blood) / ensure one-way flow of blood / OWTTE;                                                                                                                                                                                                                        | [1]                             | R – any reference to valves pumping                    |          |  |             |  |       |   |       |    |     |  |
|                                 |            | (ii)  | <table><tr><td>structure in circulatory system</td><td>has valves</td></tr><tr><td>arteries</td><td></td></tr><tr><td>capillaries</td><td></td></tr><tr><td>heart</td><td>✓</td></tr><tr><td>veins</td><td>✓;</td></tr></table><br><br>both ticks needed for mark<br>more than 2 ticks inserted = 0 | structure in circulatory system | has valves                                             | arteries |  | capillaries |  | heart | ✓ | veins | ✓; | [1] |  |
| structure in circulatory system | has valves |       |                                                                                                                                                                                                                                                                                                     |                                 |                                                        |          |  |             |  |       |   |       |    |     |  |
| arteries                        |            |       |                                                                                                                                                                                                                                                                                                     |                                 |                                                        |          |  |             |  |       |   |       |    |     |  |
| capillaries                     |            |       |                                                                                                                                                                                                                                                                                                     |                                 |                                                        |          |  |             |  |       |   |       |    |     |  |
| heart                           | ✓          |       |                                                                                                                                                                                                                                                                                                     |                                 |                                                        |          |  |             |  |       |   |       |    |     |  |
| veins                           | ✓;         |       |                                                                                                                                                                                                                                                                                                     |                                 |                                                        |          |  |             |  |       |   |       |    |     |  |
|                                 | (b)        |       | place (tips of) fingers over artery / OWTTE;<br>count number of pulses / heart beats in known period of time;                                                                                                                                                                                       | [2]                             | A – ref to pulse meters / heart monitor / stethoscopes |          |  |             |  |       |   |       |    |     |  |
|                                 | (c)        | (i)   | female 2;                                                                                                                                                                                                                                                                                           | [1]                             |                                                        |          |  |             |  |       |   |       |    |     |  |
|                                 |            | (ii)  | female 3;                                                                                                                                                                                                                                                                                           | [1]                             |                                                        |          |  |             |  |       |   |       |    |     |  |
|                                 |            | (iii) | 1 heart / pulse rate rises with exercise;<br>2 the rise in heart rate varies from person to person;<br>3 (on average) males have higher pulse rates, before running / resting / after running, than females / OWTTE / ORA;<br><br>any two – 1 mark each                                             | [2]                             | A – males have higher pulse rates than females         |          |  |             |  |       |   |       |    |     |  |

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| <b>(d)</b> | 1 exercise needs (extra) energy;<br>2 energy released by respiration;<br>3 in muscles;<br>4 (respiration) needs oxygen / glucose;<br>5 (respiration) needs removal of carbon dioxide / heat;<br>6 increased heart rate raises delivery / removal rate / OWTTE;<br><br>any four – 1 mark each | [4]                | “more” required at least once in the logical progression – penalise once for complete absence |
|            |                                                                                                                                                                                                                                                                                              | <b>[Total: 12]</b> |                                                                                               |

|              |                                                                                                                                                                                                  |                              |                        |
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| <b>3 (a)</b> | <b>(i)</b> growth of root;<br>towards gravity;<br><b>OR</b><br>growth of stem;<br>away from gravity;<br><b>OR</b><br>growth of plant;<br>towards or away from gravity;<br><br>any pair – 2 marks | [2]                          |                        |
|              | <b>(ii)</b> 1 shoot / plumule grows up;<br>2 out of soil / into light;<br>3 root / radicle grows down;<br>4 improves anchorage / reaches water / minerals;<br><br>any three – 1 mark each        | [3]                          | A – for photosynthesis |
| <b>(b)</b>   | presence / supply of oxygen;<br>suitable temperature;<br>presence / supply of water;                                                                                                             | [3]<br><br><b>[Total: 8]</b> |                        |

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| <b>4</b> | <b>(a)</b> | <b>(i)</b> <b>A</b> = evaporation;<br><b>B</b> = transpiration / evapotranspiration;<br><b>C</b> = condensation;                                                                                                 | [3]                          |                                                                     |
|          |            | <b>(ii)</b> air / clouds cool (over hills / mountains) / increased condensation;                                                                                                                                 | [1]                          | A – clouds form on / over hills<br>I – refs to where rain occurs    |
|          | <b>(b)</b> | run off from / drainage through soil;                                                                                                                                                                            | [1]                          | A – refs to leaching                                                |
|          | <b>(c)</b> | 1 less transpiration;<br>2 less water absorbed by plants;<br>3 more run off (over surface) / drainage (through soil);<br>4 more soil erosion;<br>5 blocks streams / watercourses;<br><br>any three – 1 mark each | [3]<br><br><b>[Total: 8]</b> | A – less evapotranspiration;<br>A – ORA for MP1 to 4<br>A – seepage |

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| <b>5 (a)</b> | <b>(i)</b> photosynthesis;                                                                                                                                                                                                                        | [1]                          |                                                                                                                                                                     |
|              | <b>(ii)</b> (arctic) char / (arctic) cod;                                                                                                                                                                                                         | [1]                          |                                                                                                                                                                     |
|              | <b>(iii)</b> <i>phytoplankton</i> , zooplankton, (arctic) cod, ringed seal / harbour seal, <i>killer whale</i> ;                                                                                                                                  | [1]                          |                                                                                                                                                                     |
| <b>(b)</b>   | very low numbers (in population);<br>becomes difficult to find mate / to breed;<br>may become extinct;<br><br>any two – 1 mark each                                                                                                               | [2]                          | I – refs to reasons why numbers are low                                                                                                                             |
| <b>(c)</b>   | 1 polar bears eat less seals;<br>2 seals' populations rise;<br>3 more food for killer whales;<br>4 killer whale population rises;<br>5 polar bears eat less Arctic cod;<br>6 more food for ringed / harbour seals;<br><br>any three – 1 mark each | [3]<br><br><b>[Total: 8]</b> | A – other correct deductions relating to other organisms leading to killer whales<br>I – refs to arctic birds as irrelevant<br>A – refs less competition (for food) |

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| <b>6</b> | <b>(a)</b>                      | <b>(i)</b> at least 4 points plotted accurately;<br>further 3 points plotted accurately;<br>points joined by a line;<br>both curves labelled;                                                                                                                                                                                                                     | [4]               |                                                                       |
|          |                                 | <b>(ii)</b> 0800 ( $\pm$ 15 minutes) <b>and</b> 1600 hours;                                                                                                                                                                                                                                                                                                       | [1]               | A – earliest time as per candidate's graph                            |
|          | <b>(b)</b>                      | <b>(i)</b> less water loss;<br><br>decrease in diffusion / concentration gradient /<br>rate of evaporation lower (in cooler conditions) /<br>cooler air holds less water vapour;                                                                                                                                                                                  | [2]               | A – less evaporation                                                  |
|          |                                 | <b>(ii)</b> water loss rises;<br><br>increase in diffusion / concentration gradient /<br>rate of evaporation higher (in drier conditions) /<br>drier air can hold more water;                                                                                                                                                                                     | [2]               | A – more evaporation                                                  |
|          |                                 |                                                                                                                                                                                                                                                                                                                                                                   | <b>[Total: 9]</b> |                                                                       |
| <b>7</b> | 1<br>2<br>3<br>4<br>5<br>6<br>7 | plants can obtain (more) mineral / ions;<br>named example / nitrates / magnesium;<br>(nitrates) used to form protein for growth;<br>(magnesium) used to form chlorophyll;<br>increases photosynthesis;<br>more / larger cells / plants / seeds / fruits;<br>crops can be grown on poor soil / more yield from same<br>area of land;<br><br>any four – 1 mark each | [4]               | I – nutrients, A – salts<br><br><br><br><br><br>A – bigger for larger |
|          |                                 |                                                                                                                                                                                                                                                                                                                                                                   | <b>[Total: 4]</b> |                                                                       |

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| <b>8 (a)</b> | 1 penis (of male) inserted into vagina (of female);<br>2 deposits sperm / semen (in vagina);<br>3 sperm swim into uterus / through cervix / into oviducts;<br><br>any two – 1 mark each             | [2]               | I – ref to uterus, A – ejaculation |
| <b>(b)</b>   | 1 sperm penetrates ovum / egg (cell);<br>2 gametes / sperm and ovum fuse;<br>3 nuclei fuse;<br>4 (normally) occurs in oviduct / fallopian tube;<br>5 becomes zygote;<br><br>any three – 1 mark each | [3]               | I – ref to ovule, ovary            |
| <b>(c)</b>   | 1 ball of cells / zygote passes into uterus;<br>2 sinks into / attaches (to uterus);<br>3 lining / endometrium;<br>4 cells of embryo form placenta;<br><br>any two – 1 mark each                    | [2]               | A – ref to fertilised egg          |
|              |                                                                                                                                                                                                     | <b>[Total: 7]</b> |                                    |

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| <b>9 (a)</b> | <b>(i)</b> D / G;                                                                                                                                                     | [1]               |                                                                                                                        |
|              | <b>(ii)</b> I;                                                                                                                                                        | [1]               |                                                                                                                        |
|              | <b>(iii)</b> B / F / G;                                                                                                                                               | [1]               |                                                                                                                        |
|              | <b>(iv)</b> A;                                                                                                                                                        | [1]               |                                                                                                                        |
|              | <b>(v)</b> G;                                                                                                                                                         | [1]               |                                                                                                                        |
| <b>(b)</b>   | <b>(i)</b> formation of bile;<br>formation / storage of glycogen;<br>formation of urea;<br><br>any two – 1 mark each                                                  | [2]               | A – storing iron<br>A – detoxification / example<br>A – deamination / / breakdown of amino acids<br>A – transamination |
|              | <b>(ii)</b> production of alkaline fluid / pancreatic juice;<br>production of digestive enzymes / named example;<br>production of insulin;<br>production of glucagon; | [2]               | A – production of hormones if no ref to named hormone                                                                  |
|              |                                                                                                                                                                       | <b>[Total: 9]</b> |                                                                                                                        |

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|               |                                                                                                                                                    |                    |                                                                                                            |
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| <b>10 (a)</b> | transfer of pollen;<br>from stamen / anther to stigma;                                                                                             | [2]                |                                                                                                            |
| <b>(b)</b>    | <b>(i)</b> white;                                                                                                                                  | [1]                |                                                                                                            |
|               | <b>(ii)</b> (plant) <b>A</b> ;                                                                                                                     | [1]                |                                                                                                            |
|               | <b>(iii)</b> cover flower;<br>to prevent pollen from other flowers arriving;<br>transfer pollen by hand / OWTTE;<br><br>any two – 1 mark each      | [2]                | A – prevent wind or insects reaching flower                                                                |
| <b>(c)</b>    | 1 parent genotypes Rr and Rr;<br>2 gametes<br>R      r      R      r ;<br>3 offspring<br>genotypes RR Rr Rr rr;<br>4 phenotypes red red red white; | [4]                | apply ECF for lines following from an erroneous line<br><br>NB – MP4 must have at least one of each colour |
|               |                                                                                                                                                    | <b>[Total: 10]</b> |                                                                                                            |