**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**International General Certificate of Secondary Education**

# MARK SCHEME for the May/June 2010 question paper

# for the guidance of teachers

## 0610 BIOLOGY

**0610/32** Paper 32 (Extended 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.

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

CIE is publishing the mark schemes for the May/June 2010 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

**General notes**

Symbols used in mark scheme and guidance notes.

/ separates alternatives for a marking point

; separates points for the award of a mark

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 context of response for credit. e.g. (waxy) cuticle. Waxy not needed but if it was described as a cellulose cuticle then no mark.

Small underlined words – this word only/must be spelled correctly

ORA or reverse argument/answer

ref./refs. answer makes appropriate reference to

AVP additional valid point (e.g. in comments)

AW alternative words of equivalent meaning

MP marking point (number)

| Question | Expected Answers | Marks | Guidance |
|---|---|---|---|
| 1 (a) | *sensitivity*<br>(ability to) detect / sense, changes (in the environment) / stimuli ;<br>make responses ;<br><br>*involuntary action*<br>a response that does not involve, decision / thought / AW ;<br>**A** a response that is not under conscious control | [max 3] | **A** automatic qualified<br>reflex or an example unqualified is not enough<br><br>**A** 'a reflex because it is automatic' |
| (b) (i) | **A** spinal cord / grey matter ;<br>**B** motor neurone / axon / efferent fibre ;<br>**C** sensory cell / receptor / muscle spindle ;<br>**D** quadriceps / muscle / effector ; | [4] | **A** responses on the diagram<br>**R** references to 'nerves' and CNS<br>**A** 'sense organ' in **C** but **R** sensory <u>neurone</u> |
| (ii) | movement of, <u>ions / molecules</u> + against a concentration gradient / AW ;<br>using, energy (from respiration) / ATP ;<br>**R** references to particles | [2] | **A** ref. to active transport slowed down by metabolic poison as alternative to energy / respiration / ATP<br>NB be aware of contradictory statements re concentration and reject |
| (c) | sensory neurone still carries an impulse / can still feel the sharp blow ;<br>no <u>impulses</u> in (motor) neurone / after the cut ;<br>to, muscle / effector ;<br>no, response / contraction ; | [max 3] | **R** signals and messages<br>**A** action potential |
| (d) | to test if the nervous system is functioning properly / AW ; | [1] | **A** 'to see if the nerves are working properly' |
| | | **[Total: 13]** | |

| Question | Expected Answers | Marks | Guidance |
|---|---|---|---|
| 2 (a) | *general marks*<br>roots absorb water ;<br>idea of <u>both</u> gaining water over a large, volume / area, of soil ;<br>AVP ;<br><br>**A** has deep roots / go a long way down ;<br>to gain water that drains through soil / reach water table / AW ;<br><br>**B** has shallow roots / wide spreading roots / AW ;<br>absorbs water, before it drains *or* evaporates / immediately after rainfall ; | [max 4] | NB water absorption and area marks given once only<br><br>**R** long roots unqualified |
| (b) | thick cuticle ;<br>longer distance for diffusion / not easy for water to pass through / ref to impermeable ;<br><br>rolled leaves ;<br>air trapped inside rolled leaf has high<u>er</u> humidity AW / stomata protected from wind *or* moving air (reduces transpiration) ;<br><br>sunken stomata / stomata in pits *or* grooves *or* depressions ;<br>chamber has high<u>er</u> humidity AW / stomata protected from wind *or* moving air (so reducing transpiration) ;<br><br>hairs on leaf ;<br>reduce air flow over the surface (so reducing transpiration) / increase humidity by 'trapping' water (molecules) ;<br><br>small leaves / leaves reduced to spines / leaves are needles / no leaves / leaves shed in very dry periods ;<br>small(er) / no surface area (for transpiration) ;<br><br>fewer stomata / stomata closed during hot parts of day ;<br>stomata are pores through which water can pass (so reducing transpiration) ; | [2 + 2] | **R** cuticle unqualified or ref to 'waxy' without description of thickness<br><br>Must be **TWO** descriptions (max) with appropriate linked explanations<br><br>**explanations alone cannot be accepted**<br><br>**A** correct references to water potential / concentration gradient for rolled leaves or sunken stomata<br><br>IGNORE references to succulent leaves and storage (not water loss)<br><br>'sharp' leaves also need to be small |

<table>
<tr><th>Question</th><th>Expected Answers</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>(c)</td><td>
<table>
<tr><th>tissue</th><th>substances transported</th><th>source</th><th>sink</th></tr>
<tr><td>xylem</td><td>water, ions / named ion / mineral / salts ;</td><td>roots ;</td><td>stem / growing points / buds / leaf / flower / fruit / seed / storage organ ;</td></tr>
<tr><td rowspan="4">phloem</td><td rowspan="4">Sucrose / sugar, amino acids ;</td><td colspan="2">either</td></tr>
<tr><td>leaf ;</td><td>stem / growing points / buds / root / flower / fruit / seed / storage organ ;</td></tr>
<tr><td colspan="2">or</td></tr>
<tr><td>storage organ ;</td><td><u>young AW</u> leaf / stem / growing points / buds / root ;</td></tr>
</table>
</td><td>[6]</td><td>NB substances transported score:-<br><br>ONE mark for TWO correct responses<br><br>R references to single cells as sources or sinks e.g. root hairs<br><br>R glucose<br><br>mark each box independently</td></tr>
<tr><td colspan="2"></td><td>[Total: 14]</td><td></td></tr>
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| Question | Expected Answers | Marks | Guidance |
|---|---|---|---|
| 3 (a) (i) | award two marks if the correct answer (92.86 / 92.9 / 93) is given<br>if answer missing or incorrect, award one mark for correct working<br><br>(difference = 11.7)<br><br>$\frac{11.7}{12.6} \times 100$<br><br>92.86 / 92.9 / 93 ;; | [2] | **R** rounding down to 92.8 |
| (ii) | state link between height and yield (using figures) ;<br><br>taller plants have more leaves ;<br>more leaves, increases surface area to absorb light / have more chlorophyll *or* chloroplasts ;<br>more leaves increases photosynthesis ;<br>more photosynthesis / more leaves, leads to increased, food production / potatoes / yield ;<br><br>taller stems allows more, banking / earthing up ;<br>allows more, potato tubers, to form ; | [max 2] | |

| Question | Expected Answers | Marks | Guidance |
|---|---|---|---|
| **(iii)** | plots **F** to **H**<br><br>increased yield, (per hectare / increased yield per plant) / AW ;<br><br>smaller, increase / effect, when treated with manure compared to chemical fertiliser ;<br><br>greatest increase when treated with both manure and chemical fertiliser together ;<br><br>less increase in yield when both manure and chemicals are used rather than one (compared with none) ;<br><br>comparative use of data ; | [max 3] | |
| **(iv)** | nitrate used to make, amino acids / proteins ;<br>ref to protein required for growth* ;<br>ref to enzymes* ;<br><br>nitrogen / nitrates, used to make chlorophyll **;**<br>ref to photosynthesis* ; | [max 2] | * linked marks must refer to use of nitrate |
| **(v)** | control ;<br>to, determine / compare, the effect of adding, chemicals / fertilisers / manure ; | [max 1] | |

| Question | Expected Answers | Marks | Guidance |
|---|---|---|---|
| (b) | advantages to max 4<br><br>higher yields (therefore more food) ;<br>nutrients more readily available (than from manure) ;<br>quick acting / no decomposition needed ;<br>less labour (than using manure) / easier to apply ;<br>exact quantities can be applied ;<br>can apply specific nutrients (that crop requires / that are deficient in soil) ;<br><br>disadvantages to max 4<br><br>loss of soil structure /erosion / reduced earthworm population ;<br><br>fertiliser lost from land by, leaching / run off (into waterways) ;<br>leads to, eutrophication / growth of algae / algal bloom ;<br>death / migration, of fish / invertebrates / animals ;<br><br>*two AVP to max 2*<br>AVP ; e.g. allergies / stomach cancer<br>AVP ; e.g. weed growth / wilting | [max 5] | IGNORE references to costing / profit<br><br>parts of the eutrophication process but not disadvantages therefore IGNORE not credit<br><br>(algae / plants, die)<br>(decomposers / bacteria, use up oxygen dissolved in water) |
| | **[Total: 15]** | | |

| Question | Expected Answers | Marks | Guidance |
|---|---|---|---|
| 4 (a) | drug / medicine(AW) / chemical / substance ;<br>produced by microorganisms ;<br>**A** ref to idea of synthetic analogues<br>kills / stops, growth of, bacteria / other microbes ; | [max 2] | medicine / AW e.g. '(antibiotic) used to treat infection' is worth a mark<br>**A** examples e.g. penicillin qualified<br>'penicillin is an antibiotic that kills bacteria/AW' would gain 2 marks<br>**penicillin alone cannot score**<br>**R** viruses |
| (b) (i) | (most) were killed by the antibiotic **; *ora*** | [1] | |
| (ii) | (only) antibiotic-resistant bacteria transferred from **B** / (only) resistant bacteria in **C** / fewer resistant bacteria in **B** / non-resistant bacteria were killed in **B** ; | [1] | |
| (c) | resistant bacteria, survive / not killed / are selected for / selection pressure ;<br>eventually, all / many, become resistant ;<br>AVP ; e.g. any consequence of overuse / antibiotic no longer effective ; | [max 2] | **R** references to **immunity** as alternative to resistance |
| (d) | X-rays caused mutations ;<br>change in DNA ;<br>ref to, gene / allele ;<br>mutation causes antibiotic resistance ; | [max 3] | ALLOW radiation |
| (e) | assume answer is about bacteria unless told otherwise, accept ora / AVP for viruses e.g. capsid<br><br>bacteria have cells ;<br>cell wall ;<br>cell membrane ;<br>cytoplasm ;<br>ribosome(s) ;<br>flagellum ;<br>capsule ;<br>AVP ; | [max 2] | **R** nucleus in bacteria<br>IGNORE composition of cell wall |

| Question | Expected Answers | Marks | Guidance |
|---|---|---|---|
| (f) | HIV infects lymphocytes ;<br>T helper (lymphocytes / cells) ;<br><br>fewer antibodies produced **;**<br>infected cells not killed (by immune system) ;<br>phagocytes less effective ;<br><br>increased susceptibility to / longer recovery time for, (infectious) diseases / named disease (TB) ;<br>cancers ;<br>opportunistic diseases ;<br><br>ref to AIDS ; | [max 4] | |
| | | **[Total: 15]** | |

| Question | Expected Answers | Marks | Guidance |
|---|---|---|---|
| 5 (a) (i) | diffusion ;<br>used in (aerobic) respiration ; | [2] | |
| (ii) | any *two* from<br>water<br>glucose / simple sugars / named<br>amino acids<br>salts / ions / named ion / minerals<br>vitamins<br>AVP e.g. vitamins | [1] | **NB 2 substances required for one mark.**<br>**R** sugar unqualified<br>**A** protein |
| (iii) | any *two* from<br>carbon dioxide<br>water<br>protein / amino acids / hormone / named hormone / enzyme<br>urea<br>lactic acid<br>AVP e.g. vitamins | [1] | **NB 2 substances required for one mark.**<br>**R** sugar / waste unqualified<br>**A** metabolic waste / glucose |
| (b) | **D** pores / holes / gaps in capillary wall / AW ;<br>**E** allows filtration /movement of small molecules (between blood and tissue fluid) ;<br><br>**D** thin wall / wall is one cell thick / thin lining ;<br>**E** short diffusion distance / AW ;<br><br>**D** small / thin / narrow / AW ;<br>**E** blood moves slowly (for exchange) / more cells *or* blood close to wall ;<br><br>**D** large numbers of capillaries /capillary bed ;<br>**E** provide large surface area ; | [2 + 2] | **NB**<br>**Descriptor(D) must be linked to an Explanation(E) for 2 marks**<br>**D alone can gain a point**<br>**E alone cannot score**<br>**1 + 1 and 1 + 1**<br><br>**R capillary one cell thick** |
| (c) (i) | lymph (vessel) ; | [1] | not lymphatic system or node<br>IGNORE lacteal |
| (ii) | squeezed by muscles / AW ;<br>valves, ensure one-way flow / prevent backflow ;<br>passive not pumped ; | [max 1] | **R** valves unqualified |
| | | **[Total: 10]** | |

| Question | Expected Answers | Marks | Guidance |
|---|---|---|---|
| 6 (a) | concentration of **both** gases (relatively) constant until about 1800 ;<br>steep / AW, increase in **both** from 1800 (until 2000) ;<br>comparative use of figures ;<br>**two figs for one of the gases or one fig for each** | [3] | Ref. to both gases required |
| (b) | max 3 for carbon dioxide<br>industrialisation / AW ;<br>burning of fossil fuels ;<br>vehicle exhausts / AW ;<br>deforestation / fewer trees / AW ;<br>less carbon dioxide absorbed by plants / AW ;<br>more methane from, rice fields / cattle ;<br>increased waste (disposal) ;<br>methane from (anaerobic breakdown in), landfill sites / waste dumps / AW ;<br>AVP ; | [max 4] | **R** fumes unqualified<br>IGNORE ref to natural disasters, etc.<br>NB incorrect references to methane e.g. cars producing <u>both</u> gases<br>but allow factories producing both gases |
| (c) | radiation emitted / reflected by earth's surface ;<br>ref to infra red ;<br>heat prevented from leaving (the atmosphere) ;<br>gases, absorb / reflect / trap <u>infra red</u> ;<br>atmosphere gets warmer ; | [max 3] | **A** ref. to global warming |
| (d) | fewer trees cut down ;<br>less waste ;<br>less material burnt ;<br>ref to, land-fill / rubbish tips / environmental / ecological issues / AW ;<br>conservation of, finite resources / raw materials / AW ;<br>ref to biodegradable products / plastic is non biodegradable ;<br>any correct ref to atmospheric gases e.g. carbon dioxide / methane ;<br>AVP ; | [3] | IGNORE ref to cost of recycling |
| | | **[Total: 13]** | |