



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/43

Paper 4 Theory (Extended)

May/June 2016

MARK SCHEME

Maximum Mark: 80

Published

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This document consists of **12** printed pages.

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Abbreviations used in the Mark Scheme

- ; separates marking points
- / separates alternatives within a marking point
- **R** reject
- **ignore** mark as if this material was not present
- **A** accept (a less than ideal answer which should be marked correct)
- **AW** alternative wording (accept other ways of expressing the same idea)
- underline words underlined (or grammatical variants of them) must be present
- **max** indicates the maximum number of marks that can be awarded
- **mark independently** the second mark may be given even if the first mark is wrong
- **ecf** credit a correct statement that follows a previous wrong response
- () the word / phrase in brackets is not required, but sets the context
- **ora** or reverse argument
- **AVP** any valid point

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| Question | Answer | Mark | Guidance |
|----------|---|------------|--|
| 1 (a) | function | letter | name |
| | structure that makes sounds | A | larynx |
| | bone that provides protection for the lungs | E | rib ; |
| | airway that allows passage of air only into the right lung | J | bronchus ; |
| | airway that allows passage of air into both lungs | B | trachea ; |
| | contracts to increase the volume of the thorax | F/G | (F) diaphragm / (G) external intercostal muscle ; |
| | muscle that contracts to lower the ribcage | K | internal intercostal muscles ; |
| | site of gas exchange | M | alveoli ; |
| | | [6] | |
| (b) | keeps, airways / trachea / bronchi, open ; allows (free flow of) air into (the lungs) ; allows flexibility / can breathe even when, bent / swallowing / AW ; AVP ; | [max 2] | I protection |
| (c) (i) | (aerobic) respiration ; | [1] | R anaerobic respiration |
| (ii) | rate (of breathing) increases ; | [1] | R it increase A it's faster / deeper |

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| Question | Answer | Mark | Guidance |
|-----------------|--|--------------------|-----------------|
| (iii) | stimulus (is CO ₂); A acidic / pH, of blood decreases ; (CO ₂ / pH) detected by the brain ; by a receptor ; ref to (named) neurone in context ; brain sends impulses to, (intercostal) muscles / diaphragm / effectors ; (intercostal) muscles / diaphragm / effectors, contract more (frequently) ; negative feedback / homeostasis ; reflex / automatic / involuntary ; | [max 3] | |
| | | [Total: 13] | |

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| Question | Answer | Mark | Guidance |
|------------------|--|-------------|--|
| 2 (a) (i) | retina ; | [1] | |
| (ii) | optic (nerve); | [1] | I sensory neurone |
| (iii) | (light is) refracted ; | [1] | A description of refraction |
| (iv) | sensitive to / detect, light ; in low intensity / night ; pass impulse to, <u>sensory</u> neurone / optic nerve ; AVP ; | [max 2] | sensitive in dim light = 2 marks A provides night vision |
| (b) (i) | gravity ; | [1] | |
| (ii) | negative / away from (gravity) ; (gravi)tropism / (geo)tropism ; | [2] | |

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| Question | Answer | Mark | Guidance |
|-----------------|--|--------------------|---|
| (iii) | <p><i>upwards</i> grow towards (where) light (should be); more, light absorbed / photosynthesis ; more growth ; flowers more likely to attract, insects / pollinators ; more likely to, release / shed / disperse, seeds ;</p> <p><i>downwards</i> better, anchorage / AW ; absorb, water / mineral ions ;</p> <p>AVP ; ref to competition / damage</p> | [max 2] | |
| (iv) | <p>auxins <u>made</u> in shoot tip ; (auxin) <u>spread</u> / move / diffuse ; <i>idea of</i> unequal distribution of auxin ; auxins collect, in <u>lower</u> side of stem ; auxin stimulates (cell) elongation (where it accumulates) ; AVP ;</p> | [max 4] | <p>I found in tip</p> <p>I growth e.g. (by) absorption of water (by osmosis) / ref to turgor pressure (and) stretching of cell walls / statoliths / detect gravity</p> |
| | | [Total: 14] | |

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| Question | Answer | Mark | Guidance | | | | | | | | | |
|--------------------|---|-------------------|---|-------------------|-------------------|----|----|--------------------|----|-----|-----|--|
| 3 (a) | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="background-color: #cccccc;">gametes</td> <td style="background-color: #cccccc;">\textcircled{X}</td> <td style="background-color: #cccccc;">\textcircled{X}</td> </tr> <tr> <td>\textcircled{X}</td> <td>XX</td> <td>XX</td> </tr> <tr> <td>$\textcircled{Y;}$</td> <td>XY</td> <td>XY;</td> </tr> </table> <p>offspring ratio = 1:1/50:50/50% male, 50% female/2:2 ;</p> | gametes | \textcircled{X} | \textcircled{X} | \textcircled{X} | XX | XX | $\textcircled{Y;}$ | XY | XY; | [3] | |
| gametes | \textcircled{X} | \textcircled{X} | | | | | | | | | | |
| \textcircled{X} | XX | XX | | | | | | | | | | |
| $\textcircled{Y;}$ | XY | XY; | | | | | | | | | | |
| (b) (i) | <p>cat 1 $X^bY;$</p> <p>cat 4 $X^BY;$</p> <p>cat 5 $X^BX^B;$</p> | [3] | | | | | | | | | | |
| (ii) | <p>distinct, phenotypes / coat colours / categories ;</p> <p>no (continuous) range of colour /AW;</p> <p>controlled by genes ;</p> <p>not affected by the, environment /AW/named example ;</p> | [3] | <p>A only orange, black and calico</p> <p>A inherited</p> | | | | | | | | | |
| | | [Total: 9] | | | | | | | | | | |

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| Question | Answer | Mark | Guidance |
|------------------|---|-------------|---|
| 4 (a) (i) | iodine solution diffused, into the bag/through the (Visking) tubing ; iodine molecules <u>small</u> (enough to pass through the membrane) ; iodine solution stains starch ora ; no starch diffused, out of the bag/through the (Visking) tubing ; starch molecules too <u>large</u> (to pass through the membrane) ; ref to pore / AW, size ; | [max 4] | I osmosis |
| (ii) | temperature ; (surface) area ; concentration (gradient)/water <u>potential</u> ; size / type, of molecule ; thickness / distance, across membrane / permeability (of membrane) ; pressure ; (number of) protein, channels / pumps / AW ; energy / number of mitochondria ; | [max 3] | I distance / thickness unqualified |
| (b) (i) | <i>from muscle cell</i> (produced in) mitochondrion ; diffused ; (diffused) in cytoplasm / tissue fluid / (blood) plasma ; through membrane ; through capillary wall ; <i>from blood:</i> vein / vena cava / pulmonary artery / heart ; travels to lungs ; into alveoli ; exhaled / breathed out / excreted ; | [3] | A red blood cell I exit the body unqualified |

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| Question | Answer | Mark | Guidance |
|-----------------|--|--------------------|--|
| (ii) | <p>thin, wall / epithelium ; for efficient, diffusion / gas exchange ;</p> <p>small, diameter / lumen ; idea that many capillaries can fit into tissues / capillaries reach (every cell) throughout the body / relative size to red blood cell ;</p> <p>extensive network ; large surface for diffusion ;</p> <p>capillary cells have pores ; to allow substances to pass in and out of the blood easily ;</p> | [max 3] | <p>adaptations must be linked to correct feature max 2 for features only</p> <p>A one cell thick R 'thin cell wall'</p> |
| (c) | <p>diffusion ; down concentration gradient ;</p> <p>(diffuses) through stoma / stomata ; (through) (intercellular) air space / (between) spongy mesophyll ; into / reached, palisade, mesophyll / cell ; chloroplast ;</p> <p>AVP ; e.g. dissolve / diffuse, through cell wall / cell membrane / cytoplasm</p> | [max 4] | <p>A lower concentration of carbon dioxide inside leaf / ora ;</p> <p>A into guard cell / spongy, mesophyll / cell I chlorophyll</p> |
| | | [Total: 17] | |

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| Question | Answer | Mark | Guidance |
|----------|---|---------|--|
| 5 (a) | timber / paper, manufacture / AW ; firewood ; <i>clearance for</i> agriculture ; urbanisation / roads / housing / factories / industry / leisure developments ; extraction of minerals / for other natural resources ; | [max 3] | A wood unqualified A fuel |
| (b) (i) | $118\,545 - 90\,883 = 27\,662$ $\frac{27\,662}{118\,545} \times 100$; 23.3(3459) ; 23 (%) ; | [3] | |
| (ii) | Indonesia has lost the most forest ora ; 9% (8.7%) compared with 23% in Indonesia ; Indonesian forest has continued to be lost, whereas loss in Malaysia has slowed between 2005 and 2010 ; comparative use of figures with units ; | [max 3] | A 14% more in Indonesia ecf from (b)(i) |
| (iii) | planted forest, has one (dominant) species / is a monoculture ; loss of <u>biodiversity</u> ; qualification of biodiversity loss ; (plantation) susceptible to pest / disease ; nutrients removed / soils become infertile ; <i>ref to alien / foreign / invasive / non-indigenous species ;</i> AVP ; e.g. vegetation is removed / lower canopy / all immature | [max 3] | e.g. habitats / example / extinction of a species I homes / organisms die A use of chemicals |

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| Question | Answer | Mark | Guidance |
|-----------------|---|--------------------|---|
| (c) | <p><u>roots</u> die so do not bind the soil ; loss of soil / soil erosion ; silting of rivers ; reduced (soil) fertility ; no trees to absorb the water ; increased risk of flooding ; increased rate of evaporation / land is exposed to drying ; desertification / decreased soil water ; loss of, habitat / places where organisms live / described ; disruption to food chain / described ; endangered / extinction, of species or loss of biodiversity ; AVP ; named example of affected 'land' organism in context / removed trees cause nutrient cycling disruption / lack of decomposition</p> | [max 6] | <p>A landslides A loss of, minerals / ions / nutrients A mudslides A drought / decreased rainfall I home I organisms die</p> |
| | | [Total: 18] | |

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| Question | Answer | Mark | Guidance |
|-----------------|---|-------------------|---|
| 6 (a) | V stomach ; W large intestine / colon / rectum ; | [2] | I intestine unqualified |
| (b) | breaks up food into small(er) pieces ; without chemical change ; by teeth / muscles ; to mix (with digestive juice) ; increases surface area ; for enzyme action ; speeds up <u>chemical</u> digestion ; easier to swallow ; | [3] | R molecules A without enzymes A mastication / chewing / churning A easier / more effective |
| (c) | <i>for:</i> positive correlation / as (relative) body mass increases, time in digestive system increases ; any two or more figures from the graph ; <i>against: max 3 from</i> two / one / few / some (species), are outliers / anomalies ; any figure(s) from the graph ; (description of) some mammals do not fit the, pattern / trend ; any example from the graph ; only information about 26 species of mammal / small sample size ; idea about unknown validity ; | [max 4] | units must be quoted at least once e.g. either outlier quoted |
| | | [Total: 9] | |