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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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

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

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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]	

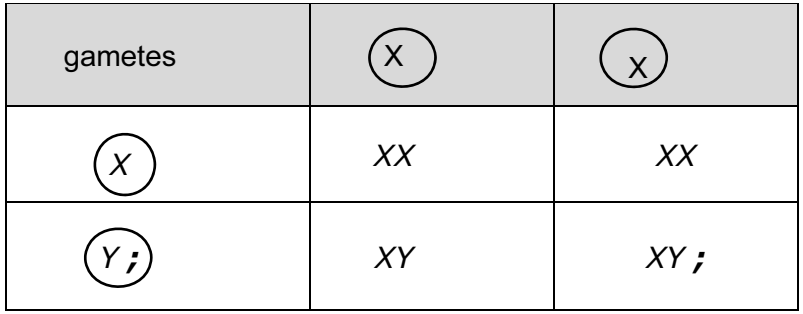
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Question	Answer	Mark	Guidance
2 (a) (i)	retina ;	[1]	
(ii)	optic (nerve) ;	[1]	**I** sensory neurone
(iii)	(light is) refracted ;	[1]	**A** description of refraction
(iv)	sensitive to / detect, light ; in low intensity / night ; pass impulse to, sensory 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)	*upwards* 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 ; *downwards* better, anchorage / AW ; absorb, water / mineral ions ; AVP ; ref to competition / damage	[max 2]	
(iv)	auxins <u>made</u> in shoot tip ; (auxin) spread / move / diffuse ; *idea of* unequal distribution of auxin ; auxins collect, in <u>lower</u> side of stem ; auxin stimulates (cell) elongation (where it accumulates) ; AVP ;	[max 4]	**I** found in tip **I** growth e.g. (by) absorption of water (by osmosis) / ref to turgor pressure (and) stretching of cell walls / statoliths / detect gravity
		[Total: 14]	

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Question	Answer	Mark	Guidance
3 (a)	 offspring ratio = 1:1 / 50:50 / 50% male, 50% female / 2:2 ;	[3]	
(b) (i)	**cat 1** X^bY ; **cat 4** X^BY ; **cat 5** X^BX^B ;	[3]	
(ii)	distinct, phenotypes / coat colours / categories ; no (continuous) range of colour / AW ; controlled by genes ; not affected by the, environment / AW / named example ;	[3]	**A** only orange, black and calico **A** inherited
		[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)	*from muscle cell* (produced in) mitochondrion ; diffused ; (diffused) in cytoplasm / tissue fluid / (blood) plasma ; through membrane ; through capillary wall ; *from blood:* 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)	thin, wall / epithelium ; for efficient, diffusion / gas exchange ; small, diameter / lumen ; idea that many capillaries can fit into tissues / capillaries reach (every cell) throughout the body / relative size to red blood cell ; extensive network ; large surface for diffusion ; capillary cells have pores ; to allow substances to pass in and out of the blood easily ;	[max 3]	adaptations must be linked to correct feature max 2 for features only **A** one cell thick **R** 'thin cell wall'
(c)	diffusion ; down concentration gradient ; (diffuses) through stoma / stomata ; (through) (intercellular) air space / (between) spongy mesophyll ; into / reached, palisade, mesophyll / cell ; chloroplast ; AVP ; e.g. dissolve / diffuse, through cell wall / cell membrane / cytoplasm	[max 4]	**A** lower concentration of carbon dioxide inside leaf / **ora** ; **A** into guard cell / spongy, mesophyll / cell **I** chlorophyll
		[Total: 17]	

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Question	Answer	Mark	Guidance
5 (a)	timber / paper, manufacture / AW ; firewood ; *clearance for* 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 ; *ref to* alien / foreign / invasive / non-indigenous species ; 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)	roots 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	[max 6]	**A** landslides **A** loss of, minerals / ions / nutrients **A** mudslides **A** drought / decreased rainfall **I** home **I** organisms die
		[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)	*for:* positive correlation / as (relative) body mass increases, time in digestive system increases ; any two or more figures from the graph ; *against: max 3 from* 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]	

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