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Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2015 series

0610 BIOLOGY

0610/32 Paper 3 (Extended Theory), maximum raw mark 80

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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	Additional Guidance
1 (a)	feathers ;	max [1]	
(b)	go to 2 ; go to 4 ; *Spinus tristris* **D** ; go to 3 ; *Ara ararauna* A ; *Aquila chrysaetos* **F** ; *Platalea regia* **C** ; go to 5 ; *Trochilus polytmus* **E** ; go to 6 ; *Recurvirostra americana* **G** ; *Phoenicopterus minor* **B**	[3]	5 or 6 correct = 3 3 or 4 correct = 2 1 or 2 correct = 1

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Question	Answer	Mark	Additional Guidance
(c) (i)	**A –** meiosis ; **B** – zygote ;	[2]	
(ii)	(cell / nucleus) has <u>two</u> sets of chromosomes ; has pairs of chromosomes ; has chromosomes from <u>two</u>, haploid cells / sperm and egg / two gametes ; has chromosomes from male and female (parents) ; has twice the number of chromosomes as the gametes ;	max [1]	**ignore** has 80 chromosomes **ignore** 2n unqualified
(iii)	increase in complexity ; (named) cells / tissue(s) / organ(s) / organ system(s), become specialised / differentiate / AW ;	max [1]	**R** ref to increase in cell number and cell size
(iv)	ref adaptation to, new / changed, environment / habitat / ecosystem ; any example ; e.g. ref to (new) disease / camouflage / escaping from (new) predators allows, selection / evolution ; ref to reduces competition ; increases chances of survival of the species / reduces chance of extinction ; AVP ; e.g. increase in gene pool	max [2]	**A** ref to selective advantage
		[Total: 10]	

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Question	Answer	Mark	Additional Guidance
2 (a) (i)	4.4 ($cm^3 kg^{-1} min^{-1}$) ;	[1]	
(ii)	increase and decrease (after a lag) ; rapid / sudden / immediate / sharp / dramatic / AW, increase ; remains constant / reaches a plateau / flat lines / AW ; more gradual decrease ; returns to, resting / original / AW / 4.4 ($cm^3 kg^{-1} min^{-1}$) ; any data quote with time and oxygen uptake with units for both	max [4]	e.g. maximum uptake is 18 $cm^3 kg^{-1} min^{-1}$ between 8 and 13 minutes
(iii)	increase in <u>muscle</u> contraction / <u>muscles</u> contract more or faster ; increase in demand for, energy / ATP ; increase in (rate of) <u>respiration</u> ; ref to <u>aerobic respiration</u> ; heart beats faster / faster pulse rate ; increase in, depth / rate, of breathing ; *idea that* body / muscles, needs more oxygen ; prevents / reduces, anaerobic respiration / build-up of lactic acid ; AVP ; e.g. release of adrenaline / uptake reaches maximum possible / ref to maximum lung capacity	max [4]	**R** 'produce / create / make, energy' **A** high rate of <u>respiration</u> **A** correct balanced equation
(b) (i)	$\frac{170}{100} \times 100 =$; 170 ;;	max [2]	

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Question	Answer	Mark	Additional Guidance
(ii)	(during faster exercise) more energy needed when running faster / there is a faster rate of respiration ; oxygen not supplied fast enough (from lung / heart) ; anaerobic respiration occurred during exercise ; lactic acid is produced ; cannot be broken down in muscle ; (so) diffuses / passes, from muscle into blood ;	max [3]	**A ora**
		[Total: 14]	

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<table>
<tr><th>Question</th><th>Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>3 (a) (i)</td><td>G oesophagus / esophagus / gullet ;
H diaphragm ;
M large intestine / large bowel / colon ;</td><td>[3]</td><td>R intestine unqualified / rectum</td></tr>
<tr><td>(ii)</td><td>
<table>
<tr><td>function</td><td>name</td><td>letter from Fig. 3.1</td></tr>
<tr><td>conversion of glucose to glycogen</td><td>liver</td><td>P ;</td></tr>
<tr><td>secretion of insulin and glucagon</td><td>pancreas</td><td>K</td></tr>
<tr><td>absorption of products of digestion</td><td>ileum / small intestine</td><td>L ;</td></tr>
<tr><td>storage of bile</td><td>gall bladder</td><td>O ;</td></tr>
<tr><td>chemical digestion of protein in an acidic pH</td><td>stomach</td><td>J ;</td></tr>
</table>
</td><td>[4]</td><td>ignore bile duct</td></tr>
</table>

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<table>
<tr><th>Question</th><th>Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>(b) (i)</td><td>emulsification / emulsifying (fat) / producing an emulsion ;</td><td>[1]</td><td>R ‘emulsion’ unqualified</td></tr>
<tr><td>(ii)</td><td>increases surface area ;
for action of, lipase / enzyme(s) ;</td><td>[2]</td><td>A speeds up, enzyme reaction / breakdown of fat / absorption of fat
A makes it easier to absorb</td></tr>
<tr><td>(c) (i)</td><td><table>
<tr><th>hormone</th><th>uptake by liver cells</th><th>concentration of glucose in the blood</th></tr>
<tr><td>insulin</td><td>increases</td><td>decreases ;</td></tr>
<tr><td>glucagon</td><td>decreases</td><td>increases / stays the same ;</td></tr>
</table></td><td>[2]</td><td>one mark per correct row</td></tr>
<tr><td>(ii)</td><td>adrenaline ;</td><td>[1]</td><td>A epinephrine, cortisol, ACTH, growth hormone, somatostatin, thyroxine, GLP–1, GIP</td></tr>
<tr><td>(d)</td><td>glucose concentration is kept, (near) constant / within narrow limits / AW ;
any change (in concentration), is detected / acts as a stimulus ;
correct ref to, glucose → glycogen / glycogen → glucose / increasing glucose concentration / decreasing glucose concentration ;
idea that it returns concentration to normal ;
idea that release of correctly named hormone, stops / switches off ;
ref to homeostasis ;</td><td>max [3]</td><td>R hormones carrying out conversions directly</td></tr>
<tr><td></td><td></td><td>[Total: 16]</td><td></td></tr>
</table>

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Question	Answer	Mark	Additional Guidance
4 (a)	guard (cells) ;	[1]	
(b) (i)	oxygen is a (waste / by) product of photosynthesis ; more oxygen is produced than used in respiration ; concentration inside the leaf is greater than outside ; ref to air spaces inside the leaf ; oxygen moves down its concentration gradient ; by <u>diffusion</u> ; *idea that* the rate of photosynthesis is greater than the rate of respiration ;	max [3]	**A** word equation / symbol equation
(ii)	passes through air spaces **;** carbon dioxide dissolves in water (in cell wall) **;** (spongy / palisade) mesophyll **;** passes / diffuses, through, cell wall / cell membrane **;** passes / diffuses, into / through, cytoplasm **;** enters chloroplast / used in chloroplast **;** reacts with water (to form glucose) **;**	max [3]	**A** palisade cells **ignore** spongy cells **A** correct equation

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Question	Answer	Mark	Additional Guidance
(c) (i)	stomata on, both sides of the leaf / both upper and lower epidermis ; fewer stomata overall (however expressed) ; fewer stomata on upper epidermis than water lily / **ora** ; fewer stomata on lower epidermis than myrtle / **ora** ; more stomata on lower epidermis than water lily / **ora** ; more stomata on upper epidermis than myrtle / **ora** ; *idea that* about the same number on each surface whereas the numbers are very different on the surfaces of the other plants ;	max [2]	**A** use of numbers to make comparisons with units used at least once in the answer **mp7** also gains **mp1**
(ii)	*white water lily* (all) stomata (on upper surface) in contact with air / AW ; for absorption of, carbon dioxide / oxygen ; no stomata (on lower epidermis) in contact with water ; diffusion (much) faster in air (than in water) ; (large number of stomata as) plant does not need to restrict, transpiration / water loss / AW ; *common myrtle* (all) stomata (on lower surface), in the shade / away from the sun / out of the heat / in a cooler place ; **ora** reduces / restricts / less, transpiration / evaporation ; **ora** so, less water is lost / water is conserved ;	max [5]	**A** gas exchange / diffusion of gases **ignore** if explained in terms of waxy cuticle only **R** 'prevents'
		[Total: 14]	

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Question	Answer	Mark	Additional Guidance
5 (a) (i)	*glucose* provides energy / required for (aerobic / anaerobic) respiration ; *amino acids* used, to make (named), proteins / polypeptides ;	[2]	**R** to produce / AW, energy **A** for (cell) growth / make new cytoplasm
(ii)	DNA / chromosome / genetic material, replicates / is copied ; cell membrane / cell wall, develops in the middle of the cell ; binary fission ; bacteria / cell / cytoplasm, divides into two ;	max [2]	**ignore** mitosis / RNA /chromosomes
(b)	some bacteria were resistant to antibiotic, **S** / **T** / both **S** and **T** ; fewer were resistant to antibiotic **T** / antibiotic **T** is more effective (than **S**) ; both antibiotics, killed / inhibited growth or reproduction of, (susceptible) bacteria ;	max [2]	**R** immune / antibodies
(c)	bacteria are resistant ; have reproduced / multiplied, (in culture) ; all genetically identical, so all resistant ;	max [2]	**R** 'growing / becoming, resistant'

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Question	Answer	Mark	Additional Guidance
(d)	*antibiotic resistant bacteria are formed by* mutation ; change to, DNA / gene ; produces, new / different, protein ; ref to anything that increases risk of resistance ; *spread* (when antibiotic is used) susceptible / AW, bacteria die ; **ORA** less competition / example ; ref to fewer limiting factor(s) ; resistant bacteria, reproduce / multiply ; pass on their (DNA / gene(s) / allele(s)) for (antibiotic) resistance ; ref to, (unprotected) sexual intercourse / many sex partners / AW ; any two methods of transmission (from host to host) ;; AVP ;	max [5]	e.g. not completing the full course /dose or taking antibiotics when not necessary e.g. more food / resources (available for resistant bacteria) e.g. body fluids / droplets (in air) / blood / needles *or* syringes / food / water / (named) vector / across placenta / at birth / breast milk
		[Total: 13]	

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Question	Answer	Mark	Additional Guidance
6 (a) (i)	rat-tailed maggot, tubifex (worms), (water) louse (and mayfly nymph) ;	[1]	**R** stonefly (nymph)
(ii)	stonefly (nymph) ;	[1]	**R** if stonefly (nymph) and mayfly (nymph)
(b)	high / very high / highest, concentration of nitrate ; nitrate needed by plants for, growth / making proteins / AW ; ref to nitrate not being a limiting factor ; AVP ;	max [2]	**ignore** eutrophication unqualified **ignore** nitrogen
(c)	invertebrates are present all the time ; pollutant, kills them / reduces their numbers / prevents them breeding ; so presence / absence, is a good indicator ; pollutant accumulates (in animal's body) ; pollutant, detectable when concentrations are low / no longer present ; do not need to know what the pollutant is (as would be the case for a chemical test) ; no need for lab facilities / no need for equipment / can be done in the field ; AVP ;	max [2]	**A** bioaccumulation

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Question	Answers	Mark	Additional Guidance
(d)	remove solids / pass through a grid / filter / screening ; allow to sediment / (primary) sedimentation / settling tank ; use, microorganisms / bacteria / fungi ; in aerobic conditions / oxygen supplied / aerobic digestion / aeration tank ; microbes, digest / decompose, complex compounds to, simple / soluble, compounds ; any example ; e.g. proteins → amino acids, starch → glucose, fat to fatty acids (and glycerol) water is, disinfected / chlorinated / treated with ozone / treated with UV ; AVP ; e.g. ref to respiration / recycling bacteria into aeration tank / flocculation described or explained	max [4]	**A** activated sludge / trickle filter **A** 'chemicals to kill bacteria'
(e)	plastic remains / persists / lasts a long time / not decomposed ; swallowed / ingested / eaten / cannot be digested / blocks gut ; caught, around / strangle / trapped / entangled / smother / suffocate / injure / cut / trap / stuck in, organism AW ; plastic blocks light for, <u>photosynthesis</u> ; may, contain / release, (oil-soluble) toxins / poisons / harmful chemicals; blocks the flow of water in streams or rivers ; so less aeration of water / reduces concentration of (dissolved) oxygen ; destruction of, habitat / ecosystem / food chain ; *idea of* bioaccumulation / biomagnification ; trapped / stationary water acts as a breeding site for mosquitoes ; AVP ; e.g. visual pollution / releases hormone-like chemicals / less oxygen from <u>photosynthesis</u>	max [3]	**ignore** cannot degrade choke can be **mp2** or **mp3** but not both **ignore** kills / dies unqualified **R** 'plastics are toxic'
		[Total: 13]	

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