

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

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

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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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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)	<table border="1"> <tr> <td>go to 2</td> <td></td> </tr> <tr> <td>go to 4</td> <td></td> </tr> <tr> <td><i>Spinus tristris</i></td> <td><b>D</b></td> </tr> <tr> <td>go to 3</td> <td></td> </tr> <tr> <td><i>Ara ararauna</i></td> <td><b>A</b></td> </tr> <tr> <td><i>Aquila chrysaetos</i></td> <td><b>F</b></td> </tr> <tr> <td><i>Platalea regia</i></td> <td><b>C</b></td> </tr> <tr> <td>go to 5</td> <td></td> </tr> <tr> <td><i>Trochilus polytmus</i></td> <td><b>E</b></td> </tr> <tr> <td>go to 6</td> <td></td> </tr> <tr> <td><i>Recurvirostra americana</i></td> <td><b>G</b></td> </tr> <tr> <td><i>Phoenicopterus minor</i></td> <td><b>B</b></td> </tr> </table>	go to 2		go to 4		<i>Spinus tristris</i>	<b>D</b>	go to 3		<i>Ara ararauna</i>	<b>A</b>	<i>Aquila chrysaetos</i>	<b>F</b>	<i>Platalea regia</i>	<b>C</b>	go to 5		<i>Trochilus polytmus</i>	<b>E</b>	go to 6		<i>Recurvirostra americana</i>	<b>G</b>	<i>Phoenicopterus minor</i>	<b>B</b>	[3]	5 or 6 correct = 3 3 or 4 correct = 2 1 or 2 correct = 1
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<b>Question</b>	<b>Answer</b>	<b>Mark</b>	<b>Additional Guidance</b>
<b>(c) (i)</b>	<b>A</b> – meiosis ; <b>B</b> – zygote ;	[2]	
<b>(ii)</b>	(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]	<b>ignore</b> has 80 chromosomes <b>ignore</b> 2n unqualified
<b>(iii)</b>	increase in complexity ; (named) cells/tissue(s)/organ(s)/organ system(s), become specialised/differentiate/AW ;	max [1]	<b>R</b> ref to increase in cell number and cell size
<b>(iv)</b>	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]	<b>A</b> ref to selective advantage
		<b>[Total: 10]</b>	

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Question	Answer	Mark	Additional Guidance
2 (a) (i)	4.4 (cm <sup>3</sup> kg <sup>-1</sup> min <sup>-1</sup> );	[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 <sup>3</sup> kg <sup>-1</sup> min <sup>-1</sup> ); any data quote with time and oxygen uptake with units for both	max [4]	e.g. maximum uptake is 18 cm <sup>3</sup> kg <sup>-1</sup> min <sup>-1</sup> 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; <i>idea that</i> 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]	<b>R</b> 'produce/create/make, energy' <b>A</b> high rate of <u>respiration</u> <b>A</b> correct balanced equation
(b) (i)	$\frac{170}{100} \times 100 =$ ;  170 ;;	max [2]	

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

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Question	Answer	Mark	Additional Guidance																		
3 (a) (i)	<b>G</b> oesophagus/esophagus/gullet ; <b>H</b> diaphragm ; <b>M</b> large intestine/large bowel/colon ;	[3]	<b>R</b> intestine unqualified/rectum																		
(ii)	<table border="1"> <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><b>P</b> ;</td> </tr> <tr> <td>secretion of insulin and glucagon</td> <td>pancreas</td> <td><b>K</b></td> </tr> <tr> <td>absorption of products of digestion</td> <td>ileum/small intestine</td> <td><b>L</b> ;</td> </tr> <tr> <td>storage of bile</td> <td>gall bladder</td> <td><b>O</b> ;</td> </tr> <tr> <td>chemical digestion of protein in an acidic pH</td> <td>stomach</td> <td><b>J</b> ;</td> </tr> </table>	function	name	letter from Fig. 3.1	conversion of glucose to glycogen	liver	<b>P</b> ;	secretion of insulin and glucagon	pancreas	<b>K</b>	absorption of products of digestion	ileum/small intestine	<b>L</b> ;	storage of bile	gall bladder	<b>O</b> ;	chemical digestion of protein in an acidic pH	stomach	<b>J</b> ;	[4]	<b>ignore</b> bile duct
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<b>Question</b>	<b>Answer</b>	<b>Mark</b>	<b>Additional Guidance</b>									
<b>(b) (i)</b>	emulsification/emulsifying (fat)/producing an emulsion ;	[1]	<b>R</b> 'emulsion' unqualified									
<b>(ii)</b>	increases surface area ; for action of, lipase/enzyme(s) ;	[2]	<b>A</b> speeds up, enzyme reaction/breakdown of fat/absorption of fat <b>A</b> makes it easier to absorb									
<b>(c) (i)</b>	<table border="1"> <tr> <td>hormone</td> <td>uptake by liver cells</td> <td>concentration of glucose in the blood</td> </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>	hormone	uptake by liver cells	concentration of glucose in the blood	insulin	increases	decreases ;	glucagon	decreases	increases/stays the same ;	[2]	one mark per correct row
hormone	uptake by liver cells	concentration of glucose in the blood										
insulin	increases	decreases ;										
glucagon	decreases	increases/stays the same ;										
<b>(ii)</b>	adrenaline ;	[1]	<b>A</b> epinephrine, cortisol, ACTH, growth hormone, somatostatin, thyroxine, GLP-1, GIP									
<b>(d)</b>	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 ; <i>idea that it returns concentration to normal ;</i> <i>idea that</i> release of correctly named hormone, stops/switches off ; ref to <u>homeostasis</u> ;	max [3]	<b>R</b> hormones carrying out conversions directly									
		<b>[Total: 16]</b>										



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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> ; <i>idea that</i> the rate of photosynthesis is greater than the rate of respiration ;	max [3]	<b>A</b> 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]	<b>A</b> palisade cells <b>ignore</b> spongy cells  <b>A</b> correct equation

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Question	Answer	Mark	Additional Guidance
(c) (i)	<p>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 / <b>ora</b> ;            fewer stomata on lower epidermis than myrtle / <b>ora</b> ;            more stomata on lower epidermis than water lily / <b>ora</b> ;            more stomata on upper epidermis than myrtle / <b>ora</b> ;  <i>idea that</i> about the same number on each surface whereas the numbers are very different on the surfaces of the other plants ;</p>	max [2]	<p><b>A</b> use of numbers to make comparisons with units used at least once in the answer</p> <p><b>mp7</b> also gains <b>mp1</b></p>
(ii)	<p><i>white water lily</i>            (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 ;  <u>diffusion</u> (much) faster in air (than in water) ;            (large number of stomata as) plant does not need to restrict, transpiration / water loss / AW ;</p> <p><i>common myrtle</i>            (all) stomata (on lower surface), in the shade / away from the sun / out of the heat / in a cooler place ; <b>ora</b>            reduces / restricts / less, <u>transpiration</u> / <u>evaporation</u> ; <b>ora</b>            so, less water is lost / water is conserved ;</p>	max [5]	<p><b>A</b> gas exchange / diffusion of gases</p> <p><b>ignore</b> if explained in terms of waxy cuticle only  <b>R</b> 'prevents'</p>
		<b>[Total: 14]</b>	

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Question	Answer	Mark	Additional Guidance
5 (a) (i)	<i>glucose</i> provides energy / required for (aerobic / anaerobic) respiration ; <i>amino acids</i> used, to make (named), proteins / polypeptides ;	[2]	<b>R</b> to produce / AW, energy <b>A</b> 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]	<b>ignore</b> mitosis / RNA / chromosomes
(b)	some bacteria were resistant to antibiotic, <b>S</b> / <b>T</b> / both <b>S</b> and <b>T</b> ; fewer were resistant to antibiotic <b>T</b> / antibiotic <b>T</b> is more effective (than <b>S</b> ) ; both antibiotics, killed / inhibited growth or reproduction of, (susceptible) bacteria ;	max [2]	<b>R</b> immune / antibodies
(c)	bacteria are resistant ; have reproduced / multiplied, (in culture) ; all genetically identical, so all resistant ;	max [2]	<b>R</b> 'growing / becoming, resistant'

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Question	Answer	Mark	Additional Guidance
(d)	<p><i>antibiotic resistant bacteria are formed by</i>  mutation ;  change to, DNA/gene ;  produces, new/different, protein ;  ref to anything that increases risk of resistance ;</p> <p><i>spread</i>  (when antibiotic is used) susceptible/AW, bacteria die ; <b>ORA</b>  less competition/example ;</p> <p>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) ;;</p> <p>AVP ;</p>	max [5]	<p>e.g. not completing the full course /dose  or taking antibiotics when not necessary</p> <p>e.g. more food /resources (available for  resistant bacteria)</p> <p>e.g. body fluids /droplets (in  air)/blood/needles <i>or</i>  syringes /food /water / (named)  vector / across placenta /at birth /breast milk</p>
		<b>[Total: 13]</b>	

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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 ; <u>nitrate</u> needed by plants for, growth/making proteins /AW ; ref to nitrate not being a limiting factor ; AVP ;	max [2]	<b>ignore</b> eutrophication unqualified <b>ignore</b> 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]	<b>A</b> bioaccumulation

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Question	Answers	Mark	Additional Guidance
(d)	<p>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</p>	max [4]	<p><b>A</b> activated sludge/trickle filter</p> <p><b>A</b> 'chemicals to kill bacteria'</p>
(e)	<p>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 ;  <i>idea of</i> 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></p>	max [3]	<p><b>ignore</b> cannot degrade</p> <p>choke can be <b>mp2</b> or <b>mp3</b> but not both  <b>ignore</b> kills/dies unqualified</p> <p><b>R</b> 'plastics are toxic'</p>
		<b>[Total: 13]</b>	