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Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2015 series

0610 BIOLOGY

0610/33

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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Page 2	Downloaded from eduresourceza.com Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0610	33

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

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0610	33

1	(a) (i)	hair / fur / whiskers ; external ears / pinna(e) ; nose / snout ;	max [1]																									
	(ii)	<table><tr><td>go to 2</td><td></td></tr><tr><td>go to 3</td><td></td></tr><tr><td>go to 4</td><td></td></tr><tr><td>go to 5</td><td></td></tr><tr><td><i>Phascolarctos cinereus</i></td><td>C</td></tr><tr><td><i>Vombatus ursinus</i></td><td>B</td></tr><tr><td><i>Sminthopsis longicaudata</i></td><td>A</td></tr><tr><td><i>Macropus rufus</i></td><td>D</td></tr><tr><td><i>Paljara tirarensis</i></td><td>F</td></tr><tr><td>go to 6</td><td></td></tr><tr><td><i>Sarcophilus harrisii</i></td><td>E</td></tr><tr><td><i>Dasyurus maculatus</i></td><td>G</td></tr></table>	go to 2		go to 3		go to 4		go to 5		<i>Phascolarctos cinereus</i>	C	<i>Vombatus ursinus</i>	B	<i>Sminthopsis longicaudata</i>	A	<i>Macropus rufus</i>	D	<i>Paljara tirarensis</i>	F	go to 6		<i>Sarcophilus harrisii</i>	E	<i>Dasyurus maculatus</i>	G	[3]	5 or 6 correct = 3 3 or 4 correct = 2 1 or 2 correct = 1
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Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0610	33

(b) (i)	meiosis ;	[1]	
(ii)	maintains / increases, population ; allows variation ; ora adaptation to, new / changed, environment(s) ; natural selection / evolution / formation of new species ; AVP ; e.g. two parents contribute to survival of offspring e.g. allows expression of recessive, alleles / traits / genes	max [3]	ignore survival unqualified
(c) (i)	gas exchange / named example with direction ; transfer of (dissolved) nutrients, from maternal (circulation) / to fetal ; transfer of excretory products, from fetal / to maternal ; by diffusion ; produces / secretes, (named) hormone ; passive immunity / antibodies, from maternal / to fetal ; prevents / limits, mixing of blood ; ref to regulating blood pressure ; AVP ; e.g. maternal / fetal <u>attachment</u> point e.g. <i>ref to</i> counter current flow / maintains concentration gradient e.g. hormone function described	max [4]	ignore food / nutrition for nutrients A glucose / amino acids / ions / water A urea / (nitrogenous) waste A progesterone / oestrogen / HCG / HPL / HCS
(ii)	protection from (mechanical) shock (of fetus) ; maintains (constant) temperature (of fetus) ; allows movement (of fetus) ; prevents dehydration ; AVP ;	max [2]	
		[Total: 14]	

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0610	33

2	(a)	hepatic portal vein ;	[1]	
	(b)	(semi lunar) valves ; prevent backflow ; large, lumen ; low, pressure / resistance to blood flow ; thin / less elastic / less muscular, walls (than arteries) ; low blood pressure ; allows vein to be squeezed by (surrounding skeletal) muscles ;	2 + 2 max [4]	in each case the explanation must be linked to a correct feature
	(c)	$= (181 - 135) \div 135 \times 100 ;$ $= 34 (\%) ; ;$	max [2]	
	(d) (i)	(liver) responds to insulin (from pancreas) ; increased, uptake / respiration, of glucose ; glucose converted to glycogen ; by enzymes ; glycogen is, insoluble / stored ; negative feedback ;	max [2]	A glycogenesis R hormones carrying out conversions directly ignore homeostasis
	(ii)	temperature ; water ; AVP ; e.g. pH / ions / urea / carbon dioxide	max [1]	

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0610	33

(e)	deamination ; (part of excess) amino acids converted to urea ; (part of) amino acid converted to ammonia ; ammonia converted to urea ; ammonia is harmful ; (rest of) amino acid molecule, releases energy / converted to glucose / glycogen / respired ; (some amino acids) used to make proteins e.g. fibrinogen ; AVP ; e.g. transamination	max [3]	A description of amino group removal ignore protein converted to urea
(f)	bile production / AW ; breakdown / remove, hormones / red blood cells / toxins / alcohol / drugs ; storage of, iron / vitamin A / vitamin D ; AVP ; e.g. cholesterol, synthesis / AW	max [1]	R homeostasis, deamination, protein synthesis, transamination
		[Total: 14]	

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0610	33

3 (a)	increased blood flow <i>or</i> heart, pumps/beats, faster ; more, oxygen/glucose (for muscles)/carbon dioxide removed ; more energy released by respiration ; for muscle contraction ;	max [2]	ignore increased, pulse rate/heart rate R 'energy produced'/'energy created'
(b)	increase in, time/exercise intensity/effort, increase in lactic acid concentration ; increase is, steady/proportional ; after exercise lactic acid concentration continues to increase ; after exercise/near end of exercise, concentration levels off/AW ; appropriate use of data ;	max [3]	units must be used at least once
(c) (i)	the release of a relatively small amount of energy ; by the breakdown of glucose ; in the absence of oxygen/without oxygen ;	max [2]	R 'produce/AW, energy' ignore 'use' unqualified ignore air / fermentation unqualified
(ii)	(by) diffusion ;	[1]	
(iii)	(blood) plasma ;	[1]	
(d)	<i>in trained cyclists</i> lower <u>anaerobic</u> respiration/more <u>aerobic</u> respiration ; less lactic acid produced (during exercise) ; because more oxygen supplied to muscles ; less <u>oxygen debt</u> ; less oxygen required, to oxidise/breakdown, lactic acid ; (breakdown) to glucose/carbon dioxide and water ; quicker, removal/breakdown, of lactic acid ; appropriate comparative data quote with units ;	max [4]	
		[Total: 13]	

Page 8	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0610	33

4 (a)	root hairs ; water moves, from high water <u>potential</u> to low water <u>potential</u> / down water <u>potential</u> gradient ; by osmosis ; through partially permeable membrane ; through protein pores (in membrane) ;	max [4]	
(b) (i)	movement of gas / oxygen / carbon dioxide, into and out of leaf ; for, photosynthesis / respiration ; allows transpiration ; enables water to be pulled up the plant / AW ;	max [2]	ignore air A transpiration pull
(ii)	greater density / more stomata, in variety A ; four times more ;	[2]	
(iii)	more stomata / AW, in variety A ; more transpiration in variety A ; ora greater opportunity for loss of water vapour through stomata in variety A ; ora by evaporation, from surfaces of (mesophyll) cells / into air spaces (in leaf) ; loss of water from leaf (cells) lowers water potential ; (this) pulls on / creates tension (in water column in xylem) ; cohesion of water molecules / AW ;	max [3]	A transpiration pull A 'stick together' / ref to polar

Page 9	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0610	33

(c)	sunken stomata ; hairs ; fleshy / succulent, leaves ; thick cuticle ; small surface area ; few / shedding of, leaves ; AVP ; e.g. rolling of leaves / reflective surfaces	max [2]	ignore ref to stems / roots
(d)	water vapour <u>condenses</u> to form, clouds / fog / dew ; precipitation ; rainwater drains into rivers ; seeps / AW, into soil / forms ground water ;	max [2]	
		[Total: 15]	

Page 10	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0610	33

5 (a)	increases, landfill / rubbish heaps / AW ; swallowed / ingested / eaten / cannot be digested ; trapped / entangled / suffocate / injure / cut / strangle / AW ; plastic blocks light for photosynthesis ; release, toxins / poisons ; large pieces of plastic may block flow of water (in a river) ; reducing (concentration of) dissolved oxygen ; habitat / ecosystem, destruction / creation ; persistent / cannot decompose ; AVP ; e.g. bioaccumulation / production of plastic pollutes the environment / eyesore	max [3]	ignore dies unqualified mp6 and 7 are linked
(b) (i)	more waterborne and airborne (chemical) waste to make paper bags ; plastic needs oil (extraction) ; ora for paper bags paper bags require trees (to be felled) ; more energy needed to make paper bags ; ora for plastic bags appropriate comparative use of data with units ;	max [3]	A deforestation / ora for plastic bags
(ii)	(heavy metals / acid) are toxic / harmful to organisms ; bioaccumulation / biomagnification (of heavy metal) / description ; decreases <u>pH</u> ; (acid) burns, shells / skin / plants ; aquatic, habitat / ecosystem, destruction ; AVP ; any qualified consequence of a named heavy metal	max [2]	ignore acid rain throughout ignore 'polluted' unqualified e.g. Minamata disease caused by mercury

Page 11	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0610	33

(c) (i)	more energy used to make than recycle (plastic bags) ; 594 <u>kJ</u> to make and 17 <u>kJ</u> (per bag) to recycle (plastic bags) ;;	max [2]	577 <u>kJ</u> (per bag) difference
(ii)	deforestation / description ; two examples of the effects of deforestation e.g. soil erosion / habitat loss / soil fertility / reduced biodiversity ;; increase in carbon dioxide (from deforestation / coal / oil, power stations) ; carbon dioxide is a greenhouse gas ; causes global warming / enhanced greenhouse effect ; two examples of the effects of global warming e.g. rising sea levels / climate change / desertification / increased yield ;; AVP ; e.g. increased use of fossil fuels ref to power stations, affecting breathing / asthma / causes acid rain	max [4]	
		[Total: 14]	

Page 12	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0610	33

6 (a)	taking a, gene / DNA / allele, from one species ; inserting it into another organism ; OR changing the, genetic material / chromosome of, an organism / cell ; by removing / changing / inserting, <u>genes</u> / <u>DNA</u> / <u>alleles</u> ;	max [2]																						
(b)	<table><tr><th>Letter from fig</th><th>Name</th><th>Description</th></tr><tr><td>M</td><td>chromosomes</td><td>threads of DNA found in the nucleus</td></tr><tr><td>N</td><td>gene / allele ;</td><td>section of DNA removed from human cell</td></tr><tr><td>Q</td><td>plasmid</td><td>vector / loop / circle, of DNA (that can carry a foreign section of DNA) / separate piece of DNA (from chromosome) ;</td></tr><tr><td>R</td><td>bacterial (cell) ; A yeast</td><td>type of cell that is genetically engineered</td></tr><tr><td>O</td><td>insulin / protein ;</td><td>specific chain of amino acids coded by the section of DNA removed from the human cell</td></tr><tr><td>P</td><td>fermenter</td><td>(container in which) bacteria / microorganisms / cells, reproduce / grow / produce insulin ;</td></tr></table>	Letter from fig	Name	Description	M	chromosomes	threads of DNA found in the nucleus	N	gene / allele ;	section of DNA removed from human cell	Q	plasmid	vector / loop / circle, of DNA (that can carry a foreign section of DNA) / separate piece of DNA (from chromosome) ;	R	bacterial (cell) ; A yeast	type of cell that is genetically engineered	O	insulin / protein ;	specific chain of amino acids coded by the section of DNA removed from the human cell	P	fermenter	(container in which) bacteria / microorganisms / cells, reproduce / grow / produce insulin ;	[5]	
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Page 13	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0610	33

(c)	clone / (genetically) identical ; rapid / less energy to reproduce (asexually) / only one parent / no gametes ; large quantity of insulin produced ; all bacteria, have the insulin gene / produce insulin ; same insulin produced ; once cells are engineered does not have to be repeated ; AVP ; e.g. cheap / ethical or religious reasons / less allergic reaction / no immune rejection / more efficient / no risk of disease (transmission)	max [3]	A <u>no</u> variation only accept in context of comparisons with animal insulin extraction methods
		[Total: 10]	