

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0610 BIOLOGY

0610/31

Paper 3 (Extended Theory), maximum raw mark 80

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0610	31

Abbreviations used in the Mark Scheme

- ; separates marking points
- / separates alternatives within a marking point
- R reject
- I ignore (mark as if this material was not present)
- A accept (a less than ideal answer which should be marked correct)
- AW alternative wording
- underline words underlined 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
- A, S, P, L Axes, Size, Plots and Line for graphs
- O, S, D, L Outline, Size, Detail and Label for drawings
- (n)ecf (no) error carried forward
- () 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 2014	0610	31

Question	Answer	Marks	Additional Guidance
1 (a)	nucleus: 1 controls (activities in) the cell/AW; 2 contains, chromosomes/genes/alleles/genetic information/DNA; 3 controls how cells, develop/divide/reproduce/grow; cell membrane: 4 cell membrane: 5 forms a barrier/separates a cell from surroundings; 6 allows/controls, movement of (named) substance(s), across/in/out; keeps contents of cell inside/keeps cytoplasm intact/AW;	max 4	I 'brain' of cell/'tells cell what to do' MP1 A ref to making proteins A makes ribosomes e.g. O ₂ /CO ₂ /nutrients I ref to shape/'covers cell'/protects cell
(b)	a group of cells, same type/do the same function;	1	cells are in the same place = group
(c)	1 mucus traps, particles/any example; 2 mucus protects lining; 3 (cilia) beat/create wave motion/wafting; 4 move, mucus/fluid away; 5 reduce risk of/stop, (named) pathogens entering lungs;	max 3	e.g. dust/bacteria/spores/virus I 'collects' particles
		[Total: 8]	
2 (a)	the allele that is expressed (if it is present)/AW; always seen in the phenotype; masks (effect of) recessive allele;	max 1	I 'powerful' defines the phenotype defines characteristic(s)
(b) (i)	<i>Parent genotype:</i> Ff , Ff; <i>Parent phenotype:</i> (with) flecks × (with) flecks; <i>Gametes:</i> F , f, F , f; Working shown to derive genotype; <i>Offspring genotype:</i> FF , Ff , ff; linked to correct phenotype	5	ECF on incorrect key usage ECF from each line A Punnett square/criss-cross lines

Question	Answer	Marks	Additional Guidance																		
(ii)	<p>ff × ff;</p> <p>parents may be implied as first part of the question asks for parental genotype</p> <p>both parents must have a recessive <u>allele</u> /</p> <p>(if ff × ff) no dominant or F <u>allele</u>, in either parent /</p> <p>(if ff × ff) both parents must be homozygous, recessive / without flecks</p> <p>no parent must be homozygous dominant /</p> <p>presence of (even) one dominant allele in parents could result in flecks;</p>	2	<p>A Ff × Ff and Ff × ff</p> <p>ECF on incorrect key usage from (i)</p> <p>A gene for allele</p>																		
		[Total: 8]																			
3 (a)	<table border="1"> <thead> <tr> <th>substance</th> <th>direction of movement</th> <th>reason</th> </tr> </thead> <tbody> <tr> <td>amino acids</td> <td>to fetus / from mother</td> <td>make proteins / translation / growth / make cells / AW;</td> </tr> <tr> <td>carbon dioxide</td> <td>from fetus</td> <td>waste gas from respiration</td> </tr> <tr> <td>glucose</td> <td>to fetus / from mother</td> <td>(release) energy / respiration / stored as glycogen;</td> </tr> <tr> <td>oxygen</td> <td>to fetus / from mother</td> <td>(gas for) respiration;</td> </tr> <tr> <td>urea</td> <td>from fetus / to mother</td> <td>excretion / metabolic waste;</td> </tr> </tbody> </table>	substance	direction of movement	reason	amino acids	to fetus / from mother	make proteins / translation / growth / make cells / AW;	carbon dioxide	from fetus	waste gas from respiration	glucose	to fetus / from mother	(release) energy / respiration / stored as glycogen;	oxygen	to fetus / from mother	(gas for) respiration;	urea	from fetus / to mother	excretion / metabolic waste;	4	<p>one mark per row</p> <p>A nitrogenous waste</p>
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Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0610	31

Question	Answer	Marks	Additional Guidance
(b)	iron: for red blood cells/haemoglobin/to transport oxygen/prevent anemia; vitamin D: absorption of calcium; growth/formation/strengthening, of bones/teeth; preventing rickets;	max 2	max 1 from vitamin D
(c) (i)	lymphocytes/white blood cells/leucocytes;	1	1 white cells unqualified
(ii)	provides (passive) <u>immunity</u> ; protects against, infection/illness/disease/pathogen(s)/AW; reference to disease(s) mother has had; immune system of babies not yet developed; any one function of antibodies;	max 3	functions of antibodies: <ul style="list-style-type: none"> • stop pathogens spreading (in the body) • stop pathogens entering cells • stop pathogens dividing/reproducing/increasing in number • cause pathogens to, clump/agglutinate • immobilise bacteria • kill bacteria • make it easier for phagocytes to ingest pathogens • neutralise toxin(s)/make toxins harmless
(iii)	bonding/AW, with mother; it's free/'cheap'; sterile/no risk of infection; body temperature; no preparation/easily available; provides, best/complete/most suitable/balanced/AW, nutrients/food; composition/quantity, of breast milk changes to match development; easier to digest/reduced risk of colic; reduce risk of allergies; contraceptive effect; AVP;	max 4	AVPs: no additives protects against, <u>breast</u> cancer/ <u>ovarian</u> cancer children less likely to develop diabetes helps the mother's body to return to 'normal', e.g. weight loss/restores uterus
		[Total: 14]	

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0610	31

Question	Answer	Marks	Additional Guidance
4 (a) (i)	xylem;	1	
(ii)	thick/lignified, cell walls; for support; lignin; cell walls are waterproof/no water leaks out; long/hollow/no cytoplasm/no organelles/no end walls; water passes through easily/low resistance (to flow); pits; for lateral movement; AVP;;	max 2	one feature linked to a reason max 1 for feature
(b)	1 transpiration/transpiration pull; 2 creates a, tension/negative pressure; 3 water potential gradient; 4 osmosis into leaf cells; 5 continuous column of water; 6 cohesion of water molecules/described; 7 adhesion of water to, cell wall/xylem; 8 water evaporates, into airspaces (in mesophyll); 9 water (vapour), diffuses/passes, out through stomata; 10 root pressure;	max 4	I water into roots I water concentration A evaporates

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0610	31

Question	Answer	Marks	Additional Guidance
(c) (i)	<p>1 two peaks; 2 at 10h, and 14/15h; 3 no water conduction before 4 h; 4 slow/gradual, increase from 4 h to 6 h/7 h; 5 maximum water conduction rate of 2.4 dm³ per hour; 6 steep increase in rate of water conduction at 7 h/7.5 h; 7 decrease in rate of water conduction after 14.5 – 15 h; 8 any other data quote;</p>	max 3	<p>Correct units (dm³ per hour) for water conduction must be stated at least once. If no units at all, only penalise once.</p> <p>A at 15h</p>
(ii)	add the volume (of water conducted) for each hour / calculate area under curve / AW;	1	A half hour
(iii)	<p>possible reasons: different rates of transpiration; different numbers of leaves / different surface areas; different rates of evaporation;</p> <p>factors affecting transpiration: (sun)light / shade; temperature / heat; humidity; wind speed;</p> <p>different species; different diameters of xylem / AW; any feature of leaf structure; e.g. thickness of cuticle / stomatal density / hairs</p> <p>length of roots; different ages; AVP;</p>	max 3	

Page 8	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0610	31

Question	Answer	Marks	Additional Guidance
(d)	<p>abiotic: increase in carbon dioxide, concentration/production; decrease in oxygen, concentration/production; increased soil erosion; reduced soil fertility; less soil water/faster flow of water from the land; increased, flooding/landslips; disrupts water cycle; greater exposure/AW;</p> <p>biotic: habitat/ecosystem, loss; disruption to, food chain/food webs; less biodiversity; extinction described; seeds germinate/seedlings grow/regeneration;</p> <p>AVP;</p>	max 4	<p>I global warming/greenhouse effect A less decomposition I desertification</p> <p>A silting of rivers</p> <p>A 'loss of/no, food' A 'species die out'/local extinction</p> <p>examples of AVP: organisms exposed to greater, grazing/ predation</p>
		[Total: 18]	
5 (a)	<p>cell wall, peptidoglycan/murein; no nucleus/no nuclear membrane/have nucleoid; loop of DNA; no mitochondria; no chloroplasts; no vacuoles; smaller ribosomes; have pili; have capsule; small/ 1–2 µm; A correct reference to size</p>	max 2	A plasmids;

Page 9	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0610	31

Question	Answer	Marks	Additional Guidance
(b) (i)	lag (phase); log/exponential (phase); stationary/plateau (phase); death (phase);	4	
(ii)	no longer reproducing/death rate greater than or equal to 'birth' rate; ref to <u>limiting</u> factor(s); no/less, (named) nutrients; no/less, space; no/less, oxygen; build-up of (named) waste; waste is toxic; idea that pH could change to be unsuitable;	max 2	A reached carrying capacity A lactose/sugar/glucose/salts/minerals e.g. carbon dioxide/lactic acid
(c)	increase in, size/length/mass/volume/AW; increase in <u>dry</u> mass; increase in <u>cell</u> number; ref to permanent;	max 2	note: increase in dry mass = 2 marks A ref to cell division/mitosis/ reproduction of cells/tissues R reproduction unqualified I development
(d)	asexual (reproduction) / binary fission;	max 1	R mitosis

Page 10	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0610	31

Question	Answer	Marks	Additional Guidance
(e)	<p>advantages: longer shelf-life/ stop foods going off; stop/reduce, growth of (unwanted) bacteria/ fungi/ microbes; prevent food poisoning; improve/give, taste/ flavor; give colour/improve appearance; give texture; emulsify/ stabilise, food components;</p> <p>disadvantages: hyperactivity (in children); allergies; vomiting/ nausea/ headache; asthma; possible link with cancer;</p> <p>AVP;</p>	max 4	<p>advantages to max 3</p> <p>A reproduction/ multiplication/ AW</p> <p>disadvantages to max 3</p>
		[Total: 15]	
6 (a)	<p><u>lock and key</u> mechanism; substrate fits into enzyme; (shape of) substrate is complementary to, enzyme/ active site; ref to active site; substrate breaks/ product(s) forms/ product(s) leaves enzyme; enzyme, free for next reaction/ not used up/ remains unchanged; AVP;</p>	max 3	e.g. lowers activation energy
(b)	(cellulose) <u>cell wall</u> ;	1	

Page 11	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0610	31

Question	Answer	Marks	Additional Guidance
(c) (i)	<p>protease activity, similar/AW, on both sites;</p> <p>all enzyme activity is, greater/better/faster, in site A;</p> <p>cellulase activity on site A greater than protease activity on site A;</p> <p>cellulase activity, higher on site A, than site B/ORA;</p> <p>cellulase and protease activity on site B similar;</p> <p>use of data with units to support any of these marking points;</p>	max 3	do not award data quote unqualified
(ii)	<p>pH/water content, no effect on protease activity;</p> <p>cellulase more active, at higher pH/less acidic environment;</p> <p>cellulase more active, at lower soil moisture;</p> <p>ref to <u>optimum</u> pH of, protease/cellulase/enzymes;</p> <p>low pH may denature cellulase;</p> <p>idea of different leaf composition;</p> <p>size of leaves/surface area/species of leaf;</p> <p>different stage of decomposition;</p>	max 3	
(d)	<ol style="list-style-type: none"> 1 ref to, decomposers/bacteria/fungi; 2 proteins are broken down to amino acids; 3 by proteases; 4 amino acids converted to, ammonia/ammonium (ions); 5 deamination; 6 ammonia/ammonium ions, converted to nitrite ions; 7 nitrites converted to nitrate ions; 8 nitrification/oxidation/nitrifying bacteria; 9 nitrate ions absorbed by plants; 	max 3	<p>protease is linked to MP2</p> <p>ammonia to nitrate = 1 A nitrites</p> <p>A nitrates</p> <p>ammonia to nitrite and then to nitrate = 2</p> <p>A nitrates</p>
(e) (i)	<u>nitrogen fixation</u> ;	1	

Page 12	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0610	31

Question	Answer	Marks	Additional Guidance
(ii)	root nodules (on legumes); free living bacteria; <u>nitrogen-fixing bacteria</u> ; nitrogen, converted to, ammonium/ammonia/amino acids;	max 2	<ul style="list-style-type: none"> lightning nitrate(s) nitrification / nitrifying bacteria
		[Total: 17]	