CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2013 series

0610 BIOLOGY

0610/31 Paper 31 (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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Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- **R** reject
- **A** accept (for answers correctly cued by the question)
- **I** ignore as irrelevant
- **Ecf** error carried forward
- **AW** alternative wording (where responses vary more than usual)
- **AVP** alternative valid point
- underline actual word given must be used by candidate (grammatical variants excepted)
- ( ) the word / phrase in brackets is not required but sets the context
- **D, L, T, Q** quality of: drawing / labelling / table / detail as indicated
- max indicates the maximum number of marks

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	Answers	Marks	Guidance for Examiners
1 (a)		[4]	
(b)	• *either* fruit is soft ***or*** seeds, are hard / thick / have a hard / thick / protective covering *or* testa **;** • no enzymes to digest, testa / seed coat / seed **;**	[2]	**I** refs to teeth

group of vertebrates	scaly skin	external ear (pinna)	feathers	mammary glands
birds	✓	×	✓	×
bony fish	✓	×	×	× ;
amphibians	×	×	×	× ;
reptiles	✓	×	×	× ;
mammals	×	✓	×	✓ ;

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	Answers	Marks	Guidance for Examiners
(c)	**1** wind (dispersal) **;** **2** 'hairs' / wing(s), on seed / fruit, to aid dispersal **;** **3** self– (dispersal) **;** **4** explosive, pods / fruits **;** **5** water (dispersal) **;** **6** float / buoyant **;**	**[max 2]**	**A** parachute / light **I** fur **I** pollination
(d)	oxygen **;** warmth / warm temperature **;** water **;**	**[max 2]**	**A** suitable quoted warm temp, 15–30 ºC **I** humidity
(e)	**1** (cassowaries are large birds) so need large, territory / habitat / feeding area / lots of space **;** **2** cannot fly so cannot move easily from one area to another **;** **3** need many trees to produce enough fruit **;** **4** cassowaries are dependent on many (tree) species **;** **5** need suitable nesting areas **;**	**[max 3]**	
		[Total: 13]	

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	Answers	Marks	Guidance for Examiners
2 (a) (i)	provides, sufficient energy / energy for needs ; provides, molecules / materials, for metabolism / equivalent ; provides, nutrients / named nutrients i.e. CPFVM H_2O fibre ; in correct / right, quantities / proportions / amounts ;	[max 3]	**A** substances fibre – accept roughage and non-starch polysaccharide. **A** minimum of any three named nutrients **A** contains (all the) food, groups / types / classes **R** 'substances' **A** adequate / sufficient **R** 'equal'
(ii)	age ; sex / gender ; activity / exercise; pregnancy / lactation ; growth / body building ; ambient temperature / climate / weather ; disease / medical condition / illness ; allergy / food intolerance ; size / body mass / build ;	[max 3]	**A** weight **I** height
(b) (i)	horizontal line at 180 mg per 100 cm^3 ;	[1]	**A** tolerance of half-square up or down
(ii)	60 to 300 minutes *Units essential*	[1]	**A** 240 minutes / 4 hours
(iii)	increases after time when glucose is ingested, decreases, but stays below or touches 180 / line from b(i) throughout ;	[1]	
(c)	insulin secreted / produced / released ; by pancreas ; glucose absorbed (by liver / muscles) ; stored as / converted to , glycogen ;	[max 3]	
		[Total:12]	

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	Answers	Marks	Guidance for Examiners
3 (a) (i)	amylase ;	[1]	
(ii)	pH is a factor that influences / affects enzyme activity / AW; to give the optimum pH ; extreme pH could denature enzyme / **AW** ;	[max 1]	**ORA**
(b)	*idea that* protease , would break down, enzymes / enzyme 2 ;	[1]	
(c)	stable at high temperatures / does not denature at 60 °C / optimum temperature near 60 °C ;	[1]	**I** bears / tolerates hot temperatures **I** heat resistant **I** ref to denatures > 60 ºC
(d)	**1** (bacteria grown in) fermenters ; **2** (bacteria provided with) substrate / food (substances) / glucose / minerals / whey / waste substances / nutrients / culture medium / AW ; **3** oxygen / aerobic conditions ; **A** air bubbled through **4** (bacteria) grow / reproduce / increase in number ; **5** enzymes, secreted / released / AW ; **6** enzymes separated from, bacteria / mixture ; **A** ref to filtration **7** AVP ; e.g. conditions – 26 °C / pH 5–6	[max 3]	**A** extracted by crushing bacteria
(e)	extracts more juice / speeds up juice extraction ; pectin converted to sugars ; so juice is sweeter ; cell wall material is removed from juice / pectin digested to soluble product(s) ; so the juice is clearer ; AVP; humans don't produce pectinase i.e. humans can digest the juice.	[max 3]	**I** easier…….
		[Total:10]	

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	Answers	Marks	Guidance for Examiners
4 (a)	**1** (red blood cells) get stuck in capillaries / do not flow smoothly / capillaries blocked**;** **2** reduce , supply of, oxygen / nutrients (to tissues / cells / muscles) **;** **3** reduce , removal of, carbon dioxide / wastes, (from tissues / cells / muscles) **;** **4** ref to respiration (in tissues) **;** **5** cause sickle cell crises **;** **6** pain **;** **7** increased chance of, thrombosis / blood clotting **;** **8** death of tissues / cells **;** **9** AVP **;**	**[max 4]**	**ignore** less haemoglobin **A** carries <u>less</u> oxygen / nutrients… **A** carries <u>less</u> carbon dioxide… **I** reduced life expectancy
(b) (i)	allele(s) **;**	**[1]**	
(ii)	H^A , H^S + H^A , H^S **;** (H^AH^A , H^AH^S , H^AH^S) <u>H^SH^S</u> **;**	**[2]**	Could be in Punnett square **A** just A and S **A** just S and S
(iii)	0.25 / 25 % / ¼ / 1 in 4 **;**	**[1]**	**I** ratios

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	Answers		Marks	Guidance for Examiners
(c) (i)	1	malaria, is severe disease / may be fatal ;		**A** sickle cell trait / carrier for H^SH^A throughout the answer
	2	*idea that it is the* selective agent / ref to natural selection ;		
	3	H^AH^A / homozygous dominant, susceptible to malaria ;		
	4	H^AH^S / heterozygous, resistant ; **A** H^SH^S resistant ;		
	5	H^AH^S survive / H^AH^A more likely to die before have children ;		**R** immune
	6	H^AH^S have children and pass on, the allele / H^S ;		
	7	(if H^AH^S x H^AH^S) 1 in 4 chance of, H^SH^S / homozygous recessive ;		
	8	2 in 4 / ½ , have advantage of resistance to malaria ;		
	9	AVP ; e.g. ref to malarial parasite /		
	10	AVP ; e.g. ref to transmission of malaria	[max 4]	
(ii)	1	malaria not very serious / not a severe strain of malaria ;		
	2	people have other genetic protection from malaria ;		E.g. Thalassemia
	3	malaria has only recently spread to these areas / no malaria before;		
	4	mutation not occurred in populations of these areas ;		
	5	people with mutation / have sickle cell allele , have not migrated here ;		**A** mutation described **I** gene, for allele
	6	(majority of) population in Australia has not lived there for long ;		
	7	came from areas where no malaria, is / was, present ;		
	8	AVP ;		
	9	AVP ;	[max 2]	
			[Total:14]	

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	Answers		Marks	Guidance for Examiners
5 (a)	1 2 3 4 5 6 7 8	eye, light ; ear, sound / noise ; ear, gravity / acceleration / movement ; tongue, taste / chemicals / flavours in food ; nose, smell / chemicals in the air / odours ; skin, touch / pressure ; skin, temperature ; skin, pain ;	[max 3]	
(b) (i)	response / reaction , to stimulus ; occurs without having to, think / use the brain / make decision ;		[2]	**I** reflex **A** not conscious of action until it has happened
(ii)	1 2 3 4 5 6 7 8 9	receptor(s) / sensory cells / nerve ending , detects heat / stimulus ; (nervous / electrical) impulses ; generated by (skin) receptor ; travels to spinal cord along sensory neurone(s) ; within spinal nerve ; synapse ; relay / connector / inter–, neurone ; motor neurone to effector / biceps / muscle ; <u>biceps</u> contracts ;	[max 5]	**R** messages, signals **R** spinal cord
(iii)	fast ; automatic ; protective / defensive / avoid injury ; removes (part of) body from source of danger ;		[2]	
(c)	hormones / chemical messengers ; secreted into the blood / which travels in blood ; stimulate target , cells / tissues / organs ;		[max 2]	**A** endocrines **I** endocrine system
			[Total:14]	

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	Answers		Marks	Guidance for Examiners
6 (a) (i)	amino acid / protein / RNA / DNA / AW**;**		**[1]**	**A** named protein, both plant and animal
(ii)	secondary (consumer) / carnivore / predator **;**		**[1]**	**R** third / tertiary
(iii)	excretion **;**		**[1]**	
(iv)	nitrification **;**		**[1]**	**A** oxidation
(b)	**1** **2** **3** **4** **5**	*idea that* (fixed) nitrogen is in limited supply **;** *idea that* if not recycled is not available for plants to absorb **;** needed for many biological compounds **;** (required by organisms to make) amino acids / proteins / DNA / chlorophyll **;** for growth / for repair / for enzymes / for genes / AW **;**	**[max 3]**	
(c)	**1** **2** **3** **4** **5** **6** **7** **9** **8**	not ideal habitat / not well adapted to habitat / conditions not favourable **;** any suitable reason **;** e.g. too dry / wrong soil / wrong pH / wider leaves / larger leaf surface (area) (seedlings) eaten by impala / herbivores **;** much tastier than grass / better nutritional content **;** competition with grasses **;** for any resource **;** e.g. light / nutrients / minerals / water slow growing **;** AVP **;** e.g. few seeds produced, lack of suitable pollinators, lack of suitable / required symbiont, soil contains plenty of nitrate (so no advantage to being a nitrogen fixer, because of much animal dung) / poor seed dispersal Connection…lightning and nitrogen in soil **;**	**[max 3]**	**I** competition with self **A** lack of light / minerals / water

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	Answers		Marks	Guidance for Examiners
(d)	**1** **2** **3** **4** **5** **6** **7** **8** **9** **10** **11** **12**	*general idea of* energy loss (in food chain) **;** cheetahs are at a higher trophic level (than impala) / impala are the primary consumers / prey **;** each cheetah eats many impala**;** large population of cheetahs cannot be sustained / number of impala controls or determines the number of cheetahs **;** hunted / poached (for skins) **;** killed by local people as they feed on animals **;** reference to balanced ecosystem / food chain / food web**;** cheetahs do not eat, all impalas / all parts of an impala 'lose energy', in respiration / as heat to environment **;** *and in* movement / excretion / egestion / reproduction **;** offspring killed / die (while growing) by other predators / their prey AVP **;**	**[max 4]**	
(e)	**1** **2** **3** **4** **5** **6** **7** **8**	***idea of*** interdependence **;** if one species is lost others may become extinct **;** rely indirectly on plants **;** impala eat a variety of plants **;** cheetahs eat a variety of other prey animals **;** *idea of* conserving habitats **;** to ensure species continue for future generations to, enjoy / use **;** biodiversity reference;	**[max 3]**	**A** idea of knock-on effect / AW **A** tourism
			[Total:17]	

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