CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

0610 BIOLOGY

0610/33 Paper 3 (Extended Theory), maximum raw mark 80

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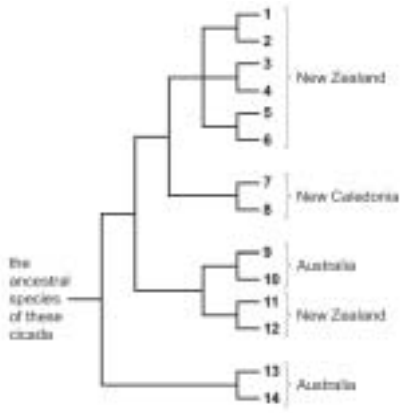
CAMBRIDGE
International Examinations

Question				Expected Answers	Marks	Additional Guidance
1	(a)			body divided into/segmented three parts / head, thorax and abdomen (one pair of) antennae / feelers wings three pairs / 6 legs compound eyes	[max 3]	**R** segmented body unqualified *do not accept arthropod features*
	(b)			arthropod / Arthropoda	[1]	**must have** arthr so accept arthropod but reject anthropod
	(c)			chromosome nucleus mitochondria chloroplast plasmid nucleolus	[2]	Note: Apply list rule
	(d)	**1** **2** **3** **4** **5**		two groups: 1 – 6 and 11 & 12 migrate to New Zealand 1 – 6, New Caledonia / indirect / migration A 11&12, direct (Australia) / migration B correct example of (evolutionary) relationship / DNA similarity, e.g. 13 & 14 most distantly related from others / 9 & 10 most closely related to each other ref to, clade(s) / cladogram	[max 3]	

	(e)	**1** **2** **3** **4** **5** **6** **7** **8** **9**	adapt to environment / conditions in new places are different competition between individuals struggle for existence ref to variation survival of fittest / those that are better adapted survive reproduce, pass on their alleles; **A** genes **I** traits mutations / changes in DNA change in the gene pool / AW changes to physical / behaviour (of species), e.g. mating behaviour	[max 4]	**A** conditions on different islands are different Mpt 9 **R** changes of individuals
			[Total: 13]		
2	**(a)**	**1** **2** **3** **4**	removal from the body / organism / cell **R** 'excreted from body' poisons / toxins / harmful substances named example OR waste products / of metabolism / respiration / deamination / chemical reactions in cells or in the body substances in excess (of requirements) / AW	[max 3]	**Ig** faeces, egestion, defecation, digestion AW **A** 'substances that cause harm' / 'harmful' *toxic waste products of metabolism / AW = 2 marks* ***ignore** routes from body* Mpt 3. **A** named examples, e.g. CO_2, urea, salt, named ions, amino acids
	(b)				

process that occurs in the kidney tubule	letter from Fig. 2.1
filtration of blood	**H**
reabsorption of most of the solutes in the filtrate	**C**
water is absorbed by osmosis to determine the concentration of urine	**G**
unfiltered blood returns to the renal vein	**D / E**

[4]

component	blood	filtrate	urine
red blood cells	✓	×	×
white blood cells	✓	×	×
plasma proteins	✓	×	×
glucose	✓	✓	×
urea	✓	✓	✓
salts	✓	✓	✓
water	✓	✓	✓

one mark for the filtrate column

one mark for the urine column

[2]

[Total: 9]

3	**(a)**	**(i)**	amylase **A** carbohydrase	[1]	**lg** odd spelling
		(ii)	**1** starch is not soluble / large /complex **2** fungus does not, secrete / produce, amylase **3** for absorption (of glucose) / AW **4** ref to, respiration / growth, (of fungus) **5** as nutrient, for fungus / fermentation / AW	[max 2]	Mpt 2 **A** ecf from (i) / carbohydrase / enzyme to digest starch
	(b)	**1** **2** **3** **4** **5**	other fungi / bacteria / virus / other microorganisms compete for nutrients reduce productivity / yield / quality contaminate the product / produce toxic *or* harmful product / ORA stop the process (early) and sterilise fermenter	[max 2]	**R** contaminate unqualified

	(c)	**1** **2** **3** **4** **5** **6**	energy is lost, between / within, trophic levels / along food chain animals are, at second trophic level / primary consumers OR plants are, autotrophs / producers / first trophic level (energy lost) in animal respiration / heat / (named) metabolic process / movement ref to (more) material that is inedible / not digestible (in longer food chains) ref to 10% energy transfer / ORA less pollution (from farm animal waste)	[max 3]	**Ig** ref to healthy diet ref to 100→10→1 Mpt 6 **A** plants use CO_2
	(d)	**1** **2** **3** **4** **5** **6** **7** **8**	cheaper requires less energy as less is lost along food chain mycoprotein can be made anywhere / less land (in fermenters) less (animal) waste better for animal welfare / more ethical lower in fat **/** lowers risk of <u>heart</u> disease suitable for, vegetarians / vegans AVP e.g. quicker, contains fibre, disease free	[max 3]	**Note:** Use list rule **R** longer shelf life, help food shortages, more protein, more nutrients, easier to digest
	(e)	**1** **2** **3** **4** **5** **6**	mycoprotein / fungus production requires supply of corn (starch) this comes from crop plants (fungus) still need to be grown (manufacture) requires energy rate of food supply cannot keep up due to overpopulation AVP e.g. does not contain all nec nutrients, may be consumer resistance to eating mycoprotein foods / needs flavourings / unbalanced diet	[max 3]	 **R** required machinery
			[Total: 14]		

4	**(a)**	$C_6H_{12}O_6$ 2 $C_3H_6O_3$		[2]	***ignore*** word equation ***ignore*** energy / ATP **R** if 2 is not included for $C_3H_6O_3$ **R** O_2, CO_2, H_2O on either side
	(b)	biceps contracts triceps relaxes		[2]	**accept** ref to <u>antagonistic</u> pair of muscles
	(c)		*During:* **1** oxygen consumption increases as exercise starts **2** levels off / increase slows down during the race **3** data quote for consumption during the race *After:* **4** starts to decrease, <u>immediately</u> at the end of the race / at 18 minutes **5** <u>gradually</u> decreases after exercise **6** rate returns to original / resting level **7** data quote for consumption after exercise	[max 4]	Units must be stated at least once e.g. of Mpt 3: **A** plateaus between 2.1 – 2.4 dm^3 min^{-1} Maximum is 2.4 dm^3 min^{-1}, 3 – 4 mins /at start / 5 to 8 or 9 mins to reach maximum e.g. of Mpt 7: **A** Resting rate at 0.25 dm^3 min^{-1}, 9 – 10 mins / at 18 to 27 or 28 min to reach original level
	(d)	**1** **2** **3** **4** **5** **6** **7** **8** **9**	<u>oxygen debt</u> not enough oxygen supplied (to muscles) during exercise to muscles anaerobic respiration lactic acid produced lactic acid, broken down / respired / converted to glucose / CO_2 and water / oxidized requires (extra) oxygen oxygen restored to haemoglobin AVP. e.g. restored to myoglobin (in muscles)	[max 5]	**A** lactate for lactic acid throughout the answer Mpt 6 **R** removed **Ig** lowers pH, muscles stiff / cramps
			[Total: 13]		

5	**(a)**	**(i)**	(80 – 30 = 50) 50 / 30 x 100 OR max – min / original x 100 = 167 / 166.7 (%)		[2]	*two marks for the correct answer (167)* *if answer incorrect, allow one mark for the correct working / formula* **R** 166, **lg** sig figs
		(ii)	**1** increase in human population / more people to feed **2** more crops being grown / higher yield **3** less land available for farming (land lost to housing etc) **4** farming has become more intensive / technological / less subsistence / AW **5** less use of crop rotation / less land left fallow / monoculture / less use of legumes **6** prevents soil becoming depleted of nitrogen **7** (compounds) **8** new varieties of crop plants have high demand AVP e.g. cheap, easy		[max 3]	
	(b)	**(i)**	**1** protein (in manure) broken down / decompose to amino acids **2** by (named) decomposers, in context **3** amino acids / proteins, deaminated **4** deamination described **5** urea converted to ammonia **6** ammonia / ammonium ions, to nitrite / nitrate ions **7** nitrite to nitrate ions **8** nitrification / nitrifying bacteria, in context		[max 4]	
		(ii)	**1** legumes contain nitrogen-fixing bacteria / rhizobium **2** in root nodules **3** nitrogen fixation / convert nitrogen (in atmosphere) to ammonia / amino acids / organic forms of N **4** transferred to legume for making protein **5** increases N (in soil) for next crop **6** reduces need to use chemical fertilisers **7** legumes are good source of protein **8** crop rotation reduces effects of, pests / diseases		[max 3]	

	(c)		*waters* **1** <u>eutrophication</u> **2** growth of algae / algal bloom **3** light blocked / toxic substances released by algae **4** (fixed) water plants die **5** algae / plants, decayed by bacteria **6** aerobic respiration **7** oxygen concentration decreases in context **8** animals / fish, migrate / die, in context *land* **9** reduction in organic content of soil **10** soil / fertilizer, blown / washed / leached, away **A** erosion of soil **11** increase in soil acidity *atmosphere* **12** increases loss of nitrous oxide / NO_x to the atmosphere **13** nitrous oxide / NO_x, is a greenhouse gas **14** carbon dioxide from combustion of fossil fuels / in production of fertilisers **15** greenhouse effect / global warming, in context *humans* **16** qualified health effect on humans / livestock	[max 5]	**Mpt 15** linked with mpt 13 or 14 e.g. blue baby syndrome, accumulation in dioxins
			[Total: 17]		
6	**(a)**	**(i)**	transport of oxygen	[1]	
		(ii)	amino acids	[1]	**A** polypeptides, haem
		(iii)	iron / Fe / Fe^{2+}	[1]	

	(b)	**1** **2** **3** **4** **5** **6** **7** **8** **9** **10** **11** **12** **13** **14**	fewer red blood cells less elastic / less flexible / sickle-shaped, red blood cells haemoglobin is abnormal shape haemoglobin / blood, less efficient at transporting oxygen less respiration less energy / fatigues / exhaustion / less active / feeling faint / breathlessness death of tissues linked to oxygen supply capillaries are blocked pain 'sickle cell crisis' slow / poor, growth susceptible to infections reduced life span AVP e.g. problems in pregnancy, kidney disease	[max 3]	**Ig** ref to malaria
	(c)	**1** **2** **3** **4** **5** **6**	malaria is common in Africa people who are, heterozygous / Hb^AHb^S have, sickle cell trait / mild sickle cell protected / AW, against malaria description of sickle cells are less prone to infection Hb^S continues to appear due to selective advantage / AW	[max 3]	Mpt 4 **R** immune **A** description of selection

	(d)		**Hb^A** is dominant / **Hb^S** is recessive / (both) parents are, carriers / heterozygous Hb^AHb^S x Hb^AHb^S Hb^A, Hb^S + Hb^A, Hb^S (Hb^AHb^A , Hb^AHb^S, Hb^AHb^S) Hb^SHb^S	[max 3]	**Note:** **Ig** incorrect text if genetic diagram is correct **ECF** for Mpt 2 and 3 in diagram key. Mpt 3 linked to correct derivation in Mpt 2 *do not allow genotypes for parents or children that are single alleles*
	(e)	**1** **2** **3**	ref to (ionising) radiation causes / increased risk, mutation change to DNA / genes	[max 2]	**A** e.g. of radiation e.g. gamma rays
			[Total: 14]		