CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2013 series

0610 BIOLOGY

0610/33 Paper 33 (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.

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Question		Expected Answers	Marks	Additional Guidance
1	(a)	arthropods/Arthropoda ;	[1]	**R** 'anthropod'
	(b)	**A** – spiny/oval, carapace/AW ; jagged edge of carapace ; claws same length ; eyes on (short) stalks ; **B** – long/coiled/soft , abdomen ; abdomen not under carapace ; (long) antennae ; multiple, appendages/mouth parts ; shorter back (walking) legs ; uneven length of, chelipeds/claws/pincer ; hair on claws ; eyes on stalks ; **C** – uneven length of, chelipeds/claws/pincers ; square/rectangular, carapace ; eyes on (long) stalks ; **D** – rounded/flattened/less hairy, back/hind (walking) legs ; longer/wider back (walking) legs (compared to other legs) ; jagged edge on claws ; jagged/pointed edge, of carapace ; short antennae ; no eye stalks ; claws same length ;	[4]	**A** descriptions of carapace/back/'shell' ***ignore*** exoskeleton for carapace ***ignore*** **'**tail' for abdomen ***ignore*** segmented abdomen ***ignore*** clamp ***ignore*** fur for hair **A** larger/bigger as BOD (for hind legs)

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Question			Expected Answers	Marks	Additional Guidance
1	(c)	(i)	mass ; size of a named suitable feature ; length of named suitable feature ; width of named suitable feature; number of hairs ; number of spikes/roughness ; thickness of a suitable named feature ; hardness of a suitable named feature ; depth of colour ;	[max 1]	*features qualified in* ***(c)(ii)*** *may be credited in* ***(c)(i)*** **R** number of anything absolute (e.g. legs) **R** shape unqualified **R** colour unqualified **R** fur ***ignore*** comparing species rather than individuals
		(ii)	balance/weighing machine/scales ; use of ruler described ; calipers ; any other suitable method for the feature given in **(i)** ;	[max 1]	***ignore*** measure unqualified **No ECF** from **(c)(i)**
1	(d)	**1** **2** **3** **4, 5** **6** **7**	population remains the same if birth rate = death rate/ref to carrying capacity ; death rate must be high ; many young crabs do not survive to, adulthood/breed ; example of cause of high death rate ;; lack of/competition for, food ; ref to <u>limiting factor</u>(s) ;	[max 3]	*examples of* **MP4** *and* **MP5** eaten by predators competition with other crabs (of the same species/other species) competition with other non-crab species (infectious) disease effect of abiotic factor (e.g. dehydration) indirect effect of man, e.g. pollution/habitat destruction genetic disease/genetic 'fault' fishing/crabbing

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	(e)	**1** **2** **3** **4** **5** **6** **7**	stops/reduces, blood loss/bleeding **;** reduce (bacterial) infection/bacteria killed in wound **;** (clotting) prevents entry of pathogens **;** more <u>red</u> blood cells, trapped in mesh/fibrin (forming a clot/scab) **;** promotes healing **;** (in an emergency) may need wound to be sealed quickly **;** less chance of allergies **;**	[max 3]	***ignore*** bandages help quicker clotting **R** <u>viral</u> infections
			[Total: 13]		

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Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	amino acids **;**	[1]	**A** (di/oligo/poly)peptide
		(ii)	(permanent) increase in, size/length/AW **;** increase in <u>dry</u> mass **;** increase in <u>cell</u> number **;**	[max 2]	**Note:** increase in dry mass = 2 marks **A** ref to cell division/mitosis/reproduction of cells **R** reproduction unqualified ***ignore*** development
	(b)	**1** **2** **3** **4** **5** **6** **7** **8**	identify/locate, the (position of) gene (in bovine genome) **;** cutting, chromosome/DNA/plasmid **;** insert gene into a, plasmid/vector **;** plasmid/vector, enters the bacterium **;** reproduction/growth, of (GM) bacteria (in fermenters) **;** bacteria, synthesise/produce, the protein/BST **;** protein/BST, harvested/purified **;** correct reference to (named) enzyme **;**	[max 3]	*answers referring to insulin can be credited with marking points 2,3,4,5,8* e.g. restriction enzyme/ligase/endonuclease

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	(c)	**(i)**	*mean milk yield to max 4* **1** immediate increase (from treatment/week 10) **;** **2** peaks/increases and decreases **;** **3** (general) decrease after 20 weeks/43.3 – 43.7 kg per day **;** **4** (mean) BST/**A**, yield always higher than, **B**/no BST (from 10 week/treatment) **;** **5** any suitable data quote giving mean milk yield with units and week **;** *mean food energy intake to max 4* **6** peaks/increase and decreases **;** **7** (then) levels off **;** **8** (mean) BST/**A**, energy always higher than, **B**/no BST (from 10 week/treatment) **;** **9** any suitable data quote giving mean food energy intake with units and week **;**	[max 6]	**Note**: All units (kg per day) must be stated for mean milk yield but ***ignored*** for food energy intake **A** optimum/maximum for peak **MP 5** 39 kg per day at, 10 weeks/start of treatment 43.3–43.7 kg per day at *either* 19/20 weeks *or* 9/10 weeks, after treatment 29 kg per day at *either* 36–37 weeks *or* 26 - 27 weeks, after treatment approx 10 kg per day difference between **A** and **B** **MP 9** 158 MJ per day at, 10 weeks/start of treatment 164 MJ per day from *either* week 29 – 34 *or* after 19–24 weeks of treatment 165 MJ per day at *either* week 36–37 *or* 26–27 weeks, after treatment 172 MJ per day at 19.5–20 weeks

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Question			Expected Answers	Marks	Additional Guidance
2 (c)	(ii)	1 2 3 4 5 6 7	milk yield does not increase much (from initial yield) ; increase only for, 10 weeks/short period ; increase in food (energy) intake ; cattle feed adds extra costs ; *idea of* milk yield decreases but food (energy) intake remains high (from 20 week) ; use of comparative data in support ; cost of, using/producing, BST ;	[max 3]	**MP 6** after, 30 weeks/20 weeks treatment, differences in milk yield 10±2 kg (per day), differences in food energy 26–52 MJ (per day) milk yield shows a 20± 2% increase, food intake shows a 15 – 32 % increase after, 30 weeks/20 weeks treatment
	(d)	1 2 3 4 5	labelling, provides information/allows consumer choice ; concerns about hormones 'in the milk' ; possible effects on human health ; e.g. allergies/side effects ref to, animal welfare/health of cattle expected to produce more milk ; there is no reason to label the milk/described example ;	[max 3]	***ignore*** unethical unqualified *examples for* **MP5** confusion in consumer minds about GM food loss in sales there is no difference in the milk this is not a GM food, but GM technology is used in the production of BST ***ignore*** 'milk is safe'
				[Total: 18]	

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<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td></td><td>E – cortex ;
F – medulla ;
G – <u>ureter</u> ;</td><td>[3]</td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>
<table>
<tr><th>process</th><th>letter</th><th>reason</th></tr>
<tr><td>diffusion of oxygen</td><td>H ;</td><td>idea that (oxygen) diffuses, from high concentration/to low concentration/down concentration gradient (into the cell) ;</td></tr>
<tr><td>active uptake of sodium ions</td><td>L ;</td><td>idea that (sodium ions) are moved against their concentration gradient/from low to high concentration ;</td></tr>
</table>
</td><td>[4]</td><td>mark the columns independently</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>glomerulus ;</td><td>[1]</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td>1 (glucose is reabsorbed) by active uptake/active transport (from filtrate) ;
2 against concentration gradient/from low to high concentration ;
3 using energy ;
4 as in L ;</td><td>[max 2]</td><td>ignore diffusion of glucose

R energy ‘produced’</td></tr>
<tr><td></td><td>(c)</td><td>1
2
3
4
5
6</td><td>active uptake/active transport, of ions against the concentration gradient (into the root) ;
energy is needed for, active uptake/active transport ;
comes from respiration ;
water is absorbed, by osmosis/down water potential gradient ;
(osmosis/diffusion is a) passive process/does not need energy ;
diffusion of ions will occur until equilibrium ;</td><td>[max 3]</td><td>R energy ‘produced’</td></tr>
<tr><td></td><td colspan="3"></td><td>[Total: 13]</td><td></td></tr>
</table>

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<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>4</td><td>(a)</td><td></td><td>
<table>
<tr><td>cell</td><td colspan="2">end products of respiration</td></tr>
<tr><td></td><td>aerobic</td><td>anaerobic</td></tr>
<tr><td>yeast</td><td>carbon dioxide/CO_2 + water/H_2O ;</td><td>carbon dioxide/CO_2 + alcohol/ethanol/C_2H_5OH ;</td></tr>
<tr><td>human muscle cell</td><td>carbon dioxide/CO_2 + water/H_2O ;</td><td>lactic acid lactate/
$C_3H_6O_3$/$CH_3CH(OH)COOH$ /
$CH_3CH(OH)COO^-$;</td></tr>
</table>
</td><td>[4]</td><td>ignore ATP/energy</td></tr>
<tr><td>4</td><td>(b)</td><td>1
2
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8
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11

12
13</td><td>muscles <u>contract</u> ;
need more energy ;
increase in need for oxygen ; ORA
removal of (more) carbon dioxide ;
(increase in) <u>aerobic</u> respiration ;
<u>anaerobic</u> respiration also occurs ;
developing <u>oxygen debt</u>,/oxygen not supplied fast enough ;
(production of) lactate/lactic acid ;
increase in stroke volume (of heart) ;
increase in, blood flow/glucose/oxygen, to muscles ;
blood pressure increase because heart rate/stroke volume increases ;
removal of heat ;
ref to adrenaline ;</td><td>[max 5]</td><td>ignore ‘breathing rate’, ‘ventilation rate’, ’oxygen absorption’, ‘heart rate’, ‘blood pressure’ (all are in the Table)

R repaying oxygen debt (occurs after exercise)</td></tr>
<tr><td></td><td></td><td></td><td></td><td>[Total: 9]</td><td></td></tr>
</table>

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Question			Expected Answers	Marks	Additional Guidance
5	(a)		transfer, of (named) pathogen/disease, from (infected) to (uninfected) person/animal/organism ; a (named) medication/substance, taken into the body that, modifies/affects/influences, (chemical reactions in) the body ;	[2]	**A** (harmful) microorganism/bacteria/virus/fungus for pathogen **A** infected by/passed down for 'transfer' **R** named non-human organisms
	(b)	**1** **2** **3** **4** **5** **6** **7** **8** **9** **10** **11**	(named) pathogens of water/(formula) milk ; (named) water-borne diseases ; (new born) babies have, weak/no, immune systems ; AW few(er) antibodies from mother (as no breast milk) ; ref to HIV infects lymphocytes/white blood cells/weakens immune system ; no/few, lymphocytes/white blood cells ; few/no, antibodies produced ; then phagocytes are less effective ; stomachs do not produce much acid ; diarrhoea/vomiting ; dehydration/loss of, water/ions ;	[max 4]	*for* **MP1** **A** contamination of, water/bottle **A** (harmful) microorganism/bacteria/virus/fungus for pathogen ***ignore*** germs *for* **MP3** ***ignore*** children

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	(c)	**1** **2** **3** **4** **5** **6** **7** **8** **9** **10** **11** **12**	bonding with mother **;** it's free/'cheap' **;** sterile/no risk of infection from, formula milk/bottled milk **;** is at, body/correct, temperature **;** no preparation/easily available **;** provides, best/complete/most suitable/AW, food **;** easier to digest **;** contains antibodies/ref to colostrum/provides passive immunity **;** provides protection against, pathogens/diseases/microorganisms **;** reduce risk of allergies **;** contraceptive effect **;** AVP **;**	[max 4]	*examples of AVPs for* **MP12** no additives further antibody detail, e.g. diseases that the mother has had/common diseases **;** composition/quantity, of breast milk changes to match development of baby **;** protects against, <u>breast</u> cancer/<u>ovarian</u> cancer **;** helps the body to return to 'normal' e.g. weight loss/restores uterus **;**

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Question			Expected Answers	Marks	Additional Guidance
5	(d)	1 2 3	(unprotected/AW) sexual intercourse/from semen/vaginal fluids **;** sharing, needles/syringes **;** blood/blood product, for transfusion/transplants/blood to blood contact **;** ***ignore*** blood unqualified	[max 2]	**A** 'sex' **R** saliva/tears/sweat/urine **R** donating blood **R** skin contact **R** kissing **R** (genetically) inherited ***ignore*** other sharps, e.g. tattoo needles/razors unless qualified by blood contact ***ignore*** unqualified body fluids/breast milk/placenta
				[Total: 12]	

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Question			Expected Answers	Marks	Additional Guidance
6	(a)	1 2 3 4 5 6 7	provide, mineral (elements)/(named) ions/(plant) nutrients ; that are in low concentration in soils ; (minerals/ions are) limiting factor(s) ; for, growth/yield ; magnesium (ions) for chlorophyll production ; for photosynthesis ; nitrogen/nitrate (ions), for making, amino acids/ proteins ;	[max 3]	**MP2 A** any reason, e.g. removed in crops at harvest/leached/AW **MP5 R** chloroplast
	(b)		oxygen ; water/moisture ; suitable/ warm temperature ; AVP ;	[max 3]	***ignore*** humidity unqualified **R** 'hot', 'heat' examples of AVPs any condition that breaks dormancy, e.g. light/optimum pH
	(c)	1 2 3 4 5 6	sulfuric acid has a bigger effect on roots than shoots ; 0.003 mol per dm^{-3} sulfuric acid has biggest effect ; increase in root growth until 0.003 mol dm^{-3} sulfuric acid ; **ORA** negligible difference in effect (on root/ shoot) between 0.001 and 0.002 mol dm^{-3} sulfuric acid ; comparative data quote for <u>root</u> growth ; comparative data quote for <u>shoot</u> growth ;	[max 4]	*for* **MP5** and **MP6** see the table of results (results from two rows are required in each case) units must be stated once
	(d)	1 2	increase in burning, fossil fuels/named fossil fuel ; cars/factories/power stations/AW ;	[2]	more is not needed for **MP2** as question says 150 years

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Question			Expected Answers	Marks	Additional Guidance
	(e)		*effects of sulfur dioxide on organisms and their environment*		
		1	plants/leaves/roots/trees/bark, damaged/killed/ stunted growth ;		
		2	plants more likely to get diseased ;		
		3	inhibits germination ;		
		4	(sensitive species of) lichens killed ;		
		5	microorganisms killed ;		
		6	soil/lake/river, pH decreases ; AW		***ignore*** sea
		7	aluminium ions become mobile ;		
		8	nutrients/named example(s), leached ;		
		9	shells damaged ;		
		10	animals fail to reproduce ;		
		11	low pH/aluminium ions, toxic to fish ;		***ignore*** marine (fish)
		12	fish produce mucus which blocks gills ;		
		13	AVP ;	[max 3]	*examples of AVPs for* **MP13** chemical weathering/dissolve carbonate rocks respiratory problems in, human/animals (described) consequence for food chains
				[Total: 15]	

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Table of results for Question **6 (c)**

Roots

concentration of acid/mol dm^{-3}	length/mm	time/days
0	25	24
0	55	72
0.001	23	24
0.001	65	72
0.002	20	24
0.002	65	72
0.003	8	24
0.003	15	72

Shoots

concentration of acid/mol dm^{-3}	length/mm	time/days
0	13	24
0	22	72
0.001	11	24
0.001	20	72
0.002	11	24
0.002	20	72
0.003	6	24
0.003	10	72

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