UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2011 question paper for the guidance of teachers

0610 BIOLOGY

0610/32 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.

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Question		Expected Answers	Marks	Additional Guidance
1	(a)	**A** left atrium ; **B** mitral / bicuspid / atrioventricular, valve ; **C** semi-lunar valve / pocket valve / aortic valve ; **D** right ventricle ;	[4]	*reject if correct and incorrect answers given for each* **A** atria **A** auricle **A** 'oracle' / 'oricle' **A** if given the plural **A** if given the plural, **A** 'half-moon' valve
	(b)	**E** (superior / anterior) vena cava ; **F** aorta ;	[2]	
	(c)	coronary ; **1** fatty deposit in (wall of) artery ; **2** blocks, artery / restricts, blood flow ; **3** restricts, oxygen / nutrient, supply ; **4** blood clotting occurs ;	[1] [max 2]	**R** cardiac **A** phonetic spellings *ignore incorrect name for MP1–4* **A** atheroma / plaque **A** cholesterol / LDL / fatty acids **A** arteriosclerosis / described **A** 'narrows' artery **R** if 'to body' ***ignore*** high blood pressure
	(d)	heart not pumping blood / keeps blood circulating ; blood is oxygenated ; carbon dioxide is removed from blood ;	[max 2]	**A** blood not pumped to the lungs **A** exchange of oxygen and carbon dioxide for two marks ***ignore*** 'to keep patient alive' / 'supply heart with blood'
	(e)	**1** ref. to (cardiac) muscle ; **2** ref. to myogenic / heart has own pacemaker ; **3** septum (divides heart into two) ; **4** two (separate) ventricles / AW ; **5** ventricle(s), contract / pump ; **6** increase blood pressure ; **7** right ventricle has thin(er) wall / left ventricle has thick(er) wall ; **8** so low(er) pressure / higher pressure ; (in context) **9** to lungs / to rest of body ; (in context)	[max 4]	**R** 'push' **A** bigger , **R** tougher **A** muscle **A** 'to whole body' for LV if blood to lungs described
		[Total: 15]		

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Question			Expected Answers	Marks	Additional Guidance
2	(a)		*whole / part of, organism* changes in position / changes in place ;	[1]	***ignore*** locomotion **A** (moves) from place to place / one place to another
	(b)	(i)	antagonistic ;	[1]	**A** antagonism
		(ii)	*idea of* muscle pull (don't push) ; biceps contracts ; triceps relaxes ; flexion / described as movement of (fore)arm ; during relaxation muscle is, stretched / passive ; both contract to maintain position / holding an object ;	[max 3]	*assume answer is about flexion – credit ora for extension – mark through if both given* if answer does not mention the names of the muscles but has the right idea for one contracts and the other relaxes, then allow one mark for MP2+3 contraction and relaxation of the pair must be linked to the correct movement of the arm. If not, no marks **R** hand **A** named correct bone – radius and/or ulna **A** lengthens
	(c)	(i)	*transmits impulses* from, receptor / nerve endings / sensory endings / skin / sensory organ ; to, CNS / spinal cord / connector neurone / relay neurone ;	[2]	***ignore*** sensory neurone as question says 'describe' ***ignore*** 'messages' / 'signals' / 'senses the stimulus' **R** 'fingers' / 'hand' **A** interneurone **R** 'brain' / 'brain and spinal cord'
		(ii)	*idea that* impulses stimulate muscle to, contract / move hand ; (only) biceps contracts (to raise the forearm) ; ref. to impulse does not cross synapse to **H** ;	[2 max]	*assume answer is about neurone G, but accept about H*
	(d)	1 2 3 4	many / different, stimuli ; brain, decides / controls / coordinates ; impulses in motor, neurones / nerves ; to, (many) muscles / effectors (involved) ;	[max 2]	**R** if one muscle
				[Total: 11]	

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Question			Expected Answers	Marks	Additional Guidance
3	(a)	1	root hairs ;		
		2	water moves from high(er) <u>water potential</u> to low(er) <u>water potential</u> ;		**A** down a water potential gradient ***ignore*** water concentration **R** dilute and concentrated
		3	osmosis ;		
		4	through partially permeable <u>membrane</u> ;		**A** semi-permeable / selectively permeable
		5	ref. to protein pores ;	[max 3]	
	(b)	1	large surface area ;		**A** minerals for ions
		2	thin (cell) walls ;		**A** thin wall as 'cell' is in the question
		3	(many) mitochondria ;		
		4	ref. respiration ;		
		5	provide / release, energy, for active transport ;		**A** active, uptake / transport, uses energy **A** active uptake **R** if water also taken up by active uptake
		6	proteins / carriers / channels, for, diffusion / active transport (of ions) ;	[max 3]	**A** 'moving against concentration gradient' for active transport
	(c)		*in appropriate boxes*		
			adult and zygote = 90 ; ovum = 45 ;	[2]	**A** ***ecf*** if half incorrect diploid number *only allow ecf if **both** diploid numbers are the same*

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Question		Expected Answers	Marks	Additional Guidance
	(d)	*advantages **for plants*** only one, parent / plant ; fast / new plants establish themselves quickly ; (potential) rapid spread close to parent / AW ; less energy required ; no wastage of gametes ; (if parent well adapted) offspring will be adapted to surroundings ; plants grow in a suitable place / no wastage ; AVP ; e.g. greater chance of reproduction	[max 2]	**R** refs to number of plants produced **R** 'does not require male and female gametes' **A** 'more likely to leave offspring' idea ***ignore*** refs to avoiding mutations unqualified **A** 'good' traits / e.g., passed on **R** 'good' genes *do not accept advantages for humans*
		disadvantage for plants plants too crowded / overcrowding ; (lots of) competition for resources ; little / no, (genetic) variation ; disease transmitted directly to offspring ; less evolution / less able to adapt ; (all identical so) can be wiped out by the same disease ; no / little, dispersal ; AVP ;	[max 1]	*genetic or infectious disease* **A** 'disease can spread easily'
		[Total: 11]		

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Question				Expected Answers	Marks	Additional Guidance
4	(a)	(i)		lymphocyte ;	[1]	***ignore*** leucocyte **A** phonetic spellings
		(ii)	1	attach to, bacteria / viruses / pathogens ;		**A** antigens
			2	cause them to, aggregate / stick together / AW ;		
			3	stop them spreading ;		**R** 'fight' against *anywhere in the answer*
			4	help phagocytes engulf them ;		**A** opsonisation / described **A** 'makes bacteria more detectable by phagocytes'
			5	cause bacteria to burst / kill bacteria / destroy bacteria ;		***ignore*** 'dissolve bacteria
			6	stop bacteria moving / immobilise bacteria ;		
			7	neutralise, toxins / poisons / harmful substances ;		**A** 'detoxify'
			8	stop, viruses / bacteria, entering cells ;	[max 2]	
	(b)	(i)	1	when blood clots / following a cut / when wounded / AW ;		**A** injury
			2	when blood vessels are damaged ;		
			3	on exposure of, blood / fibrinogen, to air ;		
			4	flows over rough surfaces / AW ;	[max 1]	
		(ii)	1	(fibrinogen is converted into) insoluble (fibrin) ;		*assume answer is about fibrin*
			2	forms, mesh / net / network / strands ;		
			3	traps, (red) blood cells / platelets ;		**A** 'gauze' / threads / fibres / web
			4	(dries) to form a scab ;		
			5	prevents, loss of blood / more bleeding ;		
			6	prevents infection / AW ;		
					[max 3]	**A** prevents entry of (named) pathogens **R** foreign bodies

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Question			Expected Answers	Marks	Additional Guidance
	(c)	(i)	5°C – low (kinetic) energy / slow movement of molecules ; low frequency of / few, collisions ; 70°C – enzyme <u>denatured</u> ; ref. to active site / shape of enzyme ;	[max 3]	*accept that 'it' refers to the enzyme* denatures active site = 2 marks, **A** thrombin for enzyme **R** if 'die' / 'die and denature'**A** 'deformed' / AW, active site / enzyme
		(ii)	time taken for fibrin to form / liquid to become sticky / AW ; time taken for fibrinogen / substrate to disappear ; how much fibrin produced in, unit time / stated time ; how much fibrinogen converted, in unit time / stated time ;	[max 1]	**A** rate of fibrin production / how long it takes blood to clot / form a mesh / to reach same viscosity **R** 'how long it took a scab to form' **A** product for fibrin **A** substrate for fibrinogen
		(iii)	pH ; volume of, enzyme / thrombin (solution) ; concentration of, enzyme / thrombin (solution) ; volume of, substrate / fibrinogen (solution) / blood ; concentration of, substrate / fibrinogen (solution) ; calcium ions ; AVP ; e.g. equilibration time	[max 2]	**R** temperature **A** 'amount' for concentration **A** 'amount' for concentration **R** blood **R** size of fibrinogen / substrate
			[Total: 13]		

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Question			Expected Answers	Marks	Additional Guidance
5	(a)		wings ; beak ; feathers / plumage ; scales on, legs / feet ;	[3]	***ignore*** adjectives such as grey / long / sharp
	(b)	(i)	quantitative (feature) ; range between two extremes ; ref. to (many) intermediates ; not in distinct groups ; influenced by the environment (and genotype) ;	[2]	**A** answer in context of wing length
		(ii)	length of …… *anything suitable* (body) mass ; age ;	[max 1]	**A** height **R** any discontinuous variable, e.g. colour **A** weight **R** size / size of ….. **A** height
	(c)	(i) 1 2 3 4 **R** 'greater life expectancy'	largest number of / most, birds trapped ; oldest (mean age for) birds trapped ; comparative data quote for numbers ; *accept fraction / percentage / proportion of total* comparative data quote for age ;	[max 4]	*assume answer is about birds trapped unless stated otherwise*

wing length at ringing / mm	number of birds trapped	mean age at trapping / days
less than 63	24	253
64	72	256
65	130	297
66	183	346
67	167	349
68	106	270
69	66	237
more than 70	23	199
	total = 771	

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Question			Expected Answers		Marks	Additional Guidance
		(ii)				*look for types of evidence, not assertions*
			1	number of young birds of each wing length ;		**R** wing length of newly hatched birds
			2	wing lengths of birds that died ;		
			3	length of life / length of life after trapping ;		
			4	results for birds in West Africa ;		
			5	effects of migration ;		
			6	wing lengths of birds that breed ;		
			7	number of times each bird is trapped ;		
			8	effect of trapping on behaviour ;		
			9	larger sample ;		**R** 'study should be repeated'
			10	other locations in, Sweden / anywhere in Europe ;		
			11	AVP ;		
			12	AVP ;		
						e.g. number of eggs laid by birds of each wing length / test which birds fly furthest / test which birds best at catching food
					[max 3]	
	(d)		birds with wing length 66–67, survive / live longer ;			
			breed / reproduce / have offspring ;			
			pass on their allele(s) for wing length ;			**A** gene(s) *wing length may be implied*
			birds with smaller and larger wings, die ;			**A** 'the others'
			do not reproduce (as successfully) ;		[max 4]	
				[Total: 17]		

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Question		Expected Answers	Marks	Additional Guidance
6	(a)	amylase ; prote(in)ase ; lipase ;	[3]	**R** carbohydrase **R** trypsin / pepsin / peptidase **R** 'protase', **A** 'proteas'
	(b)	**1** prevents spread of (named) disease / AW ***ora*** ; **2** avoids pollution / removes harmful substances ; **3** makes, water / sewage / effluent, safe / AW ; **4** avoids smells ; **5** recycling of water ; **6** AVP ; e.g. ref. to eutrophication	[max 1]	**A** removes harmful microbes / bacteria **R** 'germs' **A** examples no need to specify for whom or what it is safe, but **R** 'safer' unqualified, treat 'marine organisms' as 'aquatic'
	(c)	**1** mixes microorganisms with sewage ; **2** good contact between microorganisms and solids ; **3** more collisions ; **4** (aerobic) respiration ; **R** if anaerobic respiration **5** microorganisms produce carbon dioxide ; **6** gain / release / transfer, energy ; **7** (for) growth ; **8** (for) reproduction ; **9** to make enzymes ; **A** ref. to digestion	[max 4]	**A** microbes / bacteria
	(d)	to start the breakdown of the sewage quickly ; continuous process ; do not have to, breed / buy, the microorganisms ; *idea of* without waiting for the lag phase ;	[max 3]	**A** 'the right organisms to digest the sewage' **A** ref. to cost / less wastage of microbes **A** keeps the population of microbes constant *idea* **R** 'to save time' unqualified **R** 'to use over and over again'
	(e)	destroys / kills, bacteria / microorganisms ; prevents spread of, disease / pathogens ; makes water suitable for drinking ;	[max 2]	**R** disinfection **R** 'removes bacteria'
			[Total: 13]	

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