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

0610/31 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)	*Lilium* ;	1	
	(b)	**A** stigma ; **B** anther ; **C** petal ; **D** style ;	4	
	(c)	parallel veins / AW ; narrow / AW, leaves ; flower parts in, 3s / 6s ;	max 2	**A** non-branching veins / no mid-rib **A** long and thin **A** for any named part **R** one cotyledon
	(d)			

one mark per box – ignore any neutral comments

type of reproduction in flowering plants	advantages	disadvantages
asexual	only one, parent / plant ; fast ; (potential) rapid spread ; less energy required / no gametes needed ; if parent well adapted, offspring will be adapted to surroundings ; **max 1**	competition ; little / no, variation ; less evolution / less able to adapt to change ; may all be killed by same disease ; converse of MP5 for asexual ; **max 1**
sexual	variation ; evolution / formation of new species ; (seed) dispersal ; colonization / able to adapt to change ; **max 1**	may need two plants / pollinating agent; slow ; much pollen / many seeds wasted ; fertilization may not happen; loss of lots of energy ; **max 1**

[Total: 11]

Question		Expected Answers	Marks	Additional Guidance
2	(a)	detect / sense / feel, changes / stimuli ; make response(s) / react / AW ;	2	***ignore*** specific example of response
	(b)	**F** to skin receptor ; **G** to sensory neurone ; **H** to biceps ;	3	Label line to actual part only. **R** lines to motor end plate or neurone
	(c)	automatic ; no thought required / not a conscious action ; stimulus always leads to the same response ;	max 2	***ignore*** refs to speed of response **A** no (higher centres in) brain involved **A** fixed response
	(d)	**1** rapid response ; **2** protective / AW ; **3** mechanical damage / injury ; **4** e.g. ; **5** already present immediately after birth ;	max 3	i.e. before learning can take place
	(e)	**1** heart beats faster ; **2** increased rate of breathing ; **3** trachea / bronchi / bronchioles / airways, dilate / widen **4** vasoconstriction / AW, in gut / skin; **5** vasodilation / AW, in muscles ; **6** stimulates breakdown of glycogen in the liver ; **7** increases blood glucose concentration ; **8** dilate pupils ; **9** heightened sensitivity / increased mental awareness / AW;	max 3	**A** increase pulse (rate) **A** more oxygen to muscles **R** 'adrenaline breaks down glycogen' **A** sharper senses / more alert / AW
			[Total: 13]	

Question		Expected Answers	Marks	Additional Guidance
3	(a)	$C_6H_{12}O_6 + O_2$; $\rightarrow CO_2 + H_2O$; $6O_2, 6CO_2, 6H_2O$;	3	*marks for:* correct formulae for glucose and oxygen correct formulae for carbon dioxide and water balancing the equation ***ignore*** word equation
	(b)	**1** temperature ; **2** mass of soda lime ; **3** volume of air in the syringe ; **4** volume / size, of syringe ; **5** mass of seeds ; **6** *idea of* reading from same edge of droplet (each time) ;	max 3	**A** amount **A** 'number / size'
	(c)	(i) **1** moves to the right / towards seeds / syringe ; **2** seeds absorb oxygen ; **3** give out carbon dioxide, absorbed by soda lime ; **4** volume of, air / gas, decreases ; **5** pressure of, air / gas, decreases ;	max 3	
	(c)	(ii) **1** slows down / stops ; **2** rate of respiration decreased ; **3** oxygen being used up / AW ; **4** aerobic respiration slows / ref. to anaerobic respiration ;	max 2	 **A** aerobic respiration stops **R** respiration (unqualified) stops
			[Total: 11]	

Question			Expected Answers	Marks	Additional Guidance
4	(a)		*water jacket*		
		1	maintain optimum / constant temperature ;		**A** prevent overheating
		2	to prevent <u>enzymes</u> denaturing ;		**R** fungus denatures
		3	loss of shape / ref. to active site ;		
		4	(because as) fungus respires ;		
		5	releases heat ;		
		6	so temperature in the fermenter increases ;		MP 6 must be linked to MP4 or 5
		7	which would kill fungus ;		
		8	(therefore) no, product / penicillin / AW ;	max 4	
			addition of acids and alkalis		
		9	maintains pH / keeps pH constant ;		**R** to maintain neutral pH
		10	<u>enzymes</u> need optimum pH ;		
		11	(otherwise) enzyme activity / rate of reaction, slows ;		**R** fungus needs optimum pH
		12	to give maximum yield / AW	max 3 = max 6	**A** stop enzymes denaturing
	(b)	(i)	40–50 / 40–60 / 40–80 ;	1	**R** 40–45 / 50–60 / 60–80
		(ii)	mitosis ;	1	
		(iii)	1 nutrients are used up ;		**A** food
			2 <u>limiting</u> (factors) ;		
			3 explanation of limiting factor ;		**A** factor in shortest supply / AW
			4 waste products accumulate ;		
			5 wastes are toxic ;		
			6 penicillin could inhibit growth ;		
			7 population reaches carrying capacity ;		
			8 AVP ;	max 3	

Question			Expected Answers	Marks	Additional Guidance
	(c)	(i)	fungus grows when no penicillin produced ; during first 20 hours ; only nutrients and fungus added at the beginning / no penicillin added ;	max 2	
		(ii)	penicillin production stopped / no more penicillin produced ;	1	**accept** yield stays the same
	(d)		purifying / separating, penicillin ; from, waste / toxins / AW ; concentration ; making into, pills / packaging / AW ; AVP ; e.g. colour / taste	max 3	**R** 'make into a medicine'
	(e)		viruses are not cells ; viruses have no metabolism ; *idea that viruses have* no target for antibiotics ; antibiotics stop cell wall growth ; viruses have no cell wall ; antibiotics stop enzymes working ;	max 2	***ignore*** 'viruses are not alive' **A** viruses do not have ribosomes **A** viruses have no enzymes
			[Total: 19]		

Question			Expected Answers	Marks	Additional Guidance
5	(a)		**1** fewer red blood cells **;** **2** less elastic / less flexible, red blood cells **;** **3** less haemoglobin **;** **4** haemoglobin / blood, less efficient at transporting oxygen **;** **5** less respiration **;** **6** less energy / fatigue / exhaustion / less active / feeling faint / breathlessness **;** **7** capillaries are blocked **;** **8** increased chance of thrombosis **;** **9** pain **;** **10** death of tissues linked to oxygen supply **;** **11** 'sickle cell crisis' **;** **12** slow / poor, growth **;** **13** reduced life span **;** **14** AVP **;** e.g. susceptible to infections / kidney damage	max 5	**R** no oxygen **R** no respiration
	(b)	(i)	Hb^AHb^S × Hb^AHb^S Hb^A , Hb^S + Hb^A , Hb^S **;** Hb^AHb^A , Hb^AHb^S, Hb^AHb^S, Hb^SHb^S **;** normal, sickle cell trait, sickle cell anaemia **;**	3+1	*allow **ecf** following a mistake in the genetic diagram after the parental genotypes, but 'mistake' must be worked correctly* *do not allow genotypes for parents or children that are single alleles* *phenotypes must match genotypes, i.e. must be in the same sequence*
		(ii)	chance is 1 in 4 / 25% / 0.25 / 0,25 **;**		**R** 1:4 or 4:1

Question		Expected Answers	Marks	Additional Guidance
	(c)	resistance to / less chance of getting malaria ;	1	**R** immunity to malaria / stops you from getting malaria
	(d)	*idea that* both alleles / Hb^A and Hb^S, are expressed ; both alleles make two different forms of haemoglobin ; if dominant / recessive, then only one form of haemoglobin in heterozygous people ; three phenotypes (not two) / sickle cell trait is a different phenotype from normal and sickle cell anemia ;	max 2	
		[Total : 12]		

Question		Expected Answers	Marks	Additional Guidance
6	(a)	group of organisms / individuals, of same species ; can interbreed ; live in same area / habitat (at same time) ;	max 2	**R** 'people'
	(b)	**1** numbers of brown plant hoppers remain low, up to 40 days / day 40 ; **2** low numbers when spraying occurs (days 15 to 38) ; **3** rapid increase when spraying stopped / AW ; **4** then, crash / decrease ; **5** any population figure with unit ; e.g. to maximum of over 1000 per m^2	max 3	***ignore*** ref. to resistance
	(c)	pesticide absorbed by the plants ; transported through the plant in the phloem ; ingested / AW, by insect when it, eats / sucks ; toxic / poisonous, to insect ;	max 2	**A** 'eats the plant'
	(d)	**1** no population explosion / AW ; **2** effective at reducing the numbers / AW ; **3** ref. to comparative figures from the graph ; **4** no pollution / damage to environment ; **5** no killing of harmless species ; **6** no concentration of pesticide in food chain ; **7** no pesticide left in foods / no harm to humans from the spray ; **8** no development of resistance to pesticide ; **9** less cost / economic benefits ; **10** AVP ; e.g. accept part of natural food chain	max 3	

Question			Expected Answers	Marks	Additional Guidance
	(e)	1	decreased rainfall ;		
		2	flooding ;		
		3	erosion / loss of (top)soil ;		
		4	desertification ;		
		5	silting of rivers ;		
		6	loss of (plant) nutrients / soil fertility ;		
		7	disruption to food chain ;		
		8	loss of habitat ;		
		9	extinction / loss of biodiversity ;		**A** species become, rare / endangered
		10	effect on carbon dioxide in the atmosphere ;		**A** increase or decrease if justified e.g. leading to global warming
		11	justification for effect ; **A** unproductive forest / productive crop		
		12	AVP ;	max 4	
				[Total : 14]	