

**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.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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Question	Expected Answers	Marks	Additional Guidance
1	(a) <i>Lilium</i> ;	1	
	(b) <b>A</b> stigma ; <b>B</b> anther ; <b>C</b> petal ; <b>D</b> style ;	4	
	(c) parallel veins / AW ; narrow / AW, leaves ; flower parts in, 3s / 6s ;	max 2	<b>A</b> non-branching veins / no mid-rib <b>A</b> long and thin <b>A</b> for any named part <b>R</b> one cotyledon
	(d)		
	<b>one mark per box – ignore any neutral comments</b>		
	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 ; <b>max 1</b>	competition ; little / no, variation ; less evolution / less able to adapt to change ; may all be killed by same disease ; converse of MP5 for asexual ; <b>max 1</b>
	sexual	variation ; evolution / formation of new species ; (seed) dispersal ; colonization / able to adapt to change ; <b>max 1</b>	may need two plants / pollinating agent; slow ; much pollen / many seeds wasted ; fertilization may not happen; loss of lots of energy ; <b>max 1</b>
			<b>[Total: 11]</b>

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

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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  <b>ignore</b> 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 <i>idea of reading from same edge of droplet (each time) ;</i>	max 3	<b>A</b> amount  <b>A</b> '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	<b>A</b> aerobic respiration stops <b>R</b> respiration (unqualified) stops
		<b>[Total: 11]</b>	

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

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	(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	<b>accept</b> 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	<b>R</b> 'make into a medicine'
	(e)			
		viruses are not cells ; viruses have no metabolism ;  <i>idea that viruses have no target for antibiotics ;</i>  antibiotics stop cell wall growth ; viruses have no cell wall ;  antibiotics stop enzymes working ;	max 2	<b>ignore</b> 'viruses are not alive' <b>A</b> viruses do not have ribosomes     <b>A</b> viruses have no enzymes
			<b>[Total: 19]</b>	

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





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

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>	<b>Additional Guidance</b>
(e)	<ol style="list-style-type: none"> <li>1 decreased rainfall ;</li> <li>2 flooding ;</li> <li>3 erosion / loss of (top)soil ;</li> <li>4 desertification ;</li> <li>5 silting of rivers ;</li> <li>6 loss of (plant) nutrients / soil fertility ;</li> <li>7 disruption to food chain ;</li> <li>8 loss of habitat ;</li> <li>9 extinction / loss of biodiversity ;</li> <li>10 effect on carbon dioxide in the atmosphere ;</li> <li>11 justification for effect ; <b>A</b> unproductive forest / productive crop</li> <li>12 AVP ;</li> </ol>	max 4	<p><b>A</b> species become, rare / endangered</p> <p><b>A</b> increase or decrease if justified e.g. leading to global warming</p>
		<b>[Total : 14]</b>	