



GCSE

Biology B

General Certificate of Secondary Education

Unit **B731/02**: Modules B1, B2, B3 (Higher Tier)

Mark Scheme for January 2013

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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

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Annotations

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt not given
	error carried forward
	information omitted
	ignore
	reject
	contradiction
	Level one
	Level two
	Level three

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Subject-specific Marking Instructions

/	=	alternative and acceptable answers for the same marking point
(1)	=	separates marking points
allow	=	answers that can be accepted
not	=	answers which are not worthy of credit
reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant
()	=	words which are not essential to gain credit
—	=	underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
ecf	=	error carried forward
AW	=	alternative wording
ora	=	or reverse argument

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Question		Answer	Marks	Guidance
1	(a)	(mosquito) bites (infected) person (1) via the (plasmodium in) blood (1)	2	ignore feeding / drinking / inserting / depositing unqualified allow piercing/ injecting ignore plasmodium is in the saliva allow sucking blood (to get plasmodium out or into a person/host) allow correct reference to plasmodium if not stated e.g. it/parasite/protozoan ignore bacteria/viruses/disease
	(b)	(idea that removal will prevent ability to breed) so identifies that (swamps/water) is where mosquitoes breed / eggs or larvae found (1)	1	ignore it kills mosquitoes unless qualified ignore mosquitoes live in swamps
	(c)	idea that they thought nets were successful in stopping gas / gas can get through the nets / did not know mosquitoes caused malaria (1) idea that nets stopped mosquitoes (1)	2	allow reduction of malaria put down to stopping gas transmission but in fact it was stopping the mosquito (2)
	(d)	smell (of person) (1) wings / wing muscles (1)	2	allow scent ignore muscles unless correctly qualified
	(e) (i)	brain / hypothalamus (1) (monitors) temperature of blood (1)	2	ignore body temperature (in question)
	(ii)	any two from: (more) blood flows close to surface (1) (increased) heat loss (1) by radiation / conduction / convection (1)	2	not blood vessels move closer to surface allow any heat transfer but needs to be a loss from the body
		Total	11	

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Question		Answer	Marks	Guidance
2	(a)	X0 / 0X / X, male XX, female X0 / 0X / X, male at least one of the male boxes correct (1) but all correct (2)	2	one male box correct and one male box incorrect (0)
	(b) (i)	23 (1)	1	
	(ii)	11 / 12 / 11 or 12 (1)	1	
Total			4	

Question		Answer	Marks	Guidance
3	(a)	substitution: (minimum) mass in kg = 24.9×1.8^2 (1) calculation: (minimum) mass in kg = 80.7 (1) calculation: needs lose $120 - 80.7 \text{ kg} = 39.3 \text{ (kg)}$ (1) acceptable final answer to one decimal place (1) each marking point is dependent on the previous marking point	4	mark final answer line first final answer of 39.2 or 39.3 (kg) (with no working) (4) (difference in BMI = $12.1 \times 1.8^2 = 39.2$) or final answer of 39 or any number that can be rounded to 39 (3) or final answer of 40 or any number that can be rounded to 40 (2) (arrived at by a method of estimation where a mass of 80 gives BMI of 24.7) allow 1 ecf for clearly deducting mass from 120 i.e. third marking point (plus can still get last marking point if to 1 d.p.)

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Question	Answer	Marks	Guidance
(b)	<p>Level 3 (5–6 marks) Explains the specific consequences of high blood pressure and how cholesterol build up in coronary arteries can lead to a heart attack. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3–4 marks) Explains either specific consequences of high blood pressure or how cholesterol build up in coronary arteries can lead to a heart attack. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) Idea that high blood pressure and/or build up of cholesterol can lead to heart disease/attack. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0 (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p>This question is targeted at grades up to A.</p> <p>Indicative scientific points at level 2 and 3 may include:</p> <ul style="list-style-type: none"> • there is a link between the amount of saturated fat eaten, the build up of cholesterol (plaques), and the incidence of heart disease • narrowed coronary arteries / arteries to heart muscle, together with a thrombosis, increase the risk of a heart attack • possible consequences of high blood pressure include: burst blood vessels, brain damage, stroke, kidney damage. <p>Indicative scientific points at level 1 may include:</p> <ul style="list-style-type: none"> • high blood pressure can lead to heart disease • build up of cholesterol can lead to heart disease <p>Use the L1, L2, L3 annotations in Scoris. Do not use ticks.</p>
	Total	10	

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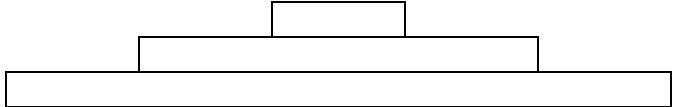
Question		Answer	Marks	Guidance
4	(a)	analyse their DNA / model multiple characteristics by computer (1)	1	allow analyse their genes allow see if they can interbreed to produce fertile offspring (1)
	(b)	(i)	1	allow intraspecific competition is stronger than interspecific allow foxes have different prey
		(ii)	1	ignore to prevent extinctions ignore affects food chain unless qualified allow to maintain biodiversity / prevent reduction of gene pool allow cultural and heritage reasons use of animal needs to be qualified
Total			3	

Question		Answer	Marks	Guidance
5	(a)	less oxygen available (1) for the respiration (of decomposers) (1)	2	ignore air/temperature/acidity/light
	(b)	(i)	3	
		any 3 from: decomposing bacteria / fungi break down dead material (1) releasing ammonia/ammonium compounds (1) ammonia/ammonium compounds converted to nitrates (1) by nitrifying bacteria (1)		
		(ii)	2	allow higher level answers referring to the net release of carbon dioxide from decomposing peat ignore references to avoiding waste /less land-fill
Total			7	

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Question			Answer	Marks	Guidance
6	(a)	(i)	three box pyramid correctly drawn or described (1)	1	mark the written answer line first, if correct then ignore diagram 
		(ii)	any two from: (for pyramid of biomass) need dry mass (1) which involved killing organisms (1) difficult to collect all parts of the plant (1)	2	
	(b)		Ixodes (1)	1	
	(c)	(i)	(idea of no link) qualitative description e.g. peaks/troughs do not coincide (1) quantitative description e.g. Lyme disease peaks in 2000 highest temperature is in 1995 (1) OR (idea of there is a link) qualitative description e.g. overall they are both rising (1) quantitative description e.g. both have lowest values in 1986 (1) OR (idea of there is a weak link) two descriptions (qualitative or quantitative) that show contradicting evidence e.g. both graphs go up (1) but they don't peak at the same time (1)	2	

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Question		Answer	Marks	Guidance
	(ii)	if it is warmer then more people will go for walks in the country / wear less clothes / ticks breed more (1)	1	allow ticks feed more in warm weather allow more ticks in warm weather ignore ticks more active in warm weather (in question)
Total			7	

Question		Answer	Marks	Guidance
7	(a)	(at high temperatures) more water is lost cooling down the insect (1)	1	allow more water is lost and evaporation takes heat from the insect ignore sweating
	(b) (i)	parasite (1)	1	mark the answer line first allow correct answer circled, underlined or ticked more than one answer = 0

Question	Answer	Marks	Guidance
(ii)	<p>Level 3 (5–6 marks) Includes an explanation of natural selection with reference to the genetic basis of the variation of the cricket and the increase in the number of silent cricket and the mechanism for speciation is explained with correct reference to crickets because the two types of crickets are less likely to mate. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3–4 marks) Includes an explanation of natural selection or the mechanism for speciation with correct reference to crickets. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) Some use of natural selection or speciation to explain the changes. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0 (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p>This question is targeted at grades up to A*.</p> <p>Indicative scientific points at level 3 may include:</p> <ul style="list-style-type: none"> • the existence of silent crickets is genetic / controlled by genes • the silent crickets are more likely to survive and pass on their genes as their larvae are less likely to be parasitized • the silent crickets are less likely to mate with the singing crickets • singing crickets get killed off so reduced chance of mating • as there is less mixing of genes, two different species may form <p>Indicative scientific points at level 2 may include:</p> <ul style="list-style-type: none"> • explanation of natural selection linked to crickets • variation in some crickets singing some not • silent crickets higher survival value • idea of isolation of cricket affecting reproduction leading to new species forming <p>Indicative scientific points at level 1 may include:</p> <ul style="list-style-type: none"> • idea of natural selection explaining the changes in generic terms • idea of isolation leading to new species forming in generic terms <p>Use the L1, L2, L3 annotations in Scoris. Do not use ticks.</p>
	Total	8	

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Question		Answer	Marks	Guidance																														
8	(a)	<table border="1"> <thead> <tr> <th>name</th> <th></th> <th>part</th> </tr> </thead> <tbody> <tr> <td>aorta</td> <td></td> <td>D</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>left atrium</td> <td></td> <td>E</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>right ventricle</td> <td></td> <td>C</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>tricuspid valve</td> <td></td> <td>B</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>vena cava</td> <td></td> <td>A</td> </tr> </tbody> </table>	name		part	aorta		D				left atrium		E				right ventricle		C				tricuspid valve		B				vena cava		A	2	3 or 4 correct (1) less than 3 correct (0)
name		part																																
aorta		D																																
left atrium		E																																
right ventricle		C																																
tricuspid valve		B																																
vena cava		A																																
	(b)	(i)	provides a large surface area to volume ratio (1)	1	allow large SA / V allow squeeze through capillaries ignore arteries/veins/vessels																													
		(ii)	any two from: DNA codes for mRNA (1) mRNA moves (from nucleus) to cytoplasm (1) (mRNA passed to) ribosomes in cytoplasm (to make haemoglobin / protein) (1)	2																														
		(iii)	(haemoglobin combines with oxygen to form) oxyhaemoglobin (in lungs) (1) reverse reaction / breakdown of oxyhaemoglobin happens in tissues/cells to release oxygen (1)	2	allow oxyhaemoglobin dissociates releasing oxygen																													

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Question		Answer	Marks	Guidance
	(c)	(bone marrow) contains stem cells / undifferentiated cells (1) (stem cells) have genes / have information to develop into different (red or white) cells (1)	2	allow have genes for either type of cell allow can turn genes on and off as required
		Total	9	

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Question		Answer	Marks	Guidance
9	(a)	$6\text{O}_2 \rightarrow 6\text{CO}_2$	1	
	(b)	<p>Level 3 (5–6 marks) RQ for both seeds calculated correctly. Compares calculated results to food type table and links pea seed with carbohydrate and peanut with a combination fat+protein. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3–4 marks) RQ for both seeds calculated correctly. Compares calculated results to food type table and links pea seed with carbohydrate or peanut with a combination fat+protein. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) RQ for both seeds calculated correctly or one correct RQ with a correct link to food source. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0 (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p>This question is targeted at grades up to C.</p> <p>Indicative scientific points at level 2 and 3 may include: consider following point with reference to RQ</p> <p>RQ for carbohydrate = 1.0 so peas must be/use RQ for fat = 0.7 RQ for protein = 0.9 peanuts must be/use combination of protein and fat</p> <p>Indicative scientific points at level 1 may include: RQ for pea seed = 1.0</p> <p>RQ for peanut seed = 0.80 (allow 0.798)</p> <p>allow pea is $\frac{0.6}{0.6}$ and peanut is $\frac{13.0}{16.3}$ for 1 mark</p> <ul style="list-style-type: none"> for 2 marks need to be clear which RQ is which but both RQs correct in the table will score 2 marks 1 RQ correct only will score 1 mark at L1 <p>Use the L1, L2, L3 annotations in Scoris. Do not use ticks.</p>

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Question		Answer	Marks	Guidance
	(c)	enzyme activity would stop (1) because enzyme and substrate cannot bind / enzyme has lost its 3-D shape / active site destroyed / enzyme denatured / protein coagulates / irreversible change (1)	2	allow enzyme is inactive not enzyme killed
		Total	9	

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Question		Answer	Marks	Guidance
10	(a)	<p>qualitative description of graph which includes two phases (MAX 1) e.g. slow increase at start then rapid increase (1) increase followed by decline(1)</p> <p>correct reference to any quantitative description of graph (1)</p>	2	<p>example between 1 -9 hours increase, 5 to 6 hours rapid increase (2)</p>
	(b)	<p>any three from: identify / select gene (antigens) for human tissue types (1) isolate (this) gene / the gene (for human tissue type) (1) insert / splice (this) gene into the pig embryo / gamete (egg cell) (1) replicate gene(s) / cells (1) check cells for expression of gene (1)</p>	3	<p>responses must relate to pigs and humans allow identify anti-rejection gene allow extract this gene ignore insert nucleus allow put this gene into the pig embryo / embryo DNA</p>

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Question		Answer	Marks	Guidance
	(c)	<p>any two from: any correctly matched pro or con with relevant argument (1)</p> <p>shows an understanding of the idea that there will be pros and cons for this type of research (1)</p> <p>government needs to make a decision that is the best outcome for most people / ie benefits outweigh the risks for the majority of people (1)</p>	2	<p>arguments against this research: it is creating an artificial situation that would not occur naturally unsure of the consequences of using another mammal's organs inside humans may consider it unethical / morally unsuitable to put another organism's organs into a human may consider it against their religious conviction</p> <p>arguments for this research: will mean benefit of reducing donor shortage help to save human life that could be saved but for lack of donors future medical advances could stem from this research health costs will be reduced as more people will benefit and need less expensive treatment / fewer anti-rejection drugs needed</p>
		Total	7	

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