

Biology B

General Certificate of Secondary Education

Unit **B731/01**: Modules B1, B2, B3 (Foundation Tier)

Mark Scheme for June 2012

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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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For answers marked by levels of response:

- a. **Read through the whole answer from start to finish**
- b. **Decide the level that best fits** the answer – match the quality of the answer to the closest level descriptor
- c. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

- d. Use the **L1, L2, L3** annotations in Scoris to show your decision; do not use ticks.
Quality of Written Communication skills assessed in 6-mark extended writing questions include:
 - appropriate use of correct scientific terms
 - spelling, punctuation and grammar
 - developing a structured, persuasive argument
 - selecting and using evidence to support an argument
 - considering different sides of a debate in a balanced way
 - logical sequencing.

Annotations used in scoris

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 1
	Level 2
	Level 3

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/	= 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
<u> </u>	= 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

Question			Answer	Marks	Guidance												
1	(a)	(i)	iris (1) optic nerve (1)	2													
		(ii)	<table border="1"> <tr> <td>Distant objects cannot be seen clearly.</td> <td>✓</td> </tr> <tr> <td>The colour of an object cannot be judged.</td> <td></td> </tr> <tr> <td>The eyes cannot focus on close objects.</td> <td></td> </tr> <tr> <td>Light rays are focused before the retina.</td> <td>✓</td> </tr> <tr> <td>Light rays are focused before the lens.</td> <td></td> </tr> <tr> <td>Objects can only be seen by one eye.</td> <td></td> </tr> </table>	Distant objects cannot be seen clearly.	✓	The colour of an object cannot be judged.		The eyes cannot focus on close objects.		Light rays are focused before the retina.	✓	Light rays are focused before the lens.		Objects can only be seen by one eye.		2	more than 2 ticks scores minus 1 for each extra tick
Distant objects cannot be seen clearly.	✓																
The colour of an object cannot be judged.																	
The eyes cannot focus on close objects.																	
Light rays are focused before the retina.	✓																
Light rays are focused before the lens.																	
Objects can only be seen by one eye.																	
	(b)	(i)	on chromosomes / in DNA (1) in the nucleus (1)	2	ignore genes												
		(ii)	both Seema and John do not have the disorder / condition / nanophthalmos (1) (but) they have children who have the disorder / condition / nanophthalmos or Kevin has the disorder (1)	2	allow Seema and John are carriers allow disorder appears in children whose parents do not have it (2) allow the disorder skips generations (2) ignore references simply to alleles, answer must refer to phenotype ignore idea that it is recessive because fewer people have the disorder than do not												
			Total	8													

Question		Answer	Marks	Guidance
2	(a)	<p>[Level 3] Identifies the trend shown in the graph and can identify a causal link. The answer appreciates the link between (saturated) fats and cholesterol build up. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Describes the trend eg. idea of more fat eaten then the more deaths from heart disease / manipulation of data to reveal a trend eg. USA has approximately 5 times more percentage energy from fat and almost twice the number of deaths than Japan. OR appreciates that fat can cause blockages to blood vessels and this leads to heart disease. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Limited discussion of either fat causes heart disease OR Limited analysis of data eg USA highest deaths and percentage energy from fat intake / Japan lowest. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</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 Relevant points include: Indicative scientific points at Level 3 may include: a trend and explanation is required</p> <ul style="list-style-type: none"> cholesterol can restrict or block blood flow in arteries by forming cholesterol plaques. <p>Indicative scientific points at Level 2 may include:</p> <ul style="list-style-type: none"> risk of heart disease is increased by eating high levels of fat there is a link between the amount of saturated fat eaten and the blockage of blood vessels. <p>Indicative scientific points at Level 1 may include:</p> <ul style="list-style-type: none"> (saturated) fat produces highest risk.

Question		Answer	Marks	Guidance								
	(b)	<table border="1"> <tr> <td>he chose to plot only 6 results from the many countries that he studied</td> <td>✓</td> </tr> <tr> <td>each country had a different number of people living in it</td> <td></td> </tr> <tr> <td>fat in the diet does not provide much energy</td> <td></td> </tr> <tr> <td>it is impossible to tell if people die from heart disease</td> <td></td> </tr> </table>	he chose to plot only 6 results from the many countries that he studied	✓	each country had a different number of people living in it		fat in the diet does not provide much energy		it is impossible to tell if people die from heart disease		1	more than 1 tick scores 0
he chose to plot only 6 results from the many countries that he studied	✓											
each country had a different number of people living in it												
fat in the diet does not provide much energy												
it is impossible to tell if people die from heart disease												
Total			7									

Question		Answer	Marks	Guidance
3	(a) (i)	<p>any two from: fast response (1)</p> <p>automatic / does not need (conscious) thought (1)</p> <p>protects the body (1)</p>	2	<p>allow quick reaction allow immediately but ignore almost immediately</p> <p>not does not involve the brain allow don't have to think about it</p> <p>allow named examples of protection eg drops hot pan to stop burning but not just drops hot pan</p>
	(ii)	LSD (1)	1	<p>allow any correct answer eg. 'magic mushrooms' / PCP / ketamine / 'angel dust' ignore cannabis (and any alternative wordings eg. weed) as in question. ignore cocaine / heroin / alcohol / ecstasy</p>
	(iii)	<p>any two from: it is more addictive (1) it contains nicotine (1) has more withdrawal effects (1)</p>	2	<p>must have comparative for addiction nicotine which is more addictive than THC = (2) ignore social implications</p>

Question		Answer	Marks	Guidance	
	(b)	(i)	75 000 (mg) (1)	1	allow 75g
		(ii)	5000	1	ecf eg 7500 (from 3bi)/15=500 (1) eg 750000 (from 3bi)/15=50000 (1)
		(iii)	any two from: heroin (no mark) because: smallest lethal dose (1) smallest therapeutic ratio (1) most likely to have an overdose as smallest dose needed to have an effect is closest to lethal dose (1)	2	no mark for heroin on its own, but need heroin to get mark(s) allow comparative answers, eg. smaller lethal dose ignore non-comparative answers eg. 'lethal dose is only 48mg' but allow eg. 'lethal dose is only 48mg but lethal doses of others are 300,000 and 75,000' ignore most dangerous (in question) / most likely to kill you ignore smallest dose needed to have an effect
		(iv)	cruel / unethical drugs may not have the same effects on rats as on people (1)	1	ignore kills them / harms them ignore they are not the same species unless qualified
			Total	10	

Question		Answer	Marks	Guidance
4	(a)	4 / four (trophic levels) (1)	1	
	(b)	reduces populations of carrot flies so less food for sparrows (1) sparrow hawk would feed on more sparrows / more predation of sparrows because they have fewer flycatcher birds to feed on so catch more sparrows (1)	2	ignore unqualified population change not they have no food
	(c) (i)	(Resistaflly) has highest mean (1) or highest individual plot / yield (of 5.6) (1)	1	
	(ii)	Fly away range is 0.2 Maestro range is 0.4 Resistaflly range is 1.0 Styan range is 0.4 (2) Resistaflly range is 1.0 (1)	2	ignore Resistaflly is the biggest unqualified
	(iii)	Resistaflly has only been tested on 3 fields / more evidence is needed on how well Resistaflly grows in different conditions (1) there is no evidence on the effects of reduced carrot fly on the sparrowhawk so cannot say it will not harm sparrowhawk (1)	2	ignore not trialled for long enough unless qualified allow only trialled for one season / need to trial through breeding season allow they may need longer time to see how use of Resistaflly affects sparrowhawks eggs / chick development
Total			8	

Question		Answer	Marks	Guidance
5	(a)	<p>[Level 3] Applies scientific knowledge to identify features of a prey organism not visible in the picture and explains how they help the prey. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Identifies features of a prey organism and has explained one of them. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Identifies features of a prey organism. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</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 E</p> <p>Relevant points include:</p> <p>Indicative scientific points at Level 3 may include: explains how (Thomson’s gazelles) are adapted to avoid being caught as prey, to include:</p> <ul style="list-style-type: none"> • synchronous breeding • live in groups/herds to reduce the chance of being caught. <p>Indicative scientific points at Level 2 may include: explains how (Thomson’s gazelles) are adapted to avoid being caught as prey, to include:</p> <ul style="list-style-type: none"> • eyes on side of head for wide field of view • ability to run fast / agile to get away from predator • cryptic colouration camouflage to colour match or counter shade with environment • sharp horns for defence but ignore for attack. <p>Indicative scientific points at Level 1 may include:</p> <ul style="list-style-type: none"> • eyes on side of head • cryptic colouration camouflage • ability to run fast / agile. <p>ignore long legs unless qualified allow</p> <ul style="list-style-type: none"> • can see over wide area • have large ears for good hearing • match with background / inconspicuous • sharp horns

Question		Answer	Marks	Guidance
	(b)	366,400 (1)	1	
	(c)	(i)	2	allow fewer cheetahs as their food source of gazelles is nearly half as much as it used to be (2) not just food reduced must be linked to Thomson gazelle ie part b also ignore there are no Thomson gazelles
		(ii)	1	allow there will be no cheetahs left / gone forever (1)
Total			10	

Question		Answer	Marks	Guidance										
6	(a)	(a group of organisms) capable of interbreeding / mating produces offspring (1) but (interbreed to) have fertile offspring (2)	2	allow can mate / can reproduce / have offspring allow additional marking point: organisms which share the same gene pool / share the same genetic information (1)										
	(b)	<table style="border-collapse: collapse; margin-left: 40px;"> <tr><td style="padding-right: 10px;">class</td><td style="border: 1px solid black; width: 20px; height: 20px;"></td></tr> <tr><td style="padding-right: 10px;">family</td><td style="border: 1px solid black; width: 20px; height: 20px;"></td></tr> <tr><td style="padding-right: 10px;">genus</td><td style="border: 1px solid black; width: 20px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="padding-right: 10px;">order</td><td style="border: 1px solid black; width: 20px; height: 20px;"></td></tr> <tr><td style="padding-right: 10px;">species</td><td style="border: 1px solid black; width: 20px; height: 20px; text-align: center;">✓</td></tr> </table>	class		family		genus	✓	order		species	✓	2	each incorrect tick above 2 loses 1 mark down to zero
class														
family														
genus	✓													
order														
species	✓													

Question		Answer	Marks	Guidance
	(c)	<p>any two from: (avoid predation) by distraction / scare off predators (1)</p> <p>attract their food source / act as bait (so they catch more food) (1)</p> <p>attract mates (to increase chance of reproducing) (1)</p>	2	<p>allow green oval structures may act as 'flares' that predators chase rather than attack the worms allow may be poisonous / toxic (to predators) ignore simply 'escape from predators' (in earlier part of question)</p> <p>ignore use structure to help them see (idea that it acts as a torch)</p>
	(d)	those producing more green oval structures will compete better so more in future generations / better survival and breed more so more in future generations (1)	1	<p>allow ones with more green oval structures outcompete the others so more in future generations. allow producing too many green oval structures may use up valuable resources so at a disadvantage allow surviving animals breed and pass on feature into offspring</p>
		Total	7	

Question			Answer	Marks	Guidance
7	(a)	(i)	60 (beats per min) (1)	1	allow 58 (beats per min)
		(ii)	levels off at 60 / levels off around 60 / 60 is the average value when it levels off (1)	1	allow last two readings are 60 allow last two readings are the same ignore most frequently appearing number
	(b)	(i)	6 (min) (1)	1	allow answer in range 5 – 7 (min)
		(ii)	time taken to return to resting value (1)	1	ignore 'time to recover' allow time to return to normal
	(c)		any three from: less energy needed (1) (therefore) less / slower respiration (1) (so) less oxygen / glucose needed (1) to / by muscles (1)	3	ignore heart beats more slowly allow to pump blood more slowly (1)
			Total	7	

Question			Answer	Marks	Guidance
8	(a)	(i)	remove shoot / branch (1) plant in soil / suitable growth medium (1)	2	allow cut stem / leaf cutting ignore cut roots allow dip in rooting powder/auxin (1)
		(ii)	lack of (genetic) variation / if one susceptible to a disease then all will be (1)	1	allow limited number of cuttings compared with lots of seeds / AW (1) ignore all the same colour unless linked to all the same genes
	(b)		contains (cell) sap (1) (provides) support (1)	2	allow higher level reference to turgidity allow stores water / sugar (1)
	(c)		plants grow continuously but animals grow in early stages of life / AW (1) plants grow in specific parts but all parts of animals grow / AW (1)	2	allow plants grow towards a stimulus (1) allow higher level answers: plants tend to grow continuously but animals grow to a finite size (1) plant cell division mainly limited to meristems / tips of roots and shoots (1) plant cells retain ability to differentiate but most animal cells lose ability at early stage (1) cell enlargement is the main method that plants gain height (1)
			Total	7	

Question		Answer	Marks	Guidance
9	(a)	mitochondria (1)	1	allow mitochondrion mark answer line first but allow correct answer written by X on the diagram
	(b)	increase chance of fertilisation (1)	1	allow many sperm die / do not reach egg (1) allow at least one will get to the egg
	(c)	idea that less chance of individual egg being fertilised / increase chances of fertilisation (1) (because) eggs / sperm dispersed in water (1)	2	allow: less chance of survival (of fertilised eggs / embryos) (1) less / no parental care or (there is) predation / AW (1) ignore simply 'external fertilisation'
	(d)	46 / 23 pairs (1)	1	
Total			5	

Question	Answer	Marks	Guidance
10	<p>[Level 3] Changes to DNA may change enzymes / proteins controlling reaction rates, causing harmful changes to cell processes (leading to illness / cancer). Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Changes to DNA may cause different quantities or different types of protein to be made, causing harmful changes to cell processes (leading to illness / cancer). Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Changes to DNA may affect proteins. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points at Level 3 may include:</p> <ul style="list-style-type: none"> • enzymes are proteins / biological catalysts / control chemical reactions in cells • changes in enzymes result in harmful changes to cell processes. <p>Indicative scientific points at Level 2 may include:</p> <ul style="list-style-type: none"> • mutations may change the amino acid sequence of proteins • mutations may lead to production of different proteins • changes in proteins result in harmful changes to cell processes. <p>Indicative scientific points at Level 1 may include:</p> <ul style="list-style-type: none"> • changes to DNA may affect amino acids in proteins. <p>ignore DNA changes are mutations</p>
	Total	6	

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