

GCSE

Biology B

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

General Certificate of Secondary Education

Mark Scheme for June 2017

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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 used in scoris

Annotation	Meaning
	correct response
	incorrect response
BOD	benefit of the doubt
NBOD	benefit of the doubt not given
ECF	error carried forward
	information omitted
I	ignore
R	reject
CON	contradiction

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

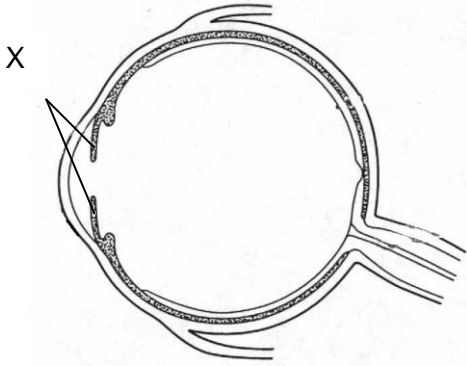
- / = alternative and acceptable answers for the same marking point
- (1)** = separates marking points
- allow** = answers that can be accepted
- not** = answers which are not worthy of credit
- reject** = answers which are not worthy of credit
- ignore** = statements which are irrelevant
- () = words which are not essential to gain credit
- = 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

MARK SCHEME

Question	Answer	Marks	Guidance
1 a i	30 (g) (1)	1	
ii	50 (%) (2) But if incorrect or incomplete then $\frac{15}{30} \times 100$ (1)	2	allow ecf from (a)(i)
b	comment 1 / about being better for health overall is an opinion (1) comment 2 / difference in fat content / link between fat and heart disease are scientific facts (1)	2	must clearly link each statement to opinion or fact allow comment 1 is opinion, comment 2 is fact (2)
		5	

Question	Answer	Marks	Guidance
2	<p>[Level 3] gives an explanation of the effect of plant hormone AND correctly works out the concentration of the plant hormone solution. (5 – 6 marks)</p> <p>[Level 2] correctly works out the concentration of the plant hormone solution OR gives an explanation of the effect of plant hormone AND makes a partial attempt at working out the concentration of the plant hormone solution Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] gives an explanation of the effect of plant hormone OR makes a partial attempt at working out the concentration of the plant hormone solution (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 up to grade A*</p> <p>Indicative scientific points about explaining the effect of plant hormone may include:</p> <ul style="list-style-type: none"> • The plant hormone causes growth /stem gets longer / stem now 25mm • This is due to promoting cell elongation • as concentration of hormone increases so does % change in length <p>Indicative scientific points about the piece include:</p> <ul style="list-style-type: none"> • Calculation to show that this is a 5mm increase • This corresponds to a 25% (increase) • This must have been caused by a plant hormone concentration of 28 (parts per million) <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
		6	

Question	Answer	Marks	Guidance
3 a	vector (1)	1	allow answer ringed, underlined or ticked more than one answer = 0
b	contains a dead / weakened / harmless form of the virus (1) (white blood cells) make antibodies (1) the antibodies/memory cells remain / are still present (1)	3	allow pathogen / antigens not bacteria ignore small amount of the virus / weakened dose of disease ignore antitoxins / antivirals allow on reinfection then antibodies made faster (2)
c	a tablet / dose / medicine that does not contain any drug / medicine (1) idea to see if any effect is psychological / to see if thinking you had the drug makes a difference (1)	2	allow fake drug / sugar pill / inactive drug ignore pill that has no effect allow effect of drug can be compared to placebo effect / feel good factor / to prevent bias / to compare the results between the real drug and the placebo / to see if the drug works / has any effect
		6	

Question	Answer	Marks	Guidance
4 a		1	<p>allow X drawn over part of iris, centre of X must be on the iris</p> <p>allow only one side correctly labelled</p>
b	<p>it bends / refracts / focuses the light less (1)</p> <p>light focused behind the retina / only light from distant objects is focused on the retina (1)</p>	2	<p>allow can't focus on near objects as this requires more refraction</p>
c	<p>mutation (1)</p> <p>recessive (1)</p> <p>heterozygous / carriers (1)</p>	3	<p>ignore different</p>
		6	

Question	Answer	Marks	Guidance
5 a	agility flexibility (1)	1	both needed in correct order for the mark
b	idea that it only assesses the strength in one part of the body (1)	1	allow idea that it might not be dominant hand / left hand stronger / right hand is weaker BUT ignore they could be left handed/right handed allow other parts could be weaker/stronger
		2	

Question	Answer	Marks	Guidance
6 a	to make proteins (1)	1	allow to make amino acids / DNA / chlorophyll ignore contains proteins
b	(decomposition) produces ammonia (1) ammonia is converted to nitrates (1) by nitrifying bacteria (1)	3	allow produces ammonium ions
c i	44.4% (2) but 1.6/3.6 (1)	2	44% / 44.5 % (1)
ii	India (1) allow any two from: least from nitrogen fixation (1) peas and beans contain root nodules (1) (contain) nitrogen-fixing bacteria (1)	3	Australia then zero for question allow ecf for USA allow least fixed / least in root nodules allow legumes contain root nodules
		9	

Question	Answer	Marks	Guidance										
7 a	<p>EITHER jackrabbits have large ears (1) greater surface area (1) lose more heat (1) OR Jackrabbits have less fur / less fat (1) less insulation (1) lose more heat (1)</p>	3	<p>allow ora for the Snowshoe hare allow greater SA/V</p>										
b	<table border="1" data-bbox="315 608 943 1031"> <thead> <tr> <th data-bbox="315 608 714 703">Charles Darwin's observation</th> <th data-bbox="714 608 943 703">Scientists' observation</th> </tr> </thead> <tbody> <tr> <td data-bbox="315 703 714 767">survival of the fittest</td> <td data-bbox="714 703 943 767">C</td> </tr> <tr> <td data-bbox="315 767 714 831">competition for resources</td> <td data-bbox="714 767 943 831">B</td> </tr> <tr> <td data-bbox="315 831 714 927">inheritance of successful adaptations</td> <td data-bbox="714 831 943 927">D</td> </tr> <tr> <td data-bbox="315 927 714 1031">presence of natural variation</td> <td data-bbox="714 927 943 1031">A</td> </tr> </tbody> </table>	Charles Darwin's observation	Scientists' observation	survival of the fittest	C	competition for resources	B	inheritance of successful adaptations	D	presence of natural variation	A	2	<p>three or four correct = 2 marks two correct = 1 mark one or none correct = 0 marks</p>
Charles Darwin's observation	Scientists' observation												
survival of the fittest	C												
competition for resources	B												
inheritance of successful adaptations	D												
presence of natural variation	A												

<p>c</p>	<p>[Level 3] idea of how carbon dioxide contributes to the greenhouse effect AND effect on snowshoe hares and their habitat AND linked to a reason for numbers dropping/extinction</p> <p>Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] idea of how carbon dioxide contributes to the greenhouse effect AND effect on snowshoe hares and their habitat OR linked to a reason for numbers dropping/extinction</p> <p>Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] idea of how carbon dioxide contributes to the greenhouse effect OR effect on snowshoe hares and their habitat OR a reason for numbers dropping/extinction OR reference to the prediction by the scientists (1 – 2 marks)</p>	<p>6</p>	<p>This question is targeted up to grade C</p> <p>Indicative scientific points about carbon dioxide in the environment include:</p> <ul style="list-style-type: none"> • the greenhouse effect • carbon dioxide being a greenhouse gas • trapping more heat in the Earth's atmosphere / less radiated out to space • global warming <p>Indicative scientific points about the hares habitat include:</p> <ul style="list-style-type: none"> • loss of habitat • not having as much camouflage • numbers may fall below critical level <ul style="list-style-type: none"> - reduced population <p>Indicative scientific points about the hares extinction include:</p> <ul style="list-style-type: none"> • this may result in <ul style="list-style-type: none"> - higher predation - lack of genetic variation - inability to find mates / lower reproduction rate <p>Indicative scientific points about prediction by the scientists at Level 1</p> <ul style="list-style-type: none"> • predictions show that less hares will survive <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
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	[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)		
		11	

Question	Answer	Marks	Guidance
8 a	the same class, genus and species.	1	more than one answer = 0
	different class, genus and species.		
	same class and genus but different species		
	same class but different genus and species ✓		
b i	an artificial (system) (1)	1	
ii	we use a system based on evolutionary relationships / does not allow any predictions to be made about other characteristics / does not allow any predictions to be made about evolutionary relationships (1)	1	allow DNA/genetics used to classify now allow this classification only uses one characteristic ora allow this classification cannot be based on ancestral relationships ora
c	Sam is correct because: any two from: 7 spotted would decrease the mean (1) an even spread would decrease the mean (1)	2	no mark for Sam Tom or Harry correct no marks

	harlequins would increase the mean (1)		
		5	

Question	Answer	Marks	Guidance								
9 a i	any two from: has a nucleus ora (1) has mitochondria ora (1) has chloroplasts ora (1)	2	not cell wall not cytoplasm not cap								
ii	<table border="1"> <tr> <td>some genes can be lost from some cells</td> <td></td> </tr> <tr> <td>both aerobic and anaerobic respiration can occur</td> <td></td> </tr> <tr> <td>cells are able to differentiate and specialise</td> <td>✓</td> </tr> <tr> <td>organisms are able to clone themselves</td> <td></td> </tr> </table>	some genes can be lost from some cells		both aerobic and anaerobic respiration can occur		cells are able to differentiate and specialise	✓	organisms are able to clone themselves		1	more than one answer = 0
some genes can be lost from some cells											
both aerobic and anaerobic respiration can occur											
cells are able to differentiate and specialise	✓										
organisms are able to clone themselves											
iii	nervous or hormone system to communicate between cells / transport or circulation or cardiovascular system to carry nutrients / oxygen / blood / CO ₂ around the organism excretory or gas exchange system to exchange materials with the surroundings (1)	1	ignore named organs e.g. kidney / heart etc. for system allow explained alternative systems e.g. respiratory system / reproductive / digestive								

<p>b</p> <p>[Level 3] includes a correct description of protein synthesis AND describes where proteins are made AND correctly links this to the change in shape of the cap over a period of time.</p> <p>Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] includes a correct description of protein synthesis AND describes where proteins are made OR correctly links this to the change in shape of the cap over a period of time.</p> <p>Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] includes simple description of protein synthesis OR describes where proteins are made OR why it takes several weeks for the change in the cap. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	<p>6</p> <p>This question is targeted up to grade A*</p> <p>Indicative scientific points about protein synthesis at level 2/3 may include:</p> <ul style="list-style-type: none"> • the order of bases codes for the order of amino acids • mRNA carries the code from the DNA • triplet base code read for amino acid <p>Indicative scientific points about where proteins are made may include:</p> <ul style="list-style-type: none"> • proteins are made on the ribosomes • in the cytoplasm <p>Indicative scientific points about why it takes several weeks for the change in the cap:</p> <ul style="list-style-type: none"> • time taken for the proteins in the cap to be replaced / make different proteins • mRNA from the old nucleus takes some time to be replaced by mRNA from new nucleus <p>Indicative scientific points about protein synthesis at level 1 may include:</p> <ul style="list-style-type: none"> • proteins are coded for by DNA/genes • sequence of bases that code for the protein <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>	<p>10</p>
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Question	Answer	Marks	Guidance
10 a	the plants lack genetic variation (1) all susceptible to the same disease/ any disease/environmental change might wipe them all out (1)	2	allow decreased gene pool / genetically identical allow all the strawberries will be ready at the same time (1)
b	some people may not want to buy / eat GM plants (1) there are concerns about their safety / some people do not think that GM is ethically right (1)	2	allow some people are against GM allow some people prefer to buy non-GM allow environmental concerns allow may cause allergies / side-effects / be harmful ignore 'playing God'
		4	

Question	Answer	Marks	Guidance
11 a	amino acids are not proteins (1) they make up proteins (1)	2	no marks if they haven't identified amino acids not incorrect statements about collagen and insulin allow amino acids make up proteins (2)
b	the substrate is like a key (not the enzyme) (1) the substrate fits into the enzyme's active site (not the other way round) (1)	2	allow the enzyme is like a lock (not a key) (1) allow the enzyme has an active site not the substrate (1) allow 'enzyme and the substrate are the wrong way round' (2)
		4	

Question	Answer	Marks	Guidance
12 a i	allows the animals to be compared (1)	1	
ii	the metabolic rate is an indication of the rate of respiration (1) oxygen is needed for (aerobic) respiration (1)	2	BUT the more oxygen consumption the more respiration for a higher metabolic rate (2)
b i	2.5 (1)	1	
ii	the shrew needs / uses lots of oxygen (1) shrew red blood cell has a large surface area to volume ratio (1) this means that it can pick up/release oxygen quickly (1)	3	ignore references to shrew's body surface area to volume ratio ignore pick up more oxygen
		7	

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