



GCSE

Biology B

General Certificate of Secondary Education

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

Mark Scheme for January 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

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

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

Annotation	Meaning
R	reject
CO	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

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Question		Answer	Marks	Guidance
1	(a)	<p>any two from:</p> <p>could cause hypothermia / exposure / (1) could lead to frostbite / unconsciousness / death (1) could slow / stop enzymes working / chemical reactions (in body) (1)</p>	2	<p>allow reverse arguments e.g. must stay warm so do not get hypothermia not hyperthermia allow (could cause) poor circulation ignore stop body / organs working ignore feel weak / shivering / pneumonia ignore enzymes denaturing when cold</p>
	(b)	<p>idea that there is less blood near skin surface (so less heat loss) (1)</p>	1	<p>allow less heat loss by radiation (1) ignore blood flows away from skin ignore blood vessels constrict / narrow ignore no blood near skin surface ignore blood not flowing as close to the skin surface not blood vessels move (further) away from skin / surface</p>
	(c)	<p>lowers (blood) glucose / sugar levels OR removes excess glucose / sugar (from blood) (1)</p> <p>by converting glucose / sugar into glycogen OR by storing (glucose / sugar) in the liver / muscles OR by increasing uptake by cells (1)</p>	2	<p>allow keeps glucose / sugar levels low allow stops glucose / sugar levels getting too high ignore just 'removes sugar from blood'</p> <p>but converts excess glucose / sugar to glycogen = (2) ignore (glucose / sugar level falls) because glucose / sugar is broken down ignore sends glucose / sugar to liver / muscles</p>
		Total	5	

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Question		Answer	Marks	Guidance
2	(a)	<p>[Level 3] Answer gives a correct explanation of how Deflex may reduce transmission across synapses in terms of its effect on (neuro)transmitters or receptors. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Answer indicates reduction of transmission across synapses OR reduced activity of (neuro)transmitters. Mechanism unclear. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Suggests that Deflex is a depressant or reduces transmission of impulses. 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 A*</p> <p>Indicative scientific points at level 3 may include:</p> <ul style="list-style-type: none"> • Deflex binds with receptors in synapses • transmitter can no longer bind to receptors • binds with the neurotransmitter once released • breaks down the released neurotransmitter <p>Indicative scientific points at level 2 may include:</p> <ul style="list-style-type: none"> • Deflex works on synapses • Deflex reduces amount of transmitter substance <p>Indicative scientific points at level 1 may include:</p> <ul style="list-style-type: none"> • Deflex is a depressant • no impulse sent along second neurone <p>ignore Deflex is a sedative / sleeping tablet ignore Deflex affects / slows the nervous system</p>
	(b)	<p>coffee contains a stimulant / caffeine is a stimulant / increases activity of the nervous system (1)</p> <p>so may have the opposite effect / keep you awake / alert (1)</p>	2	<p>allow examples e.g increase brain activity / increase transmission across synapses allow speed up nerve impulses ignore makes it difficult to sleep allow caffeine / coffee inhibits Deflex (1) because it combines with it / stops it being absorbed (1)</p>
Total			8	

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Question		Answer	Marks	Guidance
3	(a)	glycerol (1)	1	allow phonetic spelling
	(b)	contain all the essential amino acids / contain the amino acids the body cannot make (1)	1	ignore of animal origin / come from meat
	(c) (i)	26.2 (2) BUT $85 \div 3.24$ or $85 \div 1.8^2$ (1)	2	allow 26 / 26.23 / 26.234568 (2) but 26.0 (incorrect rounding) max (1)
	(ii)	(yes) his BMI is between 25-29.9 (1)	1	answer must include numbers from the box allow more than 25 and less than 30 allow ecf from (i) e.g. if BMI = 32: no, because his BMI is over 30 (1)
	(iii)	(yes) (no mark) idea that unhealthy means you have a disease (and not overweight) / ora (1) idea that an England rugby player would need to be very fit (to be able to compete at that level) (1) OR idea that England rugby players have a lot of muscle not fat (1)	2	if no, then no marks at all must have one idea about health-free from disease idea and one about fitness – ability to perform play rugby (at high level) or idea of muscle not fat idea about fitness must relate to rugby players; idea about health need not ignore just 'rugby players have a lot of muscle'
		Total	7	

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Question	Answer	Marks	Guidance
4 (a)	<p>Only seedlings 1 and 2 are showing positive geotropism <input type="checkbox"/></p> <p>Only seedling 1 is showing positive phototropism. <input checked="" type="checkbox"/> (1)</p> <p>All the seedlings are responding to gravity <input checked="" type="checkbox"/> (1)</p> <p>Only seedling 3 is showing negative phototropism <input type="checkbox"/></p> <p>None of the seedlings are responding to light <input type="checkbox"/></p> <p>All of the seedlings are showing negative phototropism <input type="checkbox"/></p>	2	more than two ticks: deduct one mark for each incorrect answer
(b)	<p>any three from:</p> <p>(A - seedling 1 grows but seedling 2 does not:) because hormone is made in the tip (of seedling 1) (1) so no hormone (made) in seedling 2 (1)</p> <p>(B - seedling 1 bends but seedling 2 does not:) (more) hormone on dark side of seedling 1 / hormone moves to dark side (1) so hormone causes (more) cell elongation (on dark side) (1)</p> <p>(hormone is) auxin (1)</p>	3	<p>to get maximum 3 marks they must have two linked ideas, i.e. at least two marks from either A or B, plus one other mark:</p> <p>e.g. no hormone is made in 2 because hormone is made in the tip and the hormone causes cell elongation (3) but hormone made in the tip is auxin and it causes cell elongation (2)</p> <p>allow hormone destroyed on light side</p> <p>ignore just more growth on dark side</p>
	Total	5	

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Question			Answer	Marks	Guidance
5	(a)	(i)	(more) tourism / generates income / more employment (1)	1	allow examples e.g. (more) safaris ignore (have more) ivory ignore uses of elephants (e.g. for transport / work)
		(ii)	prevent or reduce poaching / hunting / killing (1)	1	ignore less elephants dying ignore less harm to elephants
	(b)		any two from allows sun's rays / radiation / IR / heat pass through atmosphere (1) (carbon dioxide) stops / reduces the (re-radiated) radiation / heat / IR passing out in to space (1) because (carbon dioxide) reflects back the radiation / heat / IR (1)	2	ignore sunlight ignore UV not allows more radiation / IR / heat to enter atmosphere allow (carbon dioxide) traps heat (from Earth) ignore traps heat from sun ignore references to ozone
	(c)	(i)	any two from idea that acquired characteristics do not have a genetic basis / can not be passed on (1) hair length is controlled by genes / DNA (1) hair can not be grown longer by mammoths (when it's cold) (1)	2	allow Lamarck's ideas do not have a genetic basis
		(ii)	(variation:) some animals were born with / have longer hair (than others) (1) (competition:) those with longer hair (had an advantage and were) more likely to survive (1) (inheritance:) they will reproduce and pass on the gene / long hair OR pass on gene / long hair to offspring (1)	3	allow (some mammoths have) mutation for long hair can allow generic natural selection statements with no reference to hair length up to max 2
Total				9	

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Question	Answer	Marks	Guidance
6	<p>[Level 3] Answer gives a complete explanation using all three ideas. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Answer gives a clear explanation using at least two of the three ideas. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Answer includes a simple explanation using one of the three ideas. 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 A*</p> <p>Indicative scientific points may include:</p> <ul style="list-style-type: none"> • Idea 1: Evolutionary relationships between organisms can be tested by using DNA analysis or by looking at similarities between multiple characteristics. • Idea 2: Organisms can share similar characteristics due to evolutionary but also ecological reasons • Idea 3: Members of a species can reproduce / produce fertile offspring.
	Total	6	

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Question			Answer	Marks	Guidance
7	(a)	(i)	ticks are smaller than buffalos OR idea that many ticks (feed) on small number of buffalos (1)	1	answer must refer to this example
		(ii)	lives on / off / in a host / living organism (1) causing it harm (1)	2	ignore feeding from it / kills it
	(b)		(no / little benefit having or not having oxpeckers) as average (change in) number is the same for both groups (1) reference to limitations of data: (difficult to reach a conclusion as) only three buffalos / variability of data (1)	2	allow (no / little benefit because overall) there is little / no difference in the (change in) numbers (of ticks) allow (no / little benefit because overall) both groups of buffalo have same (change in) number (of ticks)
	(c)	(i)	52.9 (1)	1	allow 52.88 allow 53 but not 53.0
		(ii)	buffalo with oxpeckers have more wounds (in total / that do heal / that do not heal) (than buffalo without oxpeckers) / ora (1) buffalo with oxpeckers have lower percentage of wounds that heal (than buffalo without oxpeckers) / ora (1) birds might be causing the wounds / keeping them open / feeding on the blood (1)	3	allow ecf from (i) allow reverse arguments for with / without oxpeckers and wounds that heal / do not heal (1) allow proportion as alternative to percentage additional marking points: allow more wounds heal than do not heal (regardless of whether have oxpeckers or not) (1) because wounds (naturally) heal (1) (this mark is dependent on the previous marking point)
	(d)		because they do not feed on the same thing / only one feeds on ticks / only one feeds on blood / because they do not live in the same area (1)	1	answer must be specific to this example, e.g. ignore have different roles allow only one is in a mutualistic relationship
			Total	10	

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Question		Answer	Marks	Guidance
8	(a)	30 (1)	1	
	(b)	this is selective breeding / artificial selection (1) which leads to inbreeding (1) idea that lameness / diarrhoea are genetically controlled (1)	3	ignore just lameness / diarrhoea are passed down additional marking points: allow higher level response: reduced gene pool / reduction in variation / accumulation of harmful recessive characteristics (1) BUT there is no variation = 0
	(c) (i)	(most) animal (cells) lose the ability to differentiate (at an early age) OR (many) plant (cells) retain the ability to differentiate (throughout their lives) (1)	1	allow plants retain stem cells but animals do not
	(ii)	any three from other scientists can build upon their results (1) so can develop ideas quicker (1) other scientists can repeat / test the work (for validity) (1) different teams have different skills / resources / ideas / approaches (1) so that a broad range of evidence can be put together to develop the idea (1)	3	allow work continues even if some people are absent allow can share out work load allow can do more work allow can bounce ideas off each other allow able to get variety of results to solve a problem allow to gather more evidence to justify ideas
		Total	8	

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Question		Answer	Marks	Guidance
9		bacterial (1) plus any one from has no nucleus / animal and plant cells have a nucleus (1) it has flagellum (1)	2	if plant or animal then no marks allow has naked DNA / single chromosome / circular DNA allow tail
		Total	2	

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Question			Answer	Marks	Guidance
10	(a)	(i)	mitosis (1)	1	allow phonetic spelling but important that “t” is in the middle
		(ii)	idea that there is the same (amount of) DNA / genetic material in each (new) cell after division (as before) (1)	1	answer must refer to new cells produced after division allow makes a copy of chromosomes so there are two new copies, one for each cell ignore just to copy DNA
	(b)		<p>[Level 3] Comparison made between the two graphs WITH explanation in terms of collision rates OR in terms explanation of denaturing in terms of the shape of the active sites. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Comparison made between the two graphs with an explanation to include denaturing. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Comparison made between the two graphs: shape of graphs OR optimum temperatures OR when enzyme activity stops. No explanation of mechanisms. 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 A*</p> <p>Indicative scientific points at Level 3 may include:</p> <ul style="list-style-type: none"> • more frequent successful collisions with higher temperature due to increased energy for movement • denaturing irreversibly changes the shape of the active site <p>Indicative scientific points at Level 2 may include:</p> <ul style="list-style-type: none"> • high temperatures denature enzymes • active site denatured by heat / “lock and key” no longer fit <p>Indicative scientific points at Level 1 may include:</p> <ul style="list-style-type: none"> • enzyme activity for both graphs activity increases with temperature to an optimum then decreases • optimum temperature is about 37°C for humans and about 55°C for bacteria • enzyme activity stops at about 42°C for human and about 66°C for bacteria <p>allow best / peak temperature instead of optimum</p> <p>must make some comparison between the two graphs to score any marks</p>
Total				8	

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Question		Answer	Marks	Guidance
11	(a)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (2)	2	all correct (2) one mark formulae (1) case and subscripts must be correct one mark balancing (1) this mark is dependent on the first reactants and products must be on correct side of equation but can be in either order
	(b)	<p>arteries carry blood at low pressure away from the heart <input type="checkbox"/></p> <p>arteries carry blood at high pressure away from the heart <input checked="" type="checkbox"/></p> <p>arteries carry blood at low pressure and have valves to prevent backflow <input type="checkbox"/></p> <p>arteries carry blood at high pressure back to the heart <input type="checkbox"/></p> <p>arteries join veins to capillaries <input type="checkbox"/></p>	1	any additional incorrect tick loses mark
	(c) (i)	93.6% (1)	1	allow 94 or 93.62 or 93.617 not 94.0 (incorrect rounding)
	(ii)	<p>(no) (no mark)</p> <p>1. his heart rate puts him in the anaerobic threshold zone / he is not within the target heart rate zone / respiring anaerobically / he's in 85-100% max heart rate zone (1)</p> <p>2. builds up lactic acid / builds up oxygen debt (1)</p> <p>3. so causes fatigue / cramp / pain (1)</p>	3	if have not put 'no' can still award marking point 1 only allow builds up lactate lactic acid is toxic = 1
Total			7	

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