

GCSE

Biology B

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

General Certificate of Secondary Education

Mark Scheme for June 2015

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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
	benefit of the doubt
	benefit of the doubt not given
	error carried forward
	information omitted
	ignore
	reject
	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
<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		2	all correct = 2 marks 2 or 1 correct = 1 mark
b	<p>(inflexible) lens cannot become fat / cannot increase focal power (1)</p> <p>light/image is focused behind/not on the retina/back of the eye (1)</p>	2	<p>allow lens remains thin/less convex/less curved</p> <p>allow lens can't become short/thick</p> <p>ignore lens cannot become small/large</p> <p>ignore lens cannot change shape easily-in stem of question</p> <p>allow light not refracted/bent enough</p>
Total		4	

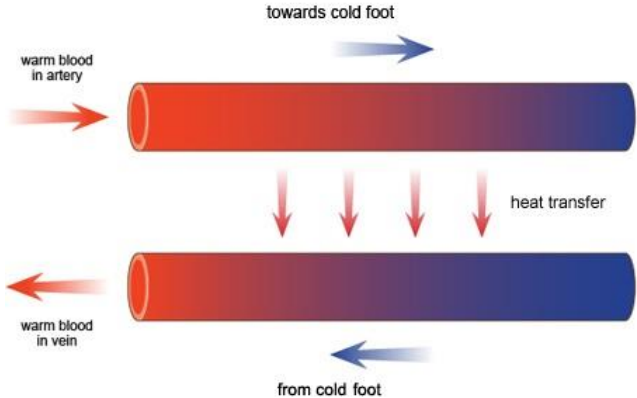
Question	Answer	Marks	Guidance
2 a i	ciliated epithelial cells (1)	1	allow correct answer ringed, ticked or underlined on list
a ii	damages the cilia (1) unable to remove/clear mucus (1)	2	allow damage to hairs allow cilia are paralysed/can't move/can't work ignore affects cilia ignore cilia are destroyed/burned/killed allow damages / stimulates goblet cells allow unable to remove pathogens/bacteria/dirt/dust allow produce more/build-up mucus ignore causes smokers' cough ignore causes (lung) cancer
a iii	benign (1) malignant are cancerous / malignant tumours spread (1)	2	allow malignant form metastases / benign don't metastasise ignore malignant tumours are uncontrolled cell growth ignore benign tumours are harmless/stop growing benign tumours aren't cancerous = 2 benign tumours do not spread = 2
b i	bar height between 7.8 and 8.8 (1)	1	
b ii	any two from: lowest risk/1% risk / (1) idea of catching people before they start (1) idea of less time for long term damage to cells / DNA (1) idea of easier to give up when younger / ORA (1) idea that under 30 year olds act more as role models for children (1)	2	allow risk nearly doubles for each 10 years after 30yrs
	Total	8	

Question	Answer	Marks	Guidance
3 a	<p>[Level 3] Calculation of BAC and quantitative discussion of short-term risks which refers to graph BAC levels in graph. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Calculation of BAC and qualitative discussion of short-term risks. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Incomplete calculation of BAC or qualitative discussion of short-term risks. 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"> • BAC = 0.2 (g in 100ml of blood) • gives 25x relative risk of accidents that a BAC of 0.2 would cause as shown on the graph <p>Indicative scientific points at level 2 may include:</p> <ul style="list-style-type: none"> • BAC = 0.2 (g in 100ml of blood) • gives increased risk of accidents <p>Indicative scientific points at level 1 may include:</p> <ul style="list-style-type: none"> • 28-20= 8g of alcohol after 2 hours • BAC = $\frac{g}{4000} \times 100$ • increased risk of accidents <p>Use the L1, L2, L3 annotations in Scoris. Do not use ticks.</p>
b	<p>any two from: alcohol breakdown produces toxins/poisons (1)</p> <p>cause cirrhosis (1)</p>	2	<p>allow forms hardening / scarring of liver tissue ignore rots your liver ignore fatty liver</p>
Total		8	

Question	Answer	Marks	Guidance
4 a i	any one from: shot requires a high strength performance / ORA (1) marathon requires high cardiovascular efficiency/ ORA (1)	1	
a ii	B (1) high cardiovascular and medium speed (1)	2	allow answer ringed on table ignore medium flexibility/agility and low strength
b	because Paula might have inherited desired genes from her mother / idea of random shuffling of chromosomes in meiosis (1) Paula would need to have suitable environment / training / correct diet / motivation (1)	2	allow desired genes from Paula's mum may be/not be expressed
	Total	5	

Question	Answer	Marks	Guidance
5 a	<p>any two from: the closer to the factory the higher the mercury concentration in the soil /ORA (1)</p> <p>the closer to the factory the higher the mercury concentration in the lichens/ ORA(1)</p> <p>more mercury in lichens than in soil close to factory / ORA (1)</p>	2	<p>responses must be comparative allow negative correlation between distance from factory and mercury concentration in soil</p> <p>allow negative correlation between distance from factory and mercury concentration in lichens</p> <p>ignore references to numbers of lichen</p> <p>allow mercury concentration follows a similar pattern for both (1)</p> <p>if no other mark allow mercury concentration decreased further from the factory (1)</p>
b	<p>any two from: there is a correlation between the levels of mercury in lichens and soil (1)</p> <p>cannot be used close to factory as idea that there is no evidence (1)</p> <p>idea that there is more variation in soil data so better to use lichens / ORA (1)</p>	2	<p>allow lichen good indicator particularly at middle distances (1)</p>
Total		4	

Question	Answer	Marks	Guidance
6 a	<p>Any two from: cyclical pattern shown (1)</p> <p>description of pattern (1)</p> <p>the idea that snowy owl and lemming populations are out of phase with each other AW (1)</p>	2	<p>allow predator prey relationship</p> <p>examples when there are more lemmings (available for food) there are more snowy owls / ORA when there are less snowy owls (for predation) there are more lemmings / ORA reject responses that imply lemmings eat owls</p> <p>allow when there are more lemmings snowy owls increase slightly after / ORA (2)</p> <p>allow possible emigration of owls so lemmings population allowed to increase again (1)</p>
b	<p>any two from: covered in fur so that its well-insulated/reduced heat loss/keeps it warm (1)</p> <p>builds up fat layer so that its well-insulated/reduced heat loss/keeps it warm (1)</p> <p>has very small snout/legs/ears/small SA/V ratio so reduced heat loss (1)</p>	2	<p>ignore unqualified features allow higher level responses linked to metabolic rate</p> <p>allow large V/SA</p> <p>allow idea of huddling to use mutual body heat / living in a burrow/nest material to conserve heat (1)</p>

Question	Answer	Marks	Guidance
<p>c</p>	<p>any two from: idea that it warms the cold blood entering the rest of the body (1) cools the blood entering the penguin foot (1) so reduces heat loss from penguin foot area (1) blood vessels close together / arteries close to veins (1)</p>	<p>2</p>	<p>allow labelled diagram</p> <p>allow warms up blood as it goes back to body to minimise any decrease in core temperature (1)</p> 
<p>Total</p>		<p>6</p>	

Question	Answer	Marks	Guidance
7 a	Drosophila (1)	1	allow drosophila and phonetic spelling
b	<p>idea that a species can produce fertile offspring and hybrids cannot/are infertile so are not a species (1)</p> <p>Catalina macaw can (sometimes) produce fertile offspring so could be classified as a species (1)</p>	2	
c i	<p>any two from:</p> <p>idea it went against other scientific theories / Lamarck (1)</p> <p>insufficient evidence / DNA not discovered (1)</p> <p>went against religious beliefs (1)</p>	2	<p>allow lack of proof</p> <p>allow made people fearful of their ancestry (1)</p>
c ii	<p>Idea that there is more evidence now / shown by fossil record / DNA mapping made clear the closeness of different organisms / selective breeding provides direct evidence of being able to change organisms (1)</p> <p>because it has been tested by (a wide range of) scientists (1)</p>	2	<p>allow now we have more proof</p> <p>allow mechanism (genes) for evolution wasn't realised / known</p> <p>allow scientists can't disprove it / other theories have been proved wrong</p>
	Total	7	

Question	Answer	Marks	Guidance
8 a	<p>[Level 3] Calculation of energy efficiency and idea that energy is lost between each trophic level and idea that insufficient energy left (due to energy transfers). Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Calculation of energy efficiency and idea that energy is lost between each trophic level or idea that insufficient energy left due to energy transfers. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Idea of whales being top predator or idea that insufficient energy left due to energy transfers. 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 2 and 3 may include:</p> <p>calculation $\frac{22.5}{225} \times 100 = 10\%$ or just 10%</p> <ul style="list-style-type: none"> • 10% of energy of herring is going into salmon • much of the energy is transferred to less useful forms e.g. heat through respiration/excretion/egestion • a similar reduction from salmon to seal would mean that the amount of energy getting to next trophic level is insufficient to sustain another trophic level <p>Indicative scientific points at level 1 may include</p> <p>No calculation/ incorrect calculation limit to level 1</p> <p>Use the L1, L2, L3 annotations in Scoris. Do not use ticks.</p>
b	<p>any two from:</p> <p>idea of it's cruel / unethical / immoral (1)</p> <p>whales are an intelligent mammal (1)</p> <p>lack of freedom / large animal confined in small area / shorter lifespan in captivity(1)</p>	2	<p>allow shouldn't make money from trapping wild animals</p> <p>allow whales become distressed</p> <p>allow they should be allowed to live in the oceans</p>

Question	Answer	Marks	Guidance
	not enough genetic variation in captivity / idea of disease wiping them out (1) less likely to survive in the ocean if released (1) will affect the food chains in the wild (1)		
	Total	8	

Question	Answer	Marks	Guidance
9 a	amino acids (1)	1	allow C, H, O, N.
b	denatures protein (1) as quickly as possible (1)	2	allow denaturing enzymes rather than proteins allow so stops acting as a poison (1) ignore idea of sterilising wound
c	(poison) gene is switched off (in all but the spine cells) (1)	1	allow allele is switched off allow higher level answers e.g. transcription prevented
d	any two from: (no – no mark) idea that small individual risk/small number of incidents (1) no serious harm caused (1) idea that can wear footwear (1) fish may move to other beaches (so will not stop the problem) (1) increase awareness of the danger (1) go on beach but not in the water (1) possible adverse effect on tourism/economy/jobs (1) (yes – no mark) idea that stings may be dangerous to some people / some people may have allergy (1) idea of liability if danger known and people not warned (1) idea that if many of the stings happened on a small number of beaches, they should be closed (1)	2	allow easily treated
Total		6	

Question	Answer	Marks	Guidance
10 a	<p>[Level 3] Quantitative explanation (to include at least one calculation of change) of how blood flow changes and include idea that some named organs receive more blood and other named organs get less. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Statement of change using data from the table and a qualitative explanation of how blood flow changes. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Qualitative explanation of how blood flow changes. 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 may include:</p> <ul style="list-style-type: none"> • blood flow to skin increases by $1600 / x 6.3$ • blood flow to muscles increases by $11\ 500 / x 12.5$ • blood flow to heart muscles increases by $550 / x 3.75$ • blood flow to digestive system decreases by $750 / x 0.44$ • blood flow to kidneys decreases by $500 / x 0.55$ • blood flow to brain increases by $50 / x 1.1$ / stays (almost constant) • blood diverted to skin / muscles / heart muscles • blood diverted from digestive system / kidneys <ul style="list-style-type: none"> • (total) blood flow is faster/increases • (total) blood flow increases by $12\ 500 / x 3.5$ <p>If answer is qualitative only with no use of data, then max L1</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
b	idea that all the blood goes through the lungs (1)	1	allow all the blood needs oxygenating
	Total	7	

Question	Answer	Marks	Guidance
11 a	undifferentiated cells / unspecialised cells (1) idea that can develop/change into different types of cells (1)	2	ignore can change into anything
b	made from skin cells (1) normal stem cells come from embryos (1)	2	allow made from differentiated cells allow stem cells come from bone marrow / umbilical cord
c	any two from: (no –do not credit) produced by meiosis (1) genetically / DNA different / contain different combinations of chromosomes (1) only contain one of each pair of chromosomes (1)	2	Yes = 0 allow phonetic spelling e.g. miosis
d	idea that just because it was successful in mice this does not mean it will be successful in humans/human cells might react differently (1) idea that this is germline treatment / that if anything goes wrong it can affect all descendants (1)	2	ignore it's unethical / immoral / against God etc. ignore any social/cultural aspects come under the umbrella of unethical ignore simply 'cost' but allow expanded economic argument e.g. money spent on this will be money taken away from other treatments/preventions (1)
e	energy (source) (1)	1	allow for swimming / movement ignore respiration reject producing energy allow release energy allow higher level, specific answers, e.g. active transport
f i	protein synthesis / make proteins / join amino acids together (1)	1	allow higher level answer: translation
ii	mRNA / messenger RNA (1)	1	ignore just RNA
iii	A, T, C, G (1)	1	must have all four ignore order ignore U / uracil allow names: adenine, thymine, cytosine, guanine
	Total	12	

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