OCR
RECOGNISING ACHIEVEMENT

GCSE

Biology B

General Certificate of Secondary Education

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

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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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
__	=	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)	**too** rounded (1) focuses light **before** the retina **or** bends / refracts light too much (1)	2	**allow too** powerful / **too** thick **ignore** long eyeball **not** reflects lights
		(ii)	concave (1)	1	**allow** diverging **allow** diagram: 
	(b)	(i)	(alternative / different) version of **a** gene (1)	1	**ignore** different types of gene **but allow** different types of a gene
		(ii)	both Seema and John do not have the disorder / condition / nanophthlamos (1) (**but**) they have children who have the disorder / condition / nanophthlamos **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
		(iii)	parental genotypes Nn x nn (1) offspring genotypes Nn, Nn, nn, nn (1) probability = 50(%) (1)	3	**allow** any clear genetic diagram **ignore** ½ / 0.5 / 1 in 2 **do not** award any ecf **allow** 50(%) (1) even if diagram incorrect
			Total	**9**	

Question			Answer	Marks	Guidance
2			**[Level 3]** More than one possible criticism given **and** an explanation that a build up of cholesterol reduces the supply of oxygen / glucose to the heart (muscle). Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** One possible criticism given **and** a recognition that cholesterol reduces blood flow to the heart (muscle) / in coronary arteries. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** One possible criticism given **or** a recognition that there is a link between (saturated) fat in the diet and cholesterol/plaque/reduced blood flow to heart **or** recognition that cholesterol reduces blood flow to heart **or** recognition that cholesterol build-up means the heart has to work harder. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to A*** **Indicative scientific points:** criticisms: • only six / seven countries studied • all developed countries • only measured total fat in diet / did not measure saturated fat in diet / can not deduce effect of saturated fat • Keys has assumed all other factors other than fat in diet were the same / other factors (influencing heart disease) have not been controlled for eg levels of salt in diet **ignore** not enough evidence **ignore** simply other factors can cause / are linked to heart disease explanations: • there is a link between the amount of saturated fat eaten and the build up of cholesterol plaques. • narrowed coronary arteries reduce blood flow to heart muscle **max 3 marks** if do not use term cholesterol **ignore** saturated fat causes heart disease (in question) **ignore** simply 'cholesterol restricts blood flow' **ignore** references to just high blood pressure
			Total	**6**	

Question			Answer	Marks	Guidance
3	(a)	(i)	some drugs are more harmful / dangerous than others / it depends how harmful / dangerous they are (1) different penalties (for possession / use) / it affects the penalty / AW (1)	2	**ignore** some drugs are stronger / addictive **ignore** incorrect class, eg class C drugs are more harmful = 1 **allow** AW for penalty eg punishment / fine / prosecution
		(ii)	LSD (1)	1	**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
		(iii)	the widening of blood vessels (1)	1	**allow** widening of arteries / capillaries **ignore** veins widen **allow** blood vessels dilate **allow** blood vessels open up / expand / get bigger **ignore** blood vessels get fatter / swell up / relax **ignore** more blood flows **not** vessels move closer to surface
	(b)		**any two from:** idea that no / less neurotransmitter / chemical to bind with next neurone / AW (1) prevents nerve impulses passing from neurone to neurone (1) at / across a synapse (1)	2	 **allow** prevents nerve impulses being sent along / to next neurone **ignore** slows down impulses / reduces impulses / blocks impulses / impulses can not get through **ignore** references to messages / signals / information

Question			Answer	Marks	Guidance
	(c)	(i)	5000 (2) **but** 75000 in lethal dose box (1)	2	**allow** ecf for max 1 if therapeutic ratio = value for lethal dose ÷15 eg lethal dose = 750, TR = 50
		(ii)	**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
			Total	**10**	

Question			Answer	Marks	Guidance
4	(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)		class ☐ family ☐ genus ✓ order ☐ species ✓	2	each incorrect tick above 2 loses 1 mark down to zero
	(c)		**any two from:** (avoid predation) by distraction / scare off predators (1) attract their food source / act as bait (so they catch more food) (1) attract mates (to increase chance of reproducing) (1)	2	**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) **ignore** use structure to help them see (idea that it acts as a torch)

Question			Answer	Marks	Guidance
	(d)		**any three from:** (in ancestral population) some worms had green oval structures / some worms did not have green oval structures (1) green oval structures allowed worms to live in deep water / worms living in deep water developed green oval structures (1) idea of isolation between worms in deep and shallow water / isolation between worms with and without green oval structures (1) idea of independent evolution between two groups (1)	3	**ignore** simply 'worms show variation' **allow** clear AW for green oval structures eg 'can glow' generic explanation with no reference to green oval structures = max (2) ie ideas of isolation and independent evolution **allow** adapt differently
			Total	**9**	

Question			Answer	Marks	Guidance
5	(a)		**[Level 3]** Explains more than one method to avoid overheating to include explanation that the frill retracts during hot part of day to reduce **SA/V**. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Explains more than one method to avoid overheating to include one method **specific** to the lizard. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Explains at least one method to avoid overheating. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to A** **Indicative scientific points at Level 3 to include:** • lowers/closes frill to reduce (exposed) surface area to volume ratio to reduce heat gain. **ignore** raises/opens frill to increase SA/V to increase heat loss **unless** it is made clear that this happens in a cool place for a L3 standard response about reduced SA/V that only includes this one method, award L2, max 4 marks **Other indicative scientific points may include:** methods specific to lizard: • alternate lifting up of feet • lower/closes frill to reduce (exposed) surface area • open mouth (to increase heat loss). **ignore** raises/opens frill to increase SA to increase heat loss **unless** it is made clear that this happens in a cool place **ignore** use of frill as a fan **generic methods**: • find shade / hide in holes • go in water • stay still (to avoid overheating). if no other marks awarded, then award **max 1** for simply 'lower/close frill' or 'go under rock' (with no explanation) **ignore** vasodilation / vasoconstriction **ignore** drinking / sweating

Question			Answer	Marks	Guidance
	(b)		**any three from:** genetic variation is limited / reduced gene pool (1) predators / habitat loss still present (1) captive breeding avoids having to collect the young iguanas from habitat (1) may not breed well in captivity (1) idea that more iguanas will be released (because young more likely to survive in captivity) (1) animals raised in captivity may not survive well when released (as don't have experience of living in the wild) **or** young/small animals released in to wild are less likely to survive (than larger ones released by headstarting) (1)	3	answer must refer to captive breeding **ignore** inbreeding / small number of adults **ignore** 'more young produced' 'animals raised in captivity don't survive when released because they are being eaten (by animals) / are prey' =1, but **does not** gain the predator mark (point 2) as well, unless the presence of predators/cats/dogs is explicitly mentioned, which gains 2nd marking point
			Total	**9**	

Question			Answer	Marks	Guidance
6	(a)		**dry** mass at each trophic level / AW (1)	1	**allow** number x **dry** mass of typical individual **ignore** dry mass of (individual) organisms **ignore** dry mass of all organisms **allow** weight as alternative to mass
	(b)	(i)	respiration (1)	1	**ignore** movement / egestion / excretion **ignore** conduction / convection / radiation
		(ii)	0.89(kJ) (1)	1	mark answer line first – if answer line blank then look for clear answer in any working
		(iii)	$\frac{0.25}{3.14}$ x 100 (1) **but** 7.96(%) (2)	2	**allow** 8 or 8.0 incorrect rounding, eg 7.9 = 1
		(iv)	energy is 'lost' at each stage / transfer at each stage is not (very) efficient (1) not enough energy for another trophic level / a long food chain requires a large energy input to sustain the top predator (1)	2	**allow** large amount of energy 'lost' **ignore** just 'energy is lost' (in previous question) **ignore** ALL energy lost **ignore** NO energy for another trophic level **ignore** sparrowhawks too fierce so nothing will attack / eat them
			Total	**7**	

Question			Answer	Marks	Guidance
7	(a)	(i)	answer in range 9-10 (years) (1)	1	
		(ii)	answer in range 0-1 (years) (1)	1	
		(iii)	13.5 (years) (1) greatest (vertical) distance/height between lines / AW (1)	2	**allow** answer in range 13-14 (years) mark the two points independently
	(b)	(i)	mitosis (1)	1	**allow** phonetically correct spelling
		(ii)	 DNA unzips (1) add bases (1) **but** add complementary bases (2)	3	marks may be awarded to a diagram **ignore** DNA unwinds / splits **allow** double helix unzips **ignore** chromosome unzips **ignore** descriptions of cell division **allow** add nucleotides (1) **allow** A pairs with T / C pairs with G (2)
			Total	**8**	

Question			Answer	Marks	Guidance
8	(a)		**[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) **[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) **[Level 1]** Changes to DNA may affect proteins. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C** **Indicative scientific points at Level 3 may include:** • enzymes are proteins / biological catalysts / control chemical reactions in cells • changes in enzymes result in harmful changes to cell processes. **Indicative scientific points at Level 2 may include:** • 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. **Indicative scientific points at Level 1 may include:** • changes to DNA may affect amino acids. **ignore** DNA changes are mutations

Question			Answer	Marks	Guidance
	(b)		**any two from:** the harm has already been done / no further harm will be done (1) unethical to deliberately expose people to radiation to investigate / otherwise it may be necessary to test people/animals (1) tells us more about cancer (eg how long it takes to develop) / helps us treat or prevent cancer / if we don't use this information more people may suffer (1)	2	if no other marks awarded **allow** 1 for idea that this is the best way to get this information **ignore** simply 'provide information linking radiation and cancer' (in question)
			Total	**8**	

Question			Answer	Marks	Guidance
9	(a)		she used anaerobic respiration / she could not get enough oxygen / (1) production of lactic acid (1) **but** need (extra) oxygen to break down / remove lactic acid (2)	3	**ignore** just 'needs oxygen' **ignore** she needs more oxygen **ignore** oxygen debt has built up **allow** need (extra) oxygen to remove / pay back oxygen debt = (1)
	(b)		some blood bypasses lungs / oxygenated and deoxygenated blood mix (1) not enough/less oxygen in blood / not enough/less oxygen supplied to muscles (1) less (aerobic) respiration / less energy (for muscles) (1)	3	**allow** lack of blood to lungs / less blood to lungs **ignore** no blood to lungs **allow** lack of oxygen in blood **ignore** no oxygen in blood **ignore** less oxygen to body **ignore** no energy / no respiration **allow additional marking points:** anaerobic respiration / oxygen debt / lactic acid (1) carbon dioxide builds up in blood / AW (1) **ignore** references to backflow / valves
			Total	**6**	

Question			Answer	Marks	Guidance
10	(a)		nucleus from Rainbow / body cell put into (empty) egg cell (1) (cell given) electric shock / cell divides (1)	2	can credit both marks in same box reference to fertilising egg negates mark **allow** mitosis **allow** electric shock to fuse (nucleus and cell)
	(b)		body cells lose ability to differentiate / AW (1) **or** many / some genes switched off (1)	1	**allow** not a stem cell **ignore** body cells do not contain stem cells **allow** already specialised / differentiated **ignore** body cell already has a function
			Total	**3**	

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