

Biology B

General Certificate of Secondary Education

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

Mark Scheme for June 2012

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

© OCR 2012

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk













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) | 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 / 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 |
| | | (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 | <p>[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)</p> <p>[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)</p> <p>[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)</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:</p> <p>criticisms:</p> <ul style="list-style-type: none"> • 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 <p>ignore not enough evidence ignore simply other factors can cause / are linked to heart disease</p> <p>explanations:</p> <ul style="list-style-type: none"> • 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 <p>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</p> |
| | 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 $\div 15$ 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) | <p>(a group of organisms) capable of interbreeding / mating produces offspring (1)</p> <p>but</p> <p>(interbreed to) have fertile offspring (2)</p> | 2 | <p>allow can mate / can reproduce / have offspring</p> <p>allow additional marking point: organisms which share the same gene pool / share the same genetic information (1)</p> | | | | | | | | | | |
| | (b) | <table style="border-collapse: collapse; margin-left: 40px;"> <tr><td style="padding: 5px;">class</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td></tr> <tr><td style="padding: 5px;">family</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td></tr> <tr><td style="padding: 5px;">genus</td><td style="border: 1px solid black; width: 30px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="padding: 5px;">order</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td></tr> <tr><td style="padding: 5px;">species</td><td style="border: 1px solid black; width: 30px; height: 20px; text-align: center;">✓</td></tr> </table> | class | | family | | genus | ✓ | order | | species | ✓ | 2 | <p>each incorrect tick above 2 loses 1 mark down to zero</p> |
| class | | | | | | | | | | | | | | |
| family | | | | | | | | | | | | | | |
| genus | ✓ | | | | | | | | | | | | | |
| order | | | | | | | | | | | | | | |
| species | ✓ | | | | | | | | | | | | | |
| | (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</p> <p>allow may be poisonous / toxic (to predators)</p> <p>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> | | | | | | | | | | |

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

| Question | Answer | Marks | Guidance |
|----------|--|-------|--|
| 5 (a) | <p>[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)</p> <p>[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)</p> <p>[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)</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 to include:</p> <ul style="list-style-type: none"> lowers/closes frill to reduce (exposed) surface area to volume ratio to reduce heat gain. <p>ignore raises/opens frill to increase SA/V to increase heat loss unless it is made clear that this happens in a cool place</p> <p>for a L3 standard response about reduced SA/V that only includes this one method, award L2, max 4 marks</p> <p>Other indicative scientific points may include:</p> <p>methods specific to lizard:</p> <ul style="list-style-type: none"> alternate lifting up of feet lower/closes frill to reduce (exposed) surface area open mouth (to increase heat loss). <p>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</p> <p>generic methods:</p> <ul style="list-style-type: none"> find shade / hide in holes go in water stay still (to avoid overheating). <p>if no other marks awarded, then award max 1 for simply 'lower/close frill' or 'go under rock' (with no explanation)</p> <p>ignore vasodilation / vasoconstriction ignore drinking / sweating</p> |

| Question | Answer | Marks | Guidance |
|----------|---|----------|---|
| (b) | <p>any three from:</p> <p>genetic variation is limited / reduced gene pool (1)</p> <p>predators / habitat loss still present (1)</p> <p>captive breeding avoids having to collect the young iguanas from habitat (1)</p> <p>may not breed well in captivity (1)</p> <p>idea that more iguanas will be released (because young more likely to survive in captivity) (1)</p> <p>animals raised in captivity may not survive well when released (as don't have experience of living in the wild)</p> <p>or</p> <p>young/small animals released in to wild are less likely to survive (than larger ones released by headstarting) (1)</p> | 3 | <p>answer must refer to captive breeding</p> <p>ignore inbreeding / small number of adults</p> <p>ignore 'more young produced'</p> <p>'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</p> |
| | Total | 9 | |

| Question | | Answer | Marks | Guidance |
|----------|---------|---|----------|--|
| 6 | (a) | dry mass at each trophic level / AW (1) | 1 | <p>allow number x dry mass of typical individual</p> <p>ignore dry mass of (individual) organisms</p> <p>ignore dry mass of all organisms</p> <p>allow weight as alternative to mass</p> |
| | (b) (i) | respiration (1) | 1 | <p>ignore movement / egestion / excretion</p> <p>ignore conduction / convection / radiation</p> |
| | (ii) | 0.89(kJ) (1) | 1 | mark answer line first – if answer line blank then look for clear answer in any working |
| | (iii) | $\frac{0.25}{3.14} \times 100$ (1) but 7.96(%) (2) | 2 | <p>allow 8 or 8.0</p> <p>incorrect rounding, eg 7.9 = 1</p> |
| | (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 | <p>allow large amount of energy 'lost'</p> <p>ignore just 'energy is lost' (in previous question)</p> <p>ignore ALL energy lost</p> <p>ignore NO energy for another trophic level</p> <p>ignore sparrowhawks too fierce so nothing will attack / eat them</p> |
| | | 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) | <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. <p>ignore DNA changes are mutations</p> |

| Question | Answer | Marks | Guidance |
|----------|---|----------|---|
| (b) | <p>any two from: the harm has already been done / no further harm will be done (1)</p> <p>unethical to deliberately expose people to radiation to investigate / otherwise it may be necessary to test people/animals (1)</p> <p>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)</p> | 2 | <p>if no other marks awarded allow 1 for idea that this is the best way to get this information</p> <p>ignore simply 'provide information linking radiation and cancer' (in question)</p> |
| | Total | 8 | |

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

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2012

