OCR
Oxford Cambridge and RSA

GCSE

Biology A

Unit **A161/02**: Modules B1, B2, B3 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2016

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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.

1. **Annotations**

Used in the detailed Mark Scheme:

Annotation	**Meaning**
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
not/reject	answers which are not worthy of credit
ignore	statements which are irrelevant - applies to neutral answers
allow/accept	answers that can be accepted
(words)	words which are not essential to gain credit
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	credit alternative wording / or words to that effect
ORA	or reverse argument

Available in scoris to annotate scripts:

	indicate uncertainty or ambiguity
BOD	benefit of doubt
CON	contradiction
	incorrect response
ECF	error carried forward
	draw attention to particular part of candidate's response
NBOD	no benefit of doubt
R	reject
	correct response

L1 , L2 , L3	indicate level awarded for a question marked by level of response
^	information omitted

2. Subject-specific Marking Instructions

a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).

b. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

e.g. for a one-mark question where ticks in the third <u>and</u> fourth boxes are required for the mark:

This would be worth 1 mark.

This would be worth 0 marks.

This would be worth 1 mark.

c. The list principle:
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

d. Marking method for tick-box questions:

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
If there is at least one tick, ignore crosses and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

e.g. if a question requires candidates to identify cities in England:

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	**2**	**2**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**NR**

e. For answers marked by levels of response:

i. **Read through the whole answer from start to finish**

ii. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor

iii. **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

iv. 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.

Question			Answer	Marks	Guidance
1	(a)		proteins ; DNA ; genotype ; phenotype	2	four correct = 2 marks two or three correct = 1 mark one correct = 0 marks **accept** enzymes
	(b)		sex (chromosomes) / XX / XY/ X AND Y	1	**do not credit** 'sex cells/gametes'/genes **do not credit** 'X' alone or 'Y' alone
			Total	3	

Question			Answer	Marks	Guidance
2	(a)	(i)	0.87	1	**accept** 0.9 **credit** .87 **do not credit** 87% / ’87 out of 100’
		(ii)	idea that she would definitely develop breast cancer / it would be certain	1	**accept** it is 100% (certain/she will get cancer / she is going to get it) **ignore** any answer that suggests she already has it, including “she will have it” unless it is qualified
	(b)		**any 3 from:** her risk of developing breast cancer is high ; (but) she may not develop breast cancer / it is not certain ; reference to risk/pain/side-effects/scars/death/infection ; consider how much the surgery would reduce the risk of cancer ; cancer is life-threatening / a very serious disease ; may not eliminate the risk of breast cancer/she might still get breast cancer ; idea that benefits (of surgery) outweigh risk/pain (of surgery) /ORA	3	**do not credit** unqualified idea that it is major surgery, as this is given in the question **ignore** ’it may go wrong’ **ignore** ‘it may not be safe’ **ignore** ref. to cost **accept** example of consequence of surgery e.g. she might not be able to breastfeed/body image issues **ignore** false positive/negative/discrimination/insurance comments/pregnancy **accept** ‘it may not work’

Question			Answer	Marks	Guidance
2	(c)		**any 2 from:** idea that it is unlikely/rare/low chance/0.1% chance that the normal allele will become faulty ; idea that Jane inherited the faulty allele/it from her mother ; idea that Jane's mother inherited the faulty allele/it from Jane's grandmother ;	2	**do not credit** ref. to "1 in 1000" unqualified, as this is given in the question **accept** the idea that it was passed on **ignore** unqualified reference to being a carrier **ignore** "Jane inherited it from her grandmother" / "it skipped a generation" as this does not support the doctor's conclusion
			Total	7	

Question			Answer	Marks	Guidance
3	(a)		☐ ☐ ☐ One egg cell and one sperm cell. ✓	1	two or more ticks = 0 marks
	(b)		transfer nucleus from (adult) body cell into (unfertilised) egg cell (1) idea that egg cell is empty / had its own nucleus removed (1)	2	**accept** DNA/genome/chromosomes/genetic material, instead of nucleus **accept** examples of named body cells **do not credit** 'donor cell' unqualified **do not credit** references to stem cells

Question			Answer	Marks	Guidance
3	(c)		**[Level 3]** Answer suggests why they are useful including at least one Level 3 useful idea AND describes issues. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer suggests why they are useful AND describes issues. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer suggests why they are useful OR describes issues. 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 may include:** *Why they are **useful**:* • they have identical alleles / genotype / genetic information / DNA / chromosomes / genes / genetically identical **ignore** 'they are clones' (given in question) • differences in characteristics likely to be due to environment/lifestyle • examples of characteristics caused by genetics or the environment Level 3 **useful** ideas: • twins can be separated / exposed to different environmental factors • idea that effect of environment can be measured/tested/investigated/distinguished ***Issues**:* • ethical issues / keeping twins apart / consent / human rights • exposure to certain environmental factors could cause harm • twin/cloned animals could be used instead • identical twin humans will provide better data (than twin animals or non-identical humans) • findings could benefit many people / results could be useful **ignore** 'playing God' **ignore** 'it is not right/fair' unless explained **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	9	

Question			Answer	Marks	Guidance
4	(a)	(i)	0.75 x 8 (1) 6 (2)	2	 correct answer without working = 2 marks **credit** correct answer written in the table
		(ii)	**any 2 from:** only true for Mali / only true for one country / does not represent the full range of data / different in different countries ; 0.75 is not the mean / 0.75 is not the average / 0.75 is not (close to) the true value ; Mali is a small sample / 8 people is a small sample / ORA	2	**do not credit** "wrong / not true / not accurate / not correct" without explanation **accept** "it" for 0.75 **do not credit** unqualified ref. to not enough data (as this does not answer the question)
	(b)	(i)	A placebo... T: ☐ F: ✓ The safety... T: ✓ F: ☐ One of the... T: ✓ F: ☐ In an 'open-label'... T: ☐ F: ✓ In a 'blind'... T: ☐ F: ✓	3	**ignore** any row in which there is more than one tick all correct = 3 marks four correct = 2 marks three correct = 1 mark
4	(b)	(ii)	some side-effects may only appear years after taking the drug (1) the drug may become less effective over time (1)	2	**accept** specific examples if clearly linked to long-term/years later **ignore** ref. to resistance

Question			Answer	Marks	Guidance
4	(b)	(iii)	**[Level 3]** Answer suggests how it could help the woman AND describes why it might not work, including at least one Level 3 idea from either area. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer suggests how it could help the woman AND describes why it might not work. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer suggests how it could help the woman OR describes why it might not work. 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 may include:** *How it could help the woman:* • the man's blood/it may contain antibodies against Ebola virus • the man's blood may contain white blood cells against Ebola virus • the man's blood may contain memory cells • (antibodies/white blood cells from) the man's blood will help to destroy the Ebola virus **Level 3 idea:** • the memory cells (from the man's blood) can respond/produce antibodies more quickly (than the woman/patient) **do not credit** the idea that the man's blood (or virus it contains) acts as a vaccination, or contains drugs *Why it might not work:* • the blood might not contain enough antibody/memory cells • the woman/patient might already be too ill to recover • the man's blood may be rejected / different blood type • the virus has changed/mutated/new strain **Level 3 ideas:** • changed/mutated/different strain/antigens virus won't be recognised by the man's antibodies/memory cells **ignore** idea that the man's blood may cause an infection **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**15**	

Question			Answer	Marks	Guidance
5	(a)		microorganisms/bacteria/pathogens are reproducing/dividing/multiplying	1	**accept** idea that there is not yet enough antibody to fight the infection **do not credit** "it/they" unqualified (as this refers to the antigen) **accept** asexual reproduction
	(b)		4.5 (days)	1	
	(c)		symptoms only occur when antigen concentration is above 2.6 (au) / ORA	1	**accept** 2.5
	(d)		2.8	1	**accept** any concentration between 2.8 and 3.0
			Total	4	

Question			Answer	Marks	Guidance
6	(a)		pituitary gland	1	
	(b)		**any 4 from:** blood (plasma) is less concentrated / blood (plasma) is more dilute ; (this is detected by) receptors in the brain / (receptors in the) hypothalamus ; less/no ADH is secreted ; less water is reabsorbed from the urine by the kidney ; large(r) quantity of (more) dilute urine produced ;	4	**Assume the candidate's answer refers to returning water level to normal after drinking water** **UNLESS the candidate clearly states that there is not enough water in the blood / blood plasma is more concentrated / less dilute, then the following reverse arguments can be credited:** blood (plasma) is more concentrated / less dilute ; (this is detected by) receptors in the brain/hypothalamus ; (more) ADH is secreted ; (more) water is reabsorbed from the urine by the kidney ; small(er) quantity of (more) concentrated urine produced **a candidate may switch from one side to the other, but do not credit** the reverse argument for a marking point that has already been awarded
			Total	5	

Question			Answer	Marks	Guidance
7	(a)		**any 2 from:** they interpreted the data in different ways ; not enough data / not enough evidence ; explanations are not obvious from data / the scientists used creative thinking ; their (different) backgrounds/experience/interests/prior knowledge/opinions influenced their judgment	2	**Ignore** ”they developed different explanations” as this is in the stem of the question. **do not credit** ‘looked at different data’
	(b)		**Max 3 from:** idea that the size of the deer population depends upon (or is affected by) the size of the bison population / ORA (1) <u>competing/competition</u> for the same resources(e.g. food) (1) relevant example (2)	3	 **accept** idea that if the size of the deer/bison population increases the other will decrease / ORA **do not credit** “eat/have the same food” without reference to competition *e.g:* if Neanderthals eat more bison, they will eat fewer deer, so deer population increases *(2 marks)* *e.g.:* if deer population increases, there will be less grass for the bison, so bison population decreases *(2 marks)*

Question			Answer	Marks	Guidance
7	(c)		**[Level 3]** Answer includes causes AND explanations including a level 3 adaptation explanation. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer includes several causes and a level 2 explanation. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer includes only causes OR explanations. 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 may include:** **Causes** *environmental conditions:* • environmental conditions changed / natural disaster • example of environmental change (e.g. change in temperature) • example of consequences of environmental change (e.g. different vegetation, affecting diet) • idea that the change was long-term (i.e. not just seasonal/temporary) *introduction of:* • a new competitor of the Neanderthals/example • a new predator of the Neanderthals/example • a new pathogen/disease/example **accept** increase in number of competitors/predators/pathogens *disappearance of another species:* • another species disappeared/died out/declined • idea that the Neanderthals ate/depended upon this species **Explanations:** **Level 1/2** • the Neanderthals could not reproduce (successfully) • not enough food • conditions too cold / too hot for them **Level 3** • the Neanderthals were not well **adapted** to the new conditions • the Neanderthals (species) did not **adapt** quickly enough **ignore** 'suited' for adapted **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**

Question			Answer	Marks	Guidance
7	(d)		isolation ; variation ; mutation ; selection	3	four correct = 3 marks three correct = 2 marks two correct = 1 mark one correct = 0 marks
	(e)	(i)	D and F C and E	1	D and F **in either order**, linked to A C and E **in either order**, linked to B
		(ii)	their DNA/genetic material is very similar to their ancestor/species A (1) (so) there has been less time/fewer generations for mutations/changes/variation in the DNA (1)	2	**do not credit** genes **accept** less time to evolve
			Total	19	

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