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 2017

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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.

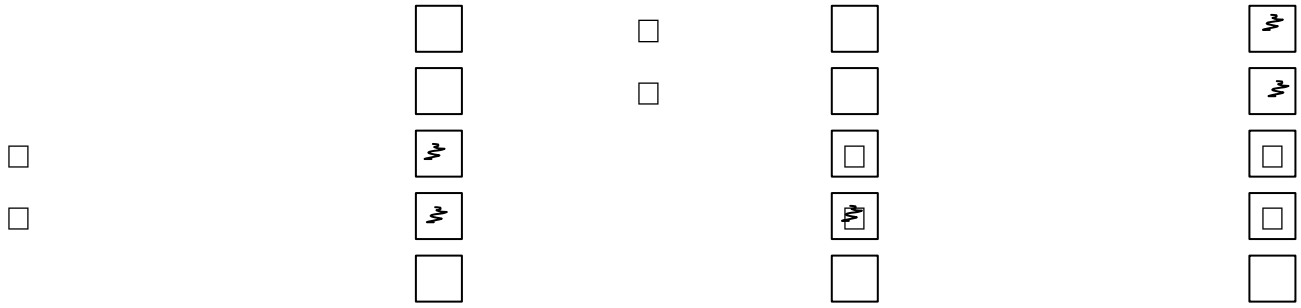
OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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 <u>should be blank</u> (or have indication of choice crossed out).

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

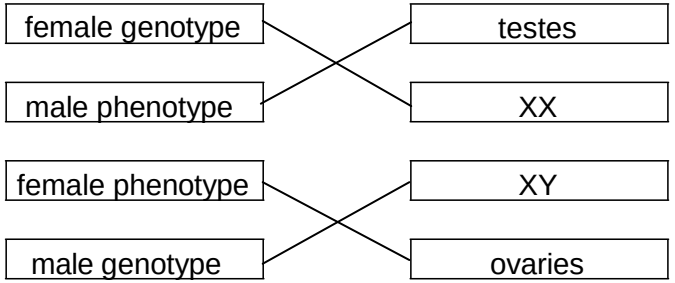
e. For answers marked by levels of response:
   i. **Read through the whole answer from start to finish**
   ii. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor
   iii. **To determine the mark within the level**, consider the following:

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 RM Assessor 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)			2	three or four correct lines = 2 marks one or two correct lines = 1 mark
	(b)		*any two from:* sex-determining/SRY gene **on** the Y chromosome ; this gene/hormone/androgen/protein causes **testes** to develop; idea that when there is no Y chromosome present, there is no sex-determining gene ; idea that when there is no sex-determining gene, **ovaries** develop	2	Ignore ref to XX and XY Do not credit Y gene 'It' refers to SRY/sex -determining gene Do not credit 'no Y chromosome, ovaries develop' unless qualified
			Total	4	

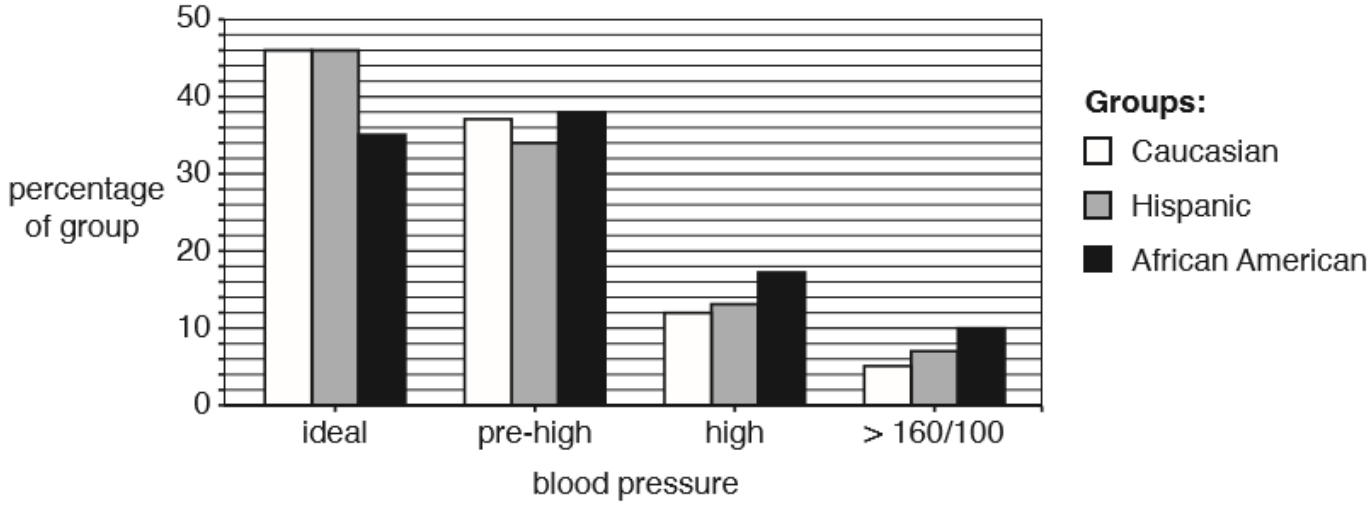
Question			Answer	Marks	Guidance
2	**(a)** O/L		**[Level 3]** Full descriptions of alleles present **AND** lack of symptoms for both people. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Correct points made for both people. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Correct points made for only one person. 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:** *Byron:* • cystic fibrosis (CF) is caused by a recessive allele • symptoms/disease/it will only appear if you **only** have two copies / are homozygous • Byron **only** has one copy / is a carrier / is heterozygous *Tania:* • Huntington's disease is caused by a dominant allele • symptoms/disease/it will appear if you **only** have one copy / are heterozygous • the symptoms are usually late onset • symptoms (e.g. clumsiness, memory loss, inability to concentrate, mood changes, tremors) could be mistaken for tiredness/other illnesses (before they become severe) **do not credit** Tania is a carrier **do not credit** has one faulty allele for Tania or Bryon **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
	(b) O/L		(idea that telling) an employer could decrease the likelihood of getting/keeping a job/promotion (1) (idea that telling) an insurance company could increase the cost/refuse (life/health/travel/car) insurance (premium) (1)	**2**	**accept** 'difficulties getting mortgage/credit', as alternative for mark point 2 **do not accept** increase cost of medical care
			Total	**8**	

Question			Answer	Marks	Guidance
3	(a)		<table><tr><th>person</th><th>combination of chromosomes and alleles</th></tr><tr><td>male with haemophilia</td><td>X^hY</td></tr><tr><td>male without haemophilia</td><td>X^HY</td></tr><tr><td>female with haemophilia</td><td>X^hX^h</td></tr><tr><td>female without haemophilia</td><td>X^HX^H</td></tr><tr><td>female carrier</td><td>X^HX^h</td></tr></table> (1) (1) (1)	3	Accept X^hX^H
	(b)	(i)	2	1	
		(ii)	25	1	
		(iii)	50	1	
	(c)		males have only one X chromosome, so the recessive/h allele will always cause haemophilia (1) females need two copies of the recessive/h allele to have haemophilia (1)	2	Accept 'allele not found on the Y chromosome, therefore recessive/h allele on X causes haemophilia' Do not credit 'males have 1 X chromosome and females have 2 X chromosomes' unless linked to h allele
			Total	8	

Question			Answer	Marks	Guidance
4	(a)	(i)	*no/incorrect because:* idea that high blood pressure increases the risk/chance of heart disease **but does not make it certain** (1) idea that other factors may change his risk/chance of heart disease (1)	2	no marks for indicating that he is incorrect; credit is awarded for the explanation **credit** examples for marking point two, e.g. genetic factors, lifestyle (diet, exercise, stress, smoking, misusing drugs) **accept** other factors cause heart disease
		(ii)	any number/range between 120 and 140 inclusive before the slash **AND** any number/range between 80 and 90 inclusive after the slash (1)	1	**BOTH** correct for 1 mark
	(b)	(i)	17	1	**do not credit** working without correct answer
		(ii)	*working:* 13 + 7 = 20 %. 20/100 x 2000 *answer:* 400 (2)	2	correct working without answer = 1 mark

Question			Answer	Marks	Guidance
4	(b)	(iii)	Caucasian (1) O/L *plus one from:* has a high percentage/46% in the ideal category and a low percentage/5% in the >160/100 category : has a high percentage/83% in the first two categories ("ideal" and "pre-high") ; has the low**est** percentage/ only 12% in high category has the low**est** percentage/only 5% in the > 160/100 category	**2**	accept reverse argument (only 17% in the last 2 categories)

Copy of graph for reference:



Question			Answer	Marks	Guidance
4	(b)	(iv)	sample size / number of people (1) (because) a large sample means the results are less likely to be affected by chance (1) **OR** people in each group **matched** on as many characteristics (other than ethnicity) as possible (1) (because) this reduces the effects of other factors / makes the effect of ethnicity clearer (1) **OR** people (of the correct ethnicity) chosen at random to fill each group (1) (because) this makes the effects of other factors equally likely in all groups / the sample is more likely to be representative of the population (1)	**2**	**do not credit** 'large sample is better' unless explained **accept** examples of factors, e.g. weight/body mass/BMI, fitness, age, smoker/non-smoker only if made clear that they are matched in the groups.
			Total	**10**	

Question			Answer	Marks	Guidance
5	(a)		homeostasis ☐ (1)	1	two or more ticks = 0 marks
	(b)		from food we eat from respiration (1)	1	**BOTH** required for 1 mark either order
	(c)		idea that (detection of) change(s) causes feedback/actions/responses (1) to reverse/counteract/cancel out change(s) / to return to normal / to return to the steady state (1)	2	Idea that an increase causes changes to bring about a decrease or reverse argument **allow** correct examples of change and correct response for mp1, and reversal for mp2, e.g. “when you get hot, you will sweat (1) to cool back down to normal levels” (1) ignore ref to homeostasis unqualified

5	**(d)**		**[Level 3]** Explains the link between alcohol, ADH and reabsorption of water in the kidneys, and explains that urine concentration would return to normal **because** increased blood plasma concentration would cause production of ADH to restart. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Explains the idea that alcohol suppresses production of ADH, and links this to reduction in reabsorption of water from urine by the kidneys. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Links observed changes in urine concentration to alcohol causing the production of greater volume of more dilute urine. 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 may include:** • idea that producing more dilute urine causes blood plasma to become more concentrated / less dilute • increase in blood plasma concentration detected by receptors in the brain • this causes production/secretion of ADH (by pituitary gland) to restart • ADH causes kidneys to reabsorb more water from the urine, so urine would become more concentrated / would return to normal concentration **ignore** references to thirst, dehydration, alcohol being broken down/excreted ref. to negative feedback must be explained for level 3 (look for the mechanisms) **Indicative scientific points at Level 2 may include:** • idea that receptors in the brain/ hypothalamus detect alcohol (in the blood) • alcohol supresses/reduces/prevents the production/secretion of ADH • by the pituitary gland • lack of ADH means kidneys reabsorb less water from the urine / kidneys are not stimulated to reabsorb water **Indicative scientific points at Level 1 may include:** • wine contains alcohol • (alcohol) causes the production of a greater volume of urine • which is more dilute / less concentrated / contains more water Answers that merely *describe* the graph without explaining the underlying causes are not worthy of credit (e.g. “The concentration of urine produced decreases.”) **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
			Total	**10**	

Question			Answer	Marks	Guidance
6	**(a)**		idea that energy decreases along/through/further up (the food chain) (1) because energy passes out/is lost from the food chain via waste heat/respiration/movement / uneaten parts / excreted/waste products / death/decomposition (1)	**2**	**do not accept** down the food chain **do not accept** energy decreases unqualified
	(b) O/L		*answer:* 0.2 (to 1 sig fig) (2)	**2**	*correct working without answer:* 16 / 10 000 x 100 (1 max) correct answer given to 2 sig figs (0.16) = (1 max)
	(c) O/L		*any two from:* efficiency of energy transfer to the predators would be too low ; not a lot of owls at the top of the food chain to eat ; the predators would use more energy hunting owls than they would get from eating them	**2**	**ignore** suggestions not related to energy (e.g. owls fly too high for predators to catch; owls kill predators with their sharp claws, etc.) **accept** little energy left in the **food chain/system** **do not accept** references to the amount of energy in an individual owl, needs to refer to energy in population or stage
			Total	**6**	

Question			Answer	Marks	Guidance
7	(a)		decomposed ☐ (1) respire ☐ (1)	2	subtract 1 mark for each additional incorrect response
	(b)		*one from:* the air/atmosphere ; respiration; decomposition	1	**accept** combustion/ burning (fossil fuels) **do not accept** respiration in phytoplankton **do not accept** decomposition of phytoplankton
	(c)		decrease in pH indicates **more carbon dioxide/CO_2** is (dissolving) in the ocean(1) this could suggest an **increase in carbon dioxide/CO_2** in the air/atmosphere (1) carbon dioxide/CO_2 causes global warming (1)	3	**accept** reverse argument throughout **accept** carbon dioxide is a greenhouse gas
			Total	6	

Question			Answer	Marks	Guidance
8	(a)		**[Level 3]** Explains why the mutated gene became more common in the population over subsequent generations **AND** considers increasing population is due to an alternative way of attracting a mate. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Explains why the mutated gene became more common in the population over subsequent generations. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Focuses on the characteristic rather than the mutation. 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 may include:** • the crickets must have another way of attracting mates (other than by 'singing') • the mutation is not a reproductive disadvantage/ has not stopped them reproducing **Indicative scientific points at Level 2 may include:** • the mutated gene/allele/variant has been inherited/passed on from parent to offspring • the mutation must have originally occurred in the (DNA/genes) of sex cells • crickets with the mutated gene/allele/variant are more likely to survive, leading to natural selection • so the mutated gene/allele/variant became more common in each new generation **Indicative scientific points at Level 1 may include:** • not 'singing' helps crickets to avoid predators • crickets that do not 'sing'/have different wing shape are more likely to survive and reproduce • so the characteristic is passed on and becomes more common in each new generation • this is natural selection • increasing population size linked to avoiding predators **ignore** references to this being an example of evolution /survival of the fittest **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**

Question			Answer	Marks	Guidance
8	(b)		*no/disagree because...* *any two from:* the crickets did not choose/plan to change their behaviour/wing shape (so that they could avoid predators) ; mutation/evolution/natural selection does not occur in order to fulfil a need ; the mutation was a random/unplanned event (that resulted in an advantageous characteristic)	**2**	no marks for indicating disagreement with the article; credit is awarded for the explanation **credit** AW/owtte throughout
			Total	**6**	

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