OCR
Oxford Cambridge and RSA

GCSE (9-1)

Combined Science A (Gateway)

Unit **J250/02**: Biology

General Certificate of Secondary Education

Mark Scheme for June 2018

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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.

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Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	Ignore

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

The breakdown of Assessment Objectives:

	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.**
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	**Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.**
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

For answers to section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

Question	Answer	Marks	AO element	Guidance
1	**D** ✓	1	1.1	
2	**B** ✓	1	1.1	
3	**B** ✓	1	1.1	
4	**C** ✓	1	2.1	
5	**B** ✓	1	2.1	
6	**C** ✓	1	2.1	
7	**B** ✓	1	1.1	
8	**C** ✓	1	2.1	
9	**B** ✓	1	2.1	
10	**B** ✓	1	1.1	

BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	precipitation ✓	1	1.1	
		(ii)	evaporation ✓	1	1.1	
		(iii)	transpiration ✓	1	1.1	
	(b)	(i)	4 ✓	1	1.1	**ALLOW** all four correct predators named (waterfowl, trout, gull, eagle)
		(ii)	respiration ✓ exothermic ✓	2	2 x 1.1	
	(c)	(i)	**predation** idea that dogfish feeds on minnows (prey) ✓ **mutualism** when breeding / when they have eggs / when dogfish protect the nest / when minnows supply oxygen or remove bacteria / when minnows move in or out of the nest ✓	2	1.1 2.1	**ALLOW** predator **ALLOW** one mark for identifying predation and mutualism with no descriptions
		(ii)	dogfish protects the eggs/nest ✓ dogfish prevents minnow or dogfish eggs from being eaten ✓ **or** minnows move in and out of the nest ✓ minnows remove (harmful) bacteria / minnows get oxygen to the eggs/nest ✓	2	2 x 3.1a	**ALLOW** dogfish looks after the eggs dogfish protects the eggs/nest from predators = 2 marks Mark pair of answers that scores highest mark

Question			Answer	Marks	AO element	Guidance
12	(a)		160 (kg) ✓ any higher mass has no more effect / is wasteful ✓	2	2 x 3.2b	needs correct numerical answer for second marking point **IGNORE** units eg kg and g **ALLOW** most economical
	(b)		can cause **water** pollution / can run-off into rivers or lakes ✓	1	1.1	**ALLOW** higher level responses referring to eutrophication
13	(a)		pituitary(gland) ✓ ovum / egg ✓ oestrogen ✓	3	3 x 1.1	 **ALLOW** follicle
	(b)		**A** ✓ so it is inserted into DNA ✓	2	2 x 1.1	needs correct letter for second marking point **ALLOW** that is where the DNA/cells genetic material is **ALLOW** so it can now make (desired) FSH

Question	Answer	Marks	AO element	Guidance
(c)*	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Identifies how rice is changed when genetically modified. **AND** Interprets information to explain at least one argument for **and** one argument against golden rice. **AND** Makes a judgement as to why the golden rice should or shouldn't be produced. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Identifies how rice is changed when genetically modified. **AND** Interprets information to explain at least one argument for **and** one argument against golden rice. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Identifies how rice is changed when genetically modified. **OR** Interprets information to explain at least one argument for **or** against golden rice. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit.*	**6**	**2 x 1.1** **2 x 2.1** **2 x 3.1b**	**AO1.1: Demonstrate scientific knowledge and understanding of genetically modified organisms.** • rice genome is altered / gene for beta carotene has been added • golden rice produces/contains beta carotene **AO2.1 Apply knowledge and understanding to explain arguments for and against genetically modified golden rice.** **For** • beta carotene can be used to make vitamin A • beta carotene/vitamin A helps improve vision of humans **Against** • effects of levels of beta carotene in golden rice are unknown / could be harmful to health / could lead to too much vitamin A in the body • wild rice genome altered and may have harmful effects on food webs in the environment • making people rely on rice might cause other deficiency diseases/malnourishment **AO3.1a Analyse information and ideas to evaluate whether genetically modified golden rice should be produced.** • a decision made based on whether golden rice should be used by referring to the benefits versus risks

Question			Answer	Marks	AO element	Guidance
14	(a)		50% / ½ / 1 in 2 / 0.5 ✓ correct genetic diagram ✓	2	1.2 2.2	<table><tr><td></td><td>**R**</td><td>**r**</td></tr><tr><td>**(r)**</td><td>**Rr**</td><td>**rr**</td></tr><tr><td>**(r)**</td><td>**Rr**</td><td>**rr**</td></tr></table>
	(b)	(i)	**First check answer on the answer line** **If answer = 902 857 then award 2 marks** $\frac{63\,200\,000}{70}$ ✓ 902 857 ✓	2	2 x 2.2	**ALLOW** 0.9 million / 900 000 / 903 000 / 902 860 ✓✓ **ALLOW** 902 857.14 **for 1 mark only**
		(ii)	**population** number is just an estimate / not everyone who is a **carrier** has been counted/identified/diagnosed/found ✓	1	1.2	**IGNORE** not all cases have been identified **ALLOW** do not know the genetic constitution of the whole population
	(c)		urea **diffuses** out of blood into dialysis fluid ✓ sugar molecules are too big to pass through (partially permeable) membrane/pores ✓	2	1.1 2.1	**ALLOW** urea moves from high to low concentration **IGNORE** too big to diffuse
	(d)		**Any three from** reasoned argument **for** avoids the need for dialysis ✓ avoids need for a kidney transplant ✓ avoids need to wait for a donor✓ avoids the risk of rejection (as they are their own stem cells) ✓	3	3 x 3.1b	**MUST have at least one argument for and one against for maximum marks**

Question			Answer	Marks	AO element	Guidance
			reasoned argument **against** stem cells could introduce viral infections ✓ may change into unwanted cells / tumours ✓ may involve the destruction of embryos ✓			**IGNORE** ethical arguments unless qualified
15	**(a)**		5:3 ✓	**1**	**2.2**	**IGNORE** 10:6
	(b)		Student **C** ✓ (18 tosses) idea that it has closest ratio to 1:1 ✓	**2**	**2x 2.1**	If incorrect student is identified, then question scores 0 **ALLOW** 5:4 or 10:8 is closest to 1:1
	(c)		increase the number of coin tosses (to remove the effect of chance) ✓	**1**	**3.3a**	**ALLOW** do it many times / repeat it **IGNORE** use more people
16	**(a)**		pooter / diagram of a pooter ✓ **Any two from** description of how to use the pooter e.g. suck the insect into a tube/jar/bottle/container ✓	**3**	**1 x 1.2** **2 x 2.2**	**IGNORE** pitfall traps / beating sheet / brush / net / use of hand lens  **ALLOW** instruction on diagram as a description of use, so correct diagram labelled with

Question			Answer	Marks	AO element	Guidance
			details of how marked ✓ collect at different heights or different areas (of the tree) ✓			instruction ✓✓ e.g. (small) paint mark / pen mark / marker (pen) / nail polish / dye / ink / colour **IGNORE** sticker / tags **ALLOW** collect at the same time each day
	(b)		idea that mark should not be able to be removed (for the time of the experiment) ✓ idea that mark must not make it more visible to predators ✓ idea that mark should not be toxic or poisonous (to the mealybug) ✓	**3**	**3 x 2.2**	**ALLOW** mark will not rub off / is permanent / waterproof **ALLOW** mark not visible to predators / doesn't make it more likely they get eaten by predators **DO NOT ALLOW** so it is visible **BUT ALLOW** only visible under UV light **IGNORE** make sure it is marked in the same place **ALLOW** does not cause harm (to the mealybug / predator) **IGNORE** does not affect (the mealybug) **IGNORE** not too much paint or ink / different colours **ALLOW** answers in terms of questions e.g. how long the mark will stay on? will it make it visible to predators? will it harm the mealybug?

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	500 ✓	1	2.2	
		(ii)	**Any two from** no deaths ✓ no reproduction / no births ✓ idea of no emigration ✓ sampling methods used are identical ✓ marking has not affected the survival rate of the animals ✓ marks have not rubbed off✓	2	2 x 2.2	**IGNORE** immigration / repopulation / migrate **ALLOW** no predation / none were eaten / all survive / predator numbers don't change **IGNORE** just population decreases **ALLOW** no breeding **IGNORE** just population increases **ALLOW** doesn't wander out of area / mealybugs stay on the tree **IGNORE** mealybugs are hiding **ALLOW** predators can't spot them easier **IGNORE** different weather conditions / other factors
	(d)	(i)	(yes) (tree B) high(er) light intensity small**er** population / (tree A) low(er) light intensity bigg**er** population ✓	1	3.2a	**IF ANSWER IS NO THEN ZERO MARKS unless (c)(i) is 250 or less** **ALLOW (**tree B) **more** light smaller population/ (tree A) **less** light bigger population **ALLOW** (tree B) more light and 250 mealybugs and (tree A) less light and 500 mealybugs **ALLOW** ecf if wrong answer in (c)(i)

Question			Answer	Marks	AO element	Guidance
		(ii)	light meter might be shielded from light / clouds may alter intensity ✓	2	2.2	**ALLOW** some areas in more shade (than others) / readings only taken on one side of tree **ALLOW** person taking reading could block the light **IGNORE** light intensity is different on different days / light intensity varies during the day **IGNORE** human error / leaves covering light meter /position of the Sun
			Any one from sample light in random or different areas of the tree ✓ sample light at different times of the day ✓		3.3b	**ALLOW** different angles / different heights / different sides of tree **ALLOW** stand back when taking readings✓ **BUT** stand back when taking readings to prevent shadowing ✓✓ **IGNORE** just 'take more readings' / 'more precise readings **BUT ALLOW** take readings over several days

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