

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
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	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)	<u>precipitation</u> ✓	1	1.1	
		(ii)	<u>evaporation</u> ✓	1	1.1	
		(iii)	<u>transpiration</u> ✓	1	1.1	
	(b)	(i)	4 ✓	1	1.1	ALLOW all four correct predators named (waterfowl, trout, gull, eagle)
		(ii)	<u>respiration</u> ✓ <u>exothermic</u> ✓	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. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> 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. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i> 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. <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i> 0 marks <i>No response or no response worthy of credit.</i>	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>		R	r	(r)	Rr	rr	(r)	Rr	rr
	R	r													
(r)	Rr	rr													
(r)	Rr	rr													
	(b)	(i)	First check answer on the answer line If answer = 902 857 then award 2 marks <u>63 200 000</u> ✓ 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 ✓			
15	(a)		5:3 ✓	1	2.2	IGNORE ethical arguments unless qualified 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 smaller population / (tree A) low(er) light intensity bigger 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 ✓ Any one from sample light in random or different areas of the tree ✓ sample light at different times of the day ✓	2	2.2 3.3b	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 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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