OCR
Oxford Cambridge and RSA

GCSE (9-1)

Biology A (Gateway)

Unit **J247/04**: Higher Tier – Paper 4

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.

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

Subject-specific Marking Instructions

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9-1) in Biology

	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			A ✓	**1**	1.1	
2			D ✓	**1**	1.1	
3			A ✓	**1**	2.1	
4			C ✓	**1**	1.1	
5			B ✓	**1**	1.1	
6			C ✓	**1**	2.2	
7			C ✓	**1**	1.2	
8			C ✓	**1**	1.2	
9			A ✓	**1**	1.1	
10			D ✓	**1**	1.1	
11			D ✓	**1**	1.1	
12			C ✓	**1**	1.2	
13			B ✓	**1**	1.1	
14			D ✓	**1**	1.2	
15			B ✓	**1**	1.2	

Question			Answer	Marks	AO element	Guidance
16	(a)		four / 4 ✓	1	1.2	
	(b)		badger number have increased ✓ more competition for food / less slugs to eat ✓	2	3.1b 3.2b	**IGNORE** reference to hedgehog numbers dropping **ALLOW** badgers eat more slugs so less for hedgehogs **ALLOW** less food to eat **IGNORE** badgers are predators of hedgehogs **IGNORE** they both eat slugs
	(c)	(i)	in country/advantage/where badgers live, if it rolls up in a ball then will provide more protection / less attacks from badgers/predators ✓ in cities/disadvantage/many roads, it will be run over by cars ✓	2	2 x 2.1	**ALLOW** in country/advantage/where badgers live hedgehogs have defence against predators/badgers **ALLOW** hedgehogs have a reduced risk of being eaten
		(ii)	hedgehogs that run away are more likely to survive / less likely to get run over ✓ they will reproduce ✓ pass on the allele/gene for running away ✓ over time/many generations (running away will become more common) ✓	4	4 x 2.1	**ALLOW** ORA for each marking point **ALLOW** reference to how change occurred e.g. mutation for running away **ALLOW** offspring produced / breed together **ALLOW** pass on advantageous gene **IGNORE** trait is pass on / genes are passed on

Question			Answer	Marks	AO element	Guidance
17	(a)		correctly chosen axes, labelled with units ✓	5	5 x 2.2	**place ticks on right hand side of grid**
			suitable scale on both axes ✓			minimum 50% of grid used scale must be in ascending order
			all points correctly plotted ✓✓			**ALLOW** +/- half a square 0 to 5 correct points plotted = 0 mark 6 or 7 correct points plotted = 1 mark All 8 correct points plotted = 2 marks
			line of best fit through most points ✓			**DO NOT ALLOW** dot to dot line **ALLOW** line of best fit for their plotting **IGNORE** any extrapolation of line
	(b)			4		**ORA** for all marking points
			idea of **less** plants/percentage of plants/% cover in shade/closer to the tree ✓		1.2	**ALLOW** shows negative correlation
			less light (in shade/closer to the tree)✓		2.1	**IGNORE** less sun **IGNORE** in shade **no** photosynthesis / **no** light
			less photosynthesis (in shade/closer to the tree)✓		3.1b	**ALLOW less** light for photosynthesis (closer to the tree) 2 marks **ALLOW** photosynthesis **less** effective (closer to the tree)
			less food/raw materials produced **for growth** (in shade/closer to the tree)✓		3.2b	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>18</td><td>(a)</td><td></td><td>Gene:
a length of DNA that codes for a protein ✓

Allele:
an alternative form/version of a gene ✓</td><td>2</td><td>2 x 1.1</td><td>IGNORE section of DNA that codes for a specific characteristic

ALLOW a particular copy of a gene</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td><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>correct gametes ✓

correct genotypes of offspring ✓

probability = 0.25 / ¼ / 25% / 1 in 4 / 1:3 ✓</td><td>3</td><td>2.2

2.2

3.2b</td><td>ALLOW other forms of diagrams other than Punnett square</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>rod cells are do not work / damaged ✓

rod cells can work in dim light ✓

but cannot detect colour ✓</td><td>3</td><td>2.1

2.1

1.1</td><td>ALLOW only rods cells broken down / cones are not broken down
IGNORE rod cells broken down (as in stem of question)

ALLOW converse for cones

ALLOW converse for cones
ALLOW rods only see in black and white</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	stem cells are not differentiated/can still specialise ✓ they could become rod cells ✓	1 1	1.2 2.1	**ALLOW** stem cells are unspecialised / can grow into any type of cell / have ability to differentiate
		(ii)	idea it would not be detected as foreign cells (by the immune system/WBC) ✓ **OR** idea it would not be rejected (by the body) ✓	1	2.2	**ALLOW** accepted (by the body) / (body) more likely to accept

Question			Answer	Marks	AO element	Guidance
19	(a)		sperm/male gametes contain either an X or Y chromosome **and** eggs/female gametes contain an X chromosome ✓ indication that XX is female **and** XY is male ✓	2	2 x 1.1	**ALLOW** correct Punnett square but unlabelled for gamete mark **ALLOW** correct Punnett square that indicates XY is male **and** XX is female for 2 marks
	(b)		**First check answer on answer line** **If answer = 357512 award 2 marks** $\frac{105}{205}$ x 698000 ✓ = 357512 ✓	2	2 x 2.2	**ALLOW** answer given to several dps
	(c)		males do not live as long/**ORA** ✓	1	3.1b	**ALLOW** they (females) live longer

Question			Answer	Marks	AO element	Guidance
20	(a)		< 3(mm) ✓ encourages more microbes from day 0 to 25✓ therefore, more rapid decay/decomposition ✓ **OR** 3 – 5(mm) ✓ encourages more microbes from day 26 to 50/overall ✓ therefore, more rapid decay/decomposition ✓	**3**	**3.1a** **3.2b** **3.2b**	**ALLOW** > 5 given only 1 mark available for more rapid decay
	(b)		**Any two from:** (small pieces means) there will be a larger surface area of dead plants ✓ therefore, decomposers will be able to reproduce faster / feed faster ✓ therefore, decomposers will be able to respire faster ✓	**2**	**2 x 2.2**	
	(c)		idea of recycling in nature ✓ named example of a recycled substance e.g. carbon/nitrogen ✓ example of reason why the recycling is important e.g. for photosynthesis / production of proteins in plants ✓	**3**	**3 x 1.1**	**ALLOW** mineral being returned to the soil / environment **IGNORE** nutrients/minerals **IGNORE** water **ALLOW** carbon dioxide/nitrates/nitrogen compounds recycled

Question			Answer	Marks	AO element	Guidance
21	(a)		number of seeds that germinated ✓	1	3.1a	**IGNORE** the number of seeds
	(b)		to keep the total volume constant / to dilute the acid by different amounts ✓	1	3.1a	**ALLOW** so volume adds up to 20cm^3 **ALLOW** change/investigate the concentration of acid **ALLOW** make it more/less acidic / vary acidity
	(c)		idea that germination is affected by temperature✓	1	3.1a	**ALLOW** higher level answers such as references to rate of diffusion or enzyme action correctly linked to temperature change **IGNORE** to make it a fair test
	(d)		**Any two from:** acid rain will reduce the number of seeds that germinate ✓ reference to addition of small volumes of acid having little effect / rapid drop in germination between third and fourth flask ✓ germination at the highest volume of acid is still possible / acid concentration would have to be higher to stop germination ✓	2	2 x 3.1b	**ALLOW** ORA **ALLOW** indication of correct flasks from table data
	(e)	(i)	**First check answer on answer line** **If answer = 100 award 2 marks** correct calculation of 10% ✓ VI = 100 ✓	2	2 x 2.2	
		(ii)	takes into account how well the seeds are growing ✓ also better to use percentage germination than number germinated ✓	2	3.3b	**ALLOW** shows seeds growing roots/shoots / shows seeds growing above/below soil

Question			Answer	Marks	AO element	Guidance
22	(a)		**Any two from:** a protein molecule ✓ made by the immune system ✓ destroys/kills pathogens / clumps them together / attaches to antigens ✓	**2**	**2 x 1.1**	 **ALLOW** made by WBC / found in WBC **IGNORE** germs and disease **IGNORE** attack or fight pathogens
	(b)		**Any four from:** (inject) methamphetamine/drug into mice ✓ lymphocytes made/collected ✓ fuse with tumour cells ✓ hybridoma cells made ✓ hybridoma make antibodies against methamphetamine/drug ✓	**4**	**4 x 1.2**	 **ALLOW** WBC made/collected **ALLOW** fuse with cancer/myeloma cells
	(c)		**Any two from:** antibodies are specific ✓ only (binds) to **one** drug/antigen (shape) ✓	**2**	 **1.1** **1.1**	 **ALLOW** they would not fit together with other drugs

Question			Answer	Marks	AO element	Guidance
23	(a)	(i)	**First check answer on answer line** **If answer = 0.9 %award 2 marks** 200 x 100 ✓ 22000 = 0.9 ✓	2	2 x 2.2	**ALLOW** 0.91 / 0.909
		(ii)	**Any two from:** egestion ✓ excretion ✓ respiration ✓ decomposition ✓ uneaten parts ✓	2	2 x 1.1	**ALLOW** faeces **ALLOW** undigested food **ALLOW** named excretory product / urine **ALLOW** heat **IGNORE** movement

Question			Answer	Marks	AO element	Guidance
	(b)		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)** Detailed explanation including conclusions about how the mechanism affects photosynthesis and links this to less biomass available to humans in the food chain. *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)** Explanation of how the mechanism affects photosynthesis or affects the biomass available to humans. *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)** Demonstrates some knowledge of how the mechanism affects photosynthesis or affects the biomass available to humans. *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**	**3 x 1.1** **2 x 2.1** **1 x 3.2b**	**AO1.1 Demonstrate knowledge of photosynthesis and biomass.** • Photosynthesis requires light energy • Mechanism reduces photosynthesis • Trapped by the leaves and used to produce food molecules • Photosynthesis required for plant growth • Plant biomass is a food source for animals including humans **AO2.1 Apply knowledge and understanding of photosynthesis to the production of biomass** • More light energy converted to heat, then less energy for photosynthesis • Less photosynthesis then plants can make less food / plants can grow less • Less plant biomass leads to less available food **AO3.2b Draw conclusions linking photosynthesis to biomass in food chains** • In low light intensities, light availability is the limiting factor • Less plant growth/crops therefore less food for cattle/less food for humans / in the food chain

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	mRNA carries the code for proteins ✓ more protein will be made ✓	2	2 x 2.1	**ALLOW** protein will be made faster
		(ii)	**First check answer on answer line** **If answer = 40 award 2 marks** $\frac{20 \times 200}{100}$ ✓ = 40 ✓	2	2 x 2.2	
		(iii)	new method uses the plants **own** genes ✓ concern that plants with the insecticide/gene might be harmful to humans / might impact on food chains / might kill useful insects ✓	2	2.2 3.2a	**ALLOW** might have side-effects **IGNORE** ideas about cultural or religious or ethical objections or that it is playing God

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