



GCSE (9-1)

Biology A (Gateway)

Unit **J247F/02**: Foundation Tier – Paper 2

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

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

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 A:

	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.

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Question			Answer	Marks	AO element	Guidance
1			C ✓	1	AO1.1	
2			A ✓	1	AO1.2	
3			A ✓	1	AO1.1	
4			B ✓	1	AO1.1	
5			D ✓	1	AO1.1	
6			A ✓	1	AO1.1	
7			A ✓	1	AO2.2	
8			A ✓	1	AO1.2	
9			A ✓	1	AO1.1	
10			C ✓	1	AO1.2	
11			C ✓	1	AO1.1	
12			D ✓	1	AO1.1	
13			C ✓	1	AO1.1	
14			C ✓	1	AO1.1	
15			A ✓	1	AO1.1	

Question		Answer		Marks	AO element	Guidance
16	(a)	Continuous	Discontinuous	2	1.1	All four correct = 2 marks Three correct = 1 mark Two or less correct = 0 marks
		height	sex blood group eye colour			
	(b)	sperm cell 23 ✓ zygote 46 ✓ body cell 46 ✓		3	1.1	

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Question		Answer	Marks	AO element	Guidance
17	(a)	type of seeds / temperature ✓	1	3.3b	ALLOW light / volume/amount of solution / size of cotton wool / type of cotton wool / time soaked in solution IGNORE reference to time/ days DO NOT ALLOW pH
	(b)	(acid rain) will lower the number of seeds growing ✓ only affects seeds if the pH is less than 6.0 ✓	2	2 x 3.2b	IGNORE references to pH for this marking point IGNORE references to alkalinity IGNORE decrease pH decreases number of seeds growing
	(c) (i)	If answer = 10 award 2 marks $\frac{5 \times 16}{8} \checkmark$ = 10 ✓	2	2 x 2.2	
	(ii)	idea that it takes into account the mean root length / growth rate ✓	1	3.2b	IGNORE grows well IGNORE more accurate result

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Question		Answer	Marks	AO element	Guidance
18	(a)	male sex chromosomes are XY ✓ female sex chromosomes are XX ✓	2	2 x 1.1	
	(b) i	51.2 (%) ✓	1	2.2	ALLOW 51 / 51.22 or correct rounding
	ii	210 (%) ✓	1	2.2	ALLOW 209
	iii	in the whole population , there are more females / less males ✓ however more males are born (than females) ORA ✓	2	2 x 3.1a	IGNORE less males alive IGNORE there are less males over the whole population than at birth If no other mark scored, credit ratio of males has decreased from birth

Question		Answer	Marks	AO element	Guidance
19	(a)	<p>type of plant material ✓ will affect the rate of microbes decomposing ✓ OR Size/SA of plant material ✓ will affect the rate of microbes decomposing ✓ OR mass of plant material ✓ will affect the rate of microbes decomposing ✓ OR oxygen ✓ will affect the (aerobic) respiration of microbes ✓</p>	2	3.1a	<p>Second marking point is dependent on a correct factor being stated ALLOW decay/breakdown/rot throughout ALLOW decomposers/saprophytes/bacteria/fungi throughout</p> <p>ALLOW amount of plant material</p> <p>IGNORE amount of compost / composter size</p>
	(b) (i)	<p>any two from:</p> <p>A reaches the highest temperature ✓ A has a higher temperature for longer/at the start ✓ temperature increases quicker in A ✓ temperature falls quicker in A ✓ towards the end the temperature in A is lower ✓</p>	2	2 x 2.2	<p>ALLOW ORA</p> <p>IGNORE A has a higher temperature</p> <p>IGNORE references to decay IGNORE comparisons to section B</p>
	(ii)	Decay/breakdown/decompose/rot is fastest (in A) ✓	1	3.2a	

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Question		Answer	Marks	AO element	Guidance
	(c)	(oxygen) is needed for microbes (that cause decay) ✓ for (aerobic) respiration ✓	2	1.2	AW decomposers/saprophytes/bacteria/fungi IGNORE references to enzymes

Question		Answer	Marks	AO element	Guidance
20	(a)	mutation: change in a gene / DNA / deletion of a base / addition of a base / change in order of bases ✓ gene: a section/length of DNA ✓ OR codes for a protein ✓	2	2 x 1.1	AW nucleotide for base ALLOW codes for the order/sequence of amino acids IGNORE codes for a characteristic
	(b) (i)	(the allele) is recessive ✓	1	2.1	ALLOW neither dominant
	(ii)	The retina is damaged/doesn't function ✓	1	1.1	ALLOW retina detects light / focuses the image / contains light receptors

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Question			Answer	Marks	AO element	Guidance									
	(c)		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td><i>R</i></td> <td><i>r</i></td> </tr> <tr> <td><i>R</i></td> <td><i>RR</i></td> <td><i>Rr</i></td> </tr> <tr> <td><i>r</i></td> <td><i>Rr</i></td> <td><i>rr</i></td> </tr> </table> <p style="text-align: right;">✓✓</p> <p><i>probability = 0.25 / ¼ / 25% / 1 in 4 / 1:3 ✓</i></p>		<i>R</i>	<i>r</i>	<i>R</i>	<i>RR</i>	<i>Rr</i>	<i>r</i>	<i>Rr</i>	<i>rr</i>	3	2 x 1.2 3.2b	All genotypes correct = 2 marks Three genotypes correct = 1 mark One / two genotypes correct = 0 marks
	<i>R</i>	<i>r</i>													
<i>R</i>	<i>RR</i>	<i>Rr</i>													
<i>r</i>	<i>Rr</i>	<i>rr</i>													
	(d)	(i)	<p>idea that stem cells are not differentiated / can still specialised ✓</p> <p>they can replace damaged cells / develop into/change/divide/become retina cells ✓</p>	2	1.2	<p>ALLOW stem cells are unspecialised / can differentiate/grow into any (type of) cell</p> <p>ALLOW can differentiate/specialise into retina cells = 2 marks</p> <p>IGNORE can repair retina</p>									
		(ii)	<p>any two from: to see if it works ✓</p> <p>make sure it is safe / identify side effects ✓</p> <p>to find the correct dosage ✓</p>	2	1.2	<p>ALLOW see results</p> <p>ALLOW could go wrong / unknown effect</p> <p>IGNORE can't test on humans</p>									

Question			Answer	Marks	AO element	Guidance
21	(a)	(i)	21800 (kg) ✓	1	2.2	

Question		Answer	Marks	AO element	Guidance
	(ii)	egestion/excretion/respiration ✓	1	1.1	ALLOW named excretory product /faeces/urine/ uneaten parts/heat IGNORE movement/waste DO NOT ALLOW growth
(b)	(i)	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Provides a detailed explanation drawing conclusions why GM plants would make more biomass available to humans. Links photosynthesis to agricultural food chains and function of insecticides. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) Provides an explanation why GM plants would make more biomass available to humans. Links photosynthesis or function of insecticides to agricultural food chains. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) Provides a basic explanation why GM plants would make more biomass available to humans. This could include ideas about photosynthesis or function of insecticide or agricultural food chains. <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p>0 marks <i>No response or no response worthy of credit.</i></p>	6	<p>3 x 1.1</p> <p>2 x 2.1</p> <p>1 x 3.2b</p>	<p>AO1.1 Demonstrates knowledge of insecticides and photosynthesis.</p> <ul style="list-style-type: none"> • Insecticides will kill insect pests • Less leaves will be eaten/pests eat less leaves • Leaves are the site of photosynthesis • Less pests of the GM plant <p>AO2.1 Apply knowledge and understanding of photosynthesis to the production of biomass</p> <ul style="list-style-type: none"> • More photosynthesis • More light absorption for photosynthesis • More chlorophyll / chloroplasts for photosynthesis • More food/glucose/biomass made by photosynthesis <p>AO3.2b Draw conclusions linking photosynthesis to food chains</p> <ul style="list-style-type: none"> • More plant growth/food/biomass for cattle • More biomass passes through the agricultural food chain • Cattle receive more energy for growth • Then cattle will grow more, therefore more food for humans

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Question		Answer	Marks	AO element	Guidance
	(ii)	<p>any two from:</p> <p>concern that they may be harmful to humans if eaten ✓</p> <p>plants may escape into the wild ✓</p> <p>useful /pollinating insects might be harmed ✓</p> <p>disrupt food chains ✓</p> <p>ethically wrong ✓</p>	2	2 x 2.1	<p>ALLOW harmful effects not discovered to humans IGNORE dangerous</p> <p>ALLOW resistance / resistance gene could get into other plants</p> <p>IGNORE harmful to insects/pests</p> <p>ALLOW harm the environment /reduce biodiversity</p> <p>ALLOW morally / religiously wrong IGNORE playing God / not natural / disrupt nature</p> <p>IGNORE may not taste good IGNORE reduced gene pool / genetic variation / susceptible to the same disease</p>

Question		Answer	Marks	AO element	Guidance
22	(a)	<p>blood vessels / arteries are blocked/narrowed ✓</p> <p>(heart muscle) gets less blood ✓</p> <p>(heart muscle) gets less oxygen ✓</p>	3	2.1	<p>ALLOW atheroma / plaque formed</p> <p>IGNORE no blood</p> <p>IGNORE no oxygen</p> <p>IGNORE references to blood circulation to body cells</p>
	(b) (i)	Three / 3 ✓	1	2.2	
	(ii)	the older a person is, the greater the risk ✓	1	3.1a	ORA

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Question			Answer	Marks	AO element	Guidance
						IGNORE the older the more points
	(iii)	Person A has total of 8 points ✓ Person B has a total of 7 points ✓ Person A has a greater risk ✓	1 1 1	2.2 2.2 3.2b	If no totalled points on the answer lines then check text boxes must be correct deduction based on the total of points ALLOW correct deduction even if there is an error in the calculation of points	
(c)	(i)	idea that it widens/opens the (lumen) of the artery ✓ more blood/oxygen will be able to reach the heart muscle ✓	1 1	2.2 3.1b	IGNORE expands the artery	
	(ii)	advantage: avoids an operation ✓ disadvantage: could be side effects of the drug / must take it on a regular basis ✓	2	2 x 2.1	ALLOW named side effect e.g. liver damage/upset stomach ALLOW may forget to take the drug / misuse of the drug	

Question		Answer	Marks	AO element	Guidance
23	(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

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

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