OCR
Oxford Cambridge and RSA

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.

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

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.

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**	

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

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** $\frac{5 \times 16}{8}$ ✓ = 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

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)		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 ✓	2	3.1a	**Second marking point is dependent on a correct factor being stated** **ALLOW** decay/breakdown/rot throughout **ALLOW** decomposers/saprophytes/bacteria/fungi throughout **ALLOW** amount of plant material **IGNORE** amount of compost / composter size
	(b)	(i)	**any two from:** **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 ✓	2	2 x 2.2	**ALLOW** ORA **IGNORE A** has a higher temperature **IGNORE** references to decay **IGNORE** comparisons to section B
		(ii)	Decay/breakdown/decompose/rot is fastest (in **A**) ✓	1	3.2a	

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

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

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)	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)** 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. *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)** Provides an explanation why GM plants would make more biomass available to humans. Links photosynthesis **or** function of insecticides to agricultural food chains. *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)** 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. *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 Demonstrates knowledge of insecticides and photosynthesis.** • 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 **AO2.1 Apply knowledge and understanding of photosynthesis to the production of biomass** • **More** photosynthesis • **More** light absorption for photosynthesis • **More** chlorophyll / chloroplasts for photosynthesis • **More** food/glucose/biomass made by photosynthesis **AO3.2b Draw conclusions linking photosynthesis to food chains** • 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

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

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

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

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

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