F

GCSE (9–1)

Combined Science A (Gateway Science)

J250/02: Paper 2 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for Autumn 2021

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

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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.

11. 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

12. 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

13. **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/ Combined Science 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.

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	1.2	
3			A✓	1	1.1	
4			D✓	1	1.2	
5			A✓	1	1.1	
6			A✓	1	1.2	
7			B✓	1	1.2	
8			B✓	1	1.2	
9			C✓	1	1.1	
10			D✓	1	1.2	

BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN

Question			Answer	Marks	AO element	Guidance
11	(a)		Photosynthesis✓ Transpiration ✓ Decomposition✓	3	3 x 1.1	
	(b)		**Any two from:** Provide (fresh) water to drink / wash ✓ Provides water for crops✓ Maintains habitats✓ Keeps lakes and rivers supplied with water✓	2	2 x 1.1	
	(c)		Food availability ✓ Predators✓	2	2 x 1.1	2 correct ticks = 2 marks 1 correct tick = 1 mark 3 ticks, two correct = 1 mark 3 ticks, one correct = 0 marks 4 or more ticks = 0 marks
	(d)	(i)	Approximately/AW (1mm rainfall) ✓	1	1.2	
	(d)	(ii)	Sunday April 3 ✓ **Any two from:** Warmest ✓ Windiest ✓ Most light ✓	3	3 x 3.2b	If answer given is Monday April 4 with an explanation that it is the windiest, credit one mark **ALLOW** highest number of hours of sunshine

Question			Answer	Marks	AO element	Guidance
12	(a)		As vaccination rate for HPV increases risk of cervical cancer decreases✓	1	2.2	**ALLOW** As vaccination rate for HPV increases the number of abnormal screening results decreases✓
	(b)		**Any two from:** Vaccine contains antigens✓ White blood cells make antibodies (to injected antigen) ✓ Antibodies attach to/clump/destroy the antigens/virus ✓ Some white blood cells remain as memory cells ✓ The memory cells produce specific antibody on infection by HPV/real pathogen ✓	2	2 x 1.1	**ALLOW** vaccine contains dead/weak form of virus

Question			Answer	Marks	AO element	Guidance
13	(a)	(i)	(Cell A) Haploid✓ (Cell B) Diploid✓	2	2 x 2.1	
		(ii)	(Cell A) Half the chromosome number / 3 chromosomes not 6 / one chromosome from each pair✓ (Cell B) Full chromosome number / 6 chromosomes present which matches the stated chromosome number / chromosomes are in pairs ✓	2	2 x 1.1	**ALLOW** one of each chromosome **ALLOW** two of each chromosome
	(b)		male **D** / **d** female **d**: Dd / dd female **d**: Dd / dd ✓ Probability = 0.5 / 50% / ½ ✓	2	1x 2.2 1 x 3.1a	**ALLOW** 1 in 2 / 1:1 / $^{2}/_{4}$ / 50:50
	(c)		35 - 39 (years) ✓	1	2.2	
	(d)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 4 400 award 2 marks** 66 000 000 / 15 000 ✓ = 4 400 ✓	2	2 x 2.2	

Question			Answer	Marks	AO element	Guidance
	(e)		Symptoms often appear after reproductive age / already passed on HD gene after symptoms appear ✓ Gene mutates during reproduction/after birth, so not inherited from parents ✓	2	2 x 3.2b	 **IGNORE** newly formed mutation unless qualified **ALLOW** idea that new mutations occur maintaining the number within the population

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>14</td><td>(a)</td><td>(i)</td><td>
<table>
<tr><th>Disease</th><th>Communicable</th><th>Non-communicable</th><th>Affects plants</th><th>Affects humans</th><th>Caused by bacteria</th><th>Caused by a virus</th></tr>
<tr><td>Crown gall disease</td><td>✓</td><td></td><td>✓</td><td></td><td>✓</td><td></td></tr>
<tr><td>Type 2 diabetes</td><td></td><td>✓</td><td></td><td>✓</td><td></td><td></td></tr>
</table>
✓✓</td><td>2</td><td>2 x 1.1</td><td>one mark for each correct row</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Any two from:
Covering mouth or nose when cough or sneeze ✓

Face coverings ✓

Washing/sanitising hands after touching surfaces ✓

Reference to avoiding crowded situations✓

Good ventilation ✓</td><td>2</td><td>2 x 2.1</td><td>ALLOW social distancing/isolating</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>Less oxygen transported/reaching cells ✓

Reference to effect on immune system e.g. unable to defend against diseases ✓</td><td>2</td><td>2 x 1.1</td><td></td></tr>
<tr><td></td><td>(b)</td><td>(ii)</td><td>Smoking ✓</td><td>1</td><td>1.1</td><td></td></tr>
</table>

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)** Detailed description of the use of stem cells to repair cornea damage. **AND** Detailed description of possible risks of using stem cell technology to repair cornea damage. *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)** Detailed description of how cells could be used to repair cornea damage. **OR** Detailed description of possible risks of stem cell technology to repair of cornea damage. **OR** Describes how cells could be used to repair cornea damage **and** describes a possible risk of stem cell technology to repair of cornea damage. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.*	**6**	**4 x 2.1** **2 x 3.2a**	**AO2.1 Apply knowledge and understanding of stem cell technology to repair of cornea damage** • stem cells could be taken from donor/embryo/or patient's own body • adult stem cells could be taken from the skin/eye • stem cells would be injected/transplanted into the eye/cornea • idea that new cells would divide to form more cells / differentiate into corneal cells / replace damaged cells **AO3.2a Analyse information and ideas to describe possible risks** • tissue transplantation has infection risk as cultured stem cells could be contaminated with viruses which would be transferred to a patient • mutations have been observed in cultured stem cells that behave like cancer cells • rejection of tissues by host recognising it as foreign • use of embryo stem cells raise ethical issues • new technology, so side effects may not be known

Question			Answer	Marks	AO element	Guidance
			Level 1 (1–2 marks) Describes how cells could be used to repair cornea damage. **OR** Describes a possible risk of stem cell technology to repair of cornea damage. *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.*			

Question			Answer	Marks	AO element	Guidance
15	(a)		(Acyanogenic are found in colder climates because they) Do not release toxin when cells are damaged by the cold ✓ (Cyanogenic are found in warmer climates because) They are protected from snails/predation ✓ **OR** Cells are damaged by toxins in the cold / ORA ✓	2	2 x 2.2	**ALLOW** idea that there may be fewer snails / too cold for snails to live (in cold climate) **ALLOW** snails will not eat them
	(b)	(i)	Too many to count individually / too time consuming ✓	1	1.2	**ALLOW** large numbers to count would lead to errors **ALLOW** idea that you will not lose track of what has been counted **ALLOW** it is faster (than counting all of them) **IGNORE** it would be impractical (unless qualified)
	(b)	(ii)	Random sampling uses a grid to place quadrats (over large area) ✓ Transect places the quadrats in a line (to show how species change) ✓	2	2 x 1.2	**ALLOW** random sampling uses a quadrat placed randomly (over large area) **IGNORE** quadrats are placed in a specific area or mapped out area
	(b)	(iii)	Random sampling will just show the number of plants between 0-250m/in the whole area ✓ Transects can show the zonation / Transects show how the plant (types) vary at different heights or altitudes ✓	2	3.3a 3.3b	 **ALLOW** transects compare different areas on the slope **ALLOW** transect measures the slope to show how the land changes

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	Increase of altitude decreases the number of cyanogenic (clover) / ora ✓	1	3.1b	**ALLOW** they prefer to grow at lower altitudes **ALLOW** negative correlation **IGNORE** inversely proportional
	(c)	(ii)	Any altitude above 150m **AND** Higher altitudes are colder (giving them advantage) ✓	1	3.2a	**ALLOW** less competition from cyanogenic plants **ALLOW** there would be less at lower altitudes as they get eaten by snails **ALLOW** no snails at higher altitude
	(d)		**Any three from:** (Cyanogenic plants) developed as a mutation ✓ Pants/clover that produce toxin are less likely to be eaten (by snails) ✓ Cyanogenic plants are more likely reproduce ✓ Cyanogenic plants are likely to pass on genes/alleles for producing toxin ✓	3	3 x 2.1	**ALLOW** converse argument for acyanogenic in cold climate / high altitude **ALLOW** plants/clover that produce toxin are more likely to survive (being eaten)

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