OCR
Oxford Cambridge and RSA

F

GCSE (9–1)

Combined Science A (Gateway Science)

J250/02: Paper 2 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for November 2020

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.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

© OCR 2020

Annotations

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 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	1.2	
2			B✓	1	1.1	
3			B✓	1	1.1	
4			B✓	1	1.1	
5			B✓	1	1.1	
6			D✓	1	1.1	
7			B✓	1	2.2	
8			C✓	1	1.1	
9			A✓	1	2.1	
10			D✓	1	1.1	

BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>11</td><td>(a)</td><td></td><td><table>
<tr><td>diet high in salt</td><td>✓</td></tr>
<tr><td>drinking contaminated water</td><td></td></tr>
<tr><td>drinking large amounts of alcohol</td><td>✓</td></tr>
<tr><td>eating under cooked chicken</td><td></td></tr>
<tr><td>fungal infection</td><td></td></tr>
<tr><td>unprotected sexual intercourse</td><td></td></tr>
</table></td><td>2</td><td>2 x 2.1</td><td>2 correct ticks = 2 marks
1 correct ticks = 1 mark

3 ticks two correct = 1 mark
3 ticks one correct = 0 marks
4 or more ticks = 0 marks</td></tr>
<tr><td></td><td>(b)</td><td></td><td>mildew ✓
gall ✓</td><td>2</td><td>2 x 1.1</td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td>HIV weakens immune system ✓

HIV patients more prone to tuberculosis/TB ✓</td><td>2</td><td>2 x 1.1</td><td>ALLOW in HIV patients, TB acts as an opportunistic infection / idea that they cannot fight off TB</td></tr>
<tr><td></td><td>(d)</td><td></td><td><table>
<tr><td>cell membrane</td><td>✓</td></tr>
<tr><td>chromosome</td><td>✓</td></tr>
<tr><td>mitochondrion</td><td></td></tr>
<tr><td>nucleus</td><td></td></tr>
<tr><td>plasmid</td><td></td></tr>
</table></td><td>2</td><td>2 x 1.1</td><td>both correct = 2 marks
1 correct = 1 mark

3 ticks two correct = 1 mark
3 ticks one correct = 0 marks
4 or 5 ticks = 0 marks</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
	(e)		**Any two from:** the size of the TMV is too small to be seen using the light microscope / the light microscope does not have sufficient/suitable resolution to view TMV ✓ TEM was not developed until the 1930s/until then ✓	**2**	**2 x 3.1b**	need reference to size / resolution for the first marking point **ALLOW** only TEM can see objects that small / only TEM has sufficient resolution / TEM can see sub-cellular structures **ALLOW** TEM was developed in 1930's / idea that could not see the virus until the TEM was available

Question			Answer	Marks	AO element	Guidance
12	(a)		hypothesis ✓	1	2.2	**ALLOW** correct answer ringed, ticked or underlined
	(b)	(i)	1 metre height on tree/above the ground ✓	1	2.2	**ALLOW** type of tree / size of grid **IGNORE** the plastic grid unless qualified
		(ii)	quadrat ✓	1	1.2	**ALLOW** correct answer ringed, ticked or underlined
		(iii)	increase sample size (at each distance) / study more trees ✓	1	3.3b	**ALLOW** repeat the investigation/method **IGNORE** take the readings twice / use different trees
	(b)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 6 award 2 marks** 7 dots counted / or numbers in order 3 3 6 7 8 ✓ 6 ✓	2	 2.2 1.2	 **ALLOW** 4.5 for one mark (median) without the reading from the grid)
		(ii)	as distance increases (from road) so does the median/number of lichen / ORA ✓ lichen growth restricted the closer to the road✓	2	3.2b	**ALLOW** median increases as move from previous tree **ALLOW** because lichen may be unable to grow in polluted areas / too much pollution for growth
	(d)		mutualism/mutualistic relationship✓ fungi and algae both benefit ✓	2	2.1 1.1	 **ALLOW** fungus gets food from algae which gets shelter from fungus **IGNORE** algae photosynthesises and gets shelter from fungus

Question			Answer	Marks	AO element	Guidance
13	(a)	(i)	physical appearance / AW ✓	1	1.1	
		(ii)	(mutation in gene) stops producing myostatin ✓ idea that excess protein tissue made / muscle will keep growing ✓	2	2x2.1	**ALLOW** mutation means that myostatin does not stop muscle growth **IGNORE** just more muscle
		(iii)	idea that there may be no selective advantage / may be a disadvantage ✓ animal would be too large/slow / energy/raw materials would be wasted on muscle growth ✓	2	2x2.1	**ALLOW** mutations are rare / very rare for mutations to affect phenotype ✓

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)** Describes the process of selective breeding related to the Belgian Blue. **AND** Explains the impact on the farming industry, including the benefits and risks, of selective breeding the Belgian Blue. *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)** Describes the process of selective breeding related to the Belgian Blue. **OR** Explains the impact on the farming industry, including the benefits and risks, of selective breeding the Belgian Blue. *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)** Basic description of selective breeding. **OR** Explains the benefits of selective breeding related to the Belgian Blue. **OR** Explains the risks of selective breeding related to the Belgian Blue.	**6**	**2 x 1.1** **2 x 2.1** **2 x 3.2a**	**AO1.1 Demonstrate knowledge and understanding of selective breeding** • decide which characteristics are important • choose parents that show the characteristics • select the best offspring to breed on • repeat the process continuously **AO2.1 Apply knowledge and understanding of selective breeding in Belgian Blue cattle** • muscular feature/mutation selected • most muscular offspring selected to breed next generation • repeat until Belgian Blue breed is established **AO3.2a Analyse information and ideas to make judgements on benefits and risks involved in selective breeding of Belgian Blue cattle** • more muscular cattle mean more meat • inbreeding risks associated with extra muscle mass (leg problems, breathing complications and enlarged tongues) • lack of genetic diversity is then present in the breed

Question			Answer	Marks	AO element	Guidance
			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.*			
	(c)		genetic engineering✓	**1**	**1.1**	**ALLOW** gene modification/GM/gene editing

<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></td><td>
<table>
<tr><th>Part of savannah</th><th>Level</th><th>Description</th></tr>
<tr><td>giraffe
elephants
zebra
trees
grasses
weather
soil
atmosphere</td><td>ecosystem✓</td><td>The living organisms in an area, together with the non-living components of the environment</td></tr>
<tr><td>giraffe
elephants
zebra
trees
grasses</td><td>community</td><td>All the organisms that live in a habitat ✓</td></tr>
<tr><td>Zebras</td><td>population</td><td>All the individuals of one species living in an area ✓</td></tr>
<tr><td>Zebra</td><td>organism</td><td>individual</td></tr>
</table>
</td><td>3</td><td>1.1

2 x 2.1</td><td>level and description needed for each mark

ALLOW species + organisms that can interbreed to produce fertile offspring ✓</td></tr>
<tr><td></td><td>(b)</td><td></td><td>temperatures ✓

large / high ✓

lose ✓</td><td>3</td><td>3x2.1</td><td>ALLOW heat

ALLOW radiate / transfer / remove</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
15	(a)	(i)	**Any two from:** higher levels of blood cholesterol result in more deaths / lower levels of blood cholesterol result in less deaths ✓ blood cholesterol level of 6.5 - 7.99 (mol/dm^3) has the highest percentage of deaths ✓ blood cholesterol level of <5 (mol/dm^3) has the least percentage of deaths ✓ 5.0 – 6.49 (mol/dm^3) the most common cholesterol level / <5 (mol/dm^3) least common cholesterol level ✓ <5 (mol/dm^3) or 5-6.49 (mol/dm^3) percentage population was higher than deaths ✓ 6.5 - 7.99(mol/dm^3) or >8 (mol/dm^3) deaths higher than percentage population ✓	**2**	**2 x 3.2b**	**ALLOW** heart disease for deaths **IGNORE** just quoting data e.g. men with blood cholesterol level less than 5 (mol/dm^3) had 4% deaths **ALLOW** as blood cholesterol level decreases the number of deaths decrease **IGNORE** smallest percentage of population has less deaths **ALLOW** those with 6.5 - 7.99 (mol/dm^3) are more likely to die **ALLOW** those with <5 (mol/dm^3) are less likely to die **ALLOW for two marks:** idea that there were few men with >8.0 (mol/dm^3) blood cholesterol levels yet they had the second highest percentage of deaths ✓✓ or idea that the percentage deaths in high cholesterol group is very high relative to the percentage of people in that group ✓✓

Question			Answer	Marks	AO element	Guidance
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 1:24 award 2 marks** 4:96 / 4 in 96 / 96÷4 ✓ 1:24 ✓	**2**	**2 x 2.2**	 **DO NOT ALLOW** 96:4 **DO NOT ALLOW** 24:1
		(iii)	only 1 in 25/4% die from heart disease (with levels <5mol/dm^3) ✓ levels above (5 mol/dm^3) account for 96% of the deaths ✓ **Or any one of these for 2 marks:** 10% of people have levels <5 (mol/dm^3) but account for 4%/less than 5% of deaths ✓✓ 12% of people have levels >8 (mol/dm^3) but account for more than 25% of deaths ✓✓	**2**	**2 x 3.2a**	**ALLOW** idea it reduces your chance of getting heart disease/heart attack/dying **ALLOW** (<5 mol/dm^3) had the least number of deaths **ALLOW** higher blood cholesterol levels result in more deaths/increase risk of heart disease
	(b)	(i)	reducing (the build-up of) cholesterol reduces (risk of) heart disease. ✓ (therefore) blood flows more freely through arteries / less blockages in arteries / less risk of heart attack / heart <u>muscle</u> gets more oxygen/glucose ✓	**2**	**2 x 2.1**	**ALLOW** build-up of cholesterol (in arteries) causes heart disease **IGNORE** HRT reduces the build-up of cholesterol/decreases blood cholesterol **IGNORE** less risk of heart disease **ALLOW** arteries will not get clogged up (with cholesterol) **ALLOW** increased blood flow to heart <u>muscle</u>

Question			Answer	Marks	AO element	Guidance
		(ii)	longer period for study (to see if reduction of cholesterol reduces heart disease) ✓	**1**	**3.3a**	**ALLOW** takes longer than 5 years for cholesterol build-up to lead to heart disease **ALLOW** perform tests of heart function **ALLOW** record the number of women in the study with heart disease / died of heart disease **ALLOW** increase the dose of HRT **IGNORE** do more tests / increase number of women in study / check on them more often than 5 years
		(iii)	(HRT might) increase the rate of cell division✓ (increase the risk of) uncontrolled cell division / (increase the risk of) tumour formation ✓	**2**	**2.1** **1.1**	**IGNORE** reference to cell growth / increased mitosis **ALLOW** (increase the risk) of uncontrolled cell replication **ALLOW as extra marking point** increased rate of mitosis (increases) risk of mutation
	(c)		(more) exercise / reduced (saturated) fat diet / less alcohol / stop smoking / less salt in diet / less stress ✓	**1**	**1.1**	**ALLOW** example of type of exercise **IGNORE** healthier diet

OCR (Oxford Cambridge and RSA Examinations)
The Triangle Building
Shaftesbury Road
Cambridge
CB2 8EA

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored