

GCSE (9–1)

Combined Science A (Gateway Science)

J250/02: Paper 2 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for November 2020

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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

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

Question			Answer	Marks	AO element	Guidance												
11	(a)		<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>	diet high in salt	✓	drinking contaminated water		drinking large amounts of alcohol	✓	eating under cooked chicken		fungal infection		unprotected sexual intercourse		2	2 x 2.1	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
diet high in salt	✓																	
drinking contaminated water																		
drinking large amounts of alcohol	✓																	
eating under cooked chicken																		
fungal infection																		
unprotected sexual intercourse																		
	(b)		mildew ✓ gall ✓	2	2 x 1.1													
	(c)		HIV weakens immune system ✓ HIV patients more prone to tuberculosis/TB ✓	2	2 x 1.1	ALLOW in HIV patients, TB acts as an opportunistic infection / idea that they cannot fight off TB												
	(d)		<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>	cell membrane	✓	chromosome	✓	mitochondrion		nucleus		plasmid		2	2 x 1.1	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		
cell membrane	✓																	
chromosome	✓																	
mitochondrion																		
nucleus																		
plasmid																		

Question			Answer	Marks	AO element	Guidance
	(e)		<p>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 ✓</p> <p>TEM was not developed until the 1930s/until then ✓</p>	2	2 x 3.1b	<p>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</p> <p>ALLOW TEM was developed in 1930's / idea that could not see the virus until the TEM was available</p>

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)	<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) 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.</p> <p><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) 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.</p> <p><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) 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.</p>	6	2 x 1.1 2 x 2.1 2 x 3.2a	<p>AO1.1 Demonstrate knowledge and understanding of selective breeding</p> <ul style="list-style-type: none"> decide which characteristics are important choose parents that show the characteristics select the best offspring to breed on repeat the process continuously <p>AO2.1 Apply knowledge and understanding of selective breeding in Belgian Blue cattle</p> <ul style="list-style-type: none"> muscular feature/mutation selected most muscular offspring selected to breed next generation repeat until Belgian Blue breed is established <p>AO3.2a Analyse information and ideas to make judgements on benefits and risks involved in selective breeding of Belgian Blue cattle</p> <ul style="list-style-type: none"> 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
			<p><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>			
	(c)		genetic engineering✓	1	1.1	ALLOW gene modification/GM/gene editing

Question			Answer	Marks	AO element	Guidance															
14	(a)		<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>	Part of savannah	Level	Description	giraffe elephants zebra trees grasses weather soil atmosphere	ecosystem✓	The living organisms in an area, together with the non-living components of the environment	giraffe elephants zebra trees grasses	community	All the organisms that live in a habitat ✓	Zebras	population	All the individuals of one species living in an area ✓	Zebra	organism	individual	3	1.1 2 x 2.1	level and description needed for each mark ALLOW species + organisms that can interbreed to produce fertile offspring ✓
Part of savannah	Level	Description																			
giraffe elephants zebra trees grasses weather soil atmosphere	ecosystem✓	The living organisms in an area, together with the non-living components of the environment																			
giraffe elephants zebra trees grasses	community	All the organisms that live in a habitat ✓																			
Zebras	population	All the individuals of one species living in an area ✓																			
Zebra	organism	individual																			
	(b)		temperatures ✓ large / high ✓ lose ✓	3	3x2.1	ALLOW heat ALLOW radiate / transfer / remove															

Question			Answer	Marks	AO element	Guidance
15	(a)	(i)	<p>Any two from:</p> <p>higher levels of blood cholesterol result in more deaths / lower levels of blood cholesterol result in less deaths ✓</p> <p>blood cholesterol level of 6.5 - 7.99 (mol/dm³) has the highest percentage of deaths ✓</p> <p>blood cholesterol level of <5 (mol/dm³) has the least percentage of deaths ✓</p> <p>5.0 – 6.49 (mol/dm³) the most common cholesterol level / <5 (mol/dm³) least common cholesterol level ✓</p> <p><5 (mol/dm³) or 5-6.49 (mol/dm³) percentage population was higher than deaths ✓</p> <p>6.5 - 7.99(mol/dm³) or >8 (mol/dm³) deaths higher than percentage population ✓</p>	2	2 x 3.2b	<p>ALLOW heart disease for deaths</p> <p>IGNORE just quoting data e.g. men with blood cholesterol level less than 5 (mol/dm³) had 4% deaths</p> <p>ALLOW as blood cholesterol level decreases the number of deaths decrease</p> <p>IGNORE smallest percentage of population has less deaths</p> <p>ALLOW those with 6.5 - 7.99 (mol/dm³) are more likely to die</p> <p>ALLOW those with <5 (mol/dm³) are less likely to die</p> <p>ALLOW for two marks: idea that there were few men with >8.0 (mol/dm³) 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 ✓✓</p>

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

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

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