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GCSE (9–1)

Combined Science A (Gateway Science)

J250/05: Paper 5 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for Autumn 2021

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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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1. 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

2. 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
<u>—</u>	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

3. 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.

Question	Answer	Marks	AO element	Guidance
1	C ✓	1	1.1	
2	D ✓	1	1.1	
3	D ✓	1	1.1	
4	D ✓	1	1.2	
5	A ✓	1	2.2	
6	C ✓	1	2.1	
7	D ✓	1	2.1	
8	A ✓	1	2.1	
9	A ✓	1	1.1	
10	B ✓	1	1.2	

Question		Answer	Marks	AO element	Guidance
11	(a)	Distance (= 36 + 36 + 18) = 90 m ✓ Displacement = 18 m / Displacement = shortest distance between 2 points (in a certain direction) / AW ✓	2	2 × 3.1b	ALLOW one option identified as 90m and the other option as 18m for 1 mark.
	(b)		2	2 × 1.1	All 4 correct = ✓✓ Any 2 or 3 correct ✓ DO NOT ALLOW contradictory lines, e.g. lines from speed to vector and scalar
	(c) (i)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 2 (m / s²) award 2 marks (Acceleration =) 4(- 0) / 2 ✓ (Acceleration =) 2 (m / s ²) ✓	2	2 × 2.2	
	(ii)	Constant speed/velocity ✓	1	1.2	ALLOW uniform speed/velocity or steady speed/velocity
	(iii)	Any diagonal line from the origin with a gradient less steep than the line for student B. ✓	1	2.2	ALLOW curved or straight lines with gradient less than the line for student B. IGNORE other lines unless contradictory ALLOW any length of line

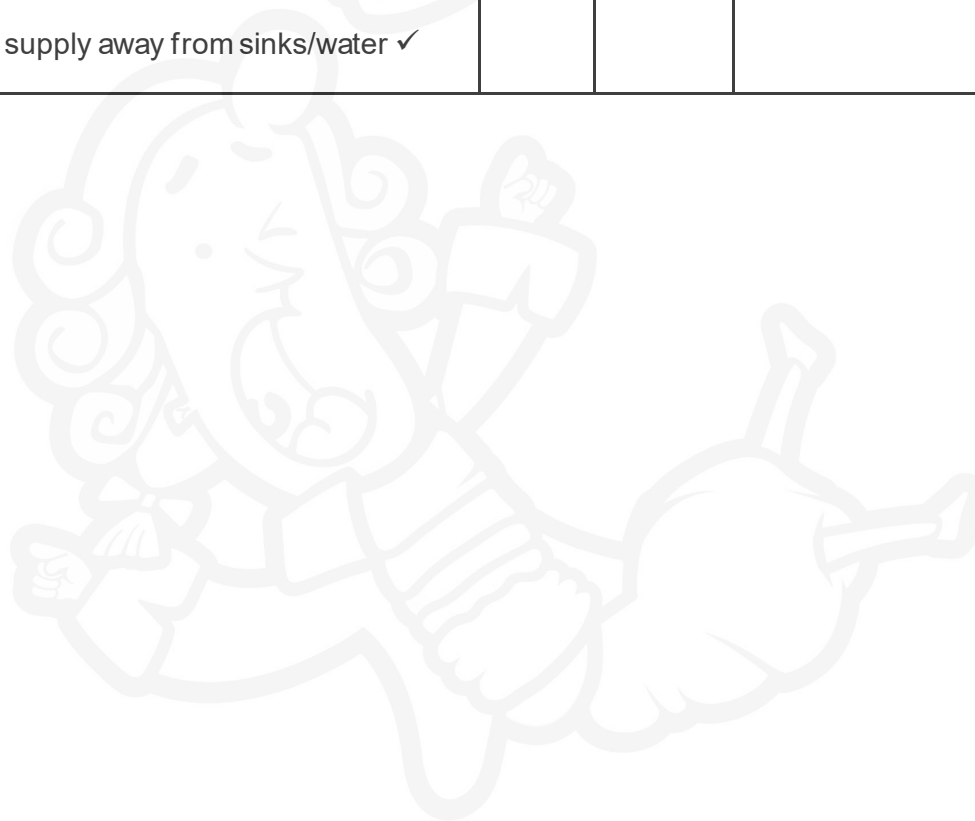
Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	Vertical arrow 5 cm long pointing upwards ✓	1	2.2	Judge 5 cm by eye IGNORE label
		(ii)	Contact ✓	1	1.1	
	(b)		Forces Unbalanced Speed ✓✓	2	2 × 1.1	All 3 correct = ✓✓ Any 2 correct = ✓
	(c)		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 160 (N) award 2 marks (Force =) 0.4×400 ✓ (Force =) 160 (N) ✓	2	2 × 2.1	
	(d)		There is more than 1 force acting on the ball ✓ Force from foot AND force from wall on ball ✓	2	2 × 2.1	ALLOW there are forces (acting) on the ball

Question		Answer	Marks	AO element	Guidance
13	(a)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 81 (J) award 2 marks (W =) 45×1.8 ✓ (W =) 81 (J) ✓	2	2 × 2.1	
	(b)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 300 W award 3 marks (P =) $1500 / 5$ ✓ (P =) 300 ✓ W / watts ✓	3	2 × 2.1 1.2	ALLOW J/s

Question		Answer	Marks	AO element	Guidance
14	(a)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 2 (N) award 3 marks</p> <p>Conversion: $200 \text{ g} = 0.2 \text{ kg}$ ✓ (Force =) 0.2×10 ✓ (Force =) 2 (N) ✓</p>	3	1.2 2 × 2.1	<p>ALLOW use of 9.8(1) to give an answer of 1.96 (N) for 3 marks ALLOW 2 marks for 2000 (N) (unit conversion missed)</p>
	(b)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 20 (N / m) award 3 marks</p> <p>Rearrangement: $(k =) F \div x$ ✓ $(k =) 4.91 \div 0.25$ or 19.6 ✓ $(k =) 20 \text{ (N / m)}$ ✓</p>	3	1.2 2 × 2.1	<p>ALLOW candidate's answer to the nearest whole number for 1 mark</p>
	(c)	<p>Mean = $((20+18+20+19)/4 =) 19 \text{ (N / m)}$ ✓</p>	1	1.2	ALLOW 19.25
	(d)	<p>Plot a graph of force against extension / AW ✓</p> <p>Gradient = spring constant ✓</p>	2	2 × 3.3b	

Question		Answer	Marks	AO element	Guidance
15	*(a)	<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) Detailed description of experiment. AND A description of how resistance can be calculated from the results. <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) Detailed description of experiment. OR A basic description of experiment. AND A simple description of how resistance can be calculated. <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 experiment. OR A simple description of how resistance can be calculated. <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	2 × 1.1 2 × 1.2 2 × 3.3a	<p>AO1.1 – Demonstrates knowledge that current depends on resistance and p.d. and resistance can change as current changes</p> <ul style="list-style-type: none"> Use the current and p.d. to calculate resistance Resistance = p.d. / current or gradient of V against I graph If resistance changes with current, then graph of p.d. against current will be curved / ORA <p>AO3.3a – Analyses information to develop experiment to measure resistance</p> <ul style="list-style-type: none"> Use a variable resistor / rheostat / potential divider (to change the current) Take readings at different values of current (and p.d.) Plot a graph of p.d. against current <p>AO1.2 – Demonstrates knowledge and understanding of how to build circuits</p> <ul style="list-style-type: none"> Appropriate circuit diagram Voltmeter in parallel with wire Ammeter in series with wire Ammeter measures current Voltmeter measures p.d. <p>ALLOW marks to be awarded from a circuit diagram.</p>

Question			Answer	Marks	AO element	Guidance
15	(b)	(i)	Hazard 1: Wire will get hot / AW OR Hazard 2: Using mains power supply (in lab) / AW ✓	1	3.3a	ALLOW idea of getting burnt ALLOW idea of electrocution (from power supply)
		(ii)	Any one from: Control 1: Use low voltages / low current / connect circuit for short time only ✓ Control 2: Keep power supply away from sinks/water ✓	1	3.3b	



Question			Answer	Marks	AO element	Guidance
16	(a)	(i)	[1 before 5] 5 before 4 ✓ 4 before 3 ✓ [3 before 2]	2	2 × 1.1	
		(ii)	Peer Review Any one from: to confirm the experiment is reproducible ✓ to check the method ✓ to check for mistakes ✓ to ensure quality of research / uphold standards / prevent unethical behaviour ✓ to offer advice by experts ✓ Communication Any one from: other scientists can check / test / verify / validate results (against own results) ✓ other scientists can develop or use ideas or theories ✓ others can use or compare the data ✓ improve knowledge or education ✓ more data available / allow further development or research ✓ to gain credit or acknowledgement for their work ✓	2	2 × 3.2a	ALLOW to check it is carried out correctly IGNORE to see if others think the same ALLOW to ensure the experiments are performed correctly / to know of any downfalls / checking the findings / check the validity / to cross check ALLOW to detect false claims ALLOW to add more ideas/points / to give another opinion ALLOW to make corrections ALLOW other investigations or experiments could be done afterwards / for more opinions and theories ALLOW to see similarities and differences ALLOW help with new technologies

Question			Answer	Marks	AO element	Guidance
16	(b)	(i)	Any two from: Density of solids is the greatest / AW ✓ Density of gases is the least / AW ✓ Density of solids > density of liquids / ORA ✓ Density of solids > density of gases / ORA ✓ Density of liquids > density of gases / ORA ✓	2	2 × 3.1a	
		(ii)	Atoms more tightly packed in a solid than liquid / ORA ✓ So greater mass in the same volume / ORA ✓	2	2 × 1.1	ALLOW answers on a labelled diagram
	(c)	(i)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 169 200 (J) award 2 marks (E =) $0.2 \times 846\,000$ ✓ (E =) 169 200 (J) ✓	2	2 × 2.1	
		(ii)	Increasing temp (of 1kg of water by 1°C) only requires molecules to move faster ✓ Evaporation requires intermolecular forces to be overcome ✓	2	2 × 2.1	ALLOW increases the kinetic energy of molecules ALLOW to break (intermolecular) bonds

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