

GCSE (9–1)

Combined Science A (Gateway Science)

J250/05: Paper 5 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2019

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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 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

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:

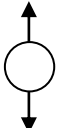
	Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	Apply knowledge 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	1.1	
2	A	1	1.2	
3	C	1	1.1	
4	B	1	2.1	
5	B	1	1.2	
6	B	1	2.1	
7	B	1	2.1	
8	B	1	2.2	
9	D	1	1.1	
10	D	1	2.1	

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	Measure one edge of the cube ✓ Value of edge cubed / $l \times w \times h$ / AW ✓	2	2×1.2	ALLOW measure side/width/length/height/ AW
		(ii)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = $6.8 \text{ (g/cm}^3\text{)}$ award 2 marks $850 / 125$ ✓ $= 6.8 \text{ (g/cm}^3\text{)}$ ✓	2	2×2.1	ALLOW answer = $7 \text{ (g/cm}^3\text{)}$ ✓✓
	(b)	(i)	Scales / (electronic) balance ✓	1	1.2	ALLOW top-pan balance
		(ii)	Measuring cylinder or eureka can or displacement can ✓	1	1.2	ALLOW overflow can

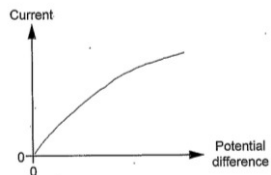
Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	Horizontal (by eye) arrow to right next to X ✓	1	1.1	ALLOW correct clockwise arrow on any of the 5 field lines above the magnet. IGNORE any extra arrows drawn if they are in the correct direction
		(ii)	Near / around / at poles	1	1.1	ALLOW at ends (of magnet) / one named pole ALLOW mark for correctly annotated diagram ALLOW where the (field) lines are closest (together)
	(b)		Earth has a magnetic field/core/force / AW ✓	1	1.1	ALLOW Earth is (like) a magnet / compass lines up with the Earth's magnetic field (lines) / AW
	(c)	(i)	Pass current through wire / add a cell/ battery/power supply to the wire ✓	1	1.2	IGNORE pass electricity through coil
		(ii)	<p>The more pins picked up, (the stronger the magnetic field)✓</p> <p>AND</p> <p>Any one from: (The number of pins increases) as the number of turns increases ✓</p> <p>The magnetic field gets stronger up to 15 ✓</p> <p>Between 15 and 20 it (number of pins / magnetic field) remains the same ✓</p>	<p>1</p> <p>1</p>	<p>3.1b</p> <p>3.2a</p>	<p>ALLOW correct examples from the table e.g. at 5 (turns) it is zero (pins) and at 20 (turns) it is 2 (pins)</p> <p>ALLOW it is true up to 15 (turns)</p> <p>ALLOW the magnetic field does not increase after 15 (turns)</p> <p>IGNORE the more turns, the magnetic field increases (in stem of question)</p>

Question			Answer	Marks	AO element	Guidance
13	(a)		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 1.5 (N) award 2 marks $25 \times 0.06 \checkmark$ $= 1.5 \text{ (N)} \checkmark$	2	2×2.1	
	(b)	(i)	 pull of spring / tension / AW $\checkmark$ (pull of) gravity / pull of earth / weight / AW $\checkmark$	2	2×1.1	ALLOW force of spring ALLOW gravitational (force) / force of gravity / force due to gravity
		(ii)	there is a resultant force / weight $\checkmark$ So the object accelerates (down) $\checkmark$	2	2×1.1	ALLOW (there is a downwards force but) no upwards force / downwards force > upwards force ALLOW correct idea of unbalanced forces
	(c)		Force of mass on bench / AW $\checkmark$ Contact force $\checkmark$	2	2×2.1	

Question			Answer	Marks	AO element	Guidance
14	*		<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 and explains in detail the similarities AND differences using ideas about current and resistance.</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 and explains the similarities OR differences using ideas about current or resistance.</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) Describes basic similarities OR differences between circuits.</p> <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>	6	3×2.2 3.1a 2×3.2b	<p>AO2.2 Applies knowledge and understanding of circuits</p> <ul style="list-style-type: none"> • A has lower current than B • A series and B parallel • resistance of circuit A higher than B / ORA • because current in B is larger / ORA • p.d. is shared between each resistor in series • full p.d. across each resistor in parallel • current before and after resistors in both circuits is the same • circuit A or B current is same in each resistor • current splits (between resistors) in B and current doesn't split (between resistors) in A <p>AO3 Analyses information and ideas to interpret and draw conclusions about the two circuits</p> <ul style="list-style-type: none"> • A has resistors in a row / B has resistors in different loops / branches / AW • resistance of circuit A = 4 × resistance of circuit B • the current in A is a quarter of the current in B • total current in circuit B is double that for each resistor

Question			Answer	Marks	AO element	Guidance
15	(a)	(i)	Force due to gravity / AW	1	1.1	ALLOW the force/pull of gravity on an object ALLOW $W = m \times g$ or $W = m \times a$ or in words
		(ii)	Recall $W = m \times g$ ✓ $100g = 0.1kg$ ✓ $W (= 0.1 \times 10) = 1N$ ✓	3	1.2 1.2 2.1	ALLOW $F=ma$ ALLOW use of $g = 9.8$ to give 0.98 (N)
	(b)		Lubricate (wheels/surface) ✓	1	3.3b	ALLOW incline surface ALLOW make surface/wheels smooth(er) ALLOW use an air track ALLOW decrease mass / weight of trolley
	(c)	(i)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 3.75 (m/s²) award 3 marks correct rearrangement of letters/words OR $1^2 - 0.5^2 = 2 \times a \times 0.1$ OR $1^2 - 0.5^2 = 0.75$ ✓ Rearrangement: $a = 1^2 - 0.5^2 / 2 \times 0.1$ OR $1^2 - 0.5^2 / 0.2$ OR $0.75 / 0.2$ ✓ $a = 3.75$ (m/s ²) ✓	3	3 x 2.1	ALLOW U and V transposed for -3.75 m./s ²
		(ii)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.72 (J) award 3 marks Recall (KE =) $\frac{1}{2} \times m \times v^2$ ✓ $\frac{1}{2} \times 1 \times (1.2)^2$ ✓ (KE =) 0.72 (J) ✓	3	1.2 2x2.1	
	(d)		(No) because line of best fit does not pass through origin / (0,0) (AW)	1	3.2b	ALLOW quantitative description of direct proportionality using data from the graph

Question			Answer	Marks	AO element	Guidance
16	(a)		<p>Connect one terminal of cell/battery to A / AW ✓ BUT Lamp only lights if A is connected to positive (terminal) ✓✓</p> <p>Connect other terminal of cell/battery to B / AW ✓</p>	3	3×3.3a	<p>IGNORE lamps does not light if B is connected to positive (terminal)</p> <p>ALLOW idea of putting cell/battery between A and B in words or drawn on the diagram ✓✓</p> <p>ALLOW add a cell/battery (to the series circuit) if no other mark awarded</p>
	(b)	(i)	<p>Any two from:</p> <p>Not a straight line ✓</p> <p>(not a straight line) through 0 ✓</p> <p>No current in reverse direction/reverse bias/when p.d. is negative / AW ✓</p> <p>no current until p.d. reaches threshold/0.5 (V) ✓</p>	2	2×1.1	<p>p.d. and voltage are interchangeable throughout this question but ignore references to resistance</p> <p>ALLOW gradient changes / gradient not constant ALLOW graph does not obey Ohm's Law ALLOW the graph is a curve ALLOW (p.d and current) not proportional</p> <p>BUT (p.d and current) not directly proportional ✓✓</p> <p>ALLOW the current only flows in one/positive direction</p> <p>ALLOW the current increases after 0.5 (V) IGNORE just 'it' begins at 0.5 (V)</p>

	(ii)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 40 (Ω) award 4 marks (R =) p.d $\div$ Current ✓ From graph, (I =) 0.02 (A) ✓ 0.8 / 0.02 ✓ = 40 (Ω) ✓	4		1.2 ALLOW 0.8 $\div$ current 2.2 ALLOW answer from graph in region 0.017 (A) to 0.023 (A) 2.1 ALLOW ecf from candidate's reading for current from graph 2.1 If reading of current from 0.017 (A) to 0.023 (A) then allow answer from 34.78 (Ω) to 47.06 (Ω) for 4 marks e.g. a current of 0.018 gives the answer of 44.4 (Ω)
	(c)	Any two from: Current becomes (too) large/increases (too much) ✓ Resistance of diode decreases (rapidly) ✓ Diode can be damaged/blow/break ✓	2	2 $\times$ 3.2b	ALLOW any answer that implies the current has increased e.g. current would be too high/too much IGNORE too strong ALLOW the diode can explode / overheat / AW IGNORE it would be dangerous / heat up / blows the circuit / damages the circuit / just diode stops / short circuit / breaks the circuit / blows the fuse
	(d)	Graph starting at 0 with positive and decreasing slope ✓	1	1.2	 IGNORE initial straight line / leveling off / any part of the graph outside the axes

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