OCR
Oxford Cambridge and RSA

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GCSE (9–1)

Combined Science (Physics) A (Gateway Science)

J250/06: Paper 6 (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.

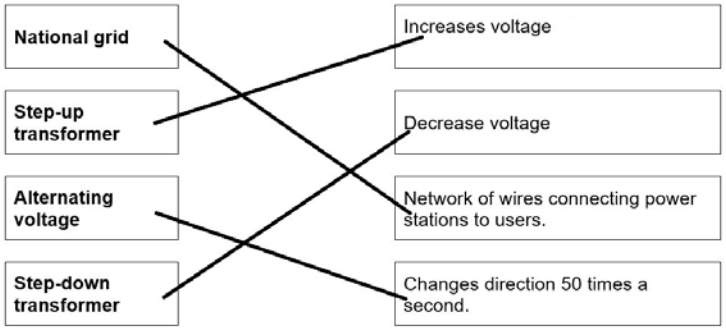
For answers to section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

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

Question			Answer	Marks	AO element	Guidance
11	(a)		Voltmeter ✓ Current AND series ✓	2	1.2 3.3a	BOTH needed.
	(b)	(i)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 115 (W) award 2 marks 230 × 0.5 ✓ = 115 (W) ✓	2	 2.1 2.1	
		(ii)	0.1 kW✓	1	1.2	
	(c)		Use meter(s) with higher resolution ✓	1	3.3b	ALLOW use meter with more decimal points ALLOW idea of taking repeat readings to see if repeated readings are close together / AW ✓
	(d)		Less than ✓ Less than ✓	2	3.2a 1.1	

Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 705 (Bq) award 1 mark (Mean = (701+704+708+707)÷4) Mean = 705 (Bq) ✓	1	1.2	
	(a)	(ii)	No (pattern) / random values / fluctuates/AW ✓ (Radioactive decay) is a random process ✓	2	3.2b 1.1	ALLOW both increased and decreased repeatedly
	(b)	(i)	They have different number of neutrons and same number of protons ✓	1	2.1	ALLOW different mass number and same proton number
		(ii)	Stays the same / unchanged ✓	1	2.1	
	(c)	(i)	Time taken for number of (radioactive) nuclei / activity / amount of isotope / mass / count rate to halve ✓	1	1.1	DO NOT ALLOW atoms
		(ii)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 458 (years) award 1 mark (Activity halves every 458 years) Half life = 458 (years) ✓	1	2.2	
		(iii)	Isotope C ✓ Need an alpha emitter as alpha cannot penetrate smoke / beta will not be blocked by smoke / AW ✓ Need long half-life so smoke alarm doesn't need replacing too often / ORA / AW ✓	3	3.2a 3.1b 3.1b	 ALLOW Alpha is highly ionising (so can ionise air) ALLOW Alpha is <u>least</u> penetrating ALLOW this marking point if B chosen

Question			Answer	Marks	AO element	Guidance
13	(a)		Transverse ✓ Speed ✓	2	2 × 1.1	
	(b)		Ruler ✓ Stopwatch / stop clock ✓	2	2 × 1.2	DO NOT ALLOW metre stick ALLOW timer

Question			Answer	Marks	AO element	Guidance
14	(a)			3	3 × 1.2	All 4 correct = 3 marks ✓✓✓ Any 3/2 correct = 2 marks ✓✓ Any 1 correct = 1 mark ✓
	(b)		From top: Neutral Live Earth	2	2 × 2.1	All 3 correct = 2 marks ✓✓ Any 2/1 correct = 1 mark ✓
	(c)	(i)	All points plotted correctly to within ± ½ square ✓ Acceptable lobf ✓	2	2 × 2.2	DO NOT ALLOW straight line
		(ii)	As voltage increases, power loss decreases / ORA ✓ As voltage doubles, power loss reduces by a factor of 4 / ORA / AW ✓	2	3.1a 3.1a	ALLOW shown by data, e.g. (200,720) to (400,180) means power loss decreases ALLOW shown by data, e.g. (200,720) to (400,180) means power loss quarters IGNORE Negative Correlation
		(iii)	less heat/energy lost in wires / current is low (as voltage is high) / AW ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
15	*		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 wave properties. AND Calculation of wave speed OR period OR frequency with correct units. AND Identifies amplitude, and wavelength. *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) Description of some wave properties. AND Calculation of wave speed OR period OR frequency. OR Identifies amplitude and wavelength. OR Detailed description of wave properties. AND Identifies amplitude OR wavelength. *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) Description of some wave properties.	6	2 × 1.1 4 x 2.2	AO1.1 – Demonstrates knowledge and understanding of wave properties • Wavelength of wave = distance between 2 successive peaks / troughs / 2 points which are in phase. • Frequency = number of waves passing a point per second. • Amplitude = height of crest or depth of trough from centre/AW AO2.2 – Applies knowledge and understanding of wave motion • Realises the graphs depict the same wave, so the amplitude is the same in both. • Identifies water as a transverse wave. • Identifies amplitude as 3 cm. • Identifies wavelength as 2 cm. • Identifies period as 2 s. • Calculates frequency as 1 wave per 2 s = 0.5 Hz. • Calculates wave speed as $v = f\lambda = 0.5 \times 2 = 1$ cm / s OR 0.01 m / s

Question			Answer	Marks	AO element	Guidance
			OR Calculation of wave speed OR period OR frequency. OR Identifies amplitude OR wavelength. *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
16	(a)		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 2 (°C / min) award 3 marks 10 ✓ 10 / 5 ✓ = 2 (°C / min) ✓	3	 2.2 2.2 2.2	 ALLOW 60/5 for 1 mark
	(b)	(i)	(As time increases), temperature decreases / ORA ✓ Decrease in temperature rapid at start / temperature decreases at a decreasing rate / ORA ✓	2	3.1a 3.1a	ALLOW examples e.g. (in the first minute) it goes down (from 70°C to 67°C) ALLOW inverse relationship IGNORE negative correlation ALLOW value for temperature getting smaller as time increases ALLOW not linear / not proportional / change is less gradual / (change) slower at end / ORA ALLOW comparison of two data points

		(ii)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 8000 (J) award 3 marks 0.2 × 4200 × 10 ✓ 8400 (J) ✓ = 8000 (J) (1sf) ✓	3	 2.1 2.1 1.2	 ECF from 11(a) for temperature change ALLOW answer of = 1680 (J) for 1 mark ALLOW answer of = 2000 (J) for 2 marks ALLOW correct sf from candidate's calculation
	(c)		Thermal/energy/heat <u>store</u> (in water) decreases / AW ✓ Thermal/energy/heat <u>store</u> in surrounding/air increases / AW ✓	2	1.1 1.1	 ALLOW energy is transferred from the thermal/energy/heat <u>store</u> (of the water) to the surroundings for 2 marks
	(d)	(i)	Any line with a smaller gradient than the line on the graph ending at a temperature between 61 °C and 69 °C ✓	1	3.2a	DO NOT ALLOW horizontal line at 70 °C
		(ii)	Increase thickness of the beaker or insulation / decrease thermal conductivity of the beaker or insulation / put the insulation on the top of the beaker / use a lid / put insulation under the beaker / AW ✓	1	1.1	ALLOW increase the temperature of the room / keep the room temperature the same as the water IGNORE reduce the temperature of the water / put in the sun / use a (hot) water bath

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