



**General Certificate of Secondary Education
2021–2022**

**Single Award Science
Physics**

Unit 3
Foundation Tier

[GSA31]

WEDNESDAY 24 NOVEMBER, MORNING

**MARK
SCHEME**

General Marking Instructions

Introduction

Mark schemes are intended to ensure that the GCSE examinations are marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria which they should apply in allocating marks to candidates' responses.

Assessment objectives

Below are the assessment objectives for GCSE Single Award Science

Candidates must:

- AO1** Demonstrate knowledge and understanding of scientific ideas, scientific techniques and procedures;
- AO2** Apply knowledge, skills and understanding of scientific ideas, scientific enquiry, techniques and procedures; and
- AO3** Analyse information and ideas to interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

Flexibility in marking

COVID-19 Context

Given the unprecedented circumstances presented by the COVID-19 public health crisis, senior examiners, under the instruction of CCEA awarding organisation, are required to train assistant examiners to apply the mark scheme in case of disrupted learning and lost teaching time. The interpretation and intended application of the mark scheme for this examination series will be communicated through the standardising meeting by the Chief or Principal Examiner and will be monitored through the supervision period. This paragraph will apply to examination series in 2021–2022 only.

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking

Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Marking Calculations

In marking answers involving calculations, examiners should apply the 'own figure rule' so that candidates are not penalised more than once for a computational error.

Types of mark schemes

Mark schemes for tasks or questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

Levels of response

Tasks and questions requiring candidates to respond in extended writing are marked in terms of levels of response. In deciding which level of response to award, examiners should look for the 'best fit' bearing in mind that weakness in one area may be compensated for by strength in another. In deciding which mark within a particular level to award to any response, examiners are expected to use their professional judgement. The following guidance is provided to assist examiners.

- **Threshold performance:** Response which just merits inclusion in the level and should be awarded a mark at or near the bottom of the range.
- **Intermediate performance:** Response which clearly merits inclusion in the level and should be awarded a mark at or near the middle of the range.
- **High performance:** Response which fully satisfies the level description and should be awarded a mark at or near the top of the range.

Quality of written communication

Quality of written communication is taken into account in assessing candidates' responses to all tasks and questions that require them to respond in extended written form. These tasks and questions are marked on the basis of levels of response. The description for each level of response includes reference to the quality of written communication.

For conciseness, quality of written communication is distinguished within levels of response as follows:

Level 1: Quality of written communication is basic.

Level 2: Quality of written communication is good.

Level 3: Quality of written communication is excellent.

In interpreting these level descriptions, examiners should refer to the more detailed guidance provided below:

Level 1 (Basic): The candidate makes only a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary. Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

Level 2 (Good): The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

Level 3 (Excellent): The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

1	(a)	Solar System	[1]	5									
	(b)	4th planet from the Sun labelled M	[1]										
	(c)	E	[1]										
	(d) (i)	Increases the time to orbit increases	[1]										
	(ii)	Observation of the Earth/weather monitoring/astronomy/ communications/spying	[1]										
2	(a)	B [1] C [1]	[2]	5									
	(b)	<table><tr><th>Description</th><th>Renewable source</th></tr><tr><td>energy from sunlight</td><td>biomass</td></tr><tr><td>energy from burning dead plants</td><td>solar</td></tr><tr><td>energy from moving water on the surface of the sea</td><td>wave</td></tr><tr><td></td><td>hydroelectric</td></tr></table>			Description	Renewable source	energy from sunlight	biomass	energy from burning dead plants	solar	energy from moving water on the surface of the sea	wave	
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energy from sunlight	biomass												
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energy from moving water on the surface of the sea	wave												
	hydroelectric												
	(c)	C	[1]										
3	(a)	Floor/door	[1]	3									
	(b)	The thicker the insulation the less heat is lost [1] the lower the house temperature the less heat is lost [1]	[2]										

4	(a) 28 °C	[1]	AVAILABLE MARKS
	(b) Fair test	[1]	
	(c) Poorer absorber	[1]	
	(d) (i) ↓ ↑	[1]	
	(ii) Convection	[1]	5
5	(a) (i) 3 bars correct [1] 4 bars correct [2]	[2]	6
	(ii) Increases	[1]	
	(b) Thinking	[1]	
	(c) Air bag [1] seat belt [1]	[2]	
6	(a) (i) 1000/250 [1] 4 [2]	[2]	6
	(ii) 5A	[1]	
	(iii) 0.75 mm ²	[1]	
	(b) B C A E All 4 correct [2] any 2 in correct order [1]	[2]	

7	(a)	$100 - (10 + 11.5 + 50 + 14 + 0.5)/86$ [1] 14% [2]	[2]	AVAILABLE MARKS												
	(b)	Background	[1]													
	(c)	<table><tr><th>Source</th><th>Caused by humans</th></tr><tr><td>nuclear weapons</td><td>✓</td></tr><tr><td>radon gas</td><td></td></tr><tr><td>x-rays from hospitals</td><td>✓</td></tr><tr><td>cosmic rays</td><td></td></tr><tr><td>granite rock</td><td></td></tr></table>	Source		Caused by humans	nuclear weapons	✓	radon gas		x-rays from hospitals	✓	cosmic rays		granite rock		[2]
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granite rock																
(d)	1.8 cps	[1]														
(e)	John [1] Adrian [1]	[2]														
8	(a)	0 V	[1]	8												
	(b) (i)	Parallel	[1]													
	(ii)	0.2 A [1] 0.4 A [1]	[2]													
	(iii)	Any two from: - if one bulb goes out the rest stay on - as more lights go on the brightness stays the same - independent switching - bulbs are brighter (than in a series circuit)	[2]													
9	(a) (i)	$\longleftrightarrow$ drawn in box	[1]	6												
	(ii)	Energy	[1]													
	(iii)	$\longleftrightarrow \bullet \longrightarrow$	[1]													
	(b)	One	[1]													
	(c) (i)	2.5 m	[1]													
	(ii)	8 m	[1]													

- 10 (a) 12.5–15.0 [1]
- (b) At 80 mg of alcohol there is still a 3.5% increased risk of crashing. [1]
- (c) Any **two** from:
- the higher the number of units of alcohol the greater the blood alcohol content
 - the greater the mass the lower the blood alcohol content (for the same number of units)
 - for the same number of alcohol units and the same body mass, females have a higher BAC than males [2]

11 Indicative content

- measure distance to the wall
- using tape measure/metre stick/trundle wheel
- use a stop watch
- make a sound and start the stop watch
- hear the echo and stop the watch
- repeat 3 times (and find an average value)
- double the distance/half the time value
- speed = distance/time or correct description of calculation

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully, in a logical sequence, how the speed of sound is measured (using at least five of the above points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to partially describe, in a logical sequence, how the speed of sound is measured (using three or four of the above points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe how the speed of sound is measured (using one or two of the above points). However these are not in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

Total

AVAILABLE
MARKS

4

6

60