Rewarding Learning

General Certificate of Secondary Education
2023–2024

Single Award Science: Physics

Unit 3

Higher Tier

[GSA32]

WEDNESDAY 15 NOVEMBER 2023, 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

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.

					AVAILABLE MARKS
1	**(a)**	**(i)**	4 cm	[1]	
		(ii)	12 cm	[1]	
	(b)		20 s	[1]	
	(c)	**(i)**	Any named EM wave	[1]	
		(ii)		[1]	5
2	**(a)**	**(i)**	Steady speed from **A** to **B** [1] stopped from **B** to **C** [1]	[2]	
		(ii)	Faster steady speed from **C** to **D**	[1]	
	(b)		150 ÷ 50 [1] 3 m/s [1]	[2]	5
3	**(a)**		Plot 4 points correctly [1] plot all 5 points correctly [2] smooth line of best fit [1]	[3]	
	(b)		As distance increases, count rate decreases [1] count rate remains constant from 1.2 m [1]	[2]	
	(c)		16 cpm	[1]	6

	AVAILABLE MARKS

4 Indicative content

- voltmeter connected in parallel
- ammeter connected in series
- change voltage in ammeter and voltmeter
- record current and voltage
- repeat for different voltages
- graph of V against I drawn/table of results drawn
- graph is straight line through origin/trend in table
- current is proportional to voltage/V = IR

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully how this circuit can be used to verify Ohm's Law (using **at least 6** 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 how this circuit can be used to verify Ohm's Law (using **3 to 5** 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 this circuit can be used to verify Ohm's Law (using **1 or 2** 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] 6

5 (a) (i) Convection [1]

(ii) Up arrow at **X** and Down arrow at **Y** [1]

(b) (i) 106 – 24 [1]
82 [1] [2]

(ii) Value greater than 106 [1]

(iii) Same length of rod/same thickness of rod [1]

(c) Any **three** from:

- conduction
- atoms/molecules vibrate
- free electrons
- electrons have more momentum/move faster [3] 9

					AVAILABLE MARKS
6	**(a)**	As speed increases, distance increases [1] up to 18 mph/420 miles then decreases [1]		[2]	
	(b)	Energy when braking [1] used to recharge battery [1]		[2]	
	(c)	Fossil fuels are running out/non-renewable		[1]	5
7	**(a)**	**(i)**	Ultraviolet	[1]	
		(ii)	As wavelength increases, frequency decreases	[1]	
	(b)	Any 2 values from same row multiplied together [1] 3×10^8 [1]		[2]	
	(c)	**(i)**	Water molecules [1] absorb microwaves [1] molecules vibrate faster producing heat [1]	[3]	
		(ii)	Mobile phones	[1]	8
8	**(a)**	**(i)**	As time increases, galaxies move further apart/Universe is expanding [1] starts from a singularity/single point [1]	[2]	
		(ii)	Red shift	[1]	
		(iii)	Steady state theory	[1]	
	(b)	Milky Way		[1]	
	(c)	Distances are enormous/billions of kilometres		[1]	6
9	**(a)**	400 g to 0.4 kg conversion [1] $20^2 = 400$ [1] 80 J [1]		[3]	
	(b)	**(i)**	Kinetic energy decreases, potential energy increases [1] kinetic energy starts from a maximum/potential energy increases to a maximum [1]	[2]	
		(ii)	Conservation of Energy	[1]	6
10	**(a)**	Balanced forces [1] steady speed [1]		[2]	
	(b)	**(i)**	12 N to right/forwards	[1]	
		(ii)	Acceleration	[1]	**4**
				Total	**60**