



**General Certificate of Secondary Education
2025**

Science: Physics

Unit 2

Foundation Tier

[GPY21]

MONDAY 16 JUNE, 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 Physics

Candidates must:

- AO1** Demonstrate knowledge and understanding of scientific ideas, scientific techniques and procedures;
- AO2** Apply knowledge 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 (QWC) 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 A: Quality of written communication is excellent.

Level B: Quality of written communication is good.

Level C: Quality of written communication is basic.

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

Level A (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 and spelling, punctuation and grammar (SPG) are of a sufficiently high standard to make meaning clear.

Level B (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 and spelling, punctuation and grammar (SPG) are sufficiently competent to make meaning clear.

Level C (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 and spelling, punctuation and grammar (SPG) may be such that intended meaning is not clear.

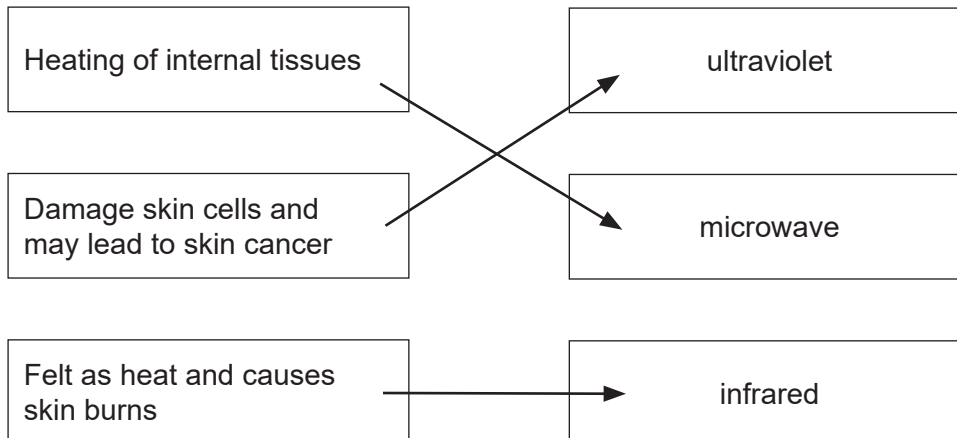
Where one response is required to gain a mark, candidates will not gain credit if a correct response is given alongside one or more incorrect responses. This is referred to as listing.

- 1 (a) (i) Wavelength = $\frac{90}{1.5}$ or $\frac{120}{2}$ [1]
= 60 (cm) [1]
- (ii) Amplitude = 5 (cm) [1]
- (iii) $f = \frac{v}{\lambda}$ (or equivalent) [1]
= $\frac{300}{60}$ {ecf for λ from (i)} [1]
= 5 [1]
Hz (or Hertz) [1] [7]

- (b) Like all waves, water waves transfer **energy**.
In a water wave the particles **vibrate** in a direction which is **perpendicular** to the direction in which the wave is travelling.
A water wave is an example of a **transverse** wave. [4]

- (c) (i) From 20 (Hz) to 20 000 (Hz.) [1]
- (ii) Ultrasound is sound with frequency **above** 20 000 (Hz) [1]
- (iii) speed = $\frac{\text{distance}}{\text{time}}$ (or $s = \frac{d}{t}$ or equivalent) [1]
= $\frac{4200}{2.8}$ or $\frac{2100}{1.4}$ [2]
= 1500 (m/s) [1] [6]

- (d) Danger Electromagnetic wave



(penalty –1 for every line in excess of 3) [3]

AVAILABLE
MARKS

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- 2 (a) (i) Image clearly labelled at correct position (threshold) [1]
 1 ray correctly extended back to image [1]
 2nd ray correctly extended back to image [1]

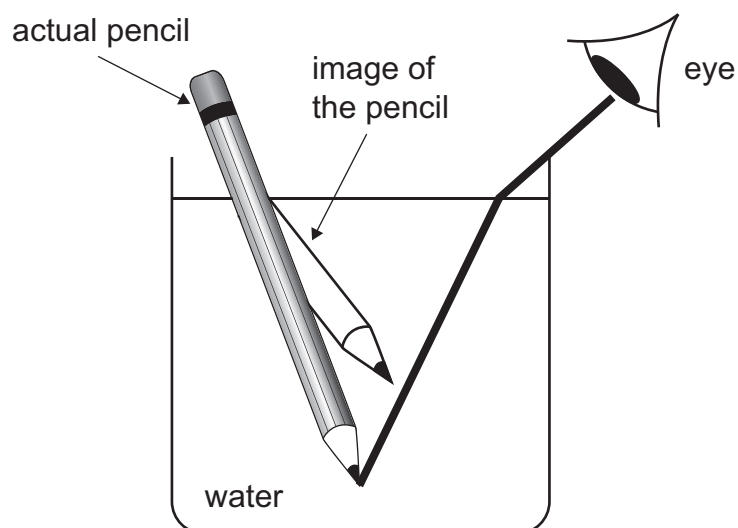
(ii)

Property of Image	Place (✓)
Real	
Virtual	✓
Larger than O	
Smaller than O	
Same size as O	✓
Double the distance from mirror as O	
Same distance from mirror as O	✓

[3]

- (iii) Left on the object appears right on the image [1] [7]

- (b) (i) Straight line from tip of pencil to water surface [1]
 Ray refracted away from normal to the eye – must be able [1]
 to be extended back to tip of image of pencil



- (ii) Light travels faster in air than in water or [1]
 or refraction of light as it travels from water [3]
 to air
- (c) (i) Ray parallel to principal axis refracted to top of image [1]
 Ray through optical centre un-deviated to top of image [1]
 Arrows on at least one ray [1]
- (ii) F clearly marked where 1st ray cuts Pr axis [1]
- (iii) Focal length = 2 cm [1]
- (iv) Projector [1] [6]
- (d) (i) Diagram 2 [1]
- (ii) Converging or convex lens [1] [2]

AVAILABLE
MARKS

- 3 (a) (i) Conductors have free electrons [1]
- (ii) Flow of electrons [1]
- (iii) $Q = It$ or charge = current $\times$ time [1]
 $= 0.5 \times 20$ [1]
 $= 10$ (coulombs) [1]
- (iv) 1.5 (V) [1] [6]
- (b) (i) Resistance = $6.0 + 4.0 + 2.0 = 12.0$ (Ω) [1]
- (ii) $I = \frac{V}{R}$ [1]
 $= \frac{3}{12}$ ecf for resistance from (i) [1]
 $= 0.25$ (A) [1]
- (iii) $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{5} + \frac{1}{5}$ if no further mark award [1]
 $R = 2.5$ (Ω) or $R = \frac{R_1 R_2}{R_1 + R_2} = \frac{5 \times 5}{5 + 5}$
 $= 2.5$ (Ω) [2] [6]
- (c) (i) Ammeter in series [1]
Voltmeter in parallel [1]
- (ii) Close the switch and take readings then open switch [1]
or switch off between readings to allow wire to cool
- (iii) Straight line [1] through origin [1] [2] [5]
- (d) Live, neutral, earth (all three required) [1]
Earth wire [1]
Earth provides a low resistance [1]
Large current flows [1]
Fuse blows or melts [1]
Appliance disconnected from mains [1]

Response	Mark
Candidate describes in detail using good spelling, punctuation and grammar 5 or more points shown above. The form and style are of a high standard and specialist terms are used appropriately at all times.	[5]–[6]
Candidate describes in detail using good spelling, punctuation and grammar 3 or 4 points shown above. The form and style are of a high standard and specialist terms are used appropriately at all times.	[3]–[4]
Candidates make some reference to 1 or 2 of the main points shown above using satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made some reference to specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

[6]

AVAILABLE
MARKS

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				AVAILABLE MARKS
4	(a) (i)	Top is S bottom is N	[1]	10
		(ii) Increase current/more cells	[1]	
		Increase number of turns	[1]	
	(b)	Insert soft iron core	[1]	
		(i) To link the coils magnetically or to ensure the magnetic field passes through both coils	[1]	
		(ii) Primary turns greater than secondary turns or converse	[1]	
		(iii) Part 2 = a.c. Part 3 = a.c.	[2]	
		(iv) Step up at power station Step down at homes	[1] [1]	
			[6]	
5	(a) (i)	A = Venus	[1]	9
		B = Mars	[1]	
		(ii) Gas planets	[1]	
	(b)	(iii) Gravity	[1]	
		hydrogen and helium	[2]	
		fusion	[1]	
	(c) (i)	Red shift also accept cosmic microwave background radiation or CMBR	[1]	
		(ii) Space is expanding or galaxies moving apart	[1]	
			[2]	
	Total			80