



*Rewarding Learning*

**General Certificate of Secondary Education  
2024**

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**Science: Physics**

Unit 2

Foundation Tier

**[GPY21]**

**TUESDAY 18 JUNE, MORNING**

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**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.

- 1 (a) (i) Vibrations/oscillations [1]  
 Transverse perpendicular to wave direction/energy flow [1]  
 Longitudinal parallel to wave direction/energy flow [1]
- (ii) Transverse – any em wave or water or on a string [1]  
 Longitudinal – sound or ultrasound [1] [5]
- (b) (i) C [1]
- (ii) B [1]
- (iii) 12 waves pass a point [1]  
 in 1 second [1] [4]
- (c) (i) The waves travel more slowly in the shallow water [1]  
 or change of speed [1]
- (ii) The wavefronts are closer or direction changes [1]
- (iii) Direction correct [1]  
 Spacing of reflected wavefront the same [1]  
 as incident wavefront [1]  
 Reflected wavefronts parallel [1] [5]
- (d) **Indicative content**  
 Microwaves faster than sound  
 Microwave is reflected/bounced/echo  
 To allow the reflected wave to be detected or allow separation of pulses  
 (Measure) time  
 The speed (of the microwave)  
 Distance = time × speed  
 Dividing by two

| Response  | Mark    |
|---|---------|
| Candidate describes in detail using good spelling, punctuation and grammar <b>5 or more</b> 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 <b>3 or 4</b> 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 <b>1 or 2 of the main points</b> 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

20

|                  |   |            | AVAILABLE MARKS |
|------------------|---|------------|-----------------|
| <b>2 (a) (i)</b> | Erect   | [1]        |                 |
|                  | Same size   | [1]        |                 |
|                  | Virtual   | [1]        |                 |
|                  | [1] each deduct [1] for each tick above 3   |            |                 |
| <b>(ii)</b>      | Distance between toy and mirror = 65 cm   | [1]        |                 |
|                  | Distance between toy and image = $65 + 65 = 130$ cm   | [1]        | [5]             |
| <b>(b) (i)</b>   | Normal  | [1]        |                 |
| <b>(ii)</b>      | Angle $i$ marked between ray and normal   | [1]        |                 |
| <b>(iii)</b>     | Refracted ray on RIGHT side of normal<br>(threshold mark)   | [1]        |                 |
|                  | with $i$ greater than $r$   | [1]        |                 |
| <b>(iv)</b>      | Increases   | [1]        | [5]             |
| <b>(c) (i)</b>   | Dispersion  | [1]        |                 |
| <b>(ii)</b>      | Correct refraction at entry   | [1]        |                 |
|                  | Correct refraction at exit  | [1]        |                 |
|                  | Red above violet (labelled)   | [1]        |                 |
| <b>(iii)</b>     | Each colour has a different wavelength<br>or speed in glass   | [1]        | [5]             |
| <b>(d) (i)</b>   | Distance between principal focus/focal point<br>and (centre of) lens/optical centre   | [1]        |                 |
|                  | <b>(ii)</b> Top ray refracts through F<br>Bottom ray refracts through F<br>If neither through F, but both refract in correct sense,<br>award 1 mark | [1]<br>[1] |                 |
| <b>(iii)</b>     | (White) screen  | [1]        |                 |
|                  | Ruler/metre stick or equivalent   | [1]        | [5]             |
|                  |   |            | 20              |

|   |     |  | AVAILABLE MARKS  |     |                   |     |
|---|-----|--|--|-----|-------------------|-----|
| 3   | (a) | (i) Wire and colour 1 each   | [3]  | 19  |                   |     |
|   |     | (ii) Fuse labelled   | [1]  |     |                   |     |
|   |     | (iii) Not a complete circuit   | [1]  |     |                   |     |
|   |     | (iv) Move contact from B to C  | [1]  |     |                   |     |
|   |     | (v) $P = IV$ or $I = P/V$<br>$I = 700/220$<br>$= 3.2 \text{ A}$<br>5 A fuse selected | [1]<br>[1]<br>[1]<br>[1]   |     | [10]              |     |
|   | (b) | (i)  | $V = IR$<br>$= 10 \times 0.3$<br>$= 3.0 \text{ V}$   |     | [1]<br>[1]<br>[1] |     |
|   |     |  | (ii) The ammeter reading reduced<br>Resistance has increased or<br>Resistance has doubled or the current is halved |     | [1]<br>[1]        | [5] |
|   |     |  | (c)  |     | (i) Parallel      | [1] |
|   |     | (ii) Two $40 \Omega$   | [1]  |     | [2]               |     |
|   | (d) | A1 = 0.5 A<br>A2 = 0.5 A<br>V1 = 1.5<br>V2 = 1.5 V 1/2 each, round down              |  |     | [2]               |     |
|   | 4   | (a)  | Polarity correct   |     | [1]               |     |
|   |     |  | One field line drawn   |     | [1]               |     |
|   |     |  | Loops N to S or central line from the north  |     | [1]               | [3] |
|   |     | (b)  | (i) A current or voltage is induced/produced/created/flows   |     | [1]               |     |
| (ii) The pointer moves to the left then right/+ to -/<br>one side to another<br>Repeatedly/continuously |     |  | [1]<br>[1]   | [3] |                   |     |
| (c)   |     | (i)  | 1. step-up   | [1] |                   |     |
|   |     |  | 2. increase  | [1] |                   |     |
|   |     |  | 3. alternating   | [1] |                   |     |
| (ii) (Stepping up the voltage) reduces the current<br>So less energy lost (or heat loss in the cables)  |     | [1]<br>[1]   | [5]  | 11  |                   |     |

|                  |   |              | AVAILABLE MARKS |
|------------------|---|--------------|-----------------|
| <b>5 (a) (i)</b> | Neptune – gas<br>Saturn – gas<br>Earth – rocky<br>Jupiter – gas<br>(1/2 each, round up) | [2]          |                 |
|                  | <b>(ii)</b> Uranus  | [1]          |                 |
|                  | <b>(iii)</b> Gravity  | [1]          |                 |
|                  | <b>(iv)</b> Asteroids   | [1]          |                 |
|                  | <b>(v)</b> Weather monitoring/astronomy/communications/espionage                        | [1]          | [6]             |
| <b>(b) (i)</b>   | Oxygen<br>It indicates the possibility of life  | [1]<br>[1]   |                 |
|                  | <b>(ii)</b> Examination of light<br>Which has passed through the planet's atmosphere    | [1]<br>[1]   | [4]             |
|                  |   | <b>Total</b> | <b>10</b>       |
|                  |   |              | <b>80</b>       |