



**General Certificate of Secondary Education  
2019**

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**GCSE Physics**

Unit 1  
Foundation Tier

**[GPY11]**

**THURSDAY 30 MAY, AFTERNOON**

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**MARK  
SCHEME**

## **General Marking Instructions and Mark Grids**

### ***Introduction***

Mark schemes are intended to ensure that the GCSE examination is 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 that they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these marking instructions.

### ***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, the examiners should seek the guidance of the Supervising Examiner.

### ***Positive marking***

Examiners must be positive in their marking, giving appropriate credit for description, explanation and analysis, using knowledge and understanding and for the appropriate use of evidence and reasoned argument to express and evaluate personal responses, informed insights and differing viewpoints. Examiners should make use of the whole of the available mark range of 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.

### ***Types of mark scheme***

Mark schemes for 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.

1 (a) (i) Statement 3 [1]

(ii) Acc = gradient

or = change in velocity(speed)/time or  $a = \frac{v}{t}$

do not accept  $a = \frac{v}{t}$  for partial credit [1]

= 80/20 or (80 – 0)/20 [1]

= 4.0 [1]

m/s<sup>2</sup> [1] [4]

(iii) F = ma [1]

=  $8.9 \times 10^4 \times 4.0$  ecf from (ii) for acc [1]

=  $3.6 \times 10^5$  ( $3.56 \times 10^5$ ) or 356,000 [1]

N [1] [4]

(b) Distance = area under graph [1]

=  $5 \times 55 + \frac{1}{2}(55 \times 50)$  or  $\frac{1}{2}(5 + 55) \times 55$  [2]

= 1650 (m) [1]

= 1.65 (km) [1] [5]

(c) Indicative content

*Timer started at Camera 1/Marker 1 or Time recorded*

*Timer stopped at Camera 2/Marker 2 or Time recorded*

*If time interval too small or too short*

*Time interval too quick – give [0]*

*Speed calculated using d/t or 2000/t*

*Photograph identifies driver/car/not to mix up cars*

*Slows between the cameras*

*It only measures average speed*

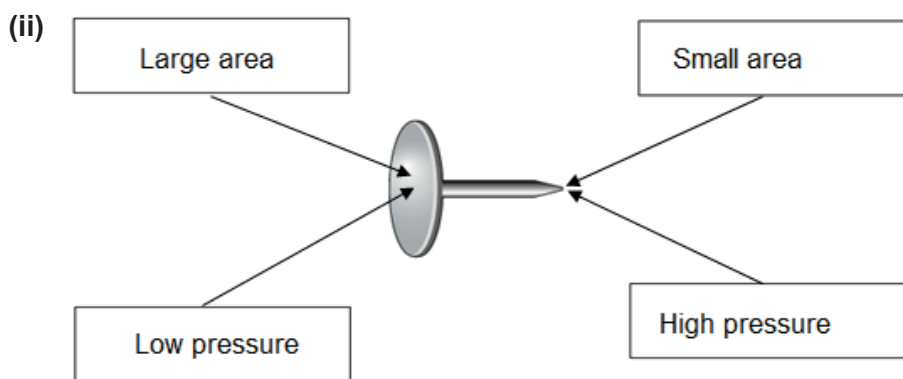
| Response                                                                                                                                                                                                                                      | Mark    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 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

- 2 (a) (i) When there is balanced forces/absence of unbalanced forces  
or  $F_{\text{RES}} = 0$  [1]  
constant speed/velocity or at rest (both required) [1] [2]
- (ii) Resultant force = 5 (N) [1]  
Direction To the left or backward [1] [2]
- (iii) No. The forces are not balanced/  
or there is a resultant force [1]
- (b) (i) *The weight of an object is the **FORCE**  
on the object due to gravity* [1]  
*The **MASS** of an object is defined as the  
amount of **MATTER** in an object and is  
measured in **KILOGRAMS*** [1]  
[1] [4]
- (ii) Weight = 10(N) [1]
- (iii) Both reach the ground at **same time** – box ticked before  
second mark can be given [1]  
They fall at the same rate regardless of mass [1] [2]
- (c) (i) 4 cm [1]
- (ii) Extension = 10 cm [1]  
Length = 10 + 10 = 20 cm [1] [2]
- (d) (i)  $P = F/A$  [1]  
= 700/0.05 [1]  
= 14 000 (Pa) [1] [3]



[1] per side

[2]

AVAILABLE  
MARKS

20

|                                                                                                                                                                                                                                                | AVAILABLE MARKS |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>3 (a)</b> Density = Mass/Volume or $D = M/V$ [1]                                                                                                                                                                                            |                 |
| <b>(b) (i)</b> Volume = $42 - 24$ [1]<br>$= 18 \text{ (cm}^3\text{)}$ [1] [2]                                                                                                                                                                  |                 |
| <b>(ii)</b> Density = $153/18$ [1]<br>$= 8.5 \text{ (g/cm}^3\text{)}$ (possible ecf from <b>(ii)</b> ) [1] [2]                                                                                                                                 |                 |
| <b>(iii)</b> Lower brass gently or avoid splashes/read vol at eye level/<br>read to bottom of meniscus [1]                                                                                                                                     |                 |
| <b>(iv)</b> Larger volume [1]                                                                                                                                                                                                                  |                 |
| <b>(c) (i)</b> Spacing or distance between the atoms/molecules/particles [1]<br>Is greater in the gas than in the solid [1] [2]<br><b>or</b> the converse<br>comparison required<br>Accept more tightly packed in solids [1] than in gases [1] |                 |
| <b>(ii)</b> Spacing greater in the ice or converse [1]                                                                                                                                                                                         | 10              |
| <b>4 (a)</b> Block on left matt black surface [1]<br>It is BETTER absorber (than shiny surface) [1] [2]<br>or converse comparison required<br>arguments in terms of conduction – give [0]                                                      |                 |
| <b>(b) (i)</b> (Install cavity wall) insulation, insulate wall [1]                                                                                                                                                                             |                 |
| <b>(ii)</b> Rock/mineral wool/fibreglass wool/urea formaldehyde/polystyrene<br>beads/foam (or equivalent) [1]<br>do not accept “wool”                                                                                                          |                 |
| <b>(c) (i)</b> $W = F \times d$ [1]<br>$= 500 \times 3$ [1]<br>$= 1500 \text{ (J)}$ [1] [3]                                                                                                                                                    |                 |
| <b>(ii)</b> Energy in = useful energy out/efficiency (or equivalent) [1]<br>e.g. $\text{Eff} = \frac{E}{EI}$<br>$= 2730/0.7$ [2]<br>$= 3900 \text{ (J)}$ [1]                                                                                   |                 |
| Alternative scheme for <b>(ii)</b><br>Efficiency = $\frac{\text{energy out}}{\text{energy in}}$ [1]<br>$0.7 = \frac{2730}{\text{eff}}$ [1]<br>Energy in = $\frac{2730}{0.7}$ [1]<br>$= 3900$ [1] [4]                                           |                 |
| <b>(iii)</b> $P = \text{Work/time (or equivalent)}$ or $= \frac{W}{t}$ [1]<br>$= 2800/3.5$ [1]<br>$= 800$ [1] [3]                                                                                                                              |                 |

|       |      |                                                                 |                                                                                                                                                    |                    |
|-------|------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
|       |      |                                                                 |                                                                                                                                                    | AVAILABLE<br>MARKS |
| (d)   | (i)  | Strain or elastic<br>do not accept potential                    | [1]                                                                                                                                                |                    |
|       | (ii) | $E_k = \frac{1}{2} mv^2$ or equivalent                          | [1]                                                                                                                                                | 20                 |
|       |      | $75 = \frac{1}{2} \times 0.2 \times v^2$ (1 subs mark per side) | [2]                                                                                                                                                |                    |
|       |      | $v^2 = 750$ or $v = \sqrt{750}$                                 | [1]                                                                                                                                                |                    |
|       |      | $v = 27.4$ (m/s)                                                | [1] [5]                                                                                                                                            |                    |
| 5     | (a)  | (i)                                                             | We cannot say when a particular nucleus will decay<br>Decay unpredictable<br>Do <b>not</b> accept “nothing we can do to make it happen/not happen” | [1]                |
|       |      | (ii)                                                            | Radioactivity/radioactive decay                                                                                                                    | [1]                |
|       |      | (iii)                                                           | Gamma                                                                                                                                              | [1]                |
|       |      |                                                                 | Alpha                                                                                                                                              | [1]                |
|       |      |                                                                 | Beta                                                                                                                                               | [1] [3]            |
|       | (b)  | (i)                                                             | (in 8 hours) the activity decreases by half or number of nuclei<br>count rate/radioactivity/mass<br>Do <b>not</b> accept radiation                 | [1]                |
|       |      | (ii)                                                            | 2048 (cps)                                                                                                                                         | [1]                |
|       |      | (iii)                                                           | (24 hours) = 3 half lives    Possible ecf from (ii)                                                                                                | [1]                |
|       |      |                                                                 | activity falls to $1/8 \times$ original activity                                                                                                   | [1]                |
|       |      |                                                                 | $2144 \rightarrow 1072 \rightarrow 536 \rightarrow 268$                                                                                            |                    |
|       |      |                                                                 | $2096 \rightarrow 1048 \rightarrow 524 \rightarrow 262$                                                                                            |                    |
|       |      |                                                                 | activity (= $1/8 \times 2048$ ) = 256 (cps)                                                                                                        | [1] [3]            |
|       |      |                                                                 | Evidence of halving is 2048 – 1024 give [1]                                                                                                        |                    |
| Total |      |                                                                 |                                                                                                                                                    | 80                 |