



*Rewarding Learning*

**General Certificate of Secondary Education  
2016**

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**Science: Physics**

Unit 2

Foundation Tier

**[GPH21]**

**FRIDAY 24 JUNE, MORNING**

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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 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***

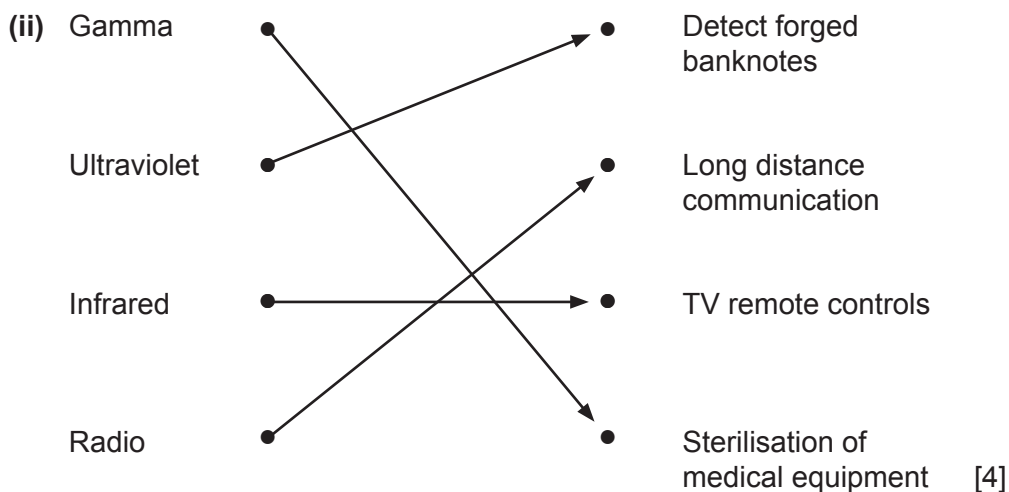
Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

### ***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) In order X-rays, Visible, Microwaves [3]



(b) (i) Transverse [1]

(ii) distance between successive crests/troughs is 2500000m [1] [1] [2]  
 give credit for a correct diagram between peaks/troughs award [1]

(iii)  $v = f\lambda$  must be an equation [1]  
 $= 0.002 \times 2500000$  [2]  
 $= 5000 \text{ (m/s)}$  [1] [4]

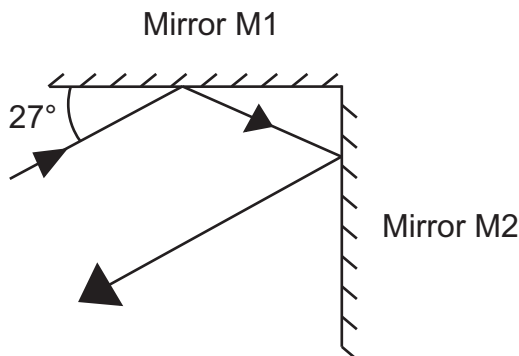
(c) (i) echo [1]

(ii) distance = speed  $\times$  time [1]  
 $= 1500 \times 0.00006$  [2]  
 $= 0.09 \text{ (m)}$  [1] [4]

(iii) X-rays kill/damage cells or are harmful to baby/change of DNA/suggestion of danger or damage or ultrasound does not/less harmful ('it' implies ultrasound) [1]

AVAILABLE MARKS
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- 2 (a) (i) Angle of reflection =  $63^\circ$  [1]
- (ii) Judge angles and direction by eye (Incident and reflected ray parallel) [2]



- (b) (i) Refraction [1]
- (ii) Normal drawn (and marked N) on both sides of boundary/interface [1]
- (iii) Angles of incidence and refraction marked both required [1]
- (iv) Light slows down [2]  
Change of speed give [1] Light speeds up give [0]
- (c) (i) Distance from the lens or optical centre to principal focus or focal point/or point to which parallel rays converge (meet) [1]  
Give credit for a correct diagram
- (ii) **Indicative content:**  
 Lens (in a holder)  
 Screen/white sheet/wall/paper  
 Metre rule/ruler/tape measure  
 Choice of distant object, e.g. a tree/window/more than 5 m away  
 Move lens until sharp image formed (on screen)/move screen  
 Focused or clear means sharp  
 Measure distance from lens to screen  
 Repeat **and** average (both required)

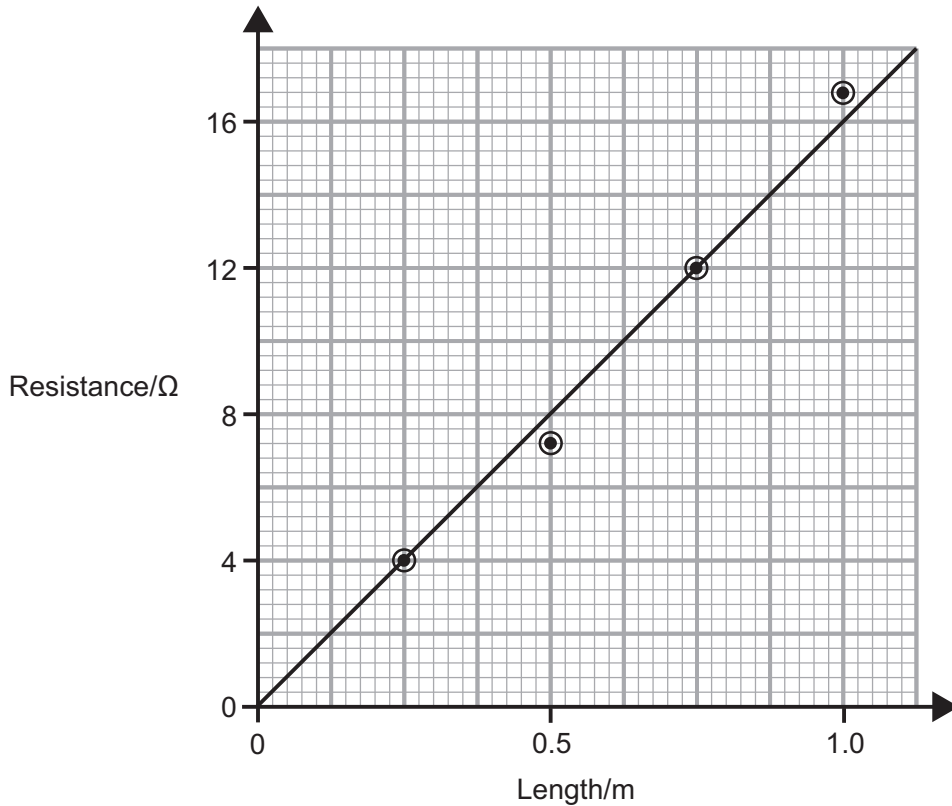
Response	Mark
Candidates describe in detail using good SPG at <b>least 5 points</b> shown opposite. The form and style are of a high standard and specialist terms are used appropriately at all times.	[5]–[6]
Candidates describe in detail using good SPG at <b>least 3 points</b> shown opposite. The form and style are of a high standard and specialist terms are used appropriately on some occasions.	[3]–[4]
Candidates make some reference to <b>one of the points</b> shown opposite using good SPG. The form and style are of a satisfactory but there is limited use of specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

[6]

AVAILABLE  
MARKS

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- 3 (a) (i) Suitable choice of scale on resistance axis [1]  
 At least half of the grid used.  
 Points correctly plotted  $\pm 1$  square  
 $[\frac{1}{2}]$  each round up to max [2]  
 Any (best) line fit through origin and through one other point [1] [4]

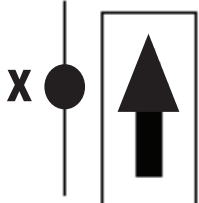


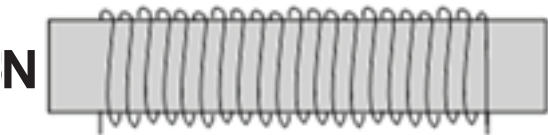
- (ii) Find the gradient/ $k = \frac{R}{L}$ /divide R by L/put values into equation [1]
- (iii) Gradient = rise/run =  $16 \pm 1$  consistent with their line [1]  
 Unit =  $\Omega/m$  or  $\frac{\Omega}{m}$  [1] [2]
- (b) (i)  $I = P/V$  or  $720/240$  [1]  
 $= 3$  (A) [1] [2]
- (ii)  $R = V/I$  or  $240/3$  ecf from (i) or  $P = I^2R$  or  $P = \frac{V^2}{R}$  [1]  
 $= 80$  ( $\Omega$ )  $R = 80$  ( $\Omega$ )  $R = 80$  ( $\Omega$ ) [1] [2]  
 (correct subs get 1 mark)
- (iii) length =  $80/40$  ecf from (ii) [1]  
 $= 2$  (m) [1] [2]
- (c) (i) 4.8 V [1]
- (ii) Cells/battery/power or voltage supply has not changed/  
 parallel circuit  
 If (c)(i) is wrong or missing (c)(ii) = [0] [1]
- (iii) 12 ( $\Omega$ ) [1]
- (iv) New resistance =  $12/2$  allow ecf from (c)(iii) [1]  
 $= 6$  ( $\Omega$ ) [1] [2]

AVAILABLE  
MARKS

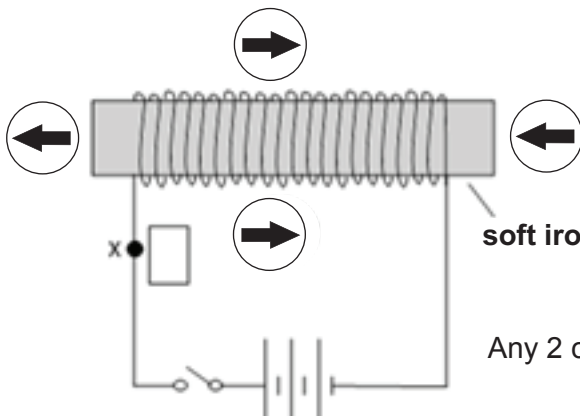
- (v) New current =  $4.8/6$  No ecf from (c)(i) [1]  
 or Resistance now  $\frac{1}{4}$  of original value [1]  
 = 0.8 (A) so current is 4 times as great [1] [2]

- 4 (a) (i) Step up [1]  
 (ii) Step down [1]  
 (iii) To reduce the voltage [1]  
 To safe value/named voltage 220–240 V/suitable voltage [1] [2]  
 for appliances  
 (iv) The voltage at the power station is stepped up [1]  
 This reduces the current in the transmission cables [1]  
 This reduces the heat loss in the cables/energy loss/  
 power loss [1] [3]

(b) (i)  Can be outside box near X [1]

(ii)  no ecf [1]  
 N S May be inside circle  
 Both poles needed

- (iii) [ $\frac{1}{2}$ ] each, round down [2]

 no ecf  
 soft iron core  
 Any 2 correct arrows gets 2 marks

- (iv) To make the current flow around the iron core [1]  
 otherwise electromagnet would not work [1] [2]  
 or to prevent short circuit/current does not flow through core  
 or core also conducts  
 To prevent electronic shock – give [0]

- (c) (i) Magnet [1]  
 (ii) a.c. [1]

AVAILABLE  
MARKS

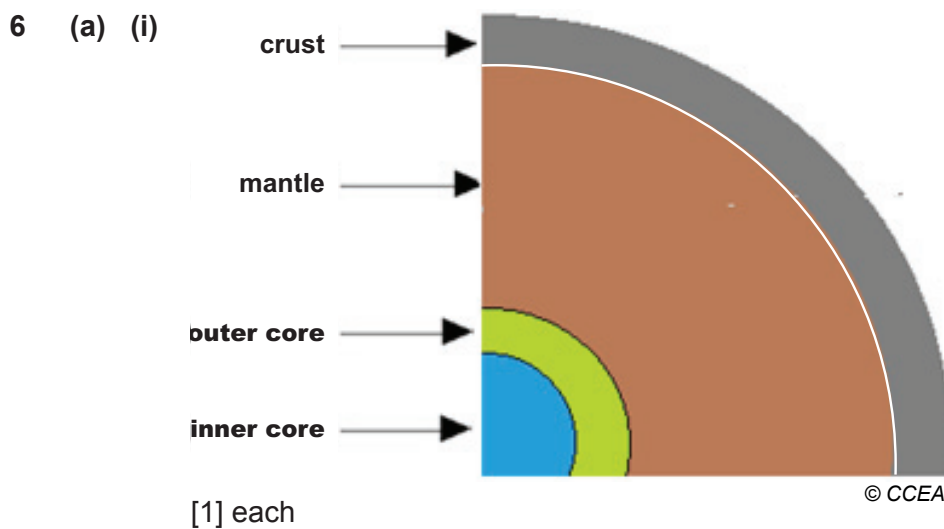
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- 5 (a) (i) 1 = Mercury  
2 = Venus  
3 = Mars  
4 = Neptune  
[1] each [4]
- (ii) The gravity (of the Sun) [1]
- (iii) The planets (orbit) in the same plane/move in same plane  
or orbit/spin around the Sun/move in the same direction [1]
- (b) (i) Hydrogen [1]  
Helium [1] [2]
- (ii) Light or spectra from/of the stars/Sun [1]
- (iii) Nuclear fusion [1]

AVAILABLE  
MARKS

10



[1] each [4]

(ii) Lithosphere [1]

(iii) Iron [1]  
Nickel [1] [2]

(b) They move (slowly)/collide [1]  
They stick/get caught [1]  
Sudden movement/jerk/lurch [1] [3]

**Total**

**90**