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Rewarding Learning

General Certificate of Secondary Education
2016

Science: Physics

Unit 2

Foundation Tier

[GPH21]

FRIDAY 24 JUNE, MORNING

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]

(ii)

Gamma   Detect forged banknotes

Ultraviolet   Long distance communication

Infrared   TV remote controls

Radio   Sterilisation of medical equipment   [4]

(b) (i) Transverse   [1]

(ii) distance between successive crests/troughs is 2 500 000 m   [1]   [1]   [2]
give credit for a correct diagram
between peaks/troughs award [1]

(iii) v = fλ   must be an equation   [1]
= 0.002 × 2 500 000   [2]
= 5000 (m/s)   [1]   [4]

(c) (i) echo   [1]

(ii) distance = speed × time   [1]
= 1500 × 0.00006   [2]
= 0.09 (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]   20

2 (a) (i) Angle of reflection = 63(°) [1]

(ii) Judge angles and direction by eye [2]
(Incident and reflected ray parallel)

Mirror M1

27°

Mirror M2
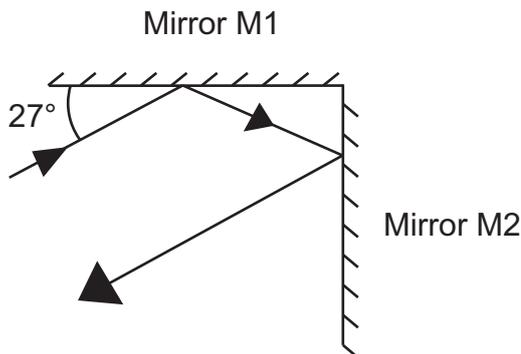
(b) (i) Refraction [1]

(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 least 5 points** 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 least 3 points** 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 **one of the points** 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]

15

3 **(a)** **(i)** Suitable choice of scale on resistance axis [1]
At least half of the grid used.
Points correctly plotted ± 1 square
[$\frac{1}{2}$] each round up to max [2] [2]
Any (best) line fit through origin and through one other point [1] [4]
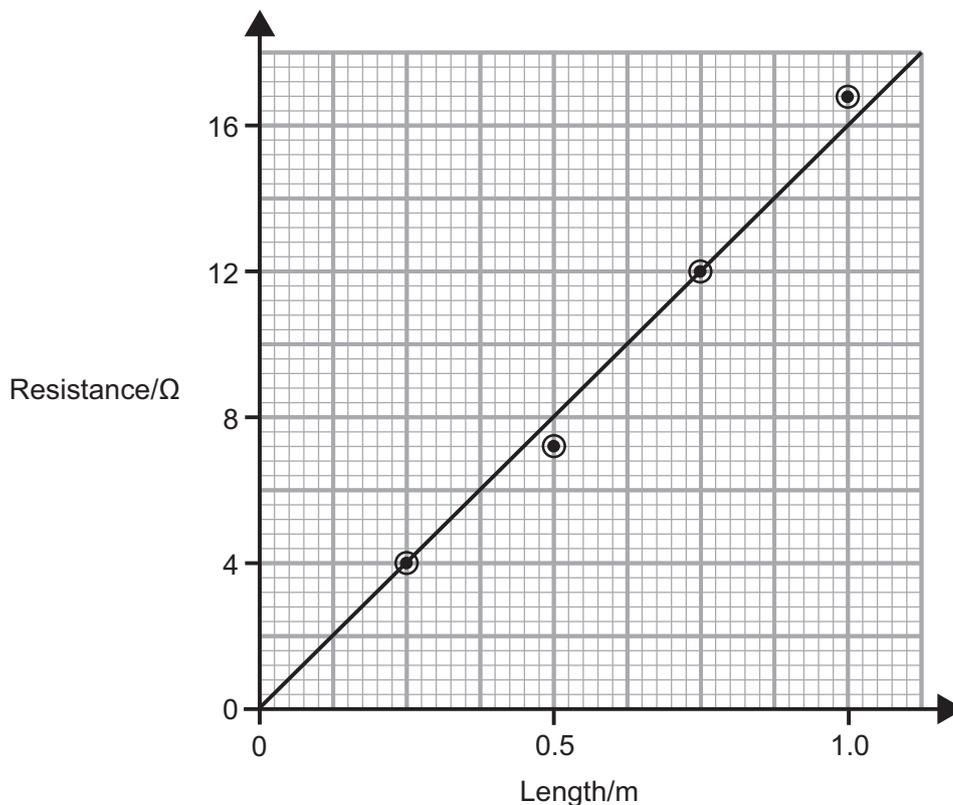
(ii) Find the gradient/k = $\frac{R}{L}$/divide R by L/put values into equation [1]

(iii) Gradient = rise/run = 16 ± 1 consistent with their line [1]
Unit = Ω/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 = I²R or P = $\frac{V^2}{R}$ [1]
= 80 (Ω) [1] [2]
R = 80 (Ω) R = 80 (Ω)
(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 (Ω) [1]

(iv) New resistance = 12/2 allow ecf from **(c)(iii)** [1]
= 6 (Ω) [1] [2]

			AVAILABLE MARKS

**(v)** New current = 4.8/6   No ecf from **(c)(i)**

or Resistance now $\frac{1}{4}$ of original value [1]

= 0.8 (A) so current is 4 times as great [1] [2]   20

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
for appliances [1] [2]

(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)**
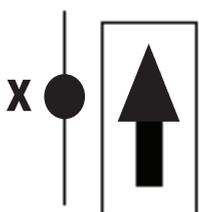
X ● Can be outside box near X [1]

(ii)
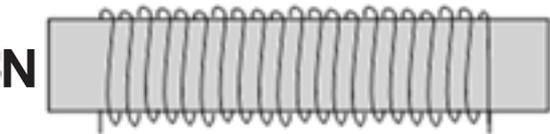
N   S **no ecf** [1]
May be inside circle
Both poles needed
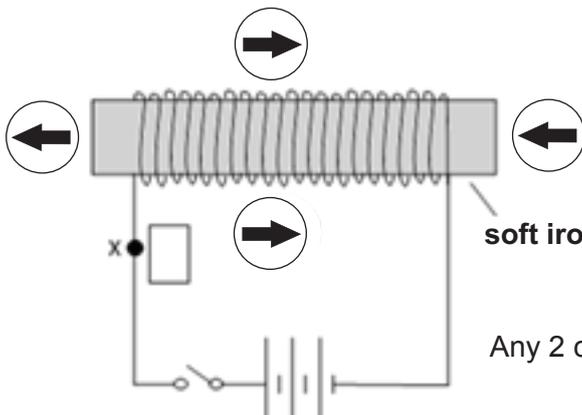
(iii) $[\frac{1}{2}]$ each, round down [2]

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]   15

						AVAILABLE MARKS

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 [1]
or orbit/spin around the Sun/move in the same direction

(b) **(i)** Hydrogen [1]
Helium [1] [2]

(ii) Light or spectra from/of the stars/Sun [1]

(iii) Nuclear fusion [1] 10

6 **(a)** **(i)**

crust →

mantle →

outer core →

inner core →

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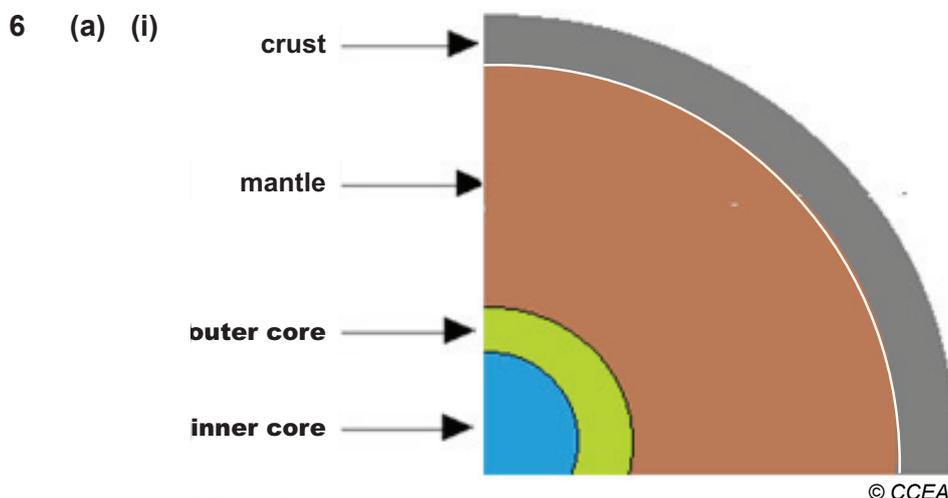
[1] each [4]

(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] 10

Total **90**