



Rewarding Learning

**General Certificate of Secondary Education
2016**

GCSE Physics

Unit 2

Higher Tier

[GPH22]

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)	Transverse	[1]	
(ii)	0.002 vibrations/waves (pass) (a fixed point) } independent every second } marking	[1] [1]	[2]
(iii)	$v = f\lambda$ (must be an equation), e.g. $f\lambda$ unqualified give [0] = (0.002) \times (2500 \times 1000) [1] per bracketed item = 5000 (m/s) (If 10^n error [-1] once only)	[1] [2] [1]	[4]
(b) (i)	echo	[1]	
(ii)	$3 \times 40 = 120$ microseconds sight of 3 divisions [1]	[1]	[2]
(iii)	60 (microseconds) ecf from (ii)	[1]	
(iv)	distance = speed \times time = 1500×0.00006 ecf for time from (iii) = 0.09 (m) = 9 (cm) (If 10^n error [-1] once only)	[1] [2] [1] [1]	[5]
(v)	X-rays kill/damage (cells) or are harmful to baby/cause cancer/ change in DNA/dangerous or ultrasound does not kill cells or harm the baby/less harmful/safe 'It' implies ultrasound	[1]	
(c)	microwaves visible X-rays	[1] [1] [1]	[3]

**AVAILABLE
MARKS**

20

- 2 (a) (i) Refraction [1]
- (ii) Normal drawn (and marked N) on both sides, air and glass. Ok if dotted. [1]
- (iii) Angles of incidence and refraction both marked [1]
- (iv) Light slows down [2]
Change of speed give [1] Light speeds up give [0]
- (b) (i) Distance from the lens or optical centre to principal focus or focal point or where parallel rays incident to lens meet after refraction [1]
- (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 or object ≥ 5 m away
Move lens or screen until sharp image formed (focused or clear means sharp)
Measure distance from lens to screen
Repeat and average [both required]

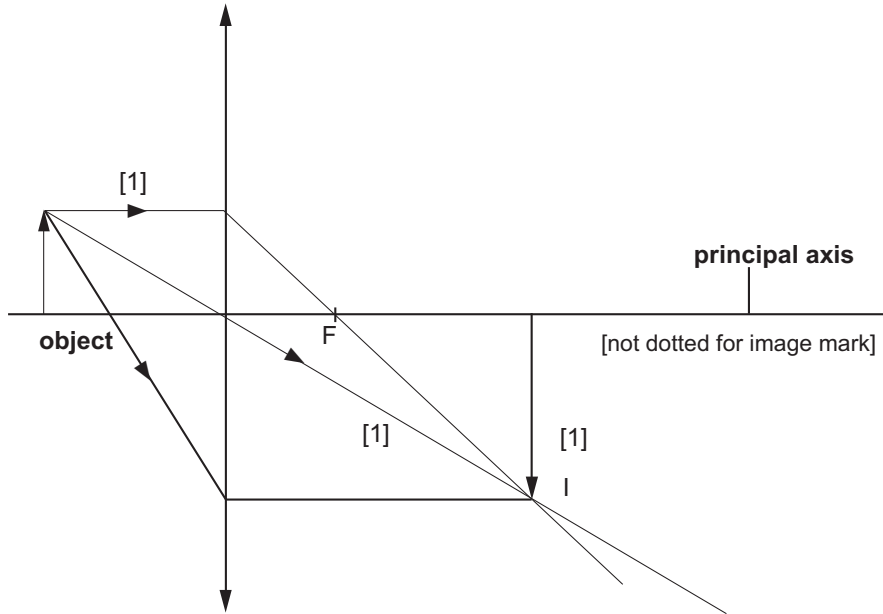
Response	Mark
Candidates describe in detail using good SPG at least 5 points shown opposite. The form and style are of a high standard and specialist terms are used appropriately at all times.	[5]–[6]
Candidates describe in detail using good SPG at least 3 points shown opposite. The form and style are 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 standard but there is limited use of specialist terms.	[1]–[2]
Response not worthy of credit	[0]

[6]

AVAILABLE
MARKS

(c) (i) Two rays [any 2 of the 3 possible rays]
 Top of image marked

[2]
 [1] [3]



(ii) arrows on both rays
 conflicting arrows or wrong direction give [0] [1]

(iii) Magnification 1.4 to 1.8
 1.3 or 1.9 give [1] **No ecf from ray diagram** [2]

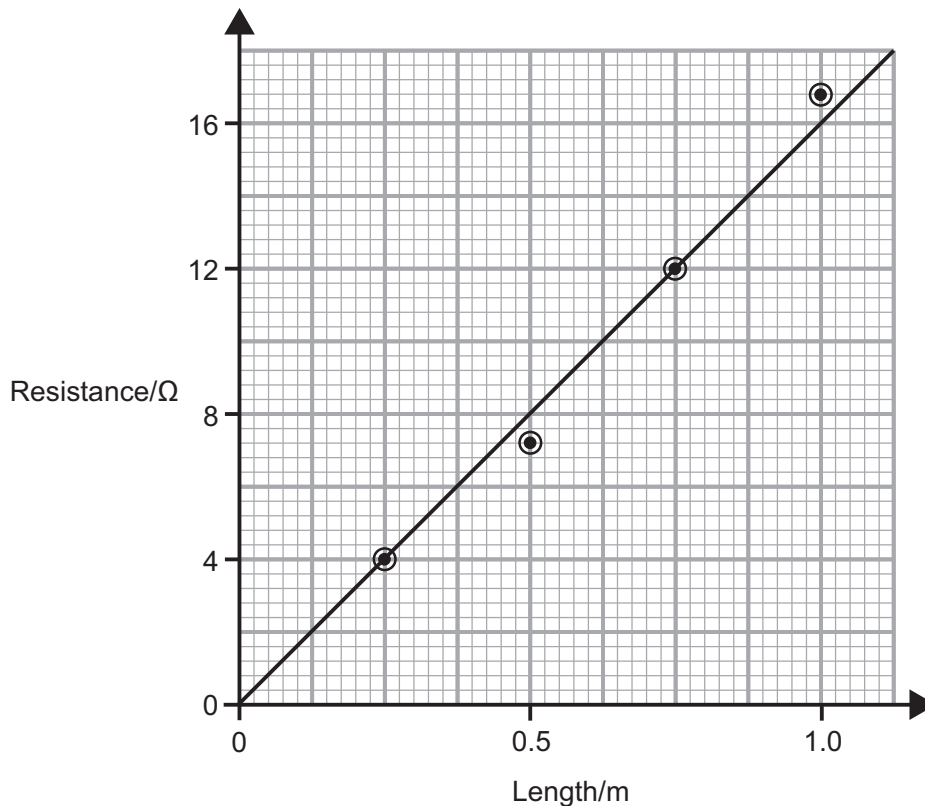
(iv) Real/yes [1]
 Light passes through it/can be projected on a screen [1] } independent marking

formed by real rays
 Opposite side from object give [0] [2]

AVAILABLE
 MARKS

20

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



- (ii) Find the gradient/put values into equation/ $k = R/L$ /divide R by L [1]
- (iii) Gradient = rise/run = 16 ± 1 consistent with their line } independent marking [1]
 Unit = Ω/m or $\frac{\Omega}{m}$ } marking [1] [2]
- (b) (i) $I = P/V$ or $720/240 = 3$ (A) (sight of 3(A) give [2]) [2]
 [1] [1]
- $R = V/I$ or $240/3 = 80$ (Ω) [2] [4]
 [1] [1]
- or
 $P = V^2/R$ $720 = 240^2/R = 57\,600/R$
 [1] [1] for subs [1]
- $R = 80$ (Ω) [1]
- (ii) length = $80/40$ ecf from (b)(i) for R [1]
 = 2 (m) [1] [2]
- (iii) Resistance is **halved** or half the value of (b)(i) ecf from (b)(i) [1]
- (iv) Length must be **doubled** or twice the value in (b)(ii) – ecf [1]

AVAILABLE
MARKS

- (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) gets [0] [1]
- (iii) = 0.8 (A) No ecf from (c)(i) [1]
- (iv) Any 2 from 3:
 (In a circle we have) 2 ($\times 12\Omega$) resistors in parallel [1]
 so total resistance is now 6Ω or $\frac{1}{4}$ of original or decreases
 so the current is larger (is now 4 times) (the original value) [1] [2]

AVAILABLE
MARKS

20

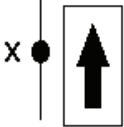
4 (a) **Indicative content:**

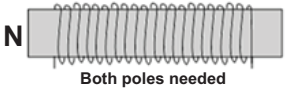
The flow of oil causes the wheel to rotate
 As magnet passes coil a voltage/current is induced
 This is electromagnetic induction
 The greater the flow the faster the wheel rotates
 This produces more pulses (every second)
 The number of pulses in one second can be used to work out the volume per second

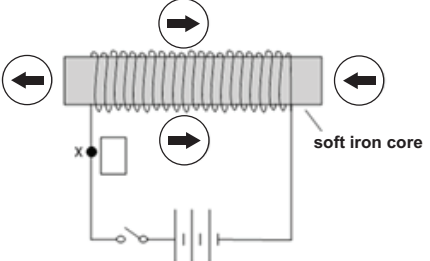
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Response not worthy of credit	[0]

[6]

- (b) (i) $\{N_s/N_p\} = \frac{120}{15} = 8 \frac{V_s}{V_p}$ with no further working give [1]. [3]
 [1] [1] Must be 8 on the answer line $\frac{1}{8}$ give [0]
- (ii) a.c. [1]
- (iii) The voltage (at the power station) is stepped up/increased [1]
 This reduces the current (in the transmission cables) [1]
 This reduces the energy/power lost (as heat) (in the cables) [1] [3]
- (iv) To step the voltage down [1]
 To 220 or 230 or 240 V or safe voltage or voltage suitable for appliances [1] [2]

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

(ii)  (may be inside circles at ends) **No ecf** [1]

(iii)  **No ecf**
Any 2 correct arrows will get [2]
(mark each arrow separately to a max of [2]) [2]

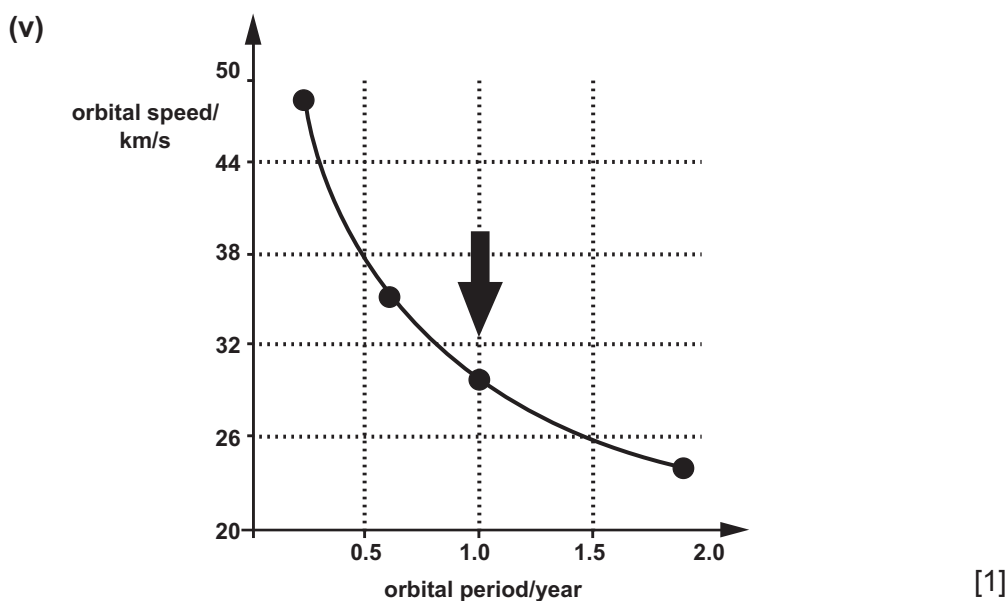
(iv) To make the current flow around the iron core or no short circuit or so current does not flow in core To prevent electric shock give [0] [1] 20

5 (a) (i) 1 – Mercury 2 – Venus [2]

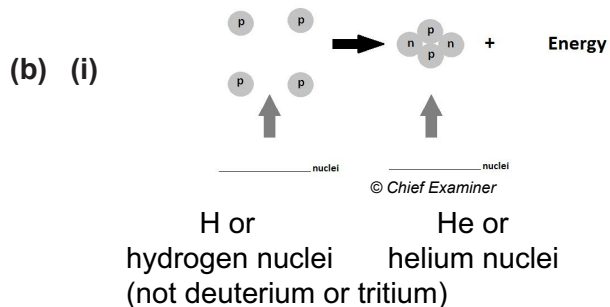
(ii) Planets (orbit) (the Sun) in **same plane** [1]
Planets (orbit) (the Sun) in **same direction** [1] [2]

(iii) Provides the (centripetal) force to keep planets **in orbit**/moving around the Sun [1] [2]

(iv) Counters or balances the outward force Outward force identified as gas/radiation pressure [1] [2]



(vi) Mars [1]



(ii) Light/spectra (from the stars) Not colour [1]

(c) (i) Cooling or temperature falls [1]

(ii) Protons [1] and neutrons [1] Not quarks [2]

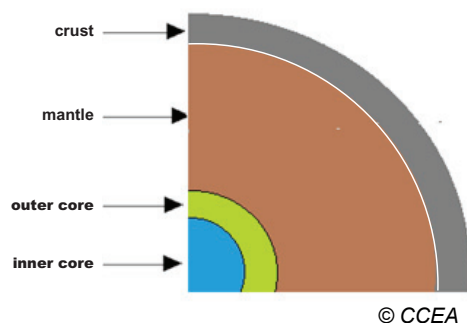
(iii) (Cosmic) **microwave background** (radiation)/CMBR or CBMR [1]

(iv) Red shift [1]

of **light** or **radiation** from other **galaxies** or stars in
other **galaxies** [1] [2]

(v) 12–15 billion years ago
or
12 000 million–15 000 million
or
A number between these limits [1] 20

6 (a) (i)



(ii) The region comprising of the crust [1] and **upper** [1] mantle [2]
Upper or outer required for 2nd mark

(iii) The upper parts of the mantle the rock is hard/solid [1]
Lower down the rock is soft or viscous or beginning to melt [1] [2]

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

(v) Outer core is liquid [1]
Inner core is solid [1] [2]

(b) The plates move (slowly) or collide [1]
They stick/get caught [1]
Eventually they jump/jerk/lurch/move suddenly [1] [3]

Total

15

115