



*Rewarding Learning*

**General Certificate of Secondary Education  
2015**

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**GCSE: Physics**

Unit 2

Higher Tier

**[GPH22]**

**FRIDAY 19 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) EM waves are **transverse** [1]  
Reject **some** are transverse  
**or** they are not longitudinal
- (ii) Longer: Infrared      Microwaves      Radio      [1]  
Use: Heating/      Cooking/      (Tele)Communication      [1]  
Remote      Communications
- Shorter: Ultraviolet      X-ray      Gamma      [1]  
Use: Sunbeds/      Diagnose broken      Cancer treatment      [1]      [4]  
Forgeries      bones      sterilise equipment
- Dependent marking  
Wave must be correct before access to mark for use
- (iii)  $\lambda = v/f = \frac{3 \times 10^8}{5.5 \times 10^{14}}$  [1] for formula, [1] for subs [2]  
=  $5.45 \times 10^{-7}$  (accept  $5.5 \times 10^{-7}$ ) [1] or 0.000 000 545  
unit mark m [1] or 0.000 000 55 [2] [4]

**(b) Indicative content**

1. Sound travels towards wall/microphone
2. Is reflected by the wall/echo/bounces/deflects **back**
3. Distance from microphone to wall
4. Time shown (on timer) or note/record the time
5. Speed = distance divided by  $\frac{1}{2}$  time or equivalent or double distance/time
6. (For reliability) repeat or use different distance

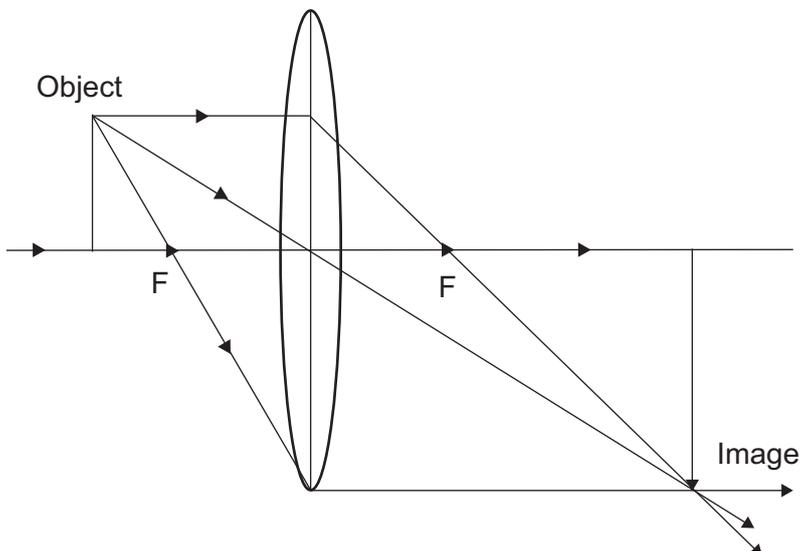
Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar <b>any 5 points</b> shown above and the precaution is clearly stated. The form and style are of a high standard and specialist terms are used appropriately at all times.	[5]–[6]
Candidates describe in detail using good spelling, punctuation and grammar <b>3 points</b> 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 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]

- (c) (i) Best fit line (be generous), judge by eye [1]
- (ii) No – line does not pass through 0,0 **or** origin  
**or** doubling the temperature does not double speed [1]
- (iii)  $342.8 \pm 0.4$  [1]
- (iv) 330 [1]
- (v) The speed of sound at 0 °C [1]

AVAILABLE  
MARKS

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- 2 (a) Ray from head A to eye and ray from chin to eye [1]  
 Correct arrow on 1 ray conflicting arrows – [0] [1]  
 So that  $i = r$  for both rays (judge by eye) [1]  
 Minimum length =  $5 + 6 = 11$  (cm) [1] [4]
- (b) (i) Dispersion **Not** refraction [1]  
 Different wavelengths colours refracted by different amounts  
**or bent or** travel at different speeds [1] [2]
- (ii) Total internal reflection **or** TIR [1]  
 Angle of incidence (in water) greater than critical angle [1] [2]
- (c) (i) The object is not distant/object or lamphouse not far enough away  
**or** distance is not large enough [1]
- (ii) 10cm to 10.3cm give [2], 10.4 give [1] [2]  
 (As the object becomes more distant) the image is formed  
 at the focal point/principal focus [1]  
 Only accesses this if 1 or more marks for first part [3]
- (iii) 20cm [1]
- (iv) Diminished/smaller/small/decreases [1]
- (d) (i) parallel to PA and refracted through F } Only gets access to  
 Through OC and not refracted } final mark if both  
 Image marked if not convergent, [-1] } rays correct  
 or inverted arrowhead  
 or I but  $\uparrow$  arrow wrong way round – [0]



- [3]
- (ii) Arrows shown left to right – conflicting arrows give [0] [1]  
 One correct arrow and no conflicts – [1]/[1]
- (iii) Inverted/upside down/laterally inverted [1]  
 not “not erect”
- (iv) Projector/enlarger [1]

AVAILABLE  
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- 3 (a) (i) Lamp in series with ammeter and variable PSU (or battery with rheostat) [1]  
 Voltmeter in parallel with lamp [1]  
 Symbols correct for ammeter, voltmeter and bulb [1]  
 Complete circuit [1] [4]

(ii) Indicative Content:

1. Switch on PSU/battery/Close switch/or indication circuit is on
  2. Record current
  3. Record voltage
  4. In a table or plot graph
  5. Adjust rheostat or PSU voltage
  6. Take a range current and voltage measurements
- } find a measure OR { reading on ammeter  
 } reading on voltmeter

Response	Mark	
Candidates describe in detail using good spelling, punctuation and grammar <b>any five points</b> in the Indicative Content. 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 spelling, punctuation and grammar <b>at least three</b> of the points in the Indicative Content. The form and style are of a high standard and specialist terms are used appropriately most of the time.	[3]–[4]	
Candidates describe in detail using good spelling, punctuation and grammar <b>at least one</b> of the points in the Indicative Content. 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]

- (iii)  $R = \frac{1.2}{0.2}$  or  $R = V/I$  [1] =  $6\ \Omega$  [1] [2]  
 from graph temperature =  $1425 \pm 25\ ^\circ\text{C}$  [1] [3]  
 No need to look at graph

(b) (i) Series [1]

- (ii) No. of cells =  $\frac{240}{0.75} = 320$  sight of [1]  
 (Area =)  $320 \times 18$  [1]  
 =  $5760\ (\text{cm}^2)$  [1] [3]

- (iii) No. of panels =  $\frac{3200}{100} = 32$  sight of [1]  
 (Area =)  $32 \times 5760$  (ecf from (ii)) =  $184\ 320\ (\text{cm}^2)$  [1]  
 =  $18.4(32)\ (\text{m}^2)$  [1] [3]  
 (PoT error [–1] only)

AVAILABLE  
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- 4 (a) (i) Iron [1]
- (ii) step-up [1]  
 magnetic/flux or magnetic field/magnetism [1]  
 step-up [1]  
 energy/heat/power **not** electricity [1] [4]
- (iii)  $V = P/I$  (or equivalent) [1]  
 $= \frac{720}{0.05}$  (= 14400)  $720 \times 3 = 14400 \times 0.5$  [3] [2] [3]  
 worth [3]
- (iv)  $N_s/N_p = V_s/V_p$  [1]  
 $N_s = (14400 \times \frac{200}{240})$  [1]  
 $N_s = 12000$  (turns) [1] [3]
- (b) (i) (Inducing a voltage in coil) requires changing flux/magnetic field [1]  
 a.c. supplies changing current/steady d.c. does not  
**or** changing direction **or** magnitude supply changing current [1] [2]
- (ii) No need to break circuit **or** no need to break leads  
 Can measure very high current  
**or** Safer [1]
- (iii) Bigger or increased (current) (reading obtained) [1]
- (c) (i) N(orth) to right of coil, S(outh) to left of coil  
 Only needs one pole [1]
- (ii) 

AB	<b>Y(es)</b>	<b>Up</b>
BC	<b>N(o)</b>	
CD	<b>Y(es)</b>	<b>Down</b>

 [1]  
 Left blank or None [1]  
 [1] per row [3]
- (iii) No effect/None [1]

AVAILABLE MARKS

[1]

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- 5 (a) (i) 1 – Asteroids;  
2 – Neptune;  
3 – Venus;  
4 – Saturn  
 $\left[\frac{1}{2}\right]$  each round up [2]
- (ii) **Rocky planet** – Mercury, Earth or Mars or Venus  
**Gaseous planet** – Jupiter or Uranus or Saturn or Neptune  
Both required [1]
- (iii) 1. Hydrogen 2. Helium  
H and He (Accept symbols) [1]
- (iv) (Nuclear) fusion Correct spelling [1]
- (b) Geocentric – planets and Sun revolve around the Earth/Earth at centre  
but in Heliocentric planets revolve around the Sun/Sun at centre. [1]
- (c) (i) The (Catholic) Church/The Pope [1]
- (ii) Retrograde/apparent looping motion of the planets;  
Venus is sometimes closer to Earth than Mars/phases for Venus  
and Mars/planets Phases of Moon  
Any **one** [1]
- (d) Flight time too long for a human lifetime (accept today's spacecraft  
too slow)  
Spacecraft could not carry sufficient food stocks.  
Spacecraft could not carry sufficient fuel stocks.  
Little to no chance of return to Earth should a problem arise.  
Long time delay in relaying of signals/messages between Earth and craft.  
Any **two** points  
Any acceptable realistic answer [2]
- (e) Sequence order 2 1 4 3 Any 2 correct consecutive gets [1]/[3]  
Any 3 correct consecutive gets [2]/[3] [3]
- (f) (Cosmic) **microwave** background (radiation) **or** CMB(R) **or** CMB [1]
- (g) Light [1]  
from galaxies [1]  
has a longer wavelength/red end of spectrum [1]  
galaxy is moving away [1] [4]
- (h) Universe **continues** to expand [2]  
Temperature drops **or** getting colder  
1st point essential before access to 2nd point  
Planets going cold [0]

AVAILABLE  
MARKS

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6	(a)	(i)	From the top: crust    mantle    inner core    outer core	[4]	<table border="1"> <thead> <tr> <th data-bbox="1292 105 1484 179">AVAILABLE MARKS</th> </tr> </thead> <tbody> <tr> <td data-bbox="1292 179 1484 268"></td> </tr> <tr> <td data-bbox="1292 268 1484 358"></td> </tr> <tr> <td data-bbox="1292 358 1484 448"></td> </tr> </tbody> </table>	AVAILABLE MARKS			
AVAILABLE MARKS									
		(ii)	Nickel and iron	[2]					
		(iii)	Outer core    Do not accept numbers	[1]					
		(iv)	The crust [1] and upper mantle [1] Accept <b>outer</b> mantle Accept <b>lower</b> crust	[2]					
	(b)		The plates move and rub against each other They stick/catch There is a sudden movement/jerk/jolt/lurch/ <b>sudden</b> release of pressure	[3]	15				
	(c)		Friction (between plates) (heats and) melts the rock/crust/plates Magma/lava	[3]	115				
			<b>Total</b>						