



Rewarding Learning

**General Certificate of Secondary Education
2015**

GCSE: Physics

Unit 2

Higher Tier

[GPH22]

FRIDAY 19 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.

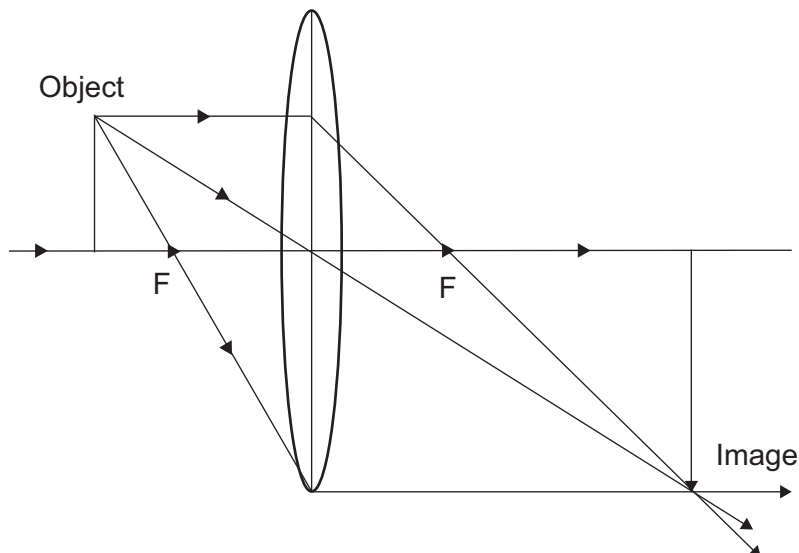
Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

- 1 (a) (i) 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]
= 5.45×10^{-7} (accept 5.5×10^{-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 any 5 points 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 3 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 1 or 2 of the points 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 ± 0.4 [1]
- (iv) 330 [1]
- (v) The speed of sound at 0 °C [1]

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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]

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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 } find a measure OR { reading on ammeter
 3. Record voltage } { reading on voltmeter
 4. In a table or plot graph
 5. Adjust rheostat or PSU voltage
 6. Take a range current and voltage measurements

Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar any five points 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 at least three 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 at least one 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 Ω [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 (cm²) [1] [3]

- (iii) No. of panels = $\frac{3200}{100} = 32$ sight of [1]
 (Area =) 32 \times 5760 (ecf from (ii)) = 184 320 (cm²) [1]
 = 18.4(32) (m²) [1] [3]

(PoT error [–1] only)

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4	(a)	(i)	Iron	[1]	[1]									
		(ii)	step-up magnetic/flux or magnetic field/magnetism step-up energy/heat/power not electricity	[1] [1] [1] [1]	[4]									
		(iii)	$V = P/I$ (or equivalent) $= \frac{720}{0.05}$ (= 14400) $720 \times 3 = 14400 \times 0.5$ worth [3]	[1] [2]	[3]									
		(iv)	$N_s/N_p = V_s/V_p$ $N_s = (14400 \times \frac{200}{240})$ $N_s = 12000$ (turns)	[1] [1] [1]	[3]									
	(b)	(i)	(Inducing a voltage in coil) requires changing flux/magnetic field a.c. supplies changing current/steady d.c. does not or changing direction or magnitude supply changing current	[1] [1]	[2]									
		(ii)	No need to break circuit or no need to break leads Can measure very high current or Safer	[1]	[1]									
		(iii)	Bigger or increased (current) (reading obtained)	[1]	[1]									
	(c)	(i)	N(orth) to right of coil, S(outh) to left of coil Only needs one pole	[1]	[1]									
		(ii)	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px 10px;">AB</td> <td style="padding: 2px 10px;">Y(es)</td> <td style="padding: 2px 10px;">Up</td> </tr> <tr> <td style="padding: 2px 10px;">BC</td> <td style="padding: 2px 10px;">N(o)</td> <td style="padding: 2px 10px;"></td> </tr> <tr> <td style="padding: 2px 10px;">CD</td> <td style="padding: 2px 10px;">Y(es)</td> <td style="padding: 2px 10px;">Down</td> </tr> </table>	AB	Y(es)	Up	BC	N(o)		CD	Y(es)	Down	[1] [1] [1]	[3]
AB	Y(es)	Up												
BC	N(o)													
CD	Y(es)	Down												
			[1] per row											
		(iii)	No effect/None	[1]	[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]

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6	(a)	(i)	From the top: crust mantle inner core outer core	[4]	AVAILABLE MARKS
		(ii)	Nickel and iron	[2]	
		(iii)	Outer core Do not accept numbers	[1]	
		(iv)	The crust [1] and upper mantle [1] Accept outer mantle Accept lower crust	[2]	
	(b)	The plates move and rub against each other They stick/catch There is a sudden movement/jerk/jolt/lurch/ sudden release of pressure		[3]	
	(c)	Friction (between plates) (heats and) melts the rock/crust/plates Magma/lava		[3]	15
				Total	115