



*Rewarding Learning*

**General Certificate of Secondary Education  
2017**

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**Science: Physics**

Unit 2

Foundation Tier

**[GPH21]**

**FRIDAY 23 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 of 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***

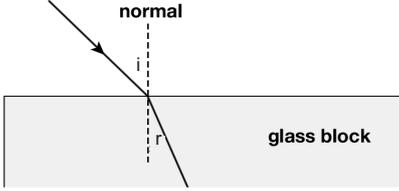
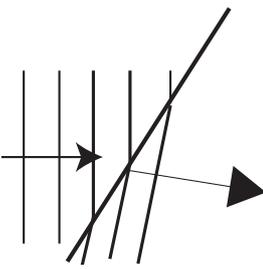
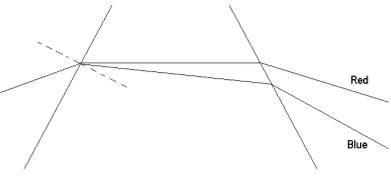
Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

### ***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.

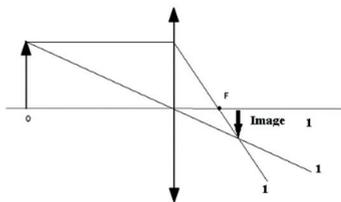
			AVAILABLE MARKS		
<b>1</b>	<b>(a) (i)</b>	Molecules <b>vibrate</b>	[1]	15	
		<b>parallel</b> to wave direction	[1]		
			[2]		
		<b>(ii)</b>	No. of waves pass/produced per second/vibrations or oscillations per second		[1]
		<b>(iii)</b>	$v = f\lambda$		[1]
			= $440 \times 0.75$		[1]
			= 330 (m/s)		[1] [3]
	<b>(b)</b>	Depth = $\frac{1}{2} \times$ time $\times$ speed of sound	[1]		
		= $\frac{1}{2} \times 0.4 \times 1500$ If no halving give 2/3	[1]		
		= 300 (m)	[1] [3]		
	<b>(c) (i)</b>	The angle of reflection is not equal to the angle of incidence	[1]		
		The wavelength/spacing of waves should not change.	[1] [2]		
	<b>(ii)</b>	Two	[1]		
<b>(d)</b>	Ultraviolet – skin cancer, sunburn, conjunctivitis, cataracts	[1]			
	Infrared – burns (not sunburn), damages eyes	[1]			
	Gamma rays – cell damage/cancer/kills cells causes mutations	[1] [3]			

- 2 (a) (i) Ray 1 – undeviated [1]  
 Ray 2 – refracted to the right [1] [2]
- (ii) Speed of light greater in air [2]  
 Speed of light changes give 1 mark
- (iii)  refracted ray r must be in its correct sense and  $r < i$   
 Both angles correctly marked [1] each [2]
- (b) (i)  3 waves parallel [1]  
 Closer spacing and equal than incident waves [1]  
 Refracted in the correct direction [1] [3]  
 Refracted in the wrong direction give [0]
- (ii) Frequency/number of waves per second [1]
- (c) (i)  Red above blue [1]  
 Correct refraction at entry [1]  
 Correct refraction at exit [1] [3]
- (ii) Dispersion [1]  
 Different colours wavelengths or frequencies refracted by different amounts  
 or travel at different speeds (in glass) [1] [2]

AVAILABLE MARKS

15

- 3 (a) (i) parallel [1]  
 (ii) thicker [1]  
 (iii) sometimes [1] [3]  
 (b) (i) Ray from top of object parallel to PA refracts through F [1]  
 Ray through OC continues without refraction [1]  
 Image marked (accept indication of I without label) [1] [3]

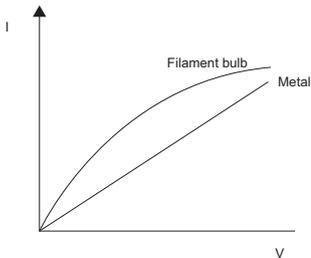


- (ii) Arrows shown left to right (at least one arrow, **no contradictions**) [1]  
 (iii) Inverted/upside down/laterally inverted [1]  
 (iv) camera/eye [1]  
 (c) **Indicative content**  
 Move lens to left/away from screen or closer to tree/object  
 Until image (of distant object on screen) is sharp/focussed/clear  
 Image is upside down/inverted/laterally inverted/smaller/diminished than object (any **two** properties – these are 2 points)  
 Measure distance between screen and lens  
**Repeat** and **average** or until distance is constant/consistent

Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar 5 points shown above. 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 describe in detail using good spelling, punctuation and grammar one or two of the points shown above. The form and style are of a high standard and specialist terms are used appropriately at all times.	[1]–[2]
Response not worthy of credit.	[0]

[6]

15

- 4 (a) (i) The paint drops lose **electrons** [1]
- (ii) Positive charges (on paint drops) **repel** each other [1]
- (iii) Negative charges (on car) **attract** positive charges (on paint drops) [1]
- (b) (i) Box X +, Box Y – both required [1]
- (ii) Box Z – arrow vertically upwards inside box essential [1]
- (iii) 4.5 (V) [1]
- (iv) Coulomb **spelling** must be correct [1]
- (v)  $I = Q/t$  (or equivalent) [1]  
 $I = 8/20$  [1]  
 $I = 0.4$  (A) [1] [3]
- (c) (i)  $30\ \Omega$  [1]  
 $20\ \Omega$  [1] [2]
- (ii) 0 and 80 (mA) [1]  
40 (mA) and 40 (mA) [1] [2]
- (iii)  $10\ \Omega$  [1]
- (d) (i) electrons and [1]  
atoms/molecules/ions [1] [2]
- (ii) Collisions make atoms/molecules/ions vibrate faster/move [1]  
More collisions or  
More violent collisions
- (e)
- 
- No labels get [0] [2]

AVAILABLE  
MARKS

20

			AVAILABLE MARKS	
5	(a) 2 (parallel) lines joining switches RH switch lines to lower terminal Accept functioning circuit (2 way)	[1] [1]	[2]	
	(b) (i) Neutral, Live, Earth (not ground) and Fuse (must be words) $\left[\frac{1}{2}\right]$ each round down Lower left – clockwise		[2]	
	(ii) yellow and green		[1]	
	(iii) To prevent damage to equipment/prevent fire/overheating break/disconnect circuit melts/breaks if too much current To protect (user) from electric shock provides low resistance path/takes current safely away or to ground/earth	[1] [1]	[2]	
	(iv) All metal parts or components encased in plastic or outer casing of appliance is made from an insulating material User cannot get a shock (from it so no earth wire required) or user cannot touch any live part	[1] [1]	[2]	
	(c) (i) Energy		[1]	
	(ii) Cost = Power in kW $\times$ Unit Cost $\times$ Time in Hours Cost = 3 $\times$ 15 $\times$ 2 Cost = 90(p)	[1] [1] [1]	[3]	
	(d) A – AC Generator      B – Step-up transformer C – Transmission lines    D – Step-down transformer $\left(\left[\frac{1}{2}\right]\right)$ each round down)		[2]	
	(e) (i) Coil must be rotated/turned/spun <b>NOT</b> moved		[1]	
	(ii) Electromagnetic induction		[1]	
	(iii) Spin the coil <b>faster or</b> Larger number of turns <b>NOT</b> stronger magnet, iron core or more wire/area		[1]	
	(iv) No change		[1]	
	(v) Graph B		[1]	
				20

6	(a)	Star	[1]		AVAILABLE MARKS	
		Nuclear Fusion	[1]			
		Hydrogen	[1]			
		Helium	[1]	[4]		
	(b)	A large gathering or cloud of gas <b>and</b> dust (in space) or hydrogen <b>and</b> dust		[1]		
	(c)	1 – Venus    2 – Jupiter		[2]		
	(d) (i)	There are many more asteroids or large number of asteroids so collision could occur/random motion/unpredictable orbit/hard to track	[1]			
			[1]	[2]		
		(ii) Distance = $300\,000 \times (4.5 \times 3600)$ (subs [1] and conversion hr to seconds [1])	[2]			
		Distance = $4\,860\,000\,000 (4.86 \times 10^9)$ (km)	[1]	[3]		
	(e)	The plates move against each other/collide/rub	[1]			
		Sometimes stick/catch	[1]			
		Suddenly release/jolt/lurch/jerk	[1]	[3]		
			<b>Total</b>			<b>15</b>
						<b>100</b>