



General Certificate of Secondary Education  
2014

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## Double Award Science: Physics

### Unit P2

### Higher Tier

**[GSD62]**

**THURSDAY 12 JUNE 2014, MORNING**

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# MARK SCHEME

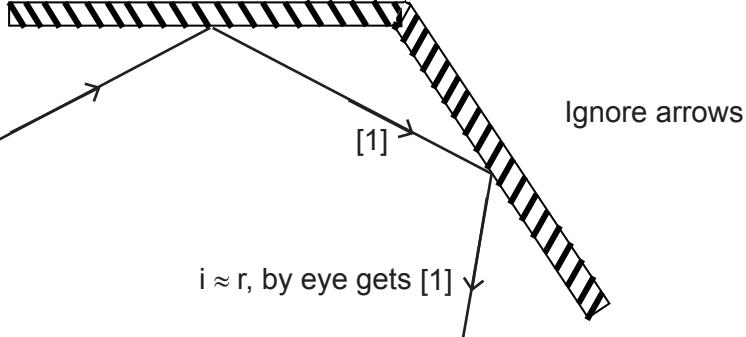
### Subject-specific Instructions

In numerical problems, the marks for the intermediate steps shown in the mark scheme are for the benefit of candidates who do not obtain the final correct answer. A correct answer and unit, if obtained from a valid starting-point, gets full credit, even if all the intermediate steps are not shown. It is not necessary to quote correct units for intermediate numerical quantities.

Note that this “correct answer” rule does not apply for formal proofs and derivations, which must be valid in all stages to obtain full credit.

**Do not reward wrong physics.** No credit is given for consistent substitution of numerical data, or subsequent arithmetic, **in a physically incorrect equation**. However, answers to subsequent stages of questions that are consistent with an earlier incorrect numerical answer, and are based on physically correct equation, must gain full credit. Designate this by writing **ECF** (Error Carried Forward) by your text marks.

The normal penalty for an arithmetical and/or unit error is to lose the mark(s) for the answer/unit line. Substitution errors lose both the substitution and answer marks, but  $10^n$  errors (e.g. writing 550 nm as  $550 \times 10^{-6}$  m) count only as arithmetical slips and lose the answer mark.

			AVAILABLE MARKS
1	(a) Transverse [1] Longitudinal [1]	[2]	
	(b) (i) Transverse [1]	[1]	
	(ii) Particles move Up and Down [1] at right angles to wave direction [1] – Mark independently [2]		
	(iii) Amplitude = 5 (m) [1] Frequency = 0.5 [1] (Hz) [2]		
	(c) $v = f \times \lambda$ [1] [1] $3 \times 10^8 = 100 \times 10^6 \times \lambda$ [1] $\lambda = 3$ (m) [1]	$\text{or } \lambda = \frac{v}{f}$ [1] $= \frac{3 \times 10^8}{100 \times 10^6}$ [1] $= 3$ (m) [1]	[4] 11
	N.B. Power of 10 error $3 \times 10^n$ in answer plus $v = f \lambda$ gets [3]/[4]		
2	(a) Each part of letter [1] each	[2]	
	(b) (i) 	[2]	
	(ii) Angle of reflection = $35^\circ$ [1] $55^\circ$ [1]	[2]	
	(c) (i) Dispersion Reject: Refraction [1]	[1]	
	(ii) Orange, Yellow, Green, Blue, Indigo and Violet [1]	[1]	
	(iii) X-rays or UV or gamma/ $\gamma$ [1] IR or micro or radio [1]	[2]	10
3	(a) 1 – crust [1] 2 – outer core [1] 3 – inner core [1]	[3]	
	(b) Nickel [1] and Iron [1] or Ni and Fe [2]		
	(c) (i) Crust [1] solid portion of upper mantle [1] – Independent marks [2]		
	(ii) Float on a liquid/on a liquid layer/convection current Reject: Magma [1]	[1]	
	(iii) Volcanoes [1] earthquakes [1]	[2]	10

			AVAILABLE MARKS
4	<p>(a) Suitable scale [1] labelled correctly [1]            6 or more points correctly plotted [2]            5 points [1]</p> <p>(b) Best fit line by eye – 2 aspects for [1] each</p> <p>(c) (i) Up to 5 (seconds)  <b>or</b> 0 to 5 (seconds)</p> <p>(ii) Straight line [1], through origin [1] – Independent marking</p> <p>(iii) grad = rise/run or equivalent [1] Grad = Accel/grad <math>\frac{v}{t}</math> /grad = <math>\frac{y_2 - y_1}{x_2 - x_1}</math>  <math>= 0.20</math> [1] <b>or</b> <math>\frac{1}{5}</math>  <math>\text{cm/s}^2</math> [1] <b>or</b> <math>\text{cm s}^{-2}</math></p>	[4] [2] [1] [2]	
	Mark (i) and (ii) independently	[3]	12
5	<p>(a) Travel through vacuum/space            Travel in straight lines            Can pass through the atmosphere            Any <b>two</b> [1] each</p> <p>(b) Espionage = Spying = Observation = Military use            Weather            (Sat.) Navigation = Google maps/mapping/Google Earth/G.P.S            Astronomy            Agriculture            Any <b>two</b> [1] each</p>	[2] [2]	4

6 (a) (i)  $\frac{1}{R_{(T)}} = \frac{1}{R_1} + \frac{1}{R_2}$  [1] or  $R_T = \frac{\text{Product}}{\text{Sum}}$  [1]

$$\frac{1}{R_{(T)}} = \frac{1}{6} + \frac{1}{3}$$
 [1]
$$= \frac{6 \times 3}{6 + 3}$$
 [1]
$$R_T = 2$$
 [1] ( $\Omega$ ) = 2 ( $\Omega$ ) [1] [3]

(ii) 12 [1]  
8 [1] **allow ecf from (a)(i) i.e. 6  $\Omega$  + their answer to 6(a)(i)** [2]

(b) 600 (mA) [1] 200 (mA) [1] 400 (mA) [1] [3]

(c) (i)  $V = IR$  [1]  
 $= 8$  [1]  $\times 0.6$  [1]  
 $= 4.8$  ( $V$ ) [1] [4]

(ii) Power =  $IV$  [1]  
 $= 0.6 \times 4.8$  [1] **allow e.c.f. for  $V$  from (c)(i)**  
 $= 2.88$  [1] W [1] or J/s  
 $= 2.9$  [4]

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or  $P = I^2R$  or  $P = \frac{V^2}{R}$   
 $= 0.6^2 \times 8$   $= \frac{4.8^2}{8}$  [3]/[3]  
 $= 2.88 = 2.9$   $= 2.88 = 2.9$  [3]/[3]

7 (a) Unlike charges attract = [2]  
Electrons move ... [1] [2]

(b)  $I = \frac{Q}{t}$  [1] or  $Q = It$   
 $Q = 0.2$  [1]  $\times 180$  [1]  
 $Q = 36$  [1] (C) [4]

(c) (i) Same material/same temperature/same length Any **two** for [2] [2]

(ii) Ammeter in series [1] voltmeter in parallel [1]  
2 correct symbols [1] [3]

(iii) Indicative content
 

- Measure current and voltage [2]
- Use  $R = \frac{V}{I}$  [1]
- Repeat [1] for different thicknesses [1]
- Draw a graph of  $R$  versus reciprocal C.S.A. [1]
- Conclusion  $R$  is inversely proportional to  $A$  [1]

 (Any **five** points)

AVAILABLE MARKS

Response	Marks
Candidates use appropriate specialist terms throughout to discuss fully and in logical sequence <b>five points</b> shown in the indicative content above. They use good spelling, punctuation and grammar throughout and the form and style are of a high standard.	[5]–[6]
Candidates use some appropriate specialist terms to discuss in logical sequence <b>three or four points</b> shown in the indicative content above. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates use limited specialist terms to discuss <b>one or two points</b> shown in the indicative content above. Their spelling, punctuation, grammar, form and style are of a limited standard.	[1]–[2]
Response not worthy of credit	[0]

[6]

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8 (a) (i) Needle moves to + side **or** to right **or** to (+)3 [1] and back to zero [1] [2]  
 – Dependent marking  
 Momentary deflection to the right [2]

(ii) AC output – **sine** or **cosine** curve [1] with constant frequency [1] [2]

(b) (i) Turns ratio =  $\frac{12}{240} = \frac{1}{20}$  or 1:20 or 0.05 [1]

(ii) Number of turns =  $600 \times 20$  [1]  
 $= 12000$  [1] [2]  
 [1] for correct formula, and if no further

(c) (i) B and C **or** B to C [1]

(ii) Increases voltage [1], reduces current [1] [2]  
 Mark (c)(i) and (ii) independent marking

AVAILABLE MARKS	
Total	90