Rewarding Learning

General Certificate of Secondary Education
2016

Double Award Science: Physics

Unit P2

Higher Tier

[GSD62]

MONDAY 20 JUNE, MORNING

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 550×10^{-6} m) count only as arithmetical slips and lose the answer mark.

1 **(a)** **(i)** 2.5 (mm) [1]

(ii) 8 (m) [1]

(b) λ

$v = f \times \lambda$ [1]

$\lambda = \frac{3 \times 10^8}{2 \times 10^6}$ [1]

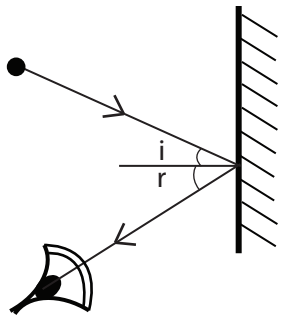
= 150 (m) [1] [3]

(c) **Burning** [1]
Cancer [1] [2]

(d) Particles vibrate [1] at right angles [1] – Independent marking
to the direction of the wave motion [1] [3]

(e) violet [1] 11

2 **(a)**



Mark independently { incident ray [1]; reflected ray [1]; correct arrow [1]; i = r [1] } [4]

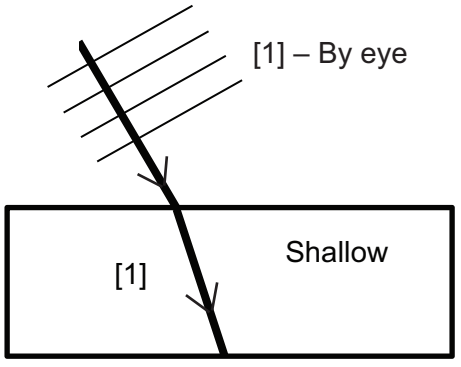
(b) **Three** from:
The image is: same size or height as object [1] **virtual** [1] upright or erect [1]
laterally inverted [1] Reject: Laterally virtual
Same distance behind the mirror as object is in front [1] [3]

(c) **(i)** 35° [1]

(ii) 22° [1]

(d) **(i)** [1] – By eye [1]

(ii)



[1]

(iii) (Speed) decreases [1]

(iv) (Wavelength) decreases [1] 13

AVAILABLE MARKS

		AVAILABLE MARKS
3	**(a)** **(i)** Outer core [1]	
	(ii) Mantle [1]	
	(iii) Crust Accept Earth's crust [1]	
	(b) hydrogen [1] gravity [1] coming together [1] increase in temp/density/pressure [1] fusion [1] fuse radiation (emitted)/light emitted/heat energy (emitted) [1] } Mark independently [6]	9

Response	Marks
Candidates explain **5 or 6** of the above points. They use good spelling, punctuation and grammar. The form and style are of a high standard and specialist terms are used appropriately.	[5]–[6]
Candidates explain **3 or 4** of the above points. They use satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made use of some specialist terms.	[3]–[4]
Candidates explain **1 or 2** of the above points. They use limited spelling, punctuation and grammar. The form and style are of a limited standard and they have made no use of specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

4	**(i)** 1 cm = 10° C Scale at least half of axis [1] labelled **with** unit [1] [2]	
	(ii) 5 points correctly plotted [2], 4 correct [1] ± 1 square [2]	
	(iii) Best fit line [1]	
	(iv) 0 (°C) [1]	
	(v) 90 (°C) Tolerance: ± 2° C [1]	
	(vi) grad = rise/run (or alternative) [1] $= \frac{180}{100}$ [1] = 1.8 [1] °F/°C [1] Allow 1.7 to 1.9 [4]	
	(vii) No Does not pass through origin/(0,0) [1]	12

5 **(a)** Friction [1]
electrons move [1]
onto rod A [1]
repel electrons in B [1]
leaving B positive [1]
opposite = unlike charges attract [1] [6]

Response	Marks
Candidates explain **5 or 6** of the above points. They use good spelling, punctuation and grammar. The form and style are of a high standard and specialist terms are used appropriately.	[5]–[6]
Candidates explain **3 or 4** of the above points. They use satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made use of some specialist terms.	[3]–[4]
Candidates explain **1 or 2** of the above points. They use limited spelling, punctuation and grammar. The form and style are of a limited standard and they have made no use of specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

(b) I = Q/t [1]
$= \frac{15}{2 \times 10^{-4}}$ [1]
= 75 000 (A) [1] or 7.5×10^4 [3] 9

6 **(i)** M1 – current [1] M2 – voltage [1] [2]

(ii) **Variable resistor or Rheostat** [1]

(iii) allows more than one set of results [1]

Dependent marking

(iv) csa, temperature, material – any **two** [2]

(v) A [1]

(vi) $\frac{1}{6}$ of 90 [1]

$\frac{5}{6}$ of 90 [1]

75 (cm) [1]

or

$1\Omega = \frac{90}{6\ (cm)}$ [1]

1Ω = 15 (cm) [1]

5Ω = 75 (cm) [1] [3] 10

AVAILABLE MARKS

AVAILABLE MARKS

7 **(a)** **(i)**

Switch X	Switch Y	Resistance between A and B/Ω
Open	Open	17
Closed	Open	9

[2]

(ii) $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$ [1]

$\left(\frac{1}{R_T}\right) = \frac{1}{6} + \frac{1}{12} + \frac{1}{4}$ [1]

$R_T = 2\,(\Omega)$ [1]

$R_{AB} = 7\ (\Omega)$ [1] [4]

(b)

Resistor	Current flowing/mA
5Ω	480
7Ω	**240**
4Ω	**320**

[2]

(c) V = IR [1] = 0.48 [1] × 5 [1] = 2.4 (V) [1] [4]

(d) Power = IV [1] = 0.02 × 6.0 [1] = 0.12 [1] (W) [1] or Js^{-1} [4] 16

8 **(a)** **(i)** no deflection/stays the same/needle doesn't move [1]

(ii) (momentary) deflection [1] to right [1] Independent marking [2]

(b) $\frac{N_S}{N_P} = \frac{V_S}{V_P}$ [1] or equivalent

$\frac{100}{2000} = \frac{V_S}{240}$ [1]

$V_S = 12\,(V)$ [1] [3]

(c) **(i)** at power station [1]

(ii) It steps up the voltage [1] which reduces the current [1] which reduces heat loss in the cables [1] } Independent marking [3] 10

Total **90**