



Rewarding Learning

**General Certificate of Secondary Education
2013**

Double Award Science: Physics

Unit P2

Higher Tier

[GSD62]

THURSDAY 13 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.

			AVAILABLE MARKS
1	(i) Middle box ticked	[1]	11
	(ii) 0.25 or $\frac{1}{4}$	[1]	
	(iii) 0.25 [1] Hz/s ⁻¹ [1] Allow e.c.f. from (ii)	[2]	
	(iv) x = 18 (cm) [1] y = 10 (cm) [1]	[2]	
	(v) $v = f \times \lambda$ [1] = 0.25 × 12 [1] e.c.f. from (iii) = 3 (cm/s) [1]	[3]	
	(vi) Any two named examples of E.M. or S-waves	[2]	
2	(a) (i) One from virtual/laterally inverted/same size (as object)/erect	[1]	7
	(ii) Normal	[1]	
	(iii) Reflected ray (i = r)	[1]	
	(iv) Eye drawn to receive reflected ray	[1]	
	(b) (i) ultraviolet [1] microwaves [1] (in correct order)	[2]	
	(ii) Any one from: travel in a vacuum, travel at same speed in a vacuum transverse.	[1]	

- 3 (a) (i) (Planet C) Earth [1]
 (Planet D) Mars [1] [2]
- (ii) Curved arrow similar to A's [1]
- (iii) Jupiter or Saturn or Uranus or Neptune [1]
- (b) • Gravity pulled (the gas and dust particles together).
 • The cloud began to spin.
 • The cloud was denser in the centre or pressure increases.
 • The centre got so hot that it became a star or fusion began.
 • Idea of accretion

Band	Response	Marks
A	Candidates use appropriate specialist terms throughout to discuss fully and in logical sequence five points 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]
B	Candidates use some appropriate specialist terms to discuss in logical sequence three or four points 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]
C	Candidates use limited specialist terms to discuss one or two points shown in the indicative content above. Their spelling, punctuation, grammar, form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit	[0]

[6]

- (c) (i) Gravity/gravitational force [1]
- (ii) Observation/weather/navigation/communication
 Any **two**, [1] each [2]

13

- 4 (i)

	2.0	4.0		7.8	10.2
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$[\frac{1}{2}]$ each, round down [2]

- (ii) Suitable scale for D [1]
 5 or 6 points for [2] } Tolerance ± 1 square [3]
 3 or 4 points for [1]

- (iii) Straight line [1]

- (iv) $k = \text{grad}$ [1]

$k = 1/4$ [1] from coordinates from graph
 $k = 0.25$ [1] m/s^2 [1] [4]

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AVAILABLE
MARKS

			AVAILABLE MARKS		
5	(a)	(i) number of protons (or positive charges) = number of electrons (or negative charges)	[1]		
		(ii) electrons [1] Dependent marking object [1]		[2]	
	(b)	(i) Circuit should include the following:			
		1. Battery + variable resistor or variable voltage supply	[1]		
		2. bulb, ammeter, voltmeter – correct symbols	[1]		
		3. ammeter in series with the cell and bulb	[1]		
		4. voltmeter in parallel with lamp/ammeter	[1]		
	5. working circuit – which will cause the bulb to light	[1]	[5]		
	(ii)	take = record			
		record V and A readings	[1]		
repeat (must have 1st mark for 2nd mark) vary voltage or alter variable resistor or vary current		[1]	[3]		
(iii) Graph B			[1]		
(iv)	increasing resistance } beginning above zero } Independent marking	[1]			
		[1]	[2]	14	
6	(a)	(i) Voltage is proportional to current at constant temperature Dependent marking	[1]		
			[1]	[2]	
	(ii)	$1/R_T = 1/R_1 + 1/R_2 + 1/R_3$	[1]		
		$1/R_T = 1/6 + 1/6 + 1/6$	[1]		
		$R = 2 \Omega$	[1]		
		Total resistance = 7 (Ω)	[1]	[4]	
	(b)	(i) $I = \frac{P}{V}$ or equivalent formula		[1]	
			= $\frac{2800}{250}$	[1]	
			= 11.2 (A)	[1]	[3]
	(ii) Fuse = 13 (A) ecf from (i) N.B. If (b)(i) > 13A, candidate forfeits mark for (b)(ii)			[1]	
(c)	$R = \frac{V}{I}$ or equivalent formula [1]				
		= $\frac{4 [1]}{0.3 [1]}$			
		= 13.3 [1]		[4]	14

				AVAILABLE MARKS	
7	(a) (i)	Deflection – Threshold mark	[1]		
		Returns to zero – Depends on 1st mark	[1]		
		Deflects in the opposite direction – Depends on 2nd mark	[1] [3]		
	(ii)	electromagnetic induction or induction or emi			[1]
	(b) (i)	wires insulated/no electrical connection			[1]
		(ii)	(momentary) deflected [1] returns to zero [1] Dependent marking		[2]
		(iii)	deflected to opposite side [1] returns to zero [1] Dependent marking		[2]
	(c)	voltage stepped up [1], current stepped down [1]			[3]
		less energy loss [1]			
	(d)	$N_p/N_s = V_p/V_s$ (or equivalent) [1]			[3]
$2000/N_s = 25/132$ (or equivalent) [1]					
$N_s = 10\ 560$ [1]			15		
8	(a)	Crust [1] and solid (part of) mantle [1]		[2]	
		(b)	Tectonic plates [1] move [1]		[4]
	Lava or molten rock or magma or ashes [1]		6		
		Rift or rupture occurs [1]			
			Total	90	