



Rewarding Learning

**General Certificate of Secondary Education
2019**

Double Award Science: Physics

Unit P2

Foundation Tier

[GDW61]

FRIDAY 14 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	(a) (i)	All electromagnetic waves travel at the same speed in a vacuum [1]	7
	(ii)	X-rays, ultraviolet, infrared, microwaves [4]	
	(b) (i)	Damage to eye [1]	
	(ii)	Cancer [1]	
2	(a) (i)	Energy [1]	7
	(ii)	4 (m) [1]	
	(iii)	1.5 (m) [1]	
	(b) (i)	Any named e.m. wave [1] Particles vibrate/oscillate [1] perpendicular to the direction of travel of the waves [1] [3]	
	(ii)	Sound, ultrasound [1]	
3	(a) (i)	Normal – must be labelled must be at point of incidence [1]	8
	(ii)	Correct reflected ray – from point of incidence and $i = r$ [1]	
	(iii)	Correct arrow [1]	
	(iv)	50 degrees/ $^{\circ}$ [1]	
	(b) (i)	Refraction [1] correct sense [1] (for $r = 0^{\circ}$ award [0]) [2]	
	(ii)	refraction [1]	
	(iii)	speed decreases [1]	
4	(a) (i)	C [1]	7
	(ii)	A [1]	
	(b)	Top ray bent down Bottom ray bent up Rays meeting at F [3]	
	(c)	Metre stick, screen [2]	
5	(a) (i)	30 Ω [1]	8
	(ii)	5 Ω [1]	
	(b)	Green/yellow – earth [1] and [1] Brown – live [1] and [1] Blue – neutral [1] and [1] [6]	

6	(a) (i)	Flow of electrons/charge	[1]	AVAILABLE MARKS											
	(ii)	x = cell, y = variable resistor or rheostat, z = lamp/bulb	[3]												
	(b)	Q = It [1] = 5 × 1800 [1] and [1] = 9000 [1] C [1]	[5]	9											
7	(a)	Heat/thermal [1] Electrons and atoms [1] Collide [1]	[3]												
	(b) (i)	P = IV [1] 345 = I × 230 [1] I = 1.5 (A) [1]	[3]												
	(ii)	3A	[1]												
	(c)	E = P × t [1] E = 1200 × 90 [1] and [1] E = 108 000 [1] (J)	[4]												
8	Planets listed Correct order Rocky from Mercury, Venus, Earth, Mars Gaseous from Jupiter, Saturn, Uranus, Neptune Moon Gravity														
	<table><tr><th>Response</th><th>Marks</th></tr><tr><td>Candidates describe in detail at least 5 of the above points using good spelling, punctuation and grammar. The form and style are of a high standard and specialist terms are used appropriately.</td><td>[5]–[6]</td></tr><tr><td>Candidates describe in detail 3 or 4 of the above points using satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made some use of specialist terms.</td><td>[3]–[4]</td></tr><tr><td>Candidates describe 1 or 2 of the above points. They use limited spelling, punctuation and grammar. The form and style are of a limited standard and there is no use of specialist terms.</td><td>[1]–[2]</td></tr><tr><td>Response not worthy of credit.</td><td>[0]</td></tr></table>			Response	Marks	Candidates describe in detail at least 5 of the above points using good spelling, punctuation and grammar. The form and style are of a high standard and specialist terms are used appropriately.	[5]–[6]	Candidates describe in detail 3 or 4 of the above points using satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made some use of specialist terms.	[3]–[4]	Candidates describe 1 or 2 of the above points. They use limited spelling, punctuation and grammar. The form and style are of a limited standard and there is no use of specialist terms.	[1]–[2]	Response not worthy of credit.	[0]	[6]	6
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9	(a) (i)	Increase current Increase number of turns Use soft iron core	[3]												
	(ii)	North and south poles reversed	[1]												
	(b)	N and S poles [1] Correct arrows showing directions [2]	[3]		7										
Total				70											