Rewarding Learning

General Certificate of Secondary Education
2016

Double Award Science: Physics

Unit P2

Foundation Tier

[GSD61]

MONDAY 20 JUNE, MORNING

MARK SCHEME

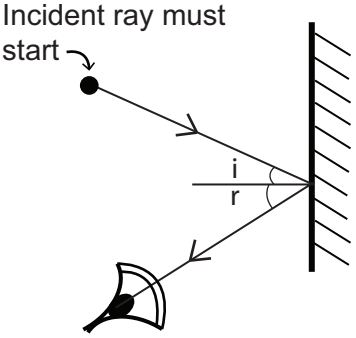
Subject-specific Instructions

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.

				AVAILABLE MARKS
1	**(a)**	Energy	[1]	
	(b)	Particles vibrate/(move) up and down/oscillate	[1]	
	(c)	Transverse	[1]	3
2	**(a)**	Ultraviolet rays, visible/light, micro(waves)	[3]	
	(b)	Radio	[1]	
	(c)	**Burning** [1] Cancer [1]	[2]	
	(d)	See **bones**/treat cancer	[1]	
	(e)	All transverse waves [1] travel through a vacuum [1] can all be reflected [1]	[3]	10
3	**(a)**	Incident ray must start  Mark independently { incident ray [1]; reflected ray [1]; correct arrow [1]; i = r [1] }	[4]	
	(b)	**Three** from: Same size **as object** [1] **virtual** [1] Erect/upright [1] **laterally inverted** [1] Same distance behind the mirror as the object is in front [1]	[3]	
	(c)	**(i)** 35°	[1]	
		(ii) 22°	[1]	
	(d)	Refraction in correct sense [1] Correct refraction for emergent ray [1] ← mark depends on first ray	[2]	
	(e)	Dispersion	[1]	12

					AVAILABLE MARKS
4	**(a)**	Speed = distance/time [1] $= \frac{1200}{0.8}$ [1] or $\frac{2400}{1.6}$ [1] = 1500 m/s [1]		[4]	
	(b)	**(i)** Cleaning jewellery or electronics/detecting cracks		[1]	
		(ii) Scanning a child/breaking up kidney stones/breaking gallstones Scanning body organs, detecting tumours, detecting bones		[1]	6
5	**(a)**	**(i)** Electrons [1] Plastic [1] Duster [1]		[3]	
		(ii) – charge at LH end of B [1], + at RH end [1] Independent marking		[2]	
		(iii) The strips attract (✓)		[1]	
	(b)	**(i)** lightning/charge could **strike** the building [1] cause structural damage/injury/fire [1]	} Independent marking	[2]	
		(ii) (lightning conductor) to earth [1]	{ **conducts** charge [1] **conducts** current **conducts** electrons **conducts** electricity } Dependent marking	[2]	
	(c)	**(i)** I = Q/t or in words		[1]	
		(ii) coulomb		[1]	12
6	**(a)**	**(i)** 2 in series			
		(ii) 3 in series			
		(iii) 2 in parallel			
		(iv) 2 in parallel plus one in series		[4]	
	(b)	**battery** [1], variable resistor **or** Rheostat [1], fuse [1]		[3]	
	(c)	V = I R [1] = 0.2 × 4 [2] = 0.8 (V) [1]		[4]	11

					AVAILABLE MARKS
7	**(a)**	**(i)**	A – earth [1] B – live [1] C – neutral [1]	[3]	
		(ii)	6 (A) 6 (A) 0 (A) [1] each	[3]	
	(b)		$I = \frac{P}{V}$ [1] or equivalent $= \frac{840}{240}$ [1] = 3.5 (A) [1]	[3]	9
8	**(a)**	**(i)**	No cutting of flux/No change in flux linkage/No field (line) cut	[1]	
		(ii)	Move magnets	[1]	
	(b)	**(i)**	(current) which changes direction [1] periodically [1] [dep. marking]	[2]	
		(ii)	(a.c.) generator/alternator/dynamo/transformer	[1]	
		(iii)	d.c. or direct	[1]	6
9	**(a)**	**(i)**	Outer core	[1]	
		(ii)	Mantle	[1]	
		(iii)	Crust Accept: Earth's crust	[1]	
	(b)		I.M. hydrogen [1] gravity [1] **or** gravitational coming **together** [1] **increase** in temp/density/pressure [1] $T \geqslant 1\,000\,000$ fusion [1] or fuse radiation (emitted)/light (emitted)/energy (emitted)/heat (emitted) [1] **or** EM waves	[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]

				AVAILABLE MARKS
10	**(i)**	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] allow 1.7 to 1.9 °F/°C [1]	[4]	
	(vii)	"No" is essential Does not pass through origin/(0,0)	[1]	12
			Total	**90**