Rewarding Learning

General Certificate of Secondary Education
2022

Double Award Science: Physics

Unit P2

Higher Tier

[GDW62]

THURSDAY 23 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.

COVID-19 Context

Given the unprecedented circumstances presented by the COVID-19 public health crisis, senior examiners, under the instruction of CCEA awarding organisation, are required to train assistant examiners to apply the mark scheme in case of disrupted learning and lost teaching time. The interpretation and intended application of the mark scheme for this examination series will be communicated through the standardising meeting by the Chief or Principal Examiner and will be monitored through the supervision period. This paragraph will apply to examination series in 2021–2022 only.

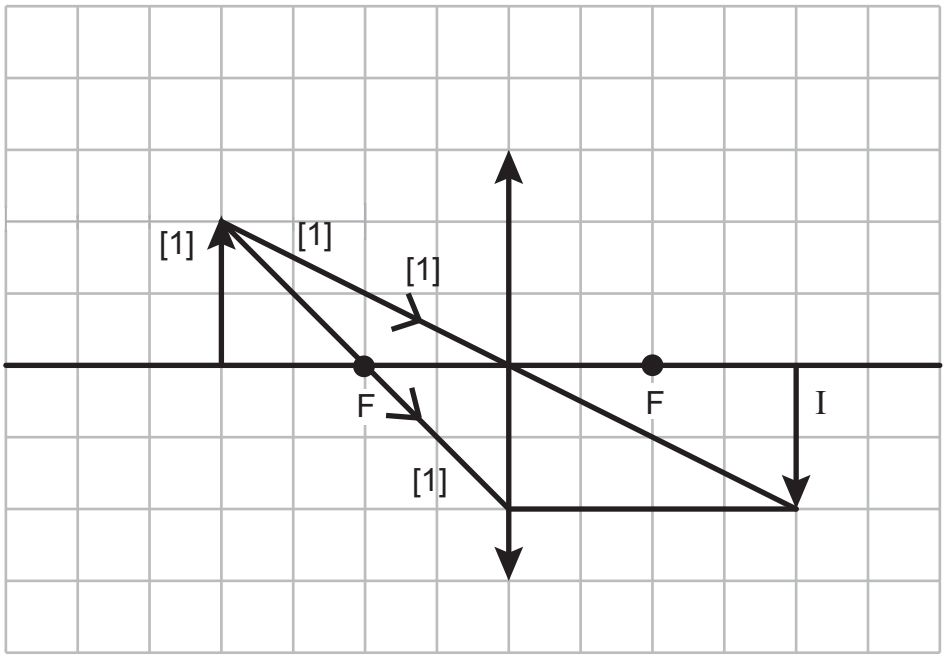
				AVAILABLE MARKS
1	(a)	(Conductors have) free electrons [1]	[1]	
	(b)	+ sign [1] Upwards arrow [1] Upwards arrow [1]	[3]	
	(c) (i)	12.5 Ω	[1]	
	(ii)	A_2 = 0.3 A [1] A_3 = 0.3 A [1] A_4 = 0.6 A [1]	[3]	
	(d)	V = IR [1] 230 = I (20) [1] I = 11.5 A [1]	[3]	11

2 **Indicative points**
Gas/Hydrogen [1]
Dust [1]
Gravity [1]
Pulled together [1]
Fusion [1]
Helium [1]

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]

[6] 6

3	(a)	Mercury [1] Neptune [1] Jupiter [1] Mars [1]	[4]	
	(b)	Comets [1] and asteroids [1] gravity [1]	[3]	
	(c)	(Satellite) launched by man [1] Any **one** from: observe Earth, monitor weather, astronomy, communications [1]	[2]	9

					AVAILABLE MARKS
4	**(a)**	**(i)**	Flows in one direction [1] Battery [1]	[2]	
		(ii)	Reverse direction [1] periodically [1] Mains electricity [1]	[3]	
	(b)		$E = P \times t$ [1] $= 72 \times 1800$ [1] and [1] $= 129\ 600$ (J) [1]	[4]	9
5	**(a)**		Amplitude = E [1], Wavelength = C [1]	[2]	
	(b)		f = Number of waves in 1 second [1] 4 waves pass in ten seconds [1] or 2 waves in 5 seconds f = 0.4 [1] (Hz)	[3]	
	(c)		$v = f\lambda$ [1] $3 \times 10^8 = 3 \times 10^4 \times \lambda$ [1] $\lambda = 10\ 000$ (m) [1]	[3]	8
6	**(a)**		30° [1] 20° [1]	[2]	
	(b)		Ray refracting [1] Correct direction [1]	[2]	
	(c)		Increases [1]	[1]	5
7	**(a)**		Distance from F [1] to centre [1] of lens [1] or Distance from the centre [1] of lens [1] to F [1]	[3]	
	(b)	**(i)**		[4]	
		(ii)	2 (cm) [1]	[1]	
		(iii)	can be shown on a screen [1]	[1]	9

				AVAILABLE MARKS
8	**(i)**	ammeter and voltmeter symbols in correct place [2] to obtain V and I results or to vary the current [1]	[3]	
	(ii)	Y axis – Voltage/X axis – Current [1] curve [1] increasing positive gradient [1] through origin [1]	[4]	
	(iii)	resistance increases [1]	[1]	8
9	**(a)**	Decrease current [1] Reduce number of coils [1] Remove core [1]	[3]	
	(b)	**(i)** correct N and S [1] correct arrows [1] each	[4]	
		(ii) (plotting) compass	[1]	8
10	**(a)**	big bang [1] 14 billion years [1]	[2]	
	(b)	**(i)** neutron – proton [1] each	[2]	
		(ii) nuclei [1]	[1]	
		(iii) hydrogen [1]	[1]	
	(c)	Cosmic Microwave Background Radiation (CMBR)	[1]	7
			Total	**80**