OCR GCSE GATEWAY PHYSICS A · J249

PHYSICS



MARK SCHEME

M5 GEOMETRY AND TRIGONOMETRY

SCORE	PERCENTAGE
/16	%

STEMUP

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Question			Answer/Indicative content	Marks	Guidance
1		i	(Wave speed =) frequency x wavelength ✓	2 (AO1.1)	**ALLOW** correct symbol equation eg (v =) f × λ **ALLOW** equation in any form **ALLOW** any frequency and corresponding wavelength from the table substituted into this equation **IGNORE** units for this marking point only
			$30 \times 10^9 \times 0.01$ or $30 \times 10^9 \times 1 \times 10^{-2}$ ✓	(AO3.2b)	**ALLOW** 30 000 000 000 × 0.01 or 30 000 000 000 × 1 × 10^{-2} **ALLOW** reverse arguments using speed and wavelength or speed and frequency Examiner's Comments This question assessed AO1 and AO3 and required candidates to recall and use the equation: *wave speed = frequency x wavelength* as well as convert 30 GHz into Hertz and 1 cm into metres. Most candidates struggled with the meaning of the prefixes and converting the units. Because many of these candidates did not write down the equation or their workings they could not be credited for any of the compensatory marks available in the mark scheme. A number of candidates used data from the table for radio or infra-red waves. Although they could not gain full marks they were credited with 1 mark for correct use of the equation.

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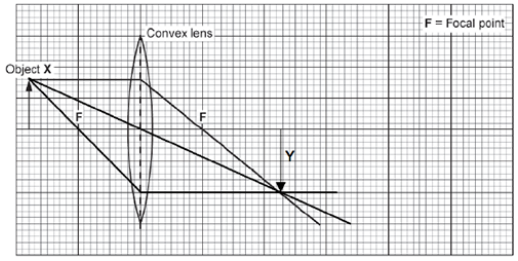
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Question			Answer/Indicative content	Marks	Guidance
		ii	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 100 (nm) award 3 marks	3	
			(Wavelength =) velocity ÷ frequency ✓	(AO1.2)	ALLOW (λ =) v ÷ f IGNORE v = f × λ and f = v / λ or words ALLOW 3×10^8 divided by any frequency from the table
			$\frac{3 \times 10^8}{3000 \times 10^{12}}$ or 1×10^{-7} ✓	(AO2.1)	IGNORE units for this marking point only
			= 100 (nm) ✓	(AO2.1)	Examiner's Comments This question required candidates to convert the prefix Tera into a power of ten, recall and rearrange the equation: *wave speed = frequency x wavelength* to calculate the wavelength of ultra-violet, and then convert their answer into nanometres. Only the higher ability candidates gained full credit. The majority of candidates did not score any marks. Those candidates, who did gain credit, were credited with a one mark for correctly rearranged equation or for the correct application of the equation (i.e. 3×10^8 divided by any frequency from the table). OCR support Candidates would benefit from greater familiarity with the standard metric prefixes (WS1.4d). The Mathematical Skills Handbook provides additional support on the use of prefixes and powers of ten for orders of magnitude: http://www.ocr.org.uk/Images/310651-mathematical-skills-handbook.pdf
			Total	5	

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Question			Answer/Indicative content	Marks	Guidance
2			A ✓	1 (AO 2.2)	Examiner's Comments This was the most challenging question in Section A. The most common response was distractor D, where candidates multiplied the numbers together rather than dividing wave speed by wavelength. AfL For these type of questions candidates should be encouraged to insert the numbers into the equation. When they do this they will see that the equation needs to be rearranged. Alternatively, candidates could rearrange the equation so that the unknown quantity is on the left-hand side of the equal sign.
			Total	1	
3			**Either** ray (centre ray or focal ray) drawn as indicated below ✓  Image upside down **AND** in the correct place ✓	2 (AO2 × 2.2)	**ALLOW** just one ray drawn If no rays drawn (or incorrect) but image is inverted, slightly larger and roughly in the correct place then award this mark **IGNORE** position of Y (if arrow is in the correct place) **ALLOW** tolerance of +/- 2 squares for image position
			Total	2	

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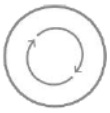
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Question			Answer/Indicative content	Marks	Guidance
4		i	3.5 (cm) ✓	1 (AO 1.1)	ALLOW 3.4 to 3.6 Examiner's Comments One in five candidates answered this question correctly. Some candidate confused wavelength with the amplitude. Another common response was 9 cm.
		ii	2.4 (cm) ✓	1 (AO 1.1)	Examiner's Comments Many candidates read the vertical axis incorrectly and gave values that were around 2.4 cm but not that specific value (for example 2.5 cm).  Misconception A common incorrect answer was 4.8 cm, where candidates confused the peak to peak value with amplitude. Other candidates confused amplitude with the wavelength.

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Question			Answer/Indicative content	Marks	Guidance
		iii	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.5 (m/s) award 2 marks 2 × 25 OR 2 × 0.25✓ 0.5 (m/s) ✓	2 (AO 2 x 2.1)	 ALLOW 50 <u>Examiner's Comments</u> Most candidates were credited with one mark for multiplying 2 by 25 to give an answer of 50. Fewer candidates appreciated that this was 50 cm/s while the unit on the answer line was m/s.  AfL Encourage candidates to check the unit used on the answer line. This additional information can help them to understand the question and the equations they should use.
			Total	4	
5		i	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.001 / 1x10^{-3} (m^3) award 2 marks 0.1 x 0.1 x 0.1 ✓ = 0.001 / 1x10^{-3} (m^3) ✓	2 (AO2x2.2)	
		ii	Density = mass/volume / density is proportional to mass ✓ (Cube B has 10 x mass of cube A, so) density of cube B is 10 x density of cube A ✓	2 (AO1.2) (AO2.2)	 ALLOW density is 10 times larger ALLOW numerical values used to show density of cube B is 10 x density of cube A
			Total	4	

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