A Level · OCR · Physics

7 mins 7 questions

Multiple Choice Questions

Refraction & Reflection

Refraction / Total Internal Reflection / Wave Phenomena

Easy (1 question)	/1
Medium (4 questions)	/4
Hard (2 questions)	/2
Total Marks	**/7**

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Easy Questions

1 Which of the following statements is/are correct about electromagnetic waves?

1. They can be plane polarised.

2. They can be refracted and diffracted.

3. They have the same speed in a vacuum and in glass.

A. Only 1

B. Only 3

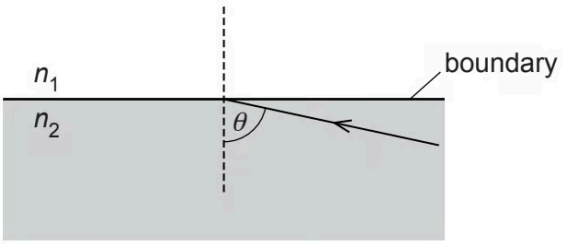
C. Only 1 and 2

D. 1, 2 and 3

(1 mark)

Medium Questions

1 A ray of monochromatic light is incident at the boundary between two transparent materials of refractive index n_1 and n_2. The critical angle θ is equal to 80°.



What is the ratio $\frac{n_1}{n_2}$?

A. 0.17

B. 0.98

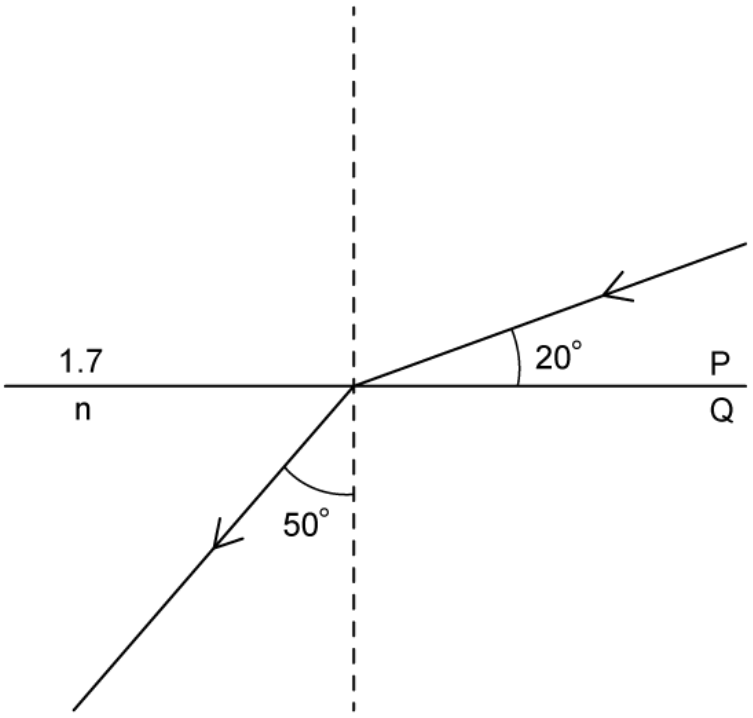
C. 1.02

D. 5.76

(1 mark)

2 Refraction of light occurs between two transparent materials **P** and **Q** as shown in the

diagram below.



The refractive index of material **P** is 1.7 and the refractive index of material **Q** is *n*.

Which of the following expressions gives the value of *n* ?

A. $\frac{1.7 \times \sin 50°}{\sin 70°}$

B. $\frac{1.7 \times \sin 40°}{\sin 20°}$

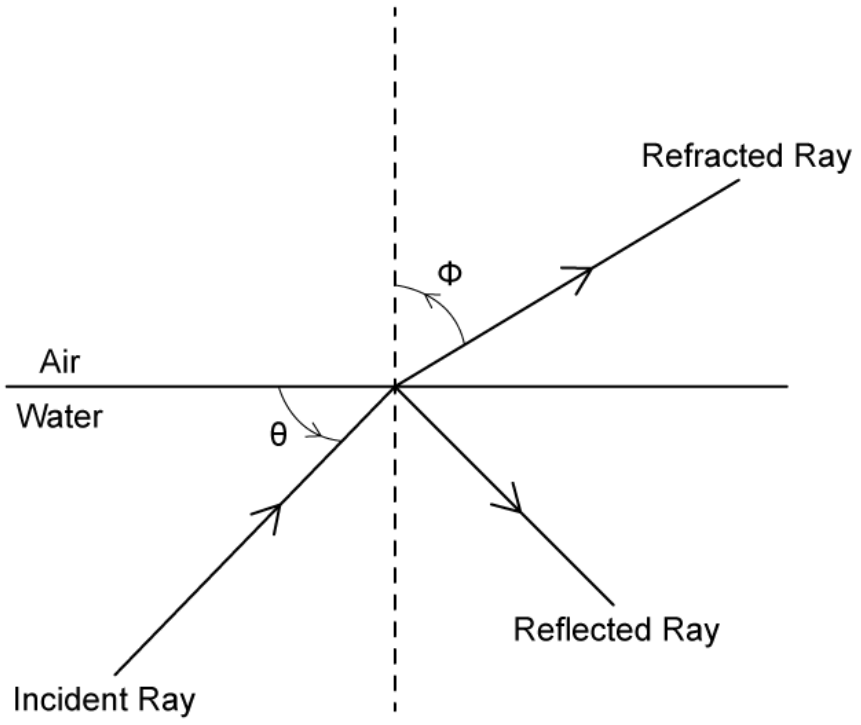
C. $\frac{1.7 \times \sin 70°}{\sin 50°}$

D. $\frac{1.7 \times \sin 20°}{\sin 40°}$

(1 mark)

3 A ray of monochromatic light is incident at a boundary between water and air.

The ray is refracted and reflected at the boundary as shown in the diagram.



Which of the following statements are true?

1. The refracted light and incident light have different wavelengths.
2. The speed of light in air is greater than the speed of light in water.
3. The angle θ is the critical angle.
4. The angle ϕ is the angle of refraction

A. 1, 2, 3 and 4

B. 2, 3 and 4

C. 1, 2 and 4

D. 4 only

(1 mark)

4 The table shows the refractive index *n* of five transparent materials **A, B, C, D** and **E**.

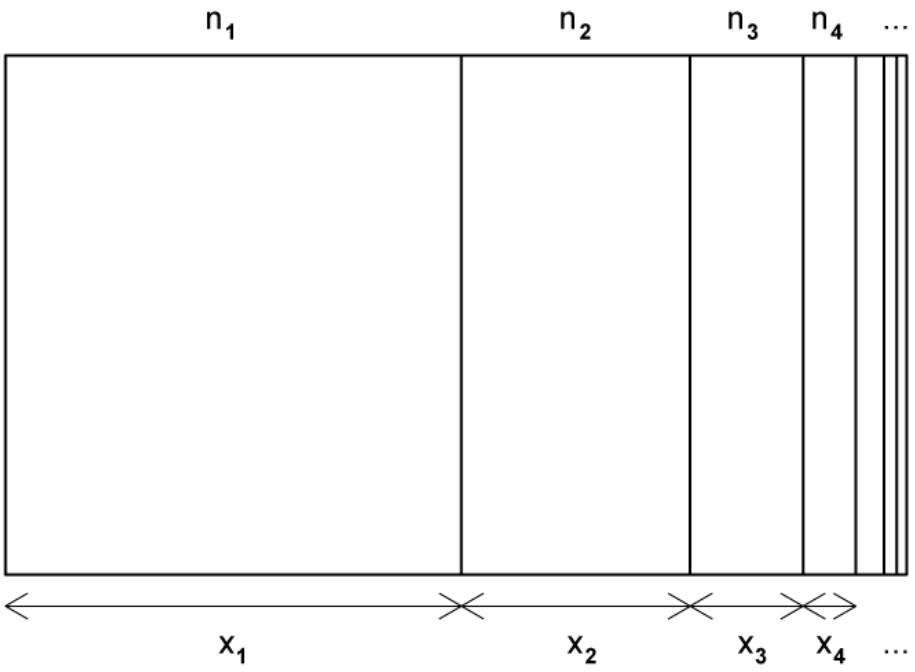
Which material has the **largest** critical angle?

Material	A	B	C	D	E
n	2.22	1.89	1.50	1.30	1.65

(1 mark)

Hard Questions

1 The diagram below shows an optical device constructed from a series of material blocks, each having refractive indices n_i (i = 1, 2, 3 ...) such that $n_{i+1} = 2n_i$. The length of each block labelled x_1, x_2, x_3 ....is chosen so that it takes light an equal amount of time Δt to pass through each block.



What is the ratio of the length of the block to the distance travelled by the light in a vacuum in a time equal to Δt?

A. $\frac{1}{2n}$

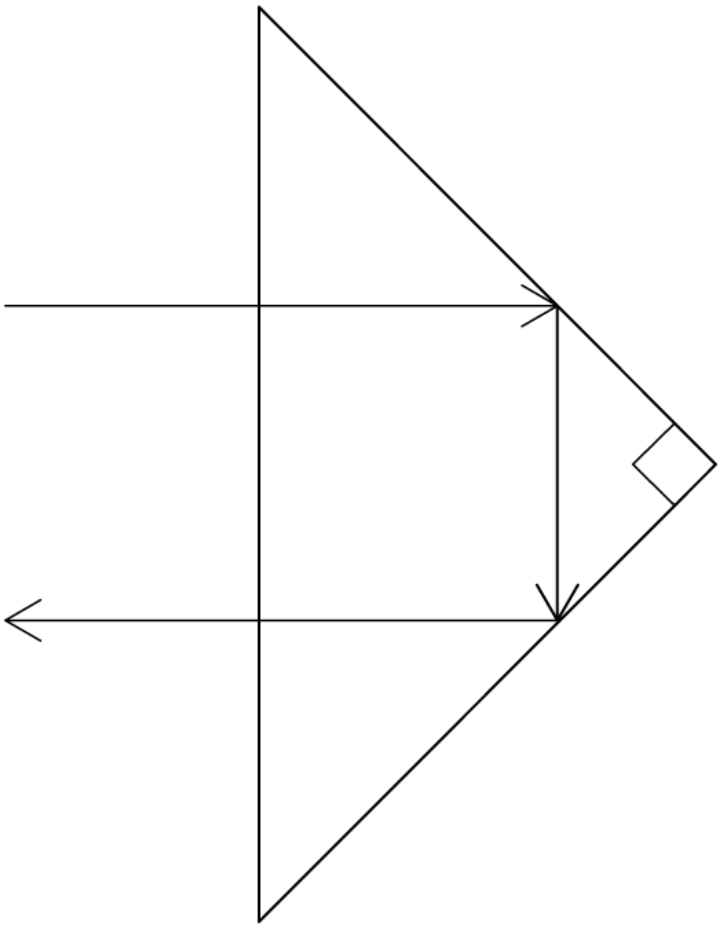
B. $\frac{2}{n}$

C. n

D. $2n$

(1 mark)

2 The diagram below shows a ray of light passing straight through the longest side of the right-angled isosceles triangular prism. Upon impact with one of the other smaller sides of the prism, the light ray is reflected towards the third side before being reflected for the final time to pass straight back out of the longest side.



What is the smallest ratio of the refractive index of the medium that the light enters the prism from n_o to the ratio of the refractive index of the prism n_p that will cause the ray of light to totally internally reflect?

A. $\frac{1}{\sqrt{2}}$

B. 1

C. $\sqrt{2}$

D. 2

(1 mark)