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10E

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TERM 1/Grade X/Physics Worksheet/2024-25

Refraction of Light at Plane Surfaces

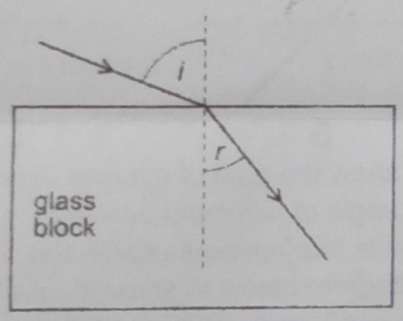
A. Choose the correct option from the options given below:

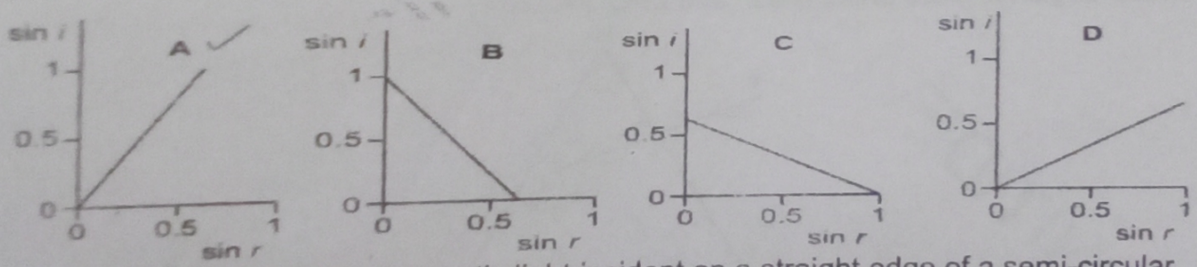
1) White light is dispersed by a prism. Compared with blue light, the red light is:
   A. slowed down less and refracted less.
   B. slowed down more and refracted more.
   C. slowed down more and refracted less.
   D. slowed down less and refracted more.

2) The angle of minimum deviation is equal to the angle of prism of an equilateral glass prism. The angle of incidence at which minimum deviation will be obtained is:
   A. 20° B. 30° C. 45° D. 60°

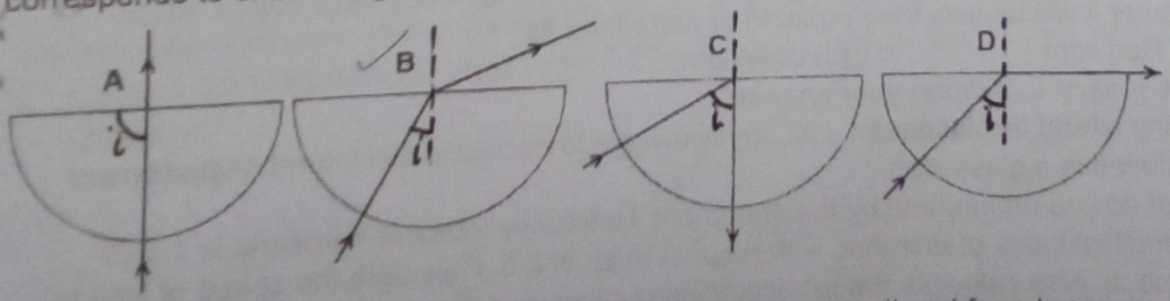
3) A ray of light is incident normally on a rectangular glass slab. Which quantities - changes as the light enters the glass slab?
   A. direction and wavelength.
   B. frequency and speed.
   C. direction and speed.
   D. wavelength and speed

4) A ray of light enters a glass slab at an angle of incidence 'i' producing an angle of refraction 'r' in the glass. A graph of sini against sinr is plotted. Which of the graph is correct?

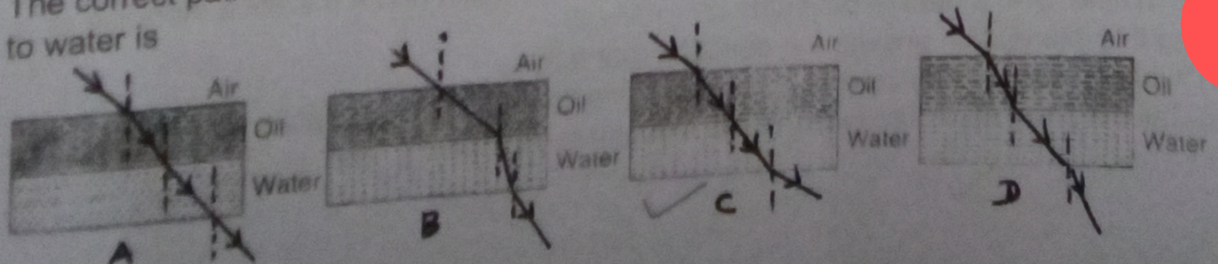




5) The diagram shows monochromatic light incident on a straight edge of a semi-circular glass block after passing through it. Which diagram shows the refraction if angle 'i' corresponds to critical angle for glass-air inteface?



6) The correct path of a ray of light passing from air to kerosene oil and from kerosene oil to water is

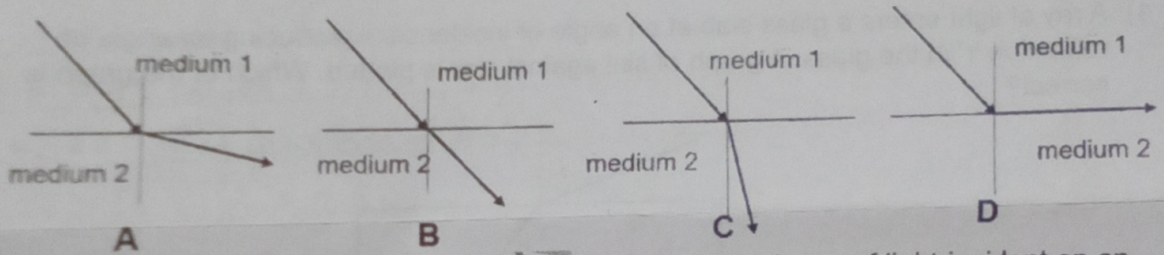


7) In total internal reflection, the value of critical angle will be maximum when light passes through:
   A. water to air
   B. diamond to air
   C. glass to air
   D. glass to water

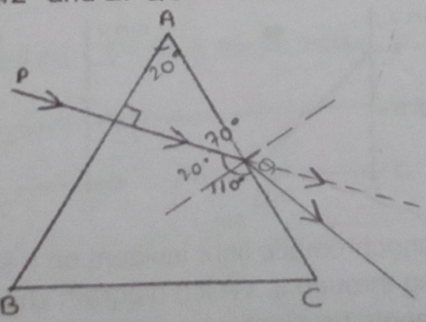
8) Assertion: A light ray moving from rarer to denser medium slows down and bends away from the normal. Assertion is false and reason is true
   Reason: The speed of light is more in a rarer medium than in the denser medium.
9) Assertion: The emergent ray in a glass slab is parallel to the direction of incident ray.
   Reason: The extent of bending of light ray at the opposite parallel faces of the slab is equal and opposite. Assertion and Reason are true
10) Assertion: Critical angle remains a constant for a given pair of media.
    Reason: Critical angle is directly proportional to the absolute refractive index of the medium. assertion is true, Reason is false.

B. Answer the following questions:

1) Arrange medium 1 given the following cases in the increasing order of optical densities if medium 2 and the angle of incidence remains the same in all 4 cases. [CBAD]



2) Draw a labelled diagram to show the path of a monochromatic ray of light incident on an equilateral prism kept at its angle of minimum deviation.
3) List any two physical quantities that remains unaffected during refractio
4) Redraw and complete the diagram below to show the path of the emergent ray. Given critical angle for glass prism is 42° and ∠PQC = 110°.



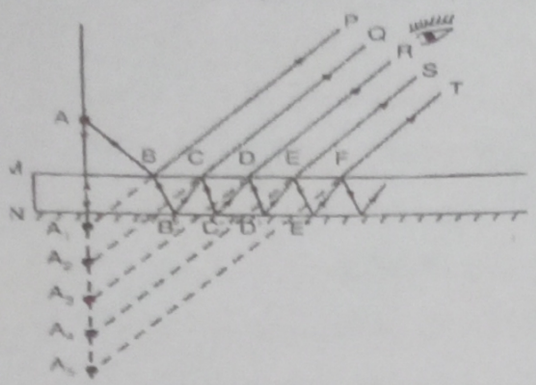
5) The critical angle for glass-air interface is 45° for the light of yellow colour. State whether it will be less than equal to or more than 45° for
   (a) Red light (b) Blue light.
   Give reason to support your answer.
6) Define lateral displacement. List any two ways to decrease the lateral displacement produced in a glass slab.
7) What do you understand by the statement 'Refractive index of kerosene is 1.45'?
8) Refractive index of diamond with respect to air is 2.5. Calculate the speed of light in diamond. Also calculate the refractive index of air w.r.t diamond.
9) Light travels a distance of '$10x$' units in time 't_1' in vacuum and it travels a distance of 'x' units in time 't_2' in a denser medium.
   Using this information answer the question that follows :
   (a) 'Light covers a distance of '$20x$' units in time 't_1' in diamond. 'State true or false.
   (b) Calculate the refractive index of the medium in terms of 't_1' and 't_2'.

10) Diagram given below shows the multiple images that are produced when a laser light is incident on a thick glass plate.

(a) Which of the image formed is the brightest.

(b) Justify your observation.

(c) Although infinite images would be formed theoretically, why are they not observed practically?



11) The picture given below depicts a highway on a hot day.

(a) Why are we able to see the reflection of the car on the road?

(b) Justify your observation.

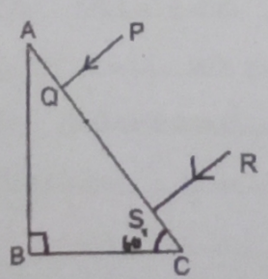
(c) Why does it disappear when the observer gets closer to the vehicle?

12) A swimming pool appears to be 1.8 m deep. If the refractive index of water is 1.33, find the actual depth of the pool.

13) A coin kept inside water [μ=4/3] when viewed from air in a vertical direction appears to be raised by 3.0 mm. Find the depth of the coin in water.

14) How is the critical angle related to the refractive index of a medium?

15) Copy and complete the following diagrams to show the path of the ray of monochromatic light in each case as it enters and emerges out of the prism. Mark the angle wherever necessary (critical angle is 42°)



16) The diagram below shows the ray OP travelling through an equilateral prism of a certain material. (a) Calculate the value of i_2, if the angle of deviation is 43° . (b) What is the ray QS called?