Snell's Law

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When light travels from a rarer medium to a denser medium, its bath is bent towards the surface normal. When light passes from denser to rarer medium It is bent away from the surface normal. The bending of light path at the boundary of two media is known as refraction. Snell's law relates the angle of refraction to the angle of incidence and the refractive indices of two media.
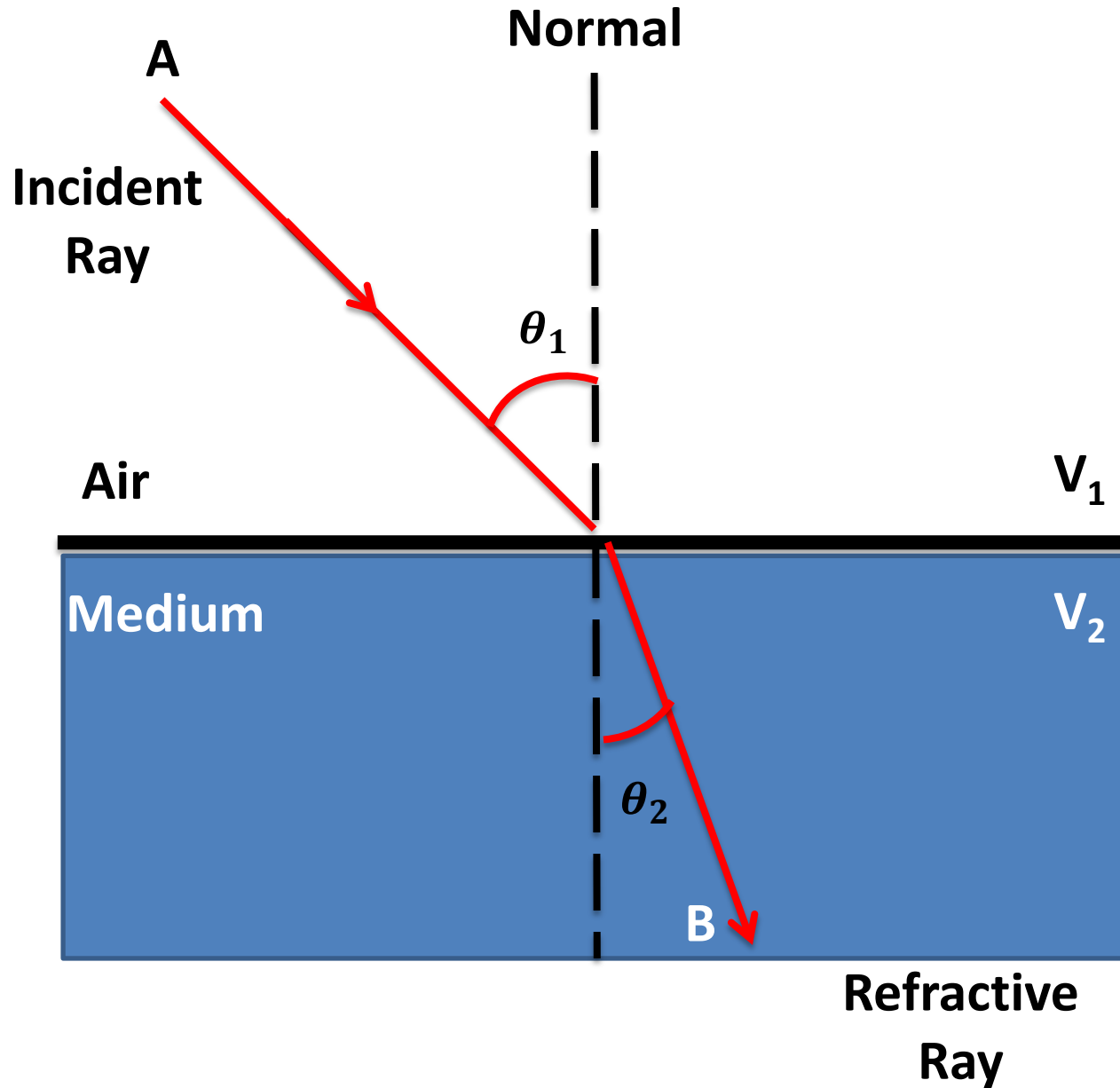
$$\frac{sin\theta_1}{sin\theta_2} = \frac{v_2}{v_1} = constant$$

v_1: Speed of light in a vacuum

v_2: Speed of light in a medium $v_1 > v_2$

θ_1: Angle of Incident

θ_2: Angle of Refractive $\theta_1 > \theta_2$

We can classify materials by their "index of refraction" defined as the ratio of

$$\frac{speed\ of\ light\ in\ a\ vacuum \quad c}{speed\ of\ light\ through\ medium\ v}$$

$$n = \frac{c}{v}$$ **index of refraction   ------ 1**

$$n > 1$$

$$v_1 = f\lambda_1 \quad \text{and} \quad v_2 = f\lambda_2 \quad ----2$$

$$f = f_1 = f_2$$

$from\ 1\ and\ 2$

$$\frac{\lambda_1}{\lambda_2} = \frac{v_1}{v_2} = \frac{c/n_1}{c/n_2} = \frac{n_2}{n_1}$$

$$\lambda_1 n_1 = \lambda_2 n_2$$

$n_1 = 1$ in vacuum

$$n = \frac{\lambda}{\lambda_n}$$

When replace $\dfrac{v_1}{v_2}$ by $\dfrac{n_1}{n_2}$ $we\ get$:

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

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The aim of exp.:
Prove that the sine of the angles of incidence and refractive are constant ratio, and satisfy Snell's Law

More Tools

λ= 650 nm

Part1:

For Air n_1 =1 and v_1 =1C, for Water n_2 =1.33 and v_1 =0.75C

θ_1	θ_2	Sin θ_1	Sin θ_2
10			
20			
30			
40			
50			
60			
70			
80			

Draw Between Sinθ_1 (X-axis) and Sinθ_2 (Y-axis) to find slop.

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Part2:

Chose mystery A where n_1 =1 for Air and $\boldsymbol{\theta_1}$=10°

Measure $\boldsymbol{\theta_2}$ to find n_2

Part3:

Repeat part2 for mystery B to find n_2

Determine the medium in part 2 and 3

Q1: Light travels from air into an optical fiber with an index of refraction of 1.44.

(A) In which direction does the light bend?

(B) If the angle of incidence on the end of the fiber is 22°, what is the angle of refraction inside the fiber?

(C) Sketch the path of light as it changes media.

Q2: Light travels between different mediums. When the total internal refraction occurs?