":Applied Physics:"

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"Quiz :- 3"

":Question 1:"

(Part a)

Given data:-

n of water = 1.33

θ with surface = 20°

n = 1.5

A/c to law of reflection:-

Angle of incident = Angle of reflection

So,

$\theta_a = \theta_r$

$\theta_r = 20°$ ∴ Same as incident beam

(Part b)

As we Know:-

$$n_a \sin \theta_a = n_b \sin \theta_b$$

But these θ are with the normal to the surface so,

$$\theta_a = 90° - \theta$$
$$\theta_a = 90° - 20°$$

$$\boxed{\theta_a = 70°}$$

Now we Know,

$$n_a = 1.33 \, , \quad n_b = 1.5 \, , \quad \theta_a = 70°$$

$$(1.33)(\sin 70°) = (1.5)(\sin \theta_b)$$

$$\sin \theta_b = \frac{(1.33)(\sin 70°)}{(1.5)}$$

$$\sin \theta_b = 0.83258$$
$$\theta_b = \sin^{-1}(0.83258)$$
$$\theta_b = 56.36° \ (\text{with normal})$$

θ_b (with surface) $= 90 - 56.4'$

$$\boxed{\theta_b = 33.5°}$$

(Part c)

In water:-

$$V = \frac{c}{n_a}$$

$$V_w = \frac{3.0 \times 10^8 \, ms^{-1}}{1.33}$$

$$\boxed{V_w = 2.5 \times 10^8 \, ms^{-1}}$$

In Quartz:-

$$V_q = \frac{c}{n_b}$$

$$V_q = \frac{3.0 \times 10^8 \, ms^{-1}}{1.5}$$

$$\boxed{V_q = 2 \times 10^8 \, ms^{-1}}$$