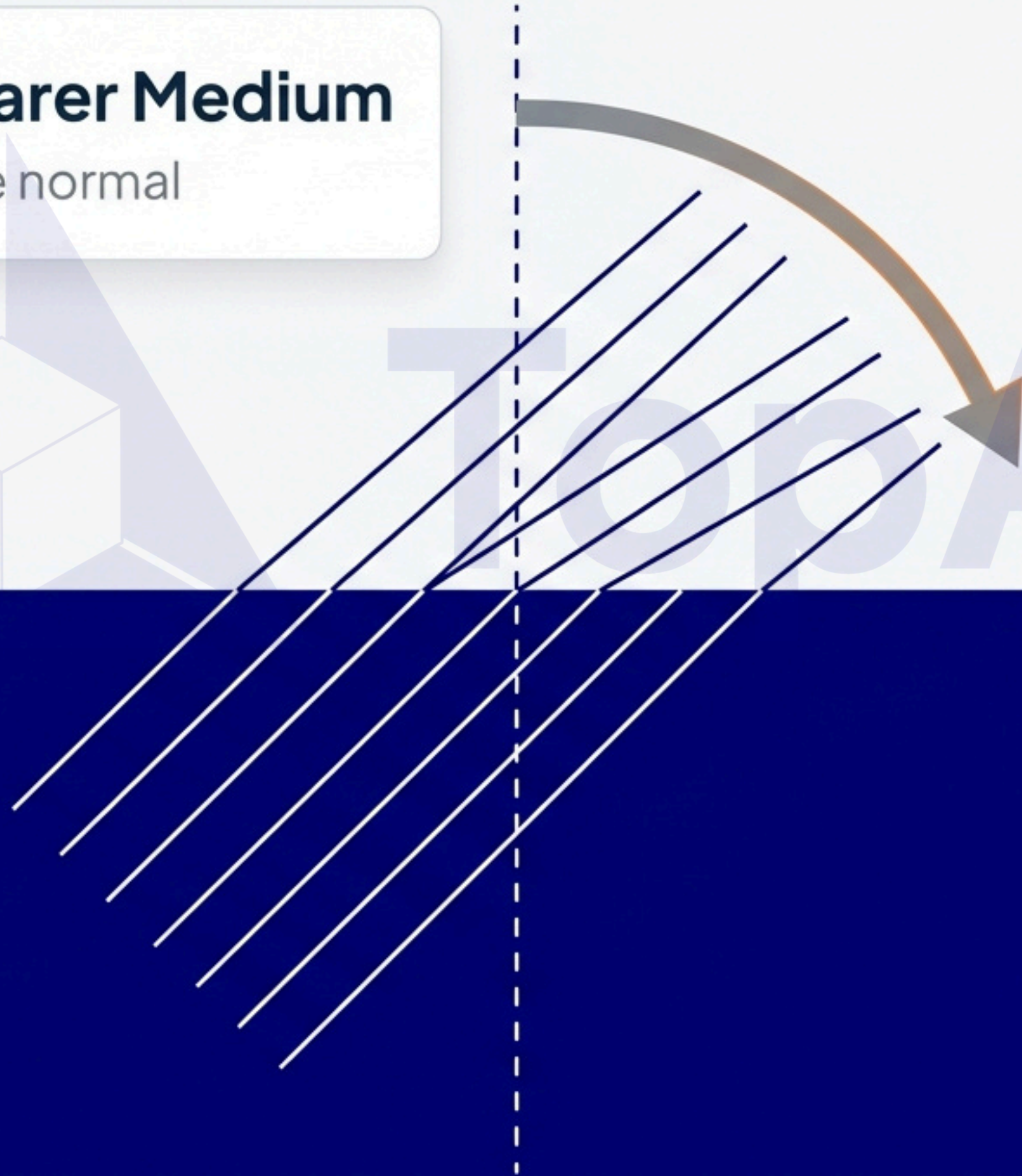


Refraction at a Rarer Medium

Bending away from the normal

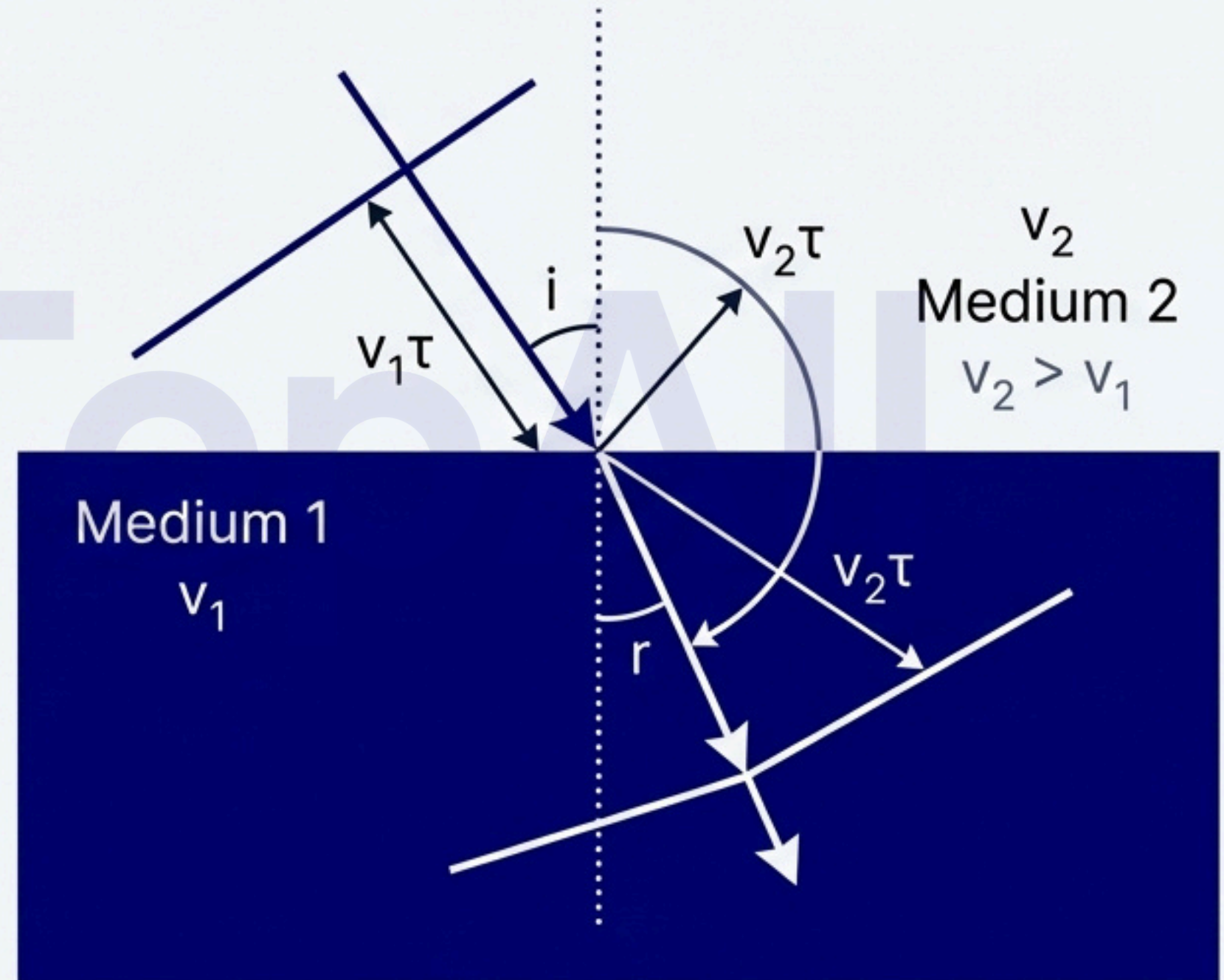


Faster Speeds in a Rarer Medium

$$v_2 > v_1$$

Because the wave travels faster in the second medium, the secondary wavelet covers more distance ($v_2\tau$) in the exact same time.

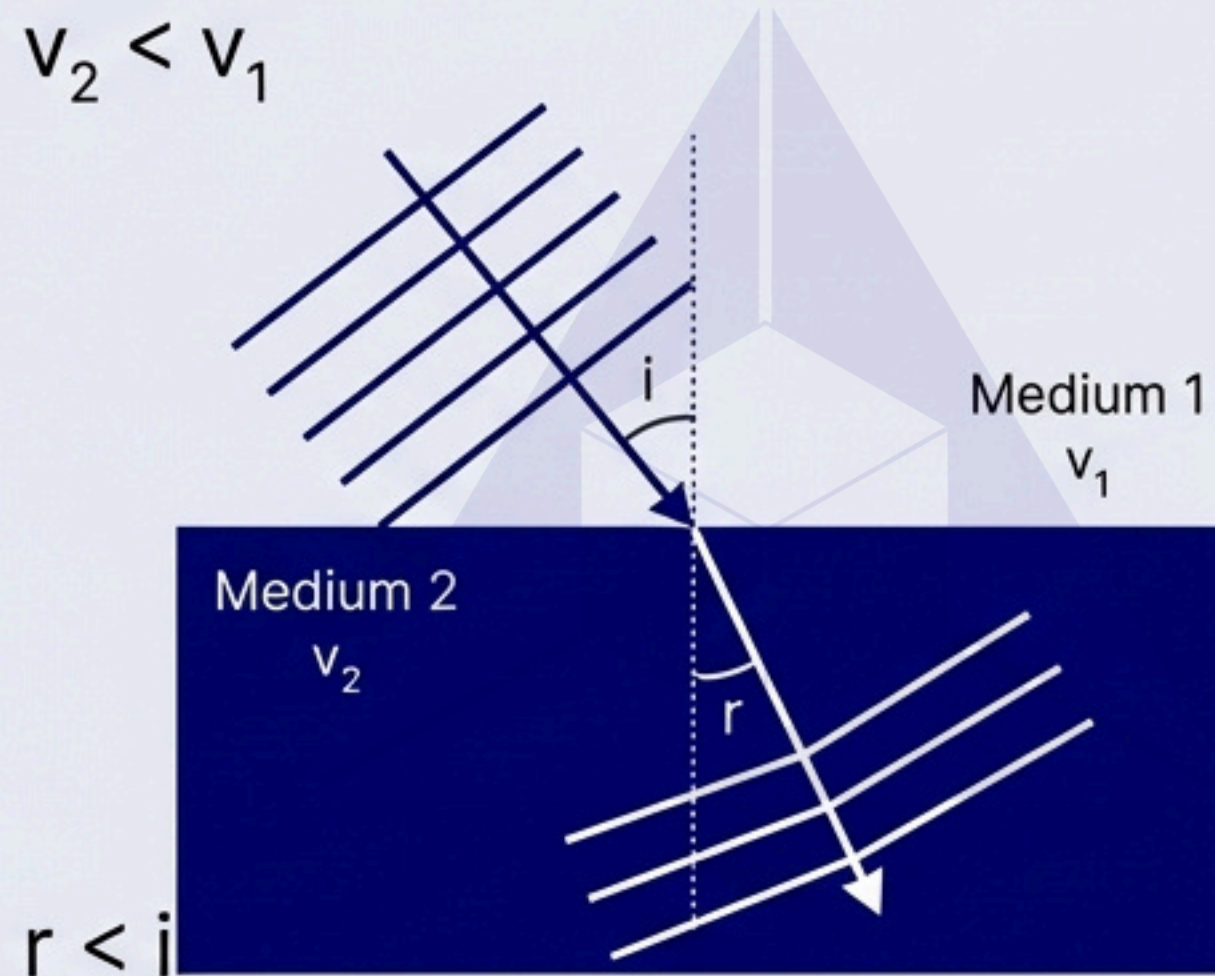
This larger radius forces the refracted wavefront to tilt further down.



Denser vs. Rarer Medium Refraction

Entering a Denser Medium

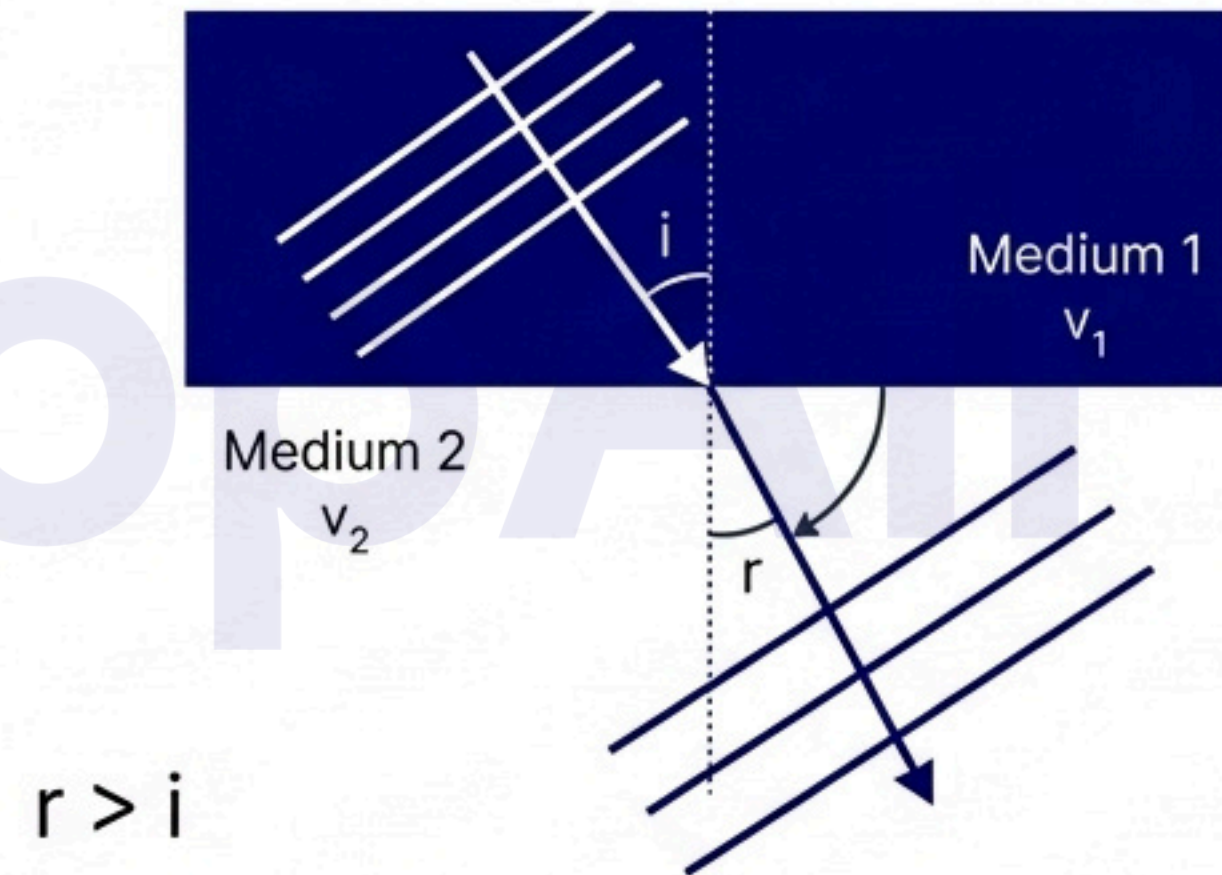
$$v_2 < v_1$$



Because n increases, $\sin r$ must decrease to balance $n_1 \sin i = n_2 \sin r$.

Entering a Rarer Medium

$$v_2 > v_1$$



$r > i$
Because n decreases, $\sin r$ must increase to balance the equation.



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

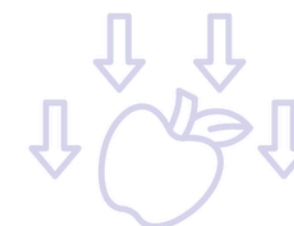
Practice Now



[At prep.topall.app](https://prep.topall.app)



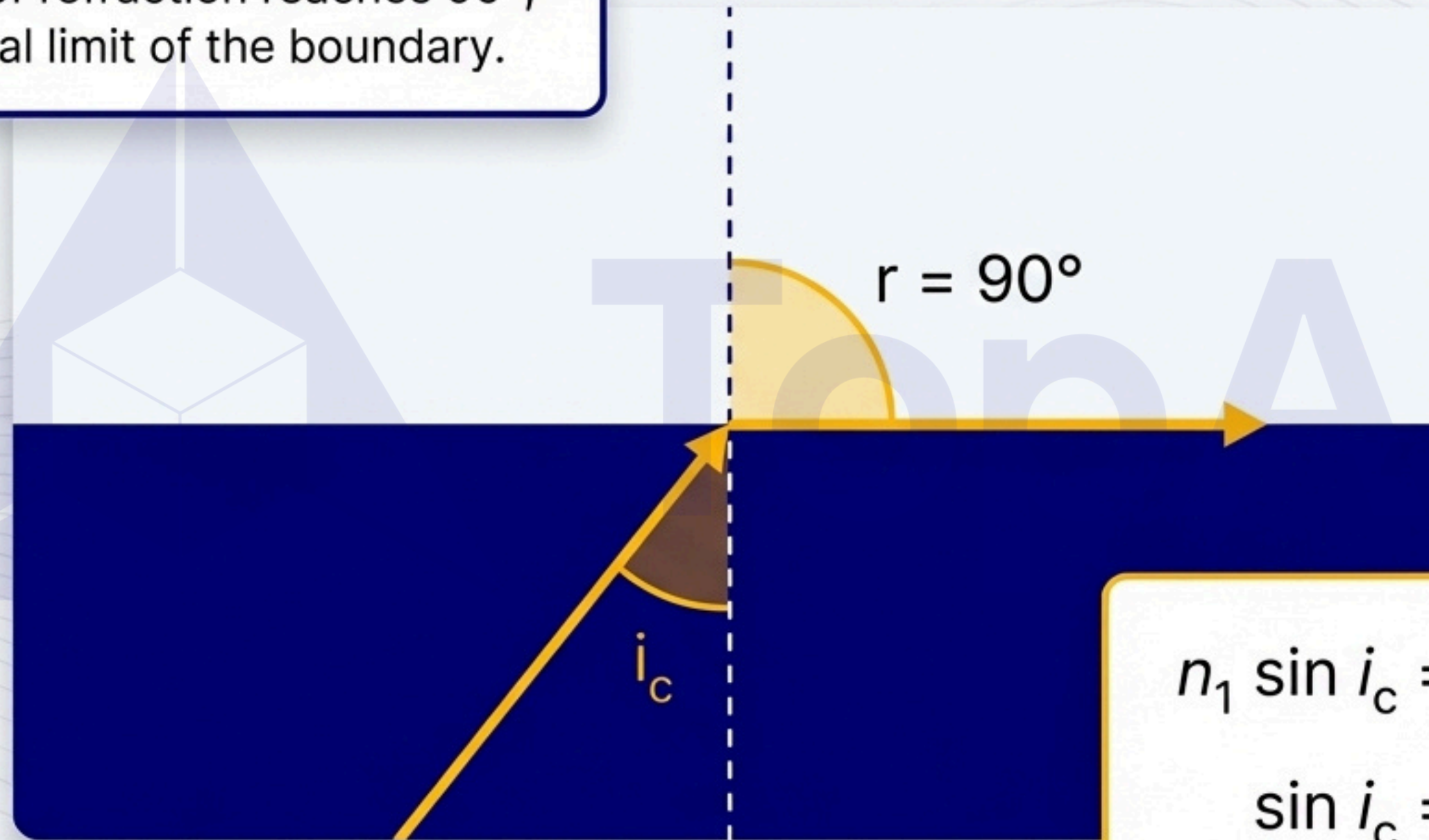
Key Highlights



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- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter

The Limit of Refraction: Critical Angle (i_c)

When the angle of refraction reaches 90° , we hit the physical limit of the boundary.



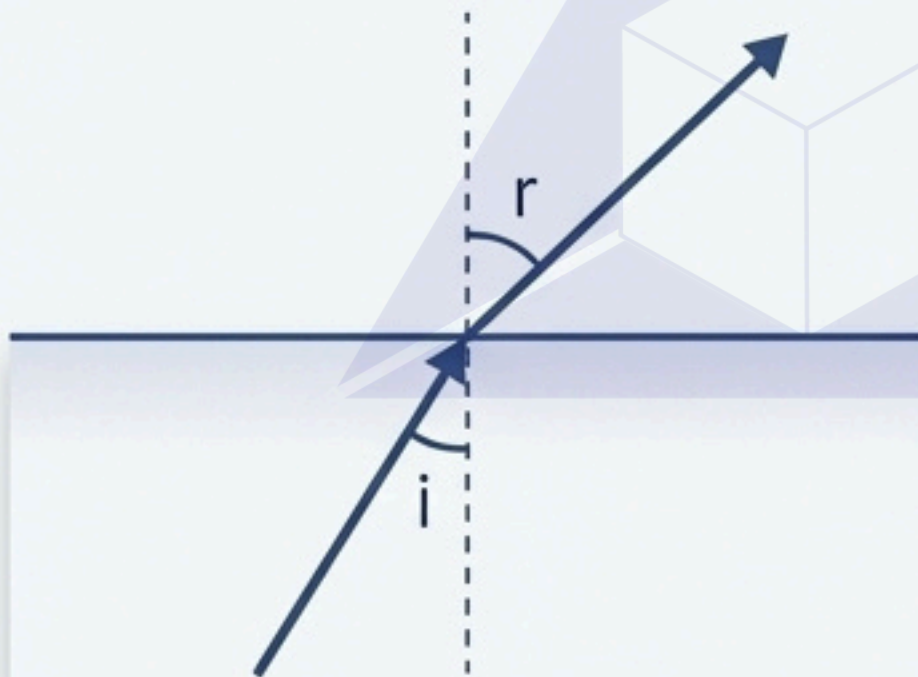
$$n_1 \sin i_c = n_2 \sin(90^\circ)$$
$$\sin i_c = \frac{n_2}{n_1}$$

Breaking the Limit: Total Internal Reflection

For all angles of incidence greater than the critical angle, there is no refracted wave. The boundary acts as a perfect mirror.

Normal Refraction

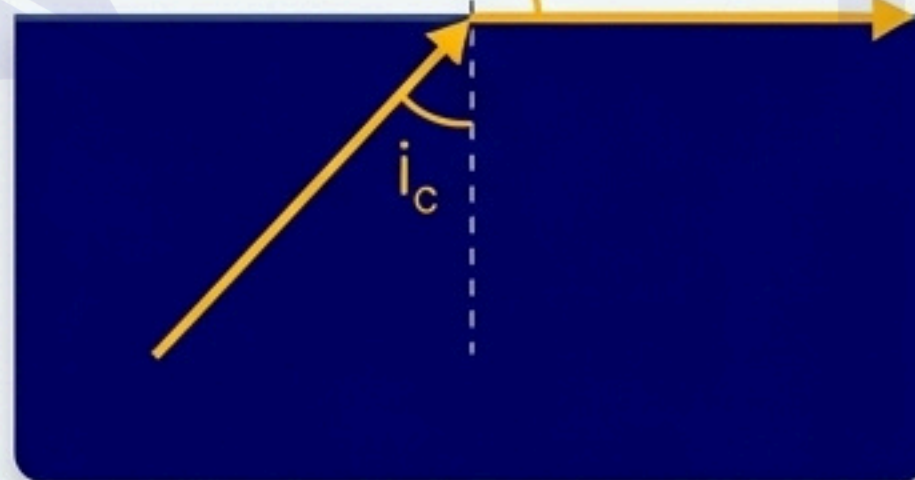
$$i < i_c$$



Grazing Refraction

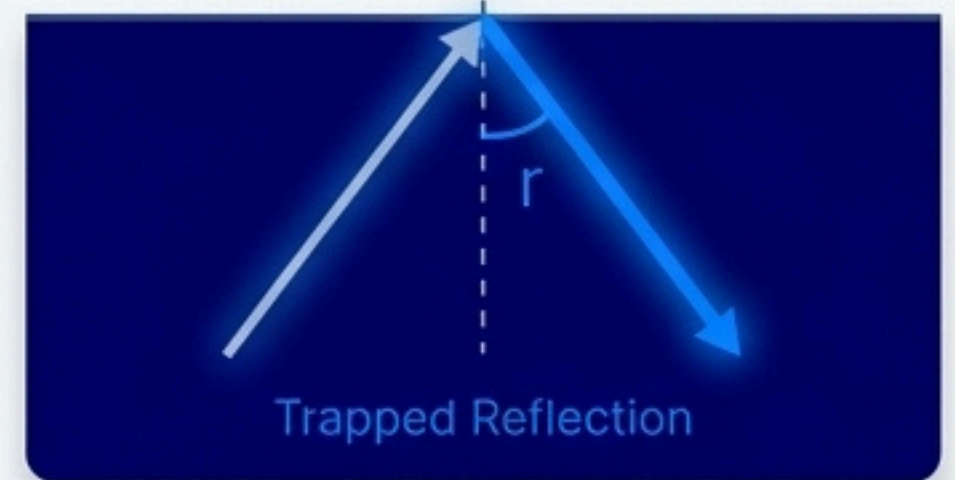
$$i = i_c$$

$$r = 90^\circ$$



Total Internal Reflection

$$i > i_c$$



Chapter Summary



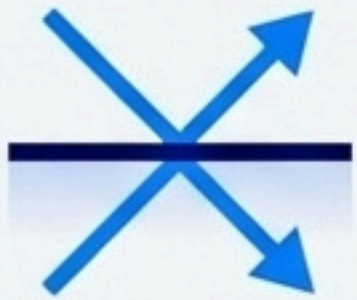
In a rarer medium, the wave bends away.

Because $v_2 > v_1$, the angle of refraction is greater than the angle of incidence.



Critical angle is the limit for refraction.

Occurs when $r = 90^\circ$. Calculated by the formula $\sin i_c = n_2/n_1$.



Beyond the critical angle, Total Internal Reflection occurs.

No light escapes; 100% of the wave is reflected back into the denser medium.



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