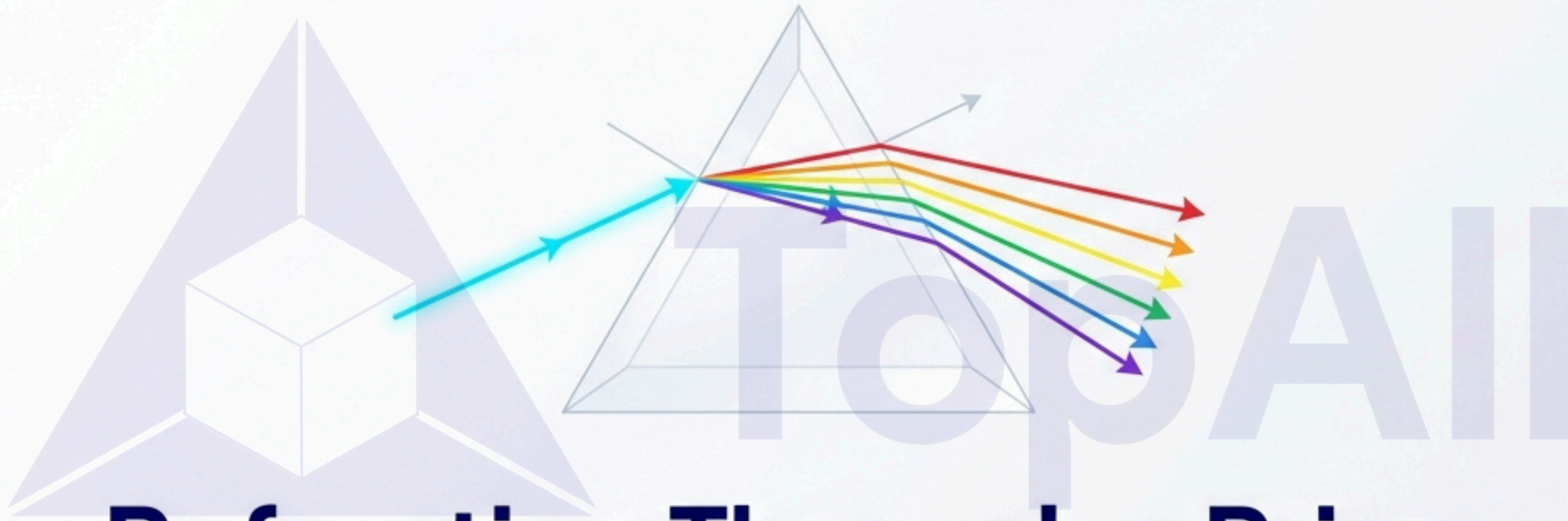


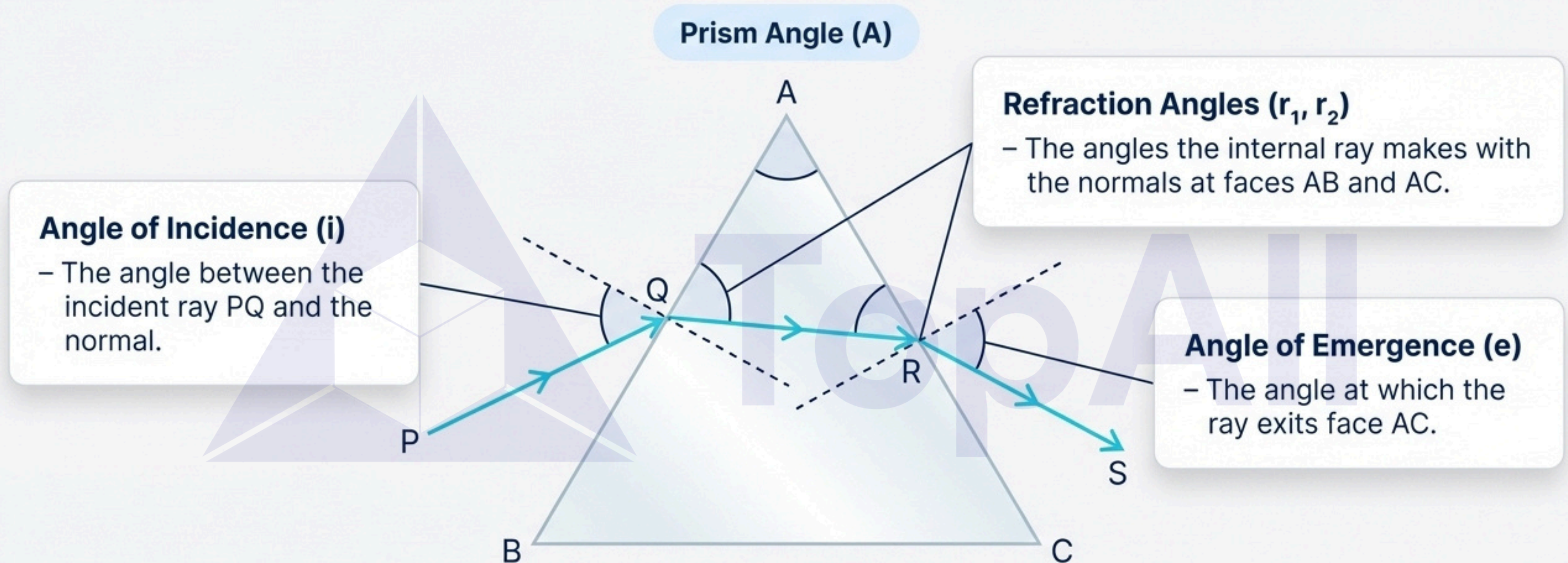
Class 12 Physics / Ray Optics



Refraction Through a Prism

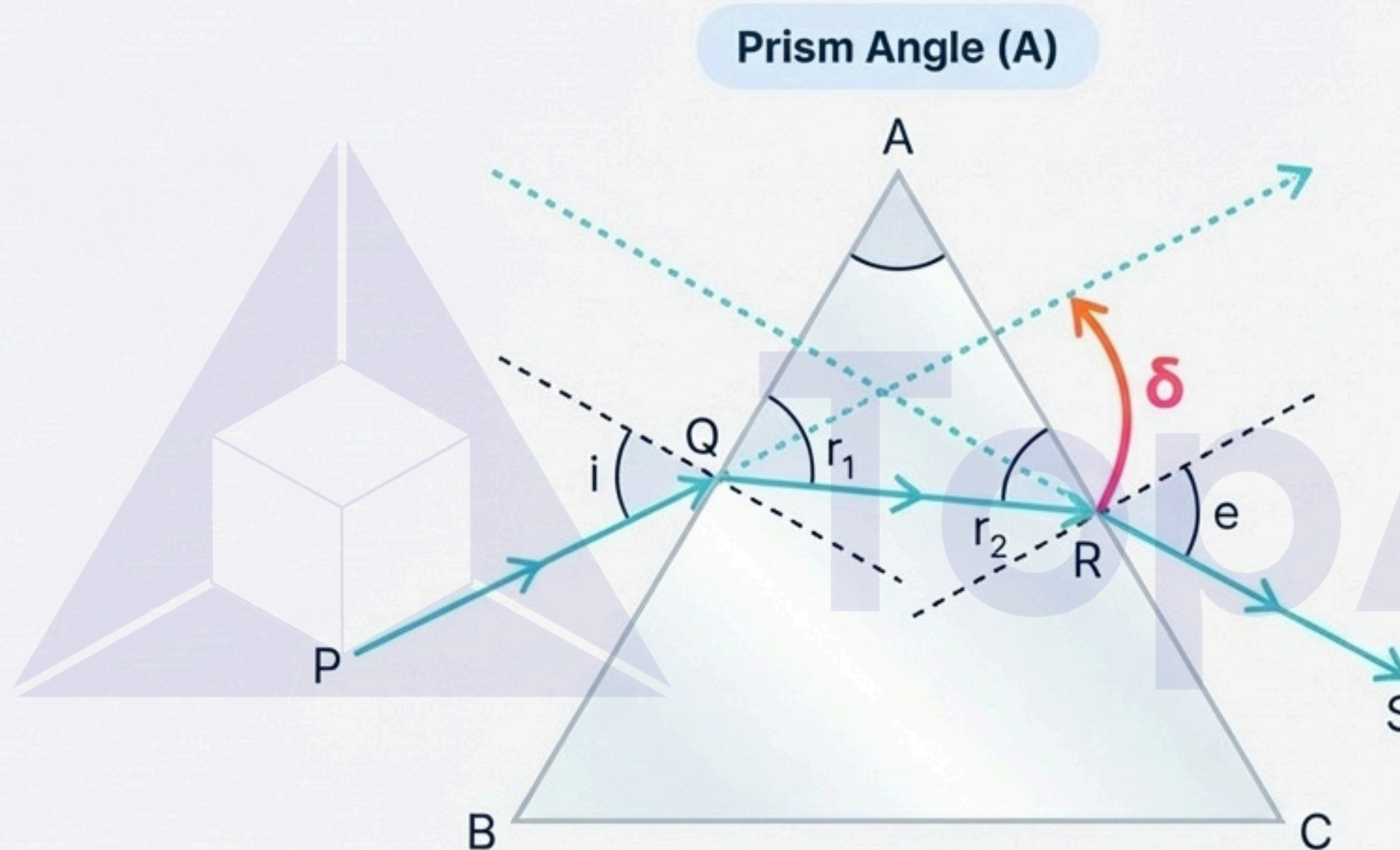
Understanding deviation geometry, symmetric paths, and refractive index.

Anatomy of the Ray Path



$$r_1 + r_2 = A$$

Total Angle of Deviation (δ)



1. Deviation at the first face:
($i - r_1$)

2. Deviation at the second
face: ($e - r_2$)

Definition

Deviation (δ) – The total angle between the original direction of the incident ray and the final direction of the emergent ray.

$$\delta = i + e - A$$



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

$$E=mc^2$$



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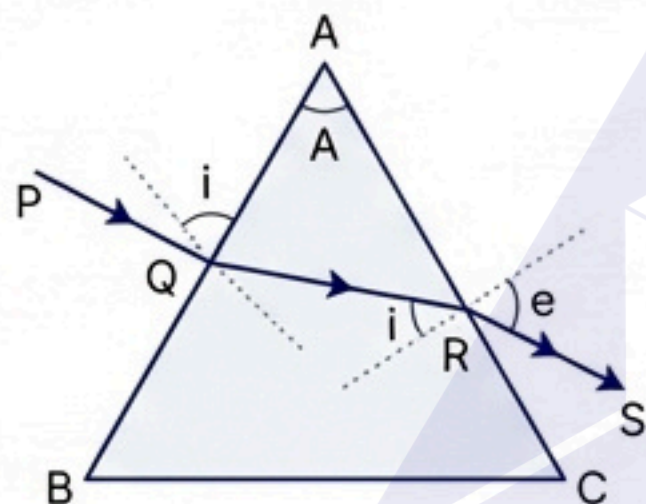
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Key Highlights

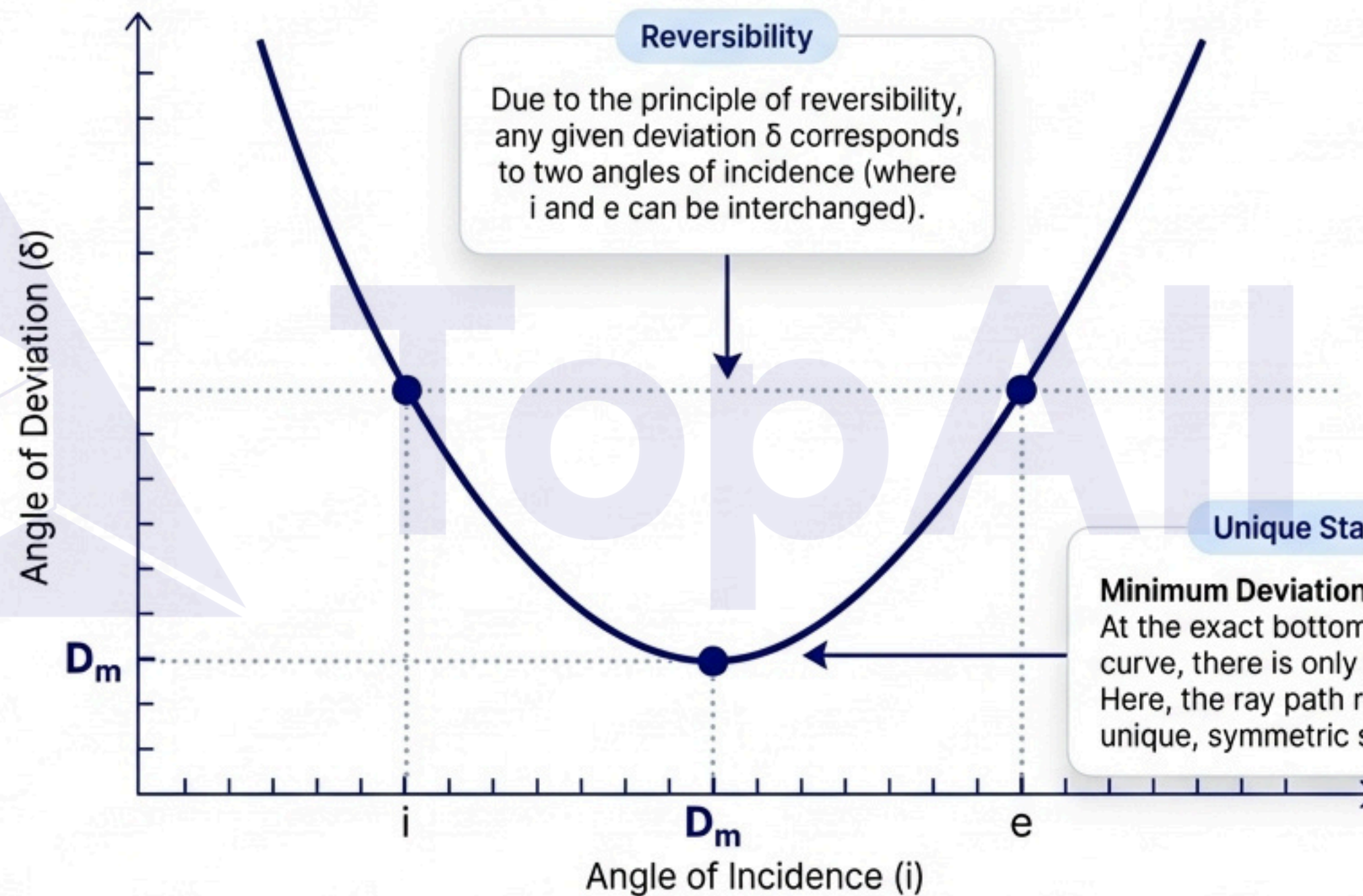
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The Minimum Deviation Curve



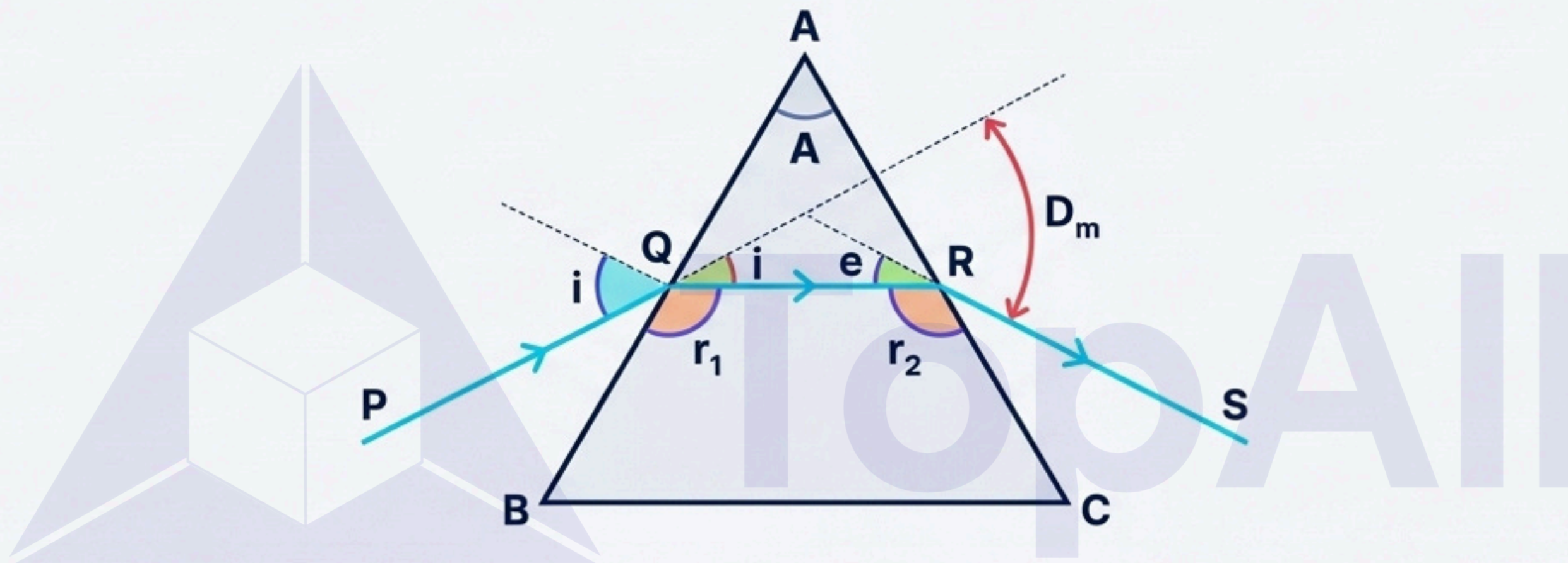
The eclaming a miniaturized diagram arison prism ray path from the previous slides.



The Symmetric Path Condition

State of Minimum Deviation

At minimum deviation (D_m), the internal refracted ray becomes parallel to the prism's base.



Internal Symmetry

$r_1 = r_2$ (Let's call this r). Therefore:

$$2r = A \Rightarrow r = A/2$$

External Symmetry

$i = e$. Therefore:

$$D_m = 2i - A \Rightarrow i = (A + D_m)/2$$

Determining Refractive Index

By utilizing the symmetric path conditions derived at minimum deviation, we can adapt Snell's Law to find the refractive index of the prism material using only macroscopically measurable angles.



Key Takeaways



$$n_{21} = \frac{\sin\left(\frac{A + D_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

Measuring the prism angle (A) and minimum deviation (D_m) experimentally provides a highly precise method for identifying the optical properties of the material.



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