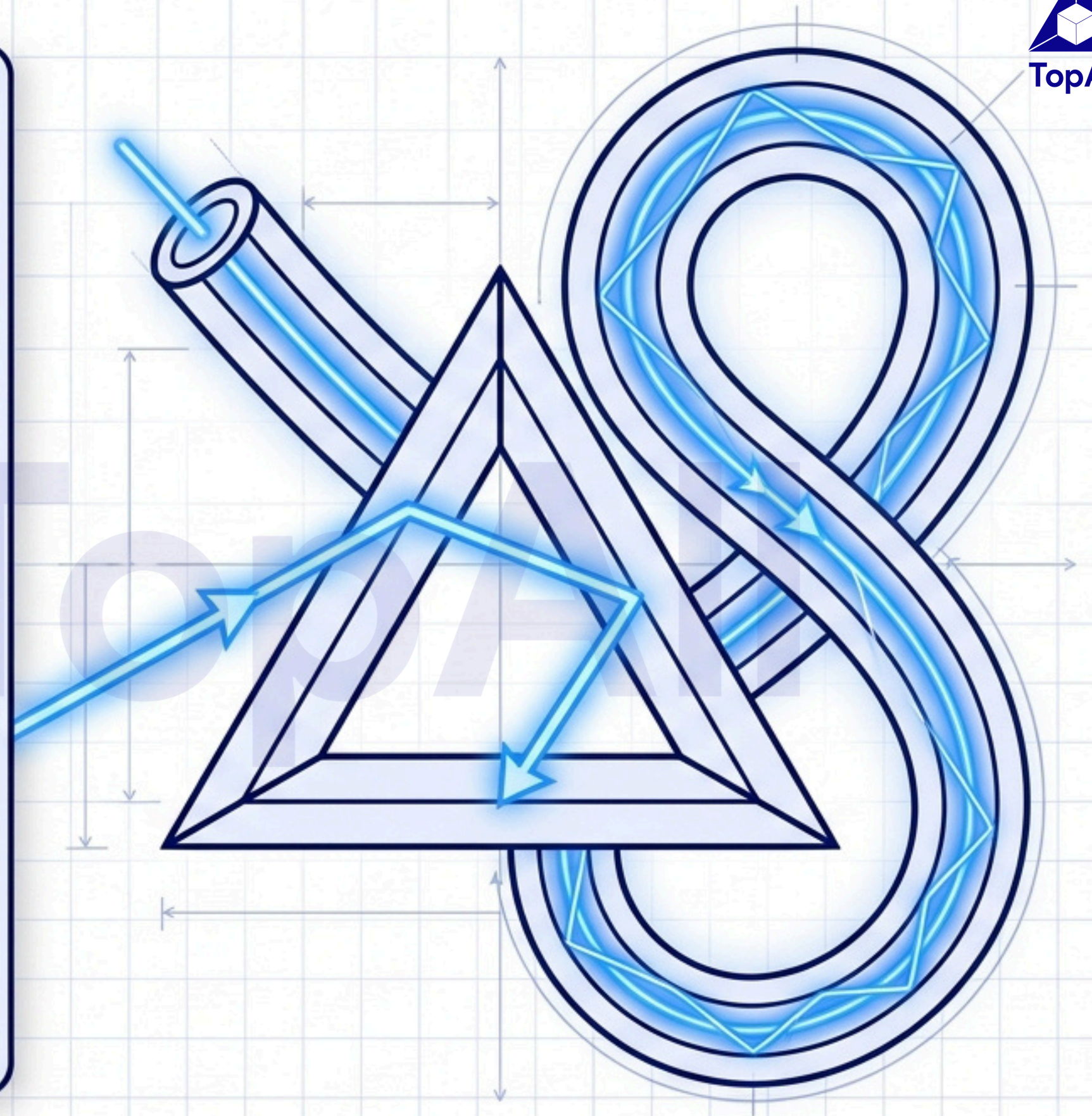


JEE Physics Concept Module

Applications of Total Internal Reflection

Prisms & Optical Fibres



Totally Reflecting Prisms

- Prisms use TIR to bend light by exactly 90° or 180° .
- Used to invert images without changing their size.

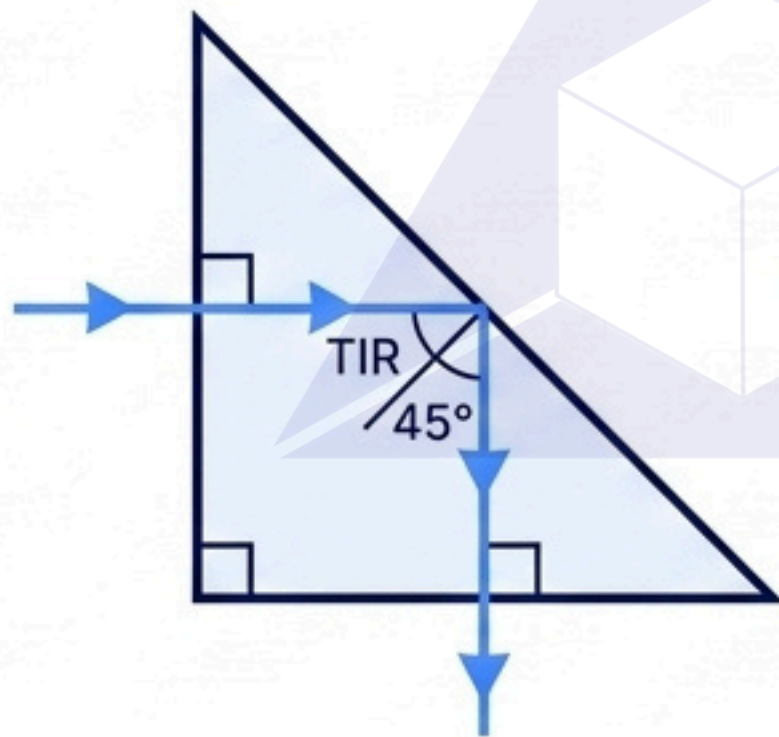
The critical angle (i_c) for the material of the prism must be **less than 45°**

Crown Glass: $i_c \approx 41.14^\circ$ ($n = 1.52$)

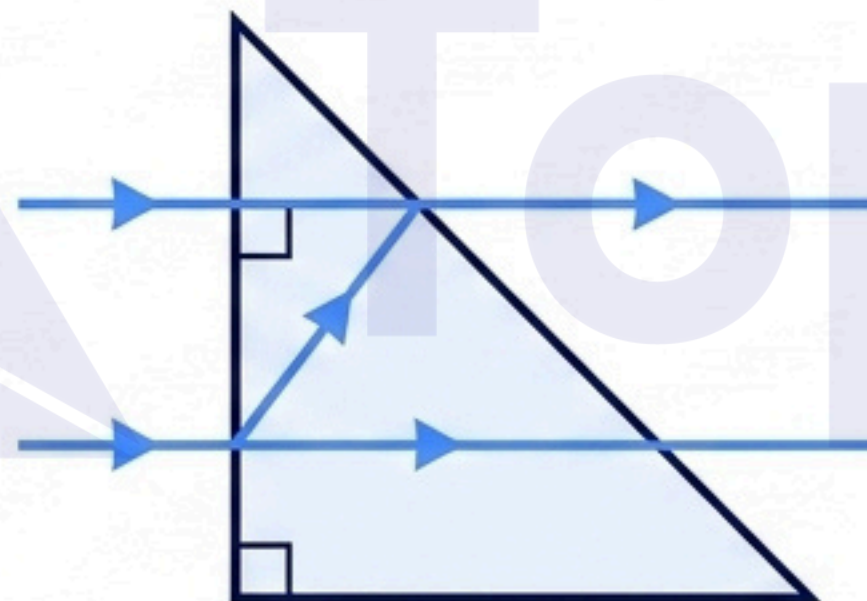
Dense Flint Glass: $i_c \approx 37.31^\circ$ ($n = 1.62$)

Prism Configurations via TIR

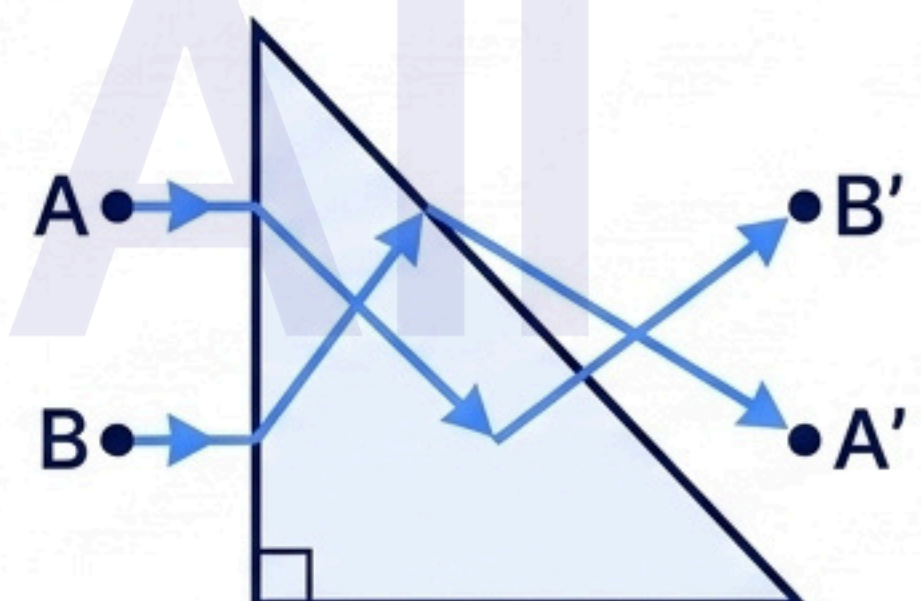
1. Bending by 90°



2. Bending by 180°



3. Image Inversion





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$$E=mc^2$$



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Key Highlights

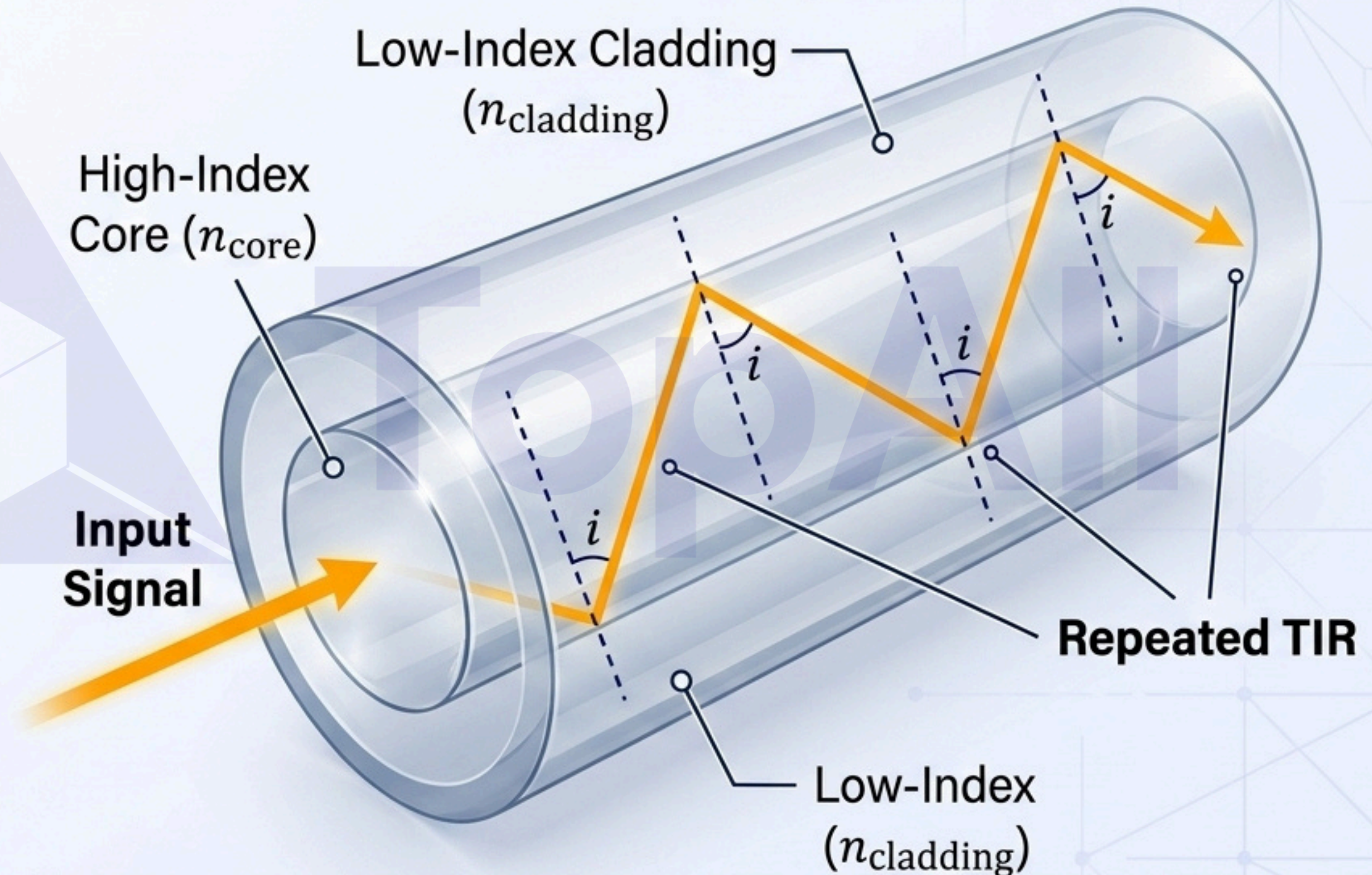
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Optical Fibre Construction

Used as an 'optical pipe' for transmitting audio, video, or optical signals over long distances with no appreciable loss of intensity.

Silica glass fibres can transmit >95% of light over a 1 km length!



Mathematical Conditions for Fibres


$$n_{\text{core}} > n_{\text{cladding}}$$

The core must be optically denser than the outer cladding.

$$i > i_c$$

The angle of incidence at the interface must exceed the critical angle.

JEE Trap Alert!



MYTH

“Optical fibres work just like an ordinary hollow tube lined with silvered mirrors.”

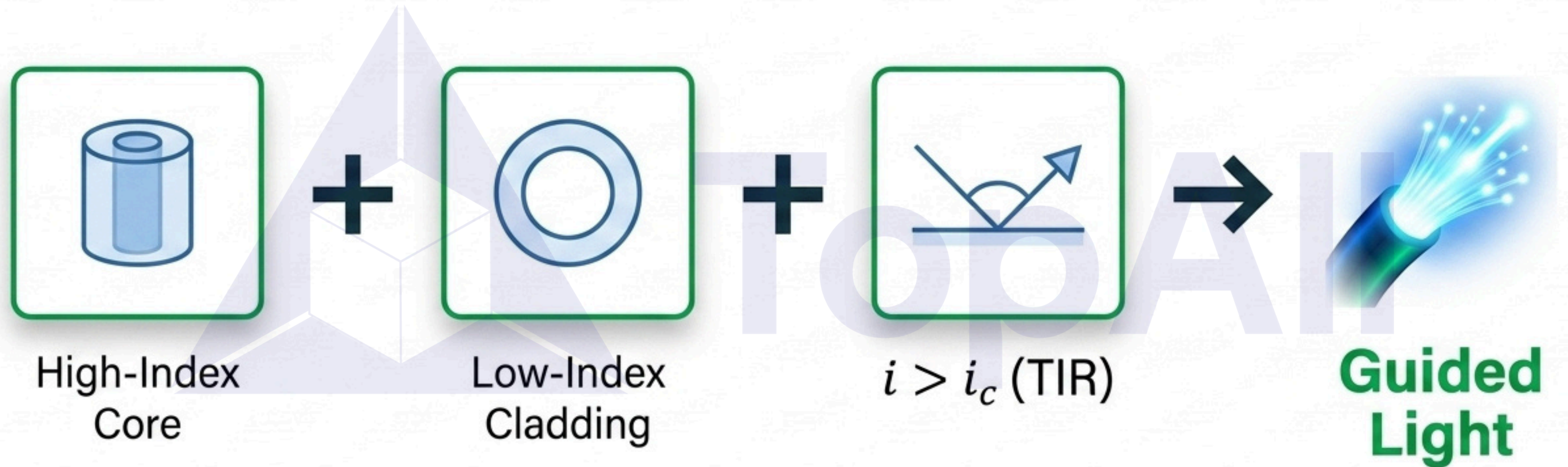


FACT

Optical fibres rely on Total Internal Reflection, NOT ordinary metallic reflection.

Ordinary mirror reflection always absorbs a small fraction of light, causing rapid loss of intensity over multiple bounces. TIR allows exactly 100% reflection, retaining signal intensity over kilometers.

Quick Revision



Real-world applications include medical endoscopes, telecommunication lines, and decorative fountain lamps.



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