

# PRAYAS

## JEE 2025



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Lecture - 01

Physics

Ray Optics



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# Topics *to be covered*

1

Plane Mirror

2

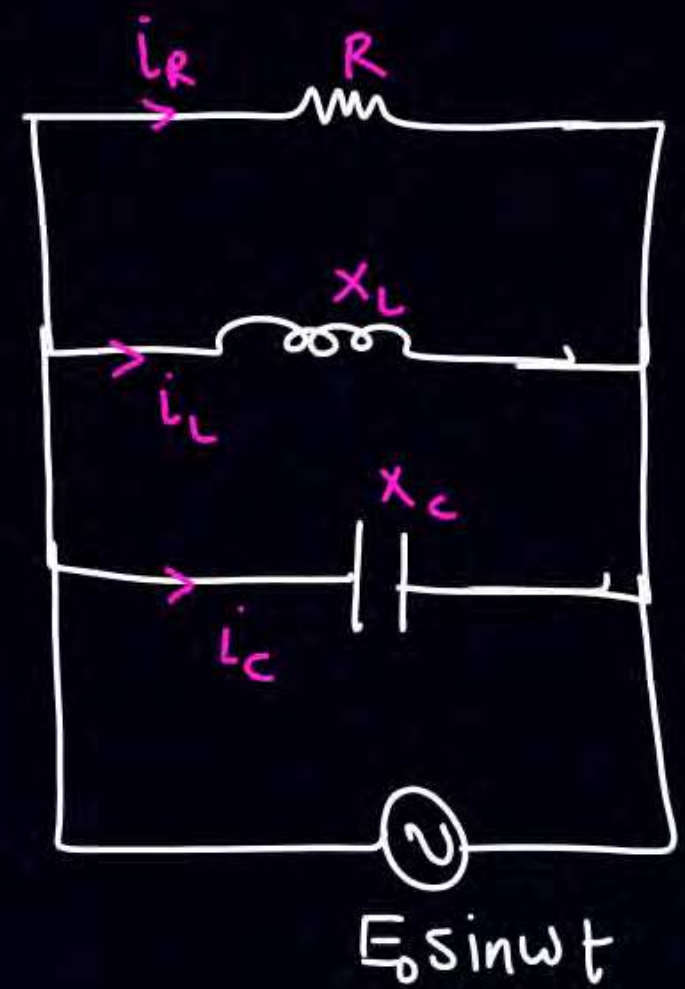
3

4

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#



$$i_R = \frac{E_0}{R} \sin \omega t$$

$$i_L = \frac{E_0}{X_L} \sin(\omega t - 90^\circ)$$

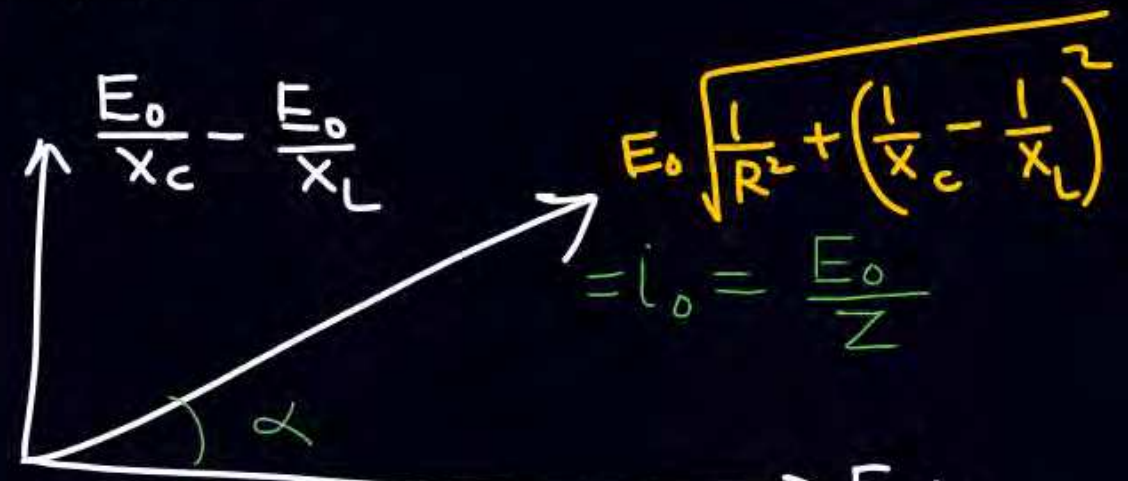
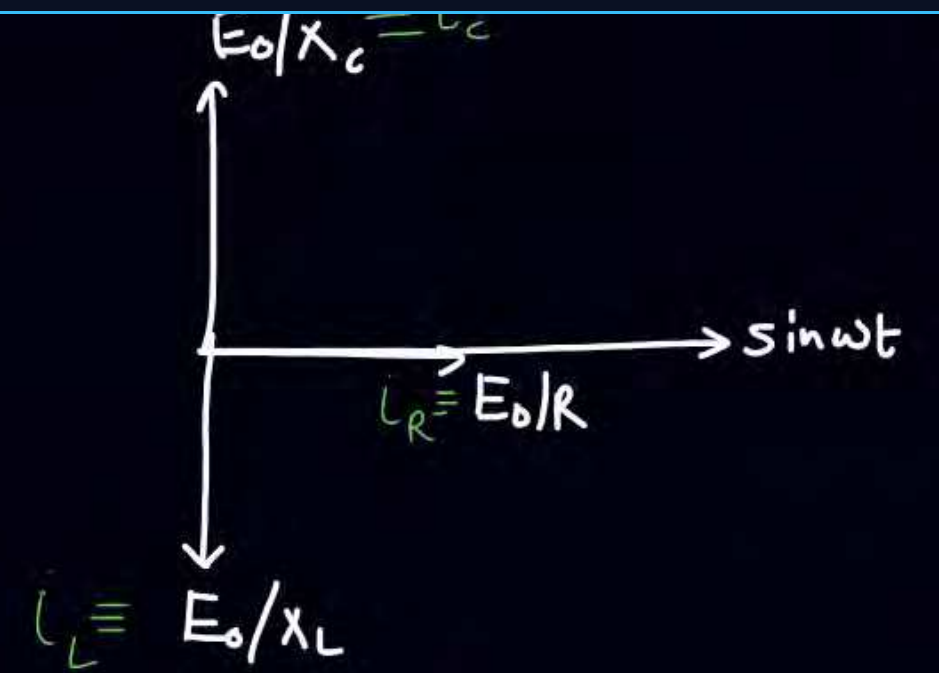
$$i_C = \frac{E_0}{X_C} \sin(\omega t + 90^\circ)$$

⇓ Add

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$$i_{net} = E_0 \sqrt{\frac{1}{R^2} + \left(\frac{1}{X_C} - \frac{1}{X_L}\right)^2} \sin(\omega t + \alpha)$$

$$i = \frac{E_0}{Z} \sin(\omega t + \alpha)$$

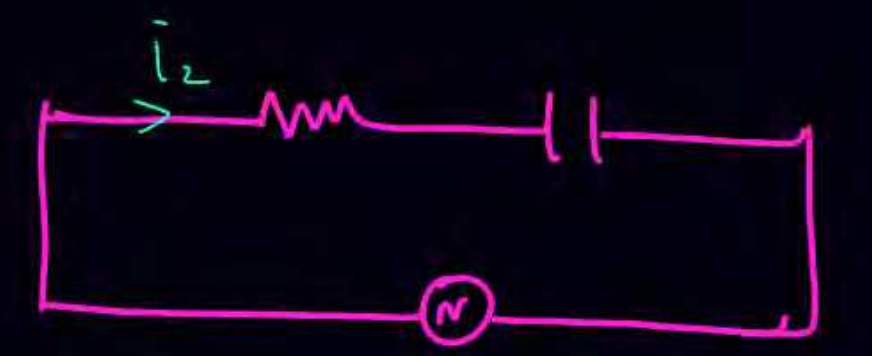
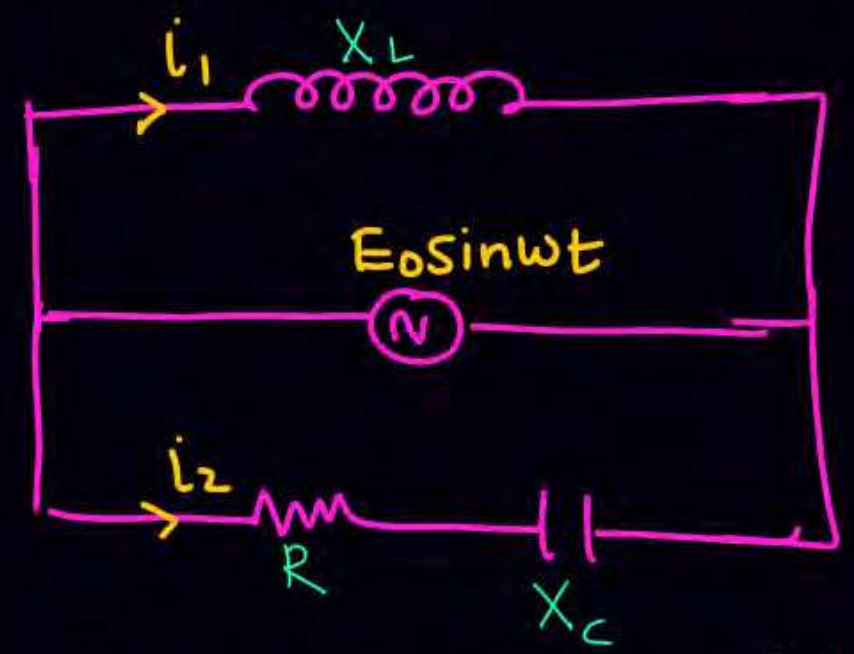


$$\frac{1}{Z} = \sqrt{\frac{1}{R^2} + \left(\frac{1}{X_C} - \frac{1}{X_L}\right)^2} = \frac{1}{Z} = \text{Admittance}$$

$$\tan \alpha = \frac{\frac{1}{X_C} - \frac{1}{X_L}}{1/R}$$



Q



phase diff  
Ans  $(\omega t + \alpha) - (\omega t - 90)$   
 $= \underline{\alpha + 90}$

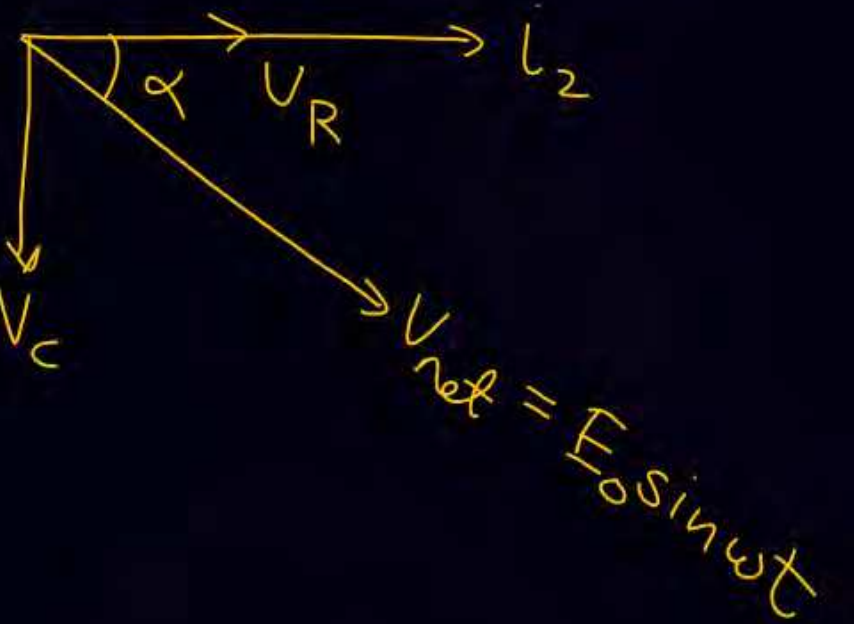
find phase difference b/w  $i_1$  &  $i_2$

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$$i_1 = \frac{E_0}{X_L} \sin(\omega t - 90)$$

$$i_2 = \frac{E_0}{\sqrt{R^2 + X_C^2}} \sin(\omega t + \alpha)$$

$$\tan \alpha = \frac{V_C}{V_R} = \frac{X_C}{R}$$





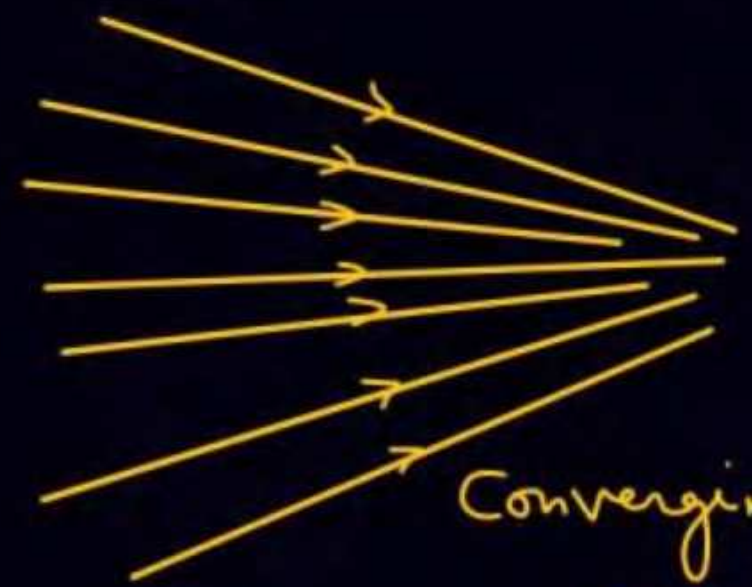
Ray optics

Geometrical optics

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parallel Beam  
↳ collection of rays



Converging rays  
Beam

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Diverging rays  
(Beam)

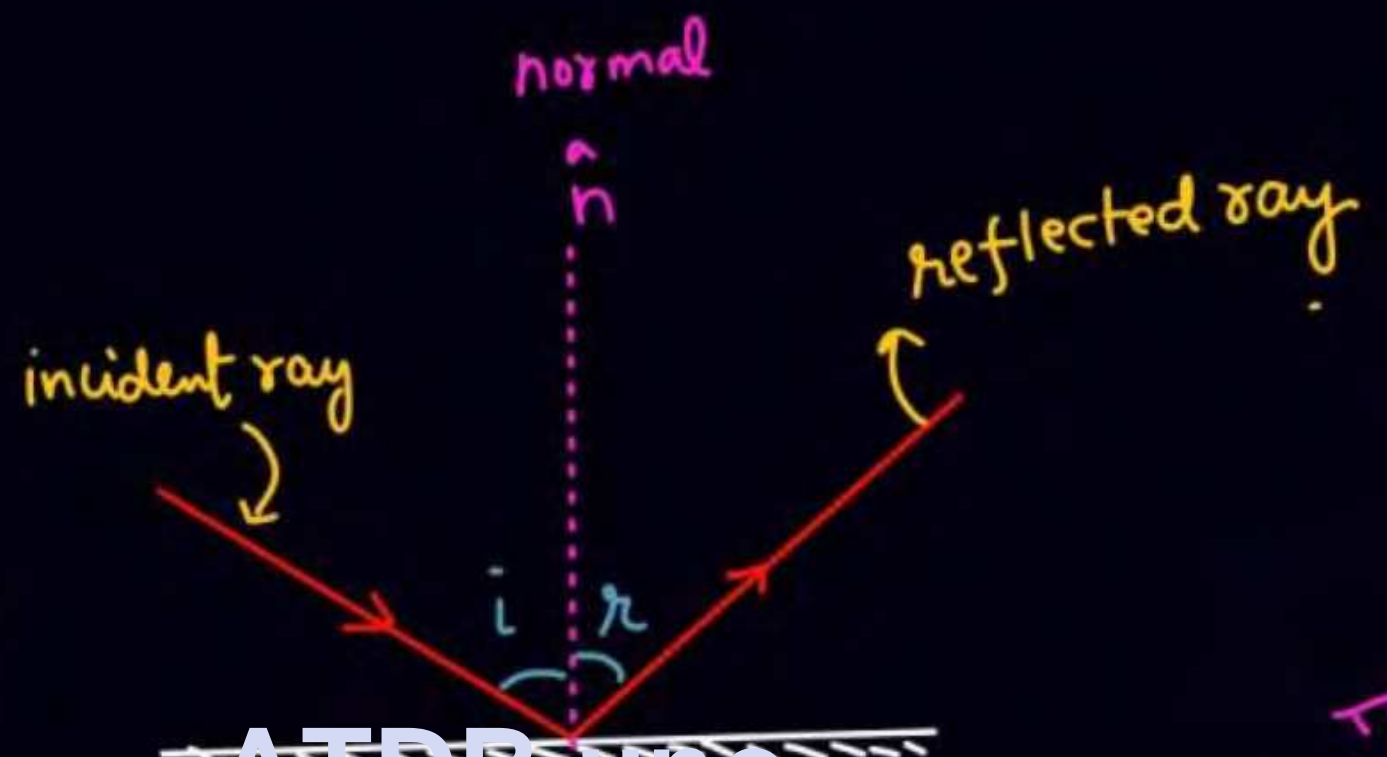


## Law of Reflection

- ① incident ray, reflected ray  
normal to the mirror

In  
In same plane

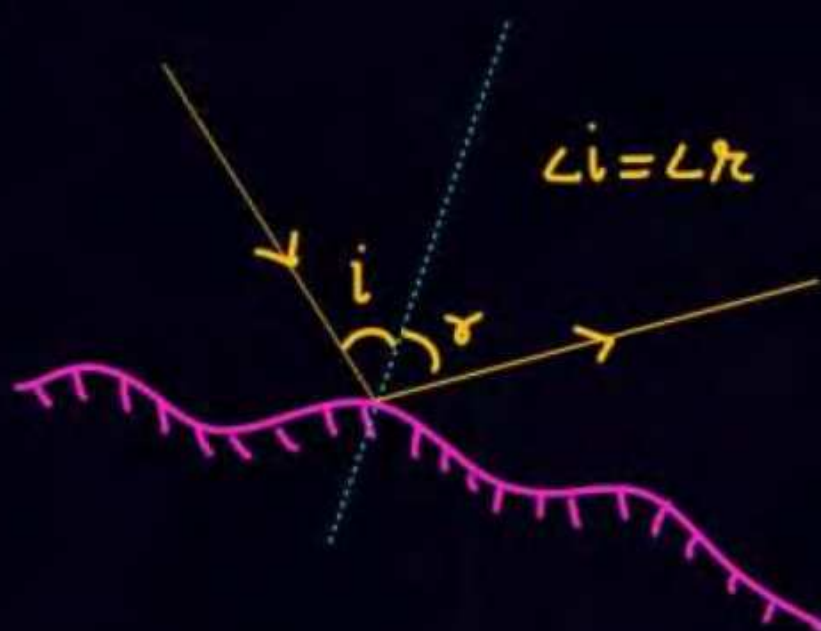
②  $\angle i = \angle r$

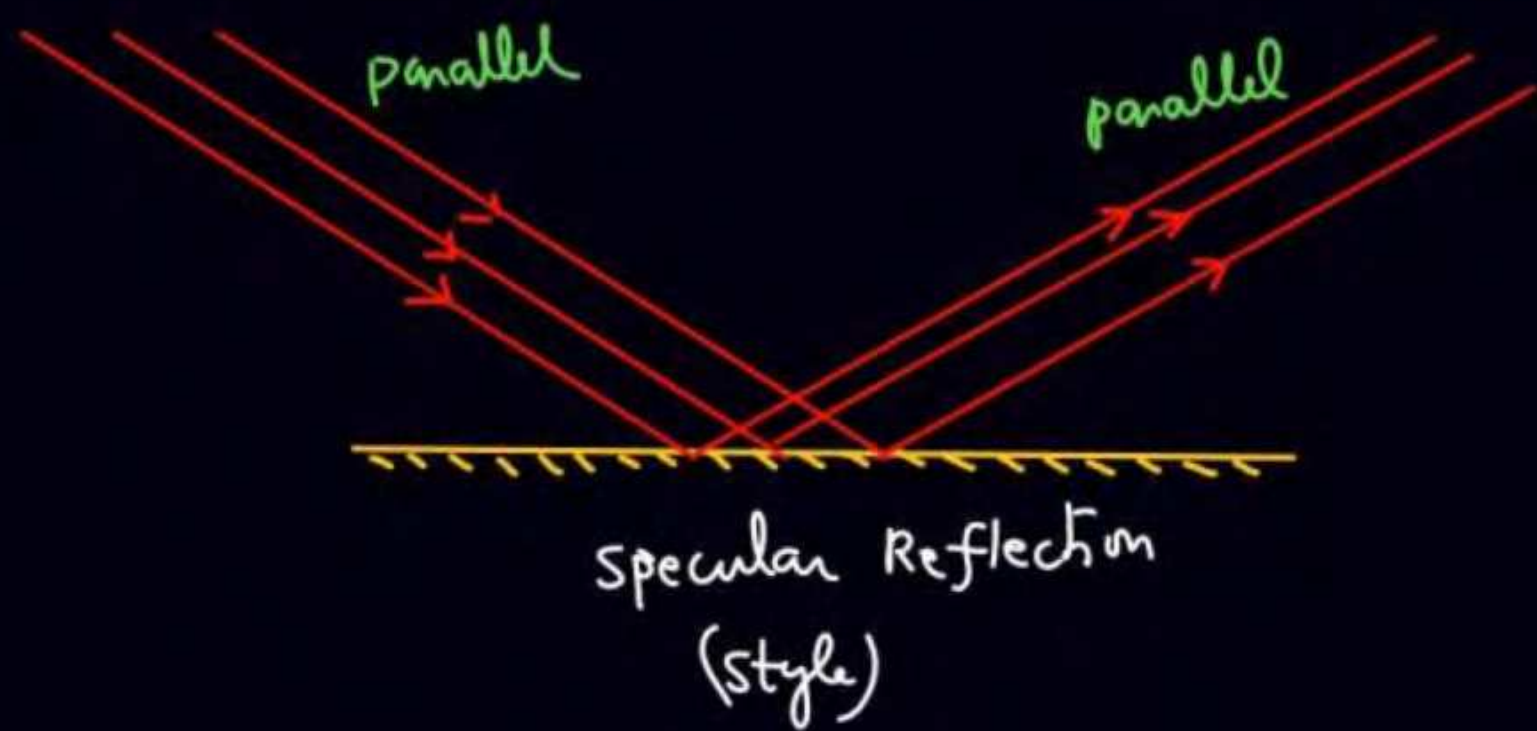


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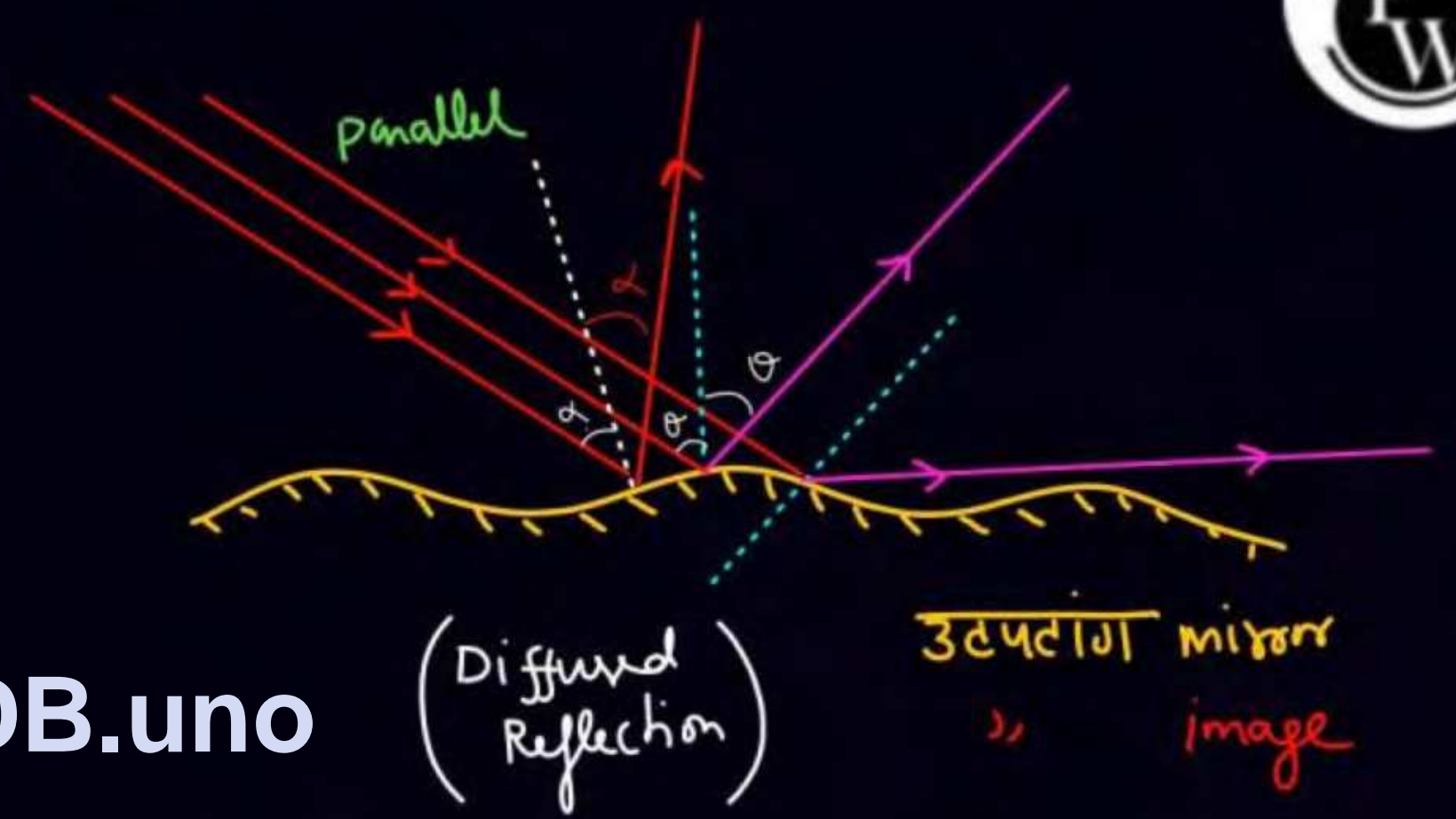
$\angle i$  → angle of incident

$\angle r$  → angle of reflection





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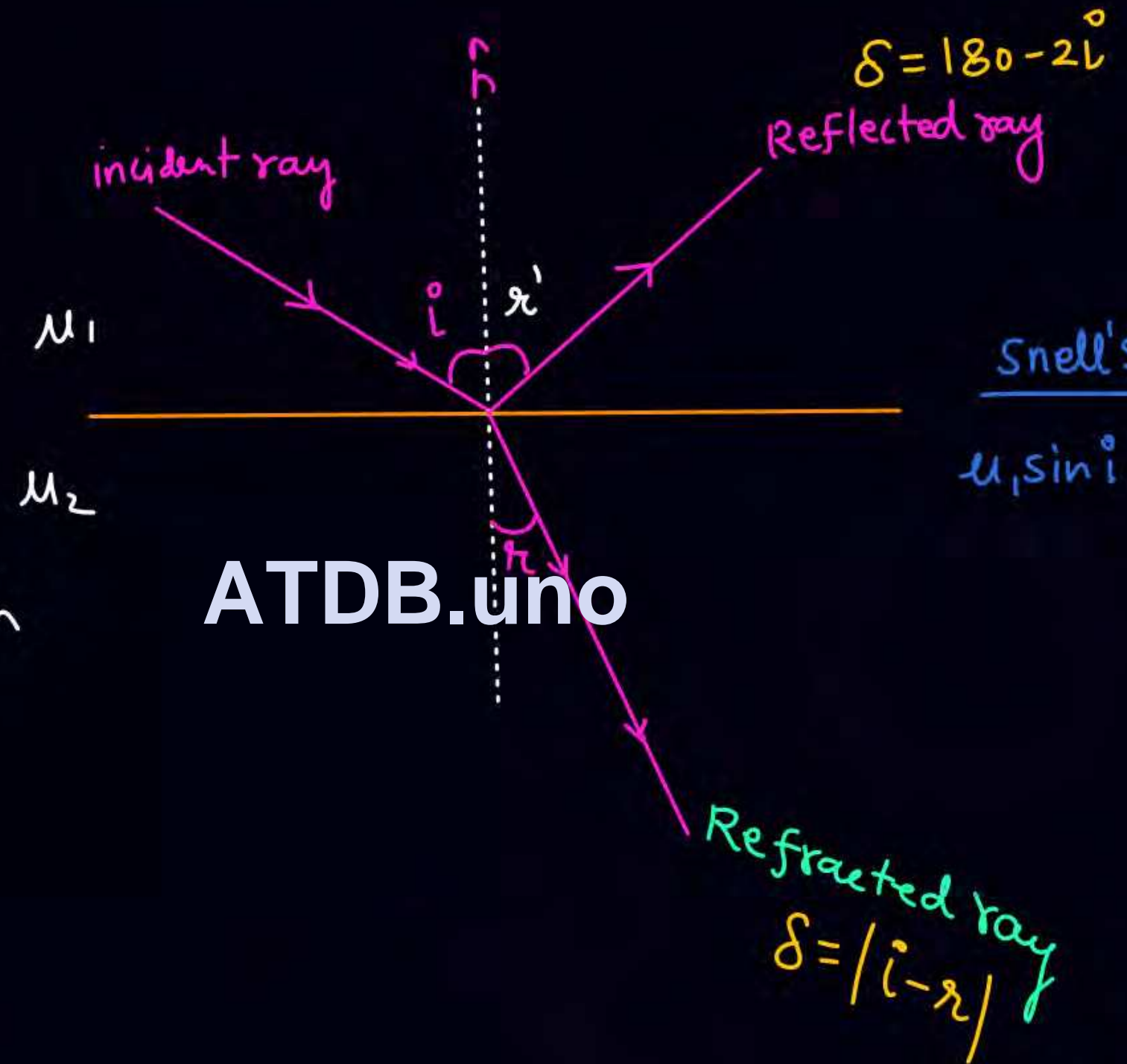


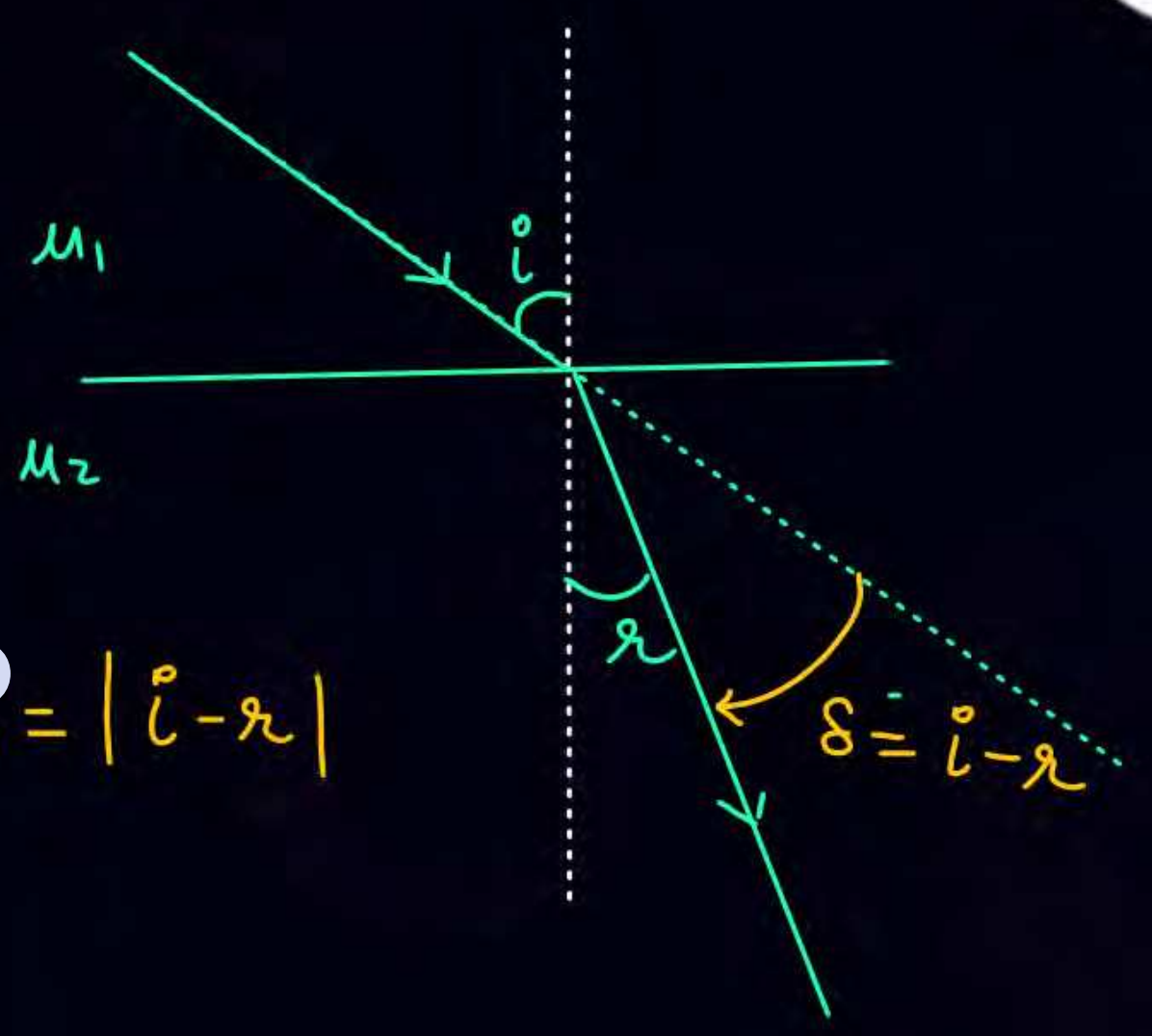
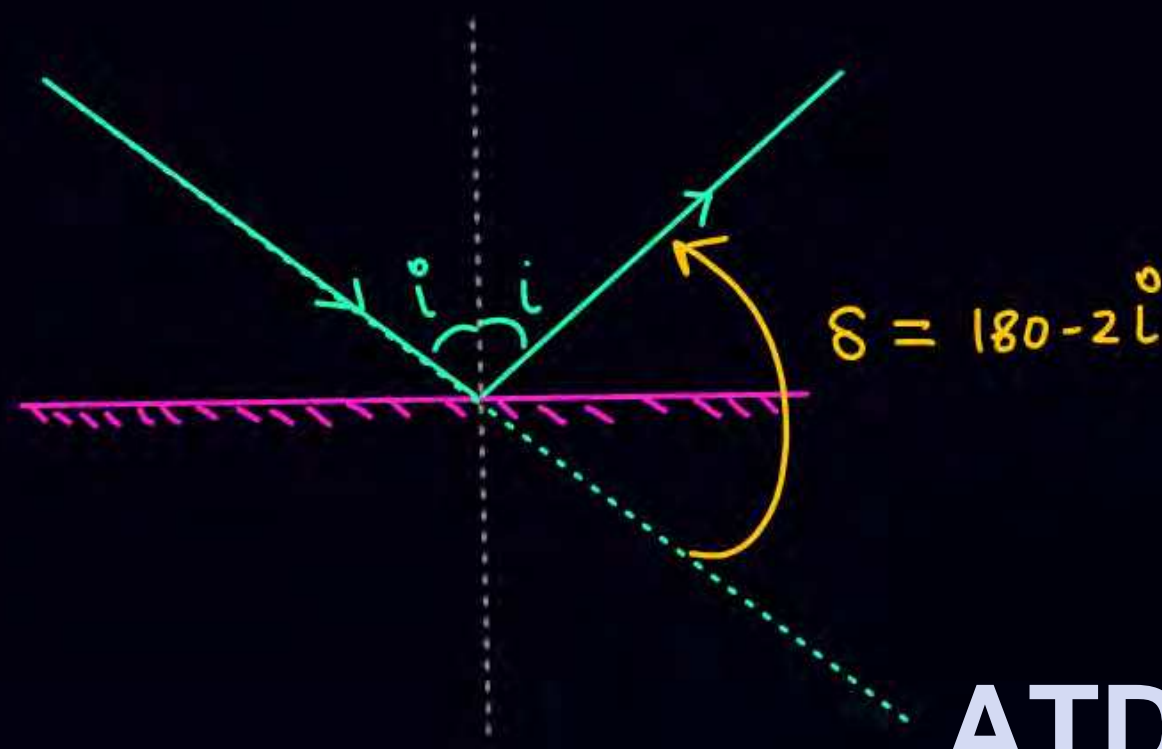


$i$  → angle of incident  
 $r'$  → " reflection

$$\angle i = \angle r'$$

$r$  → Angle of refraction



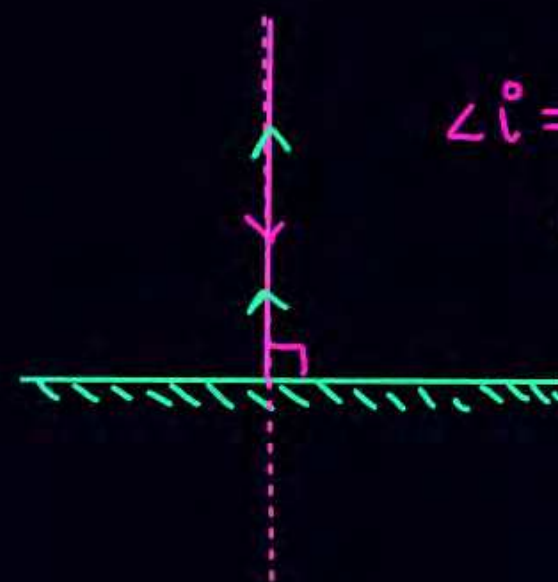


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$\delta = |i - r|$



#  $\delta = 180 - 2i$  (single reflection)



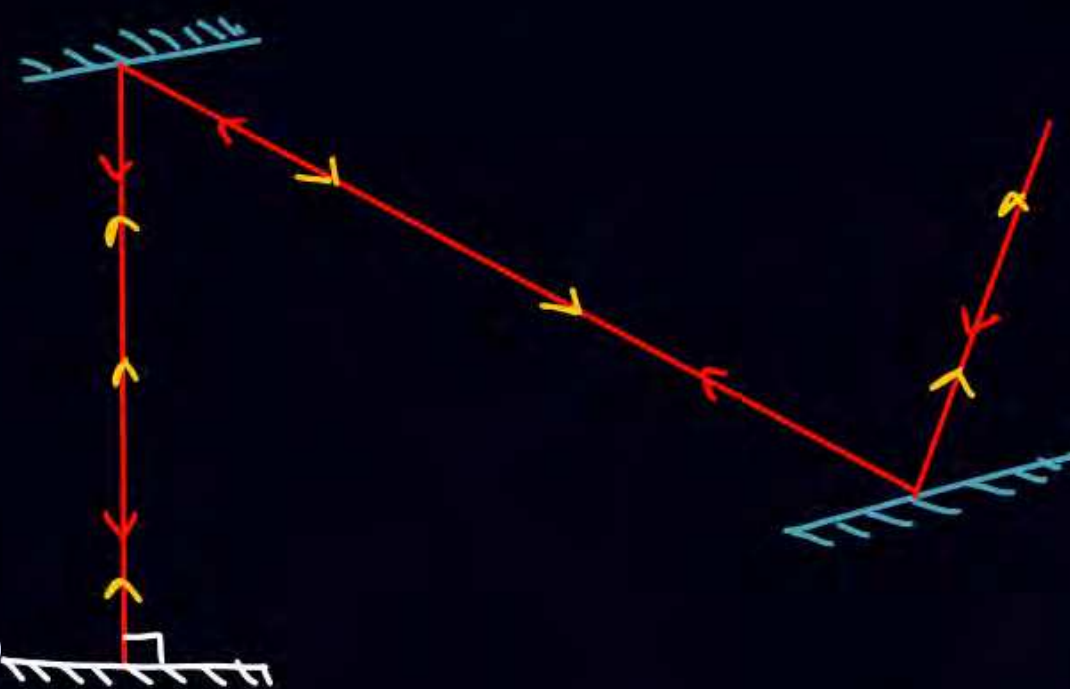
$$\angle i = 0 = \angle r$$

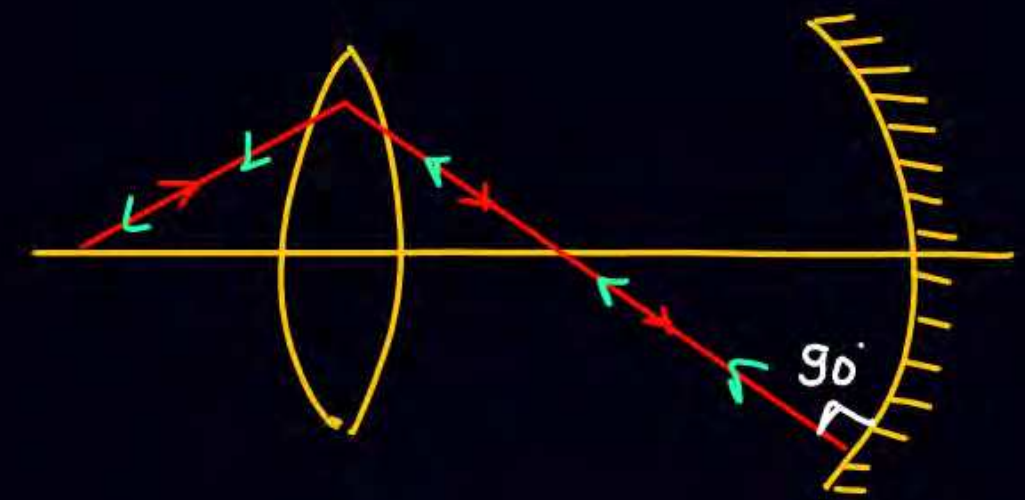
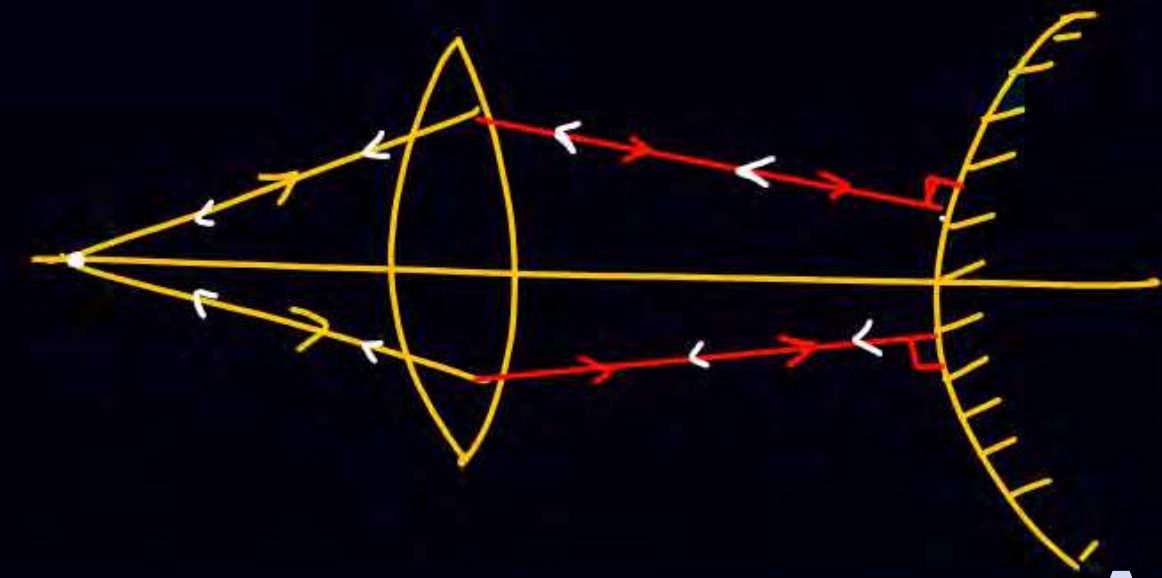
$$\delta = 180 - 2i, \text{ (put } i = 0)$$

$$\delta = 180$$

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\*

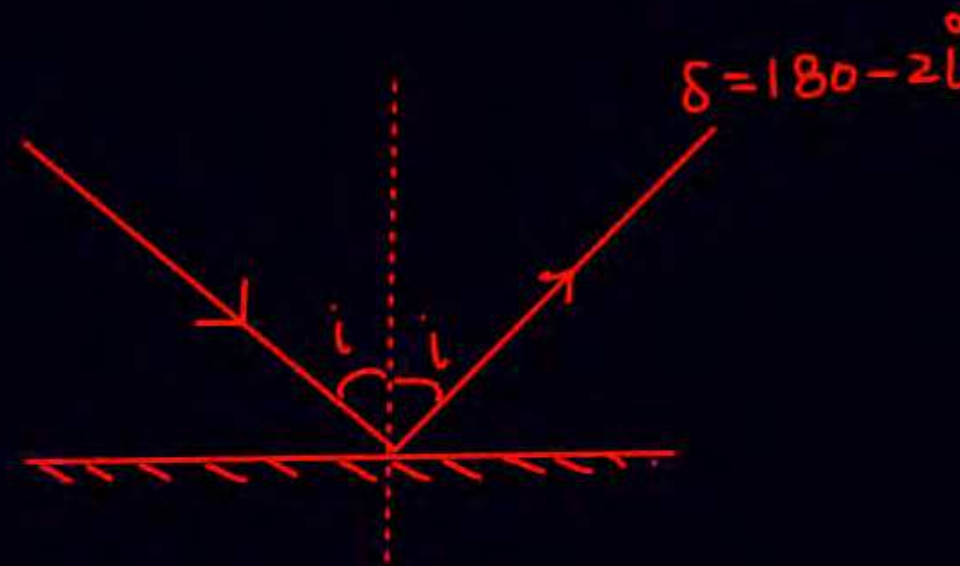




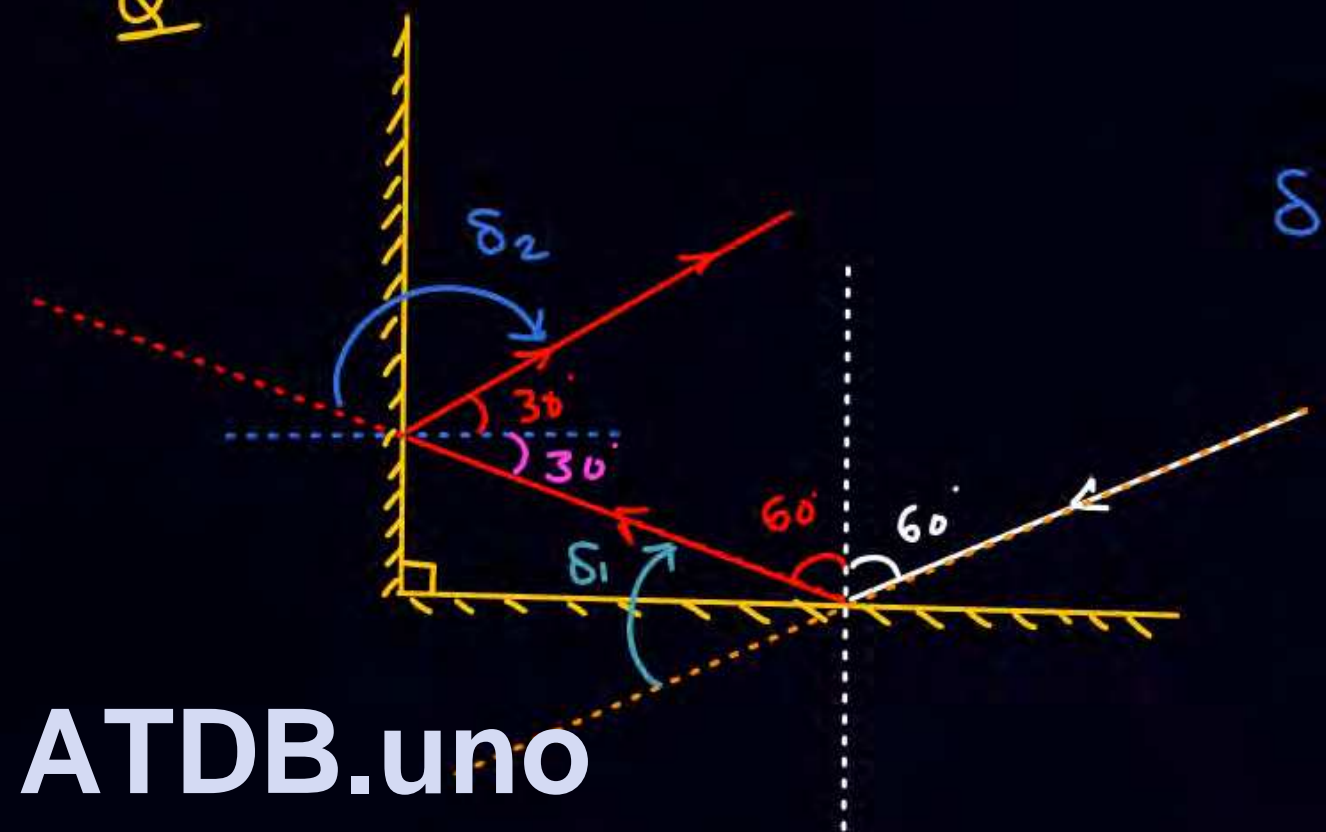
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#



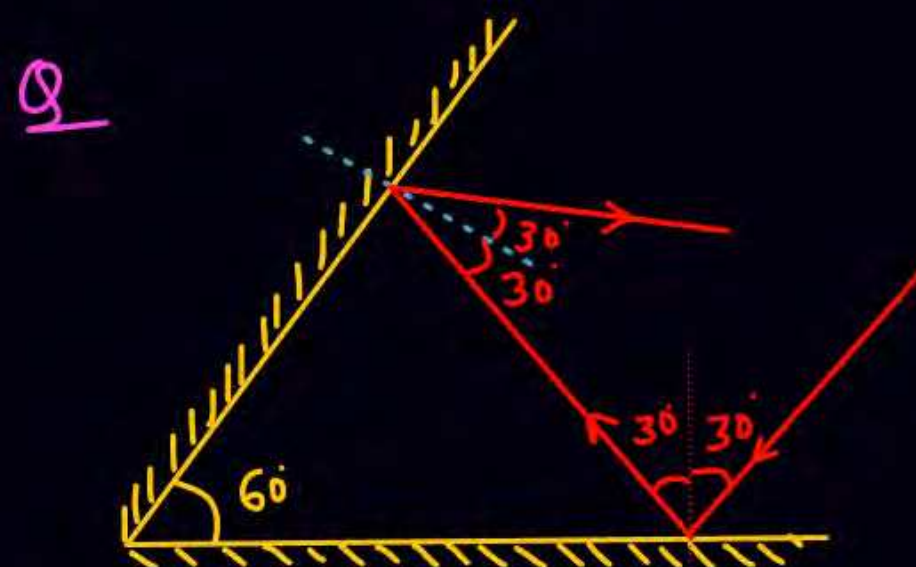
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$$\delta = \underset{\text{(CW)}}{\delta_1} + \underset{\text{(CW)}}{\delta_2} = (180 - 2 \times 60) + (180 - 2 \times 30)$$

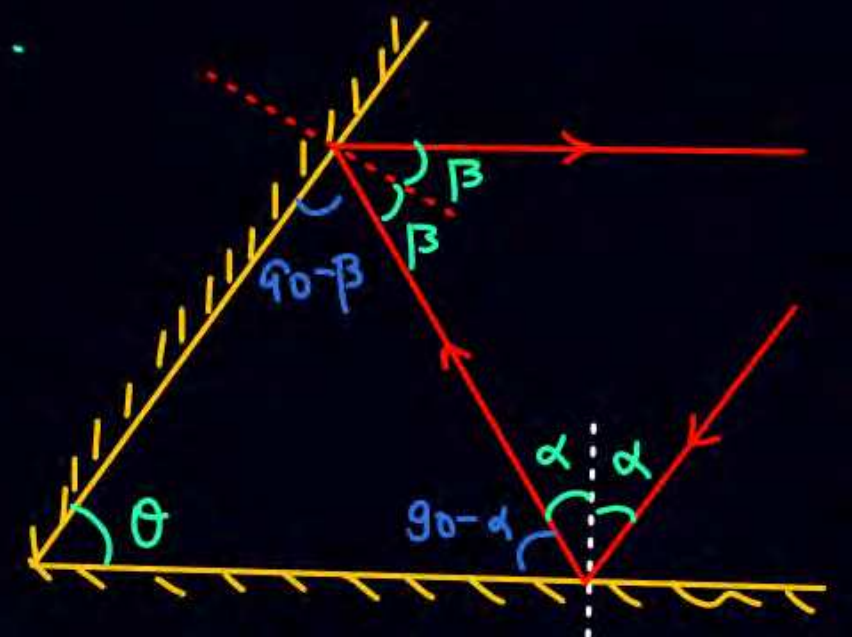
$$= \underline{\underline{180}}$$



$$\begin{aligned} \delta &= (180 - 2 \times 30) + (180 - 2 \times 30) \\ &= 240 \text{ (CW)} \\ &= 120 \text{ ACW.} \end{aligned}$$

$$\delta = 360 - 2 \times 60 = 240$$

formula

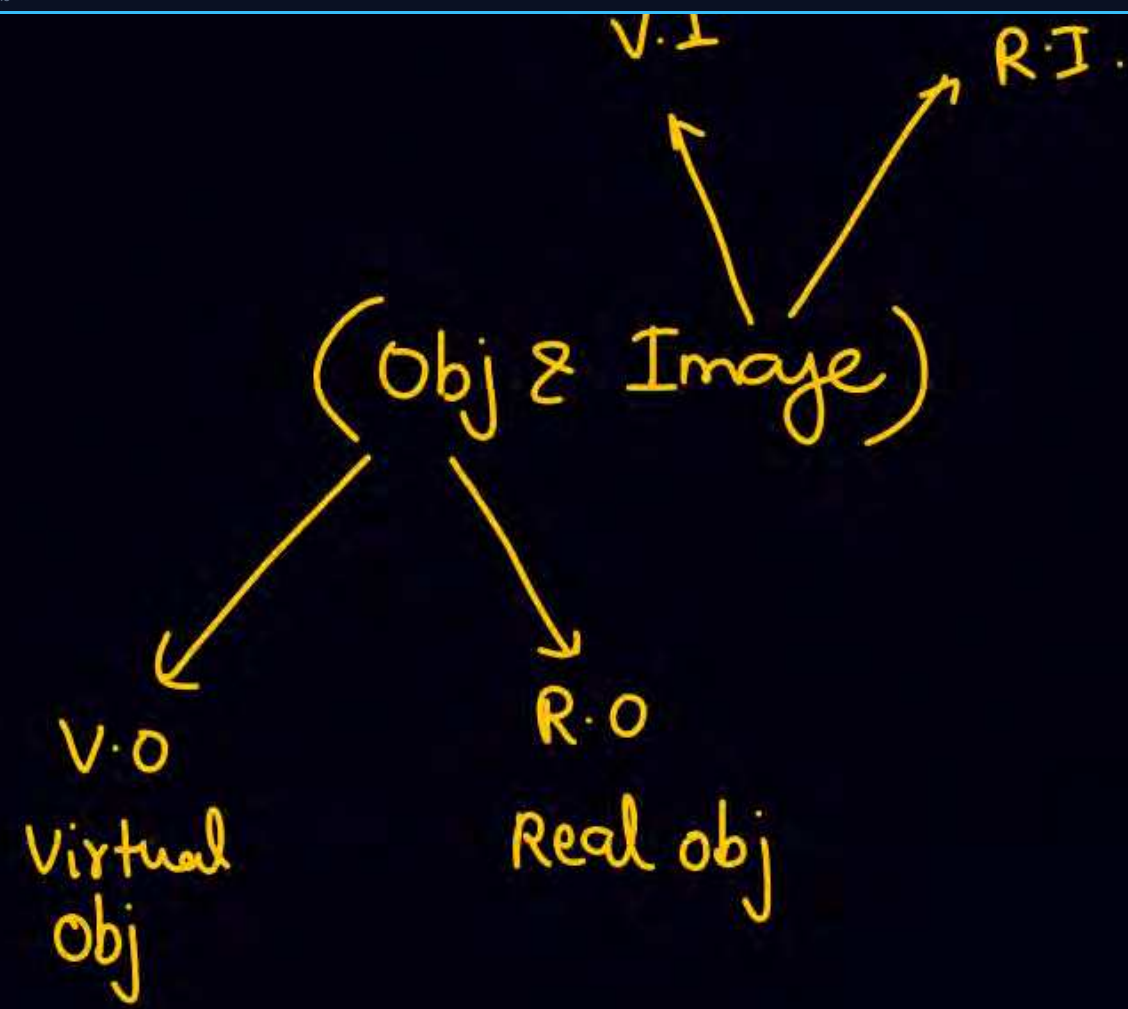


$$\begin{aligned} \theta + 90 - \alpha + 90 - \beta \\ &= 180 \end{aligned}$$

$$\boxed{\alpha + \beta = \theta}$$

$$\begin{aligned} \delta &= (180 - 2\alpha) + (180 - 2\beta) \\ &= 360 - 2(\alpha + \beta) \end{aligned}$$

$$\boxed{\delta = 360 - 2\theta}$$



# {

Obj → point of interesection of incident ray

Image → " " " reflected ray

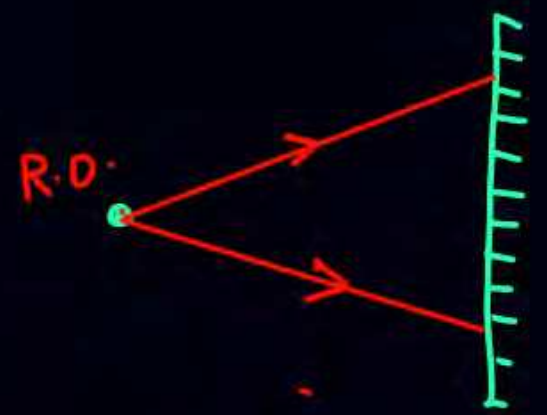
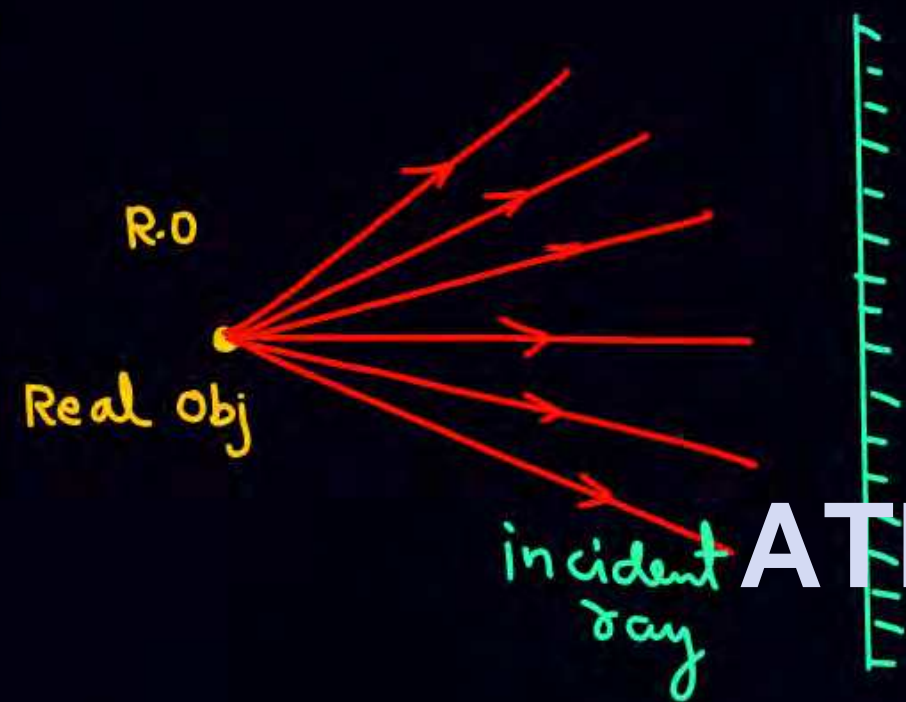
" " " refracted ray

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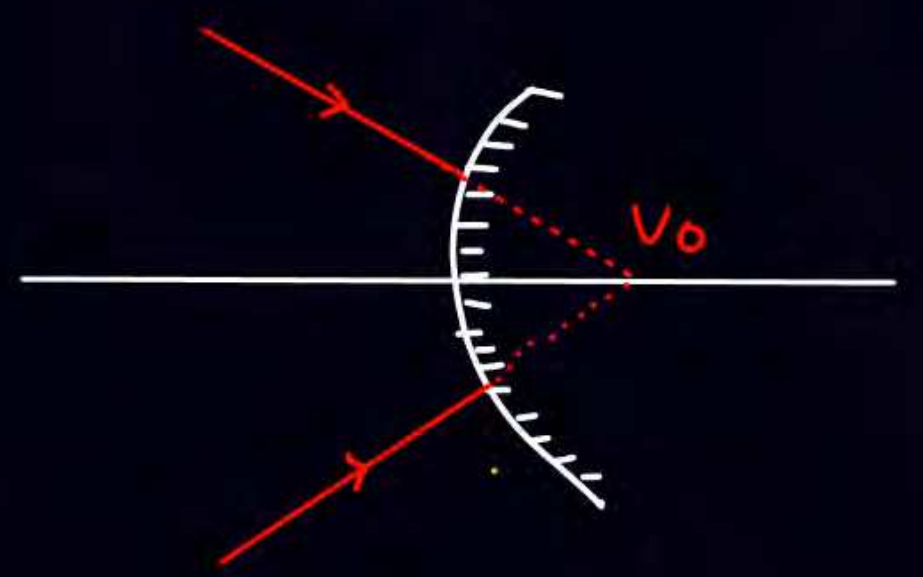
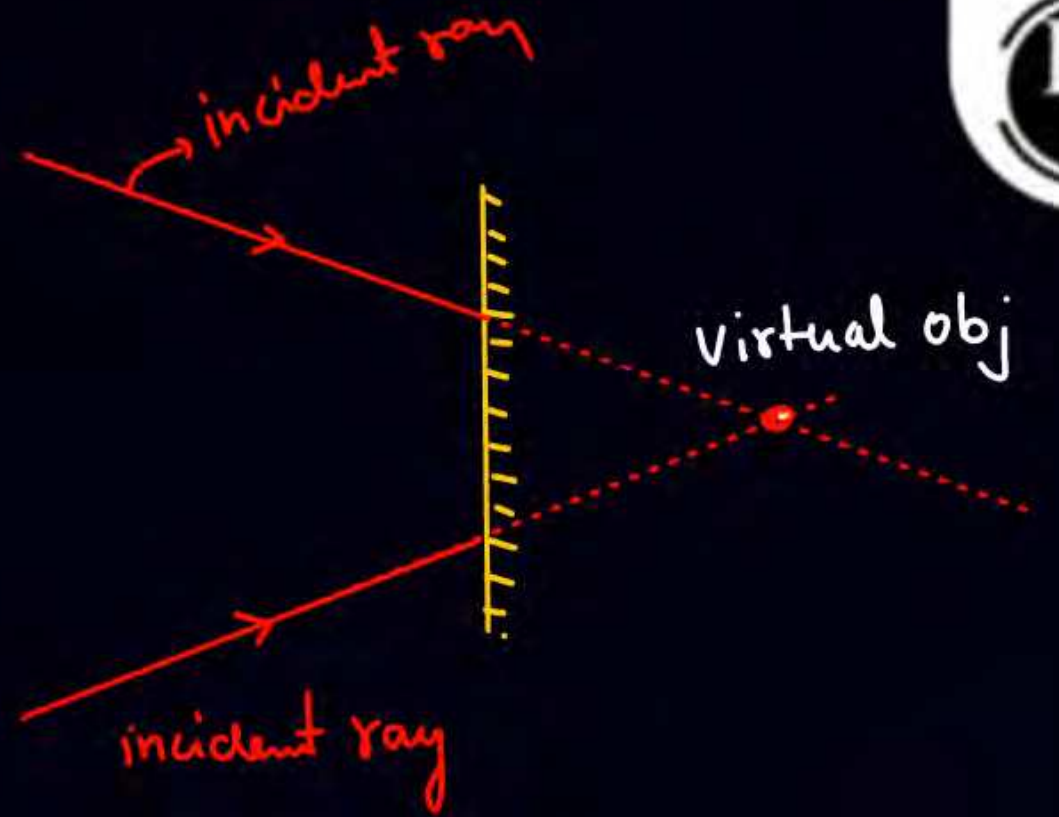


Real obj.

Start



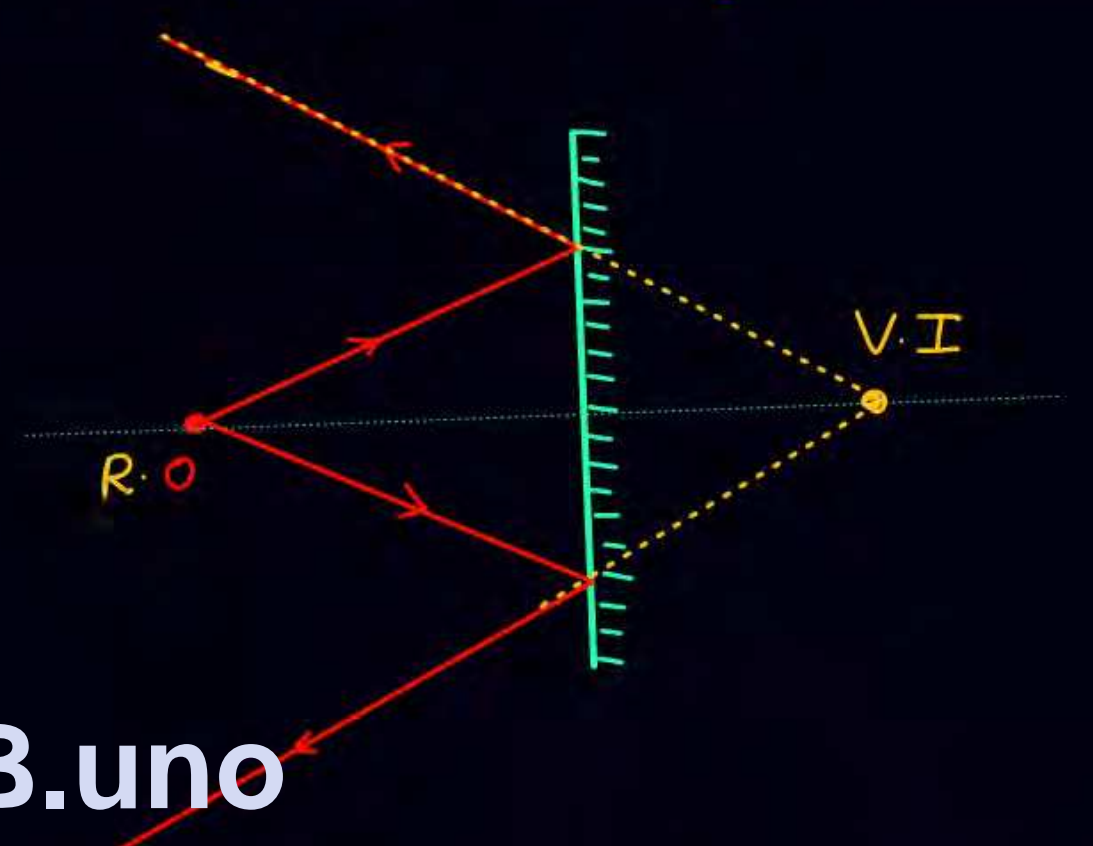
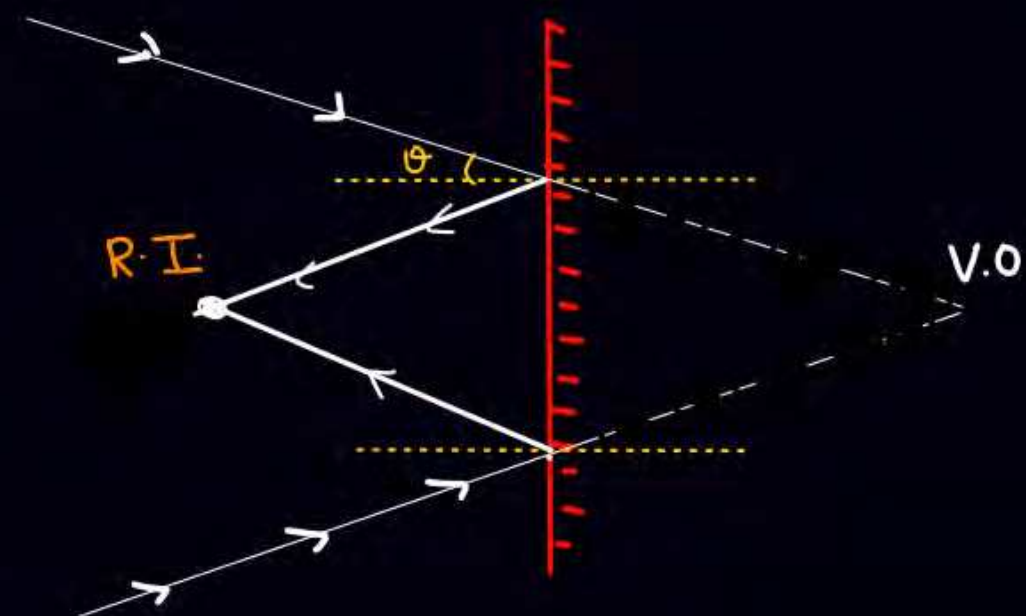
&



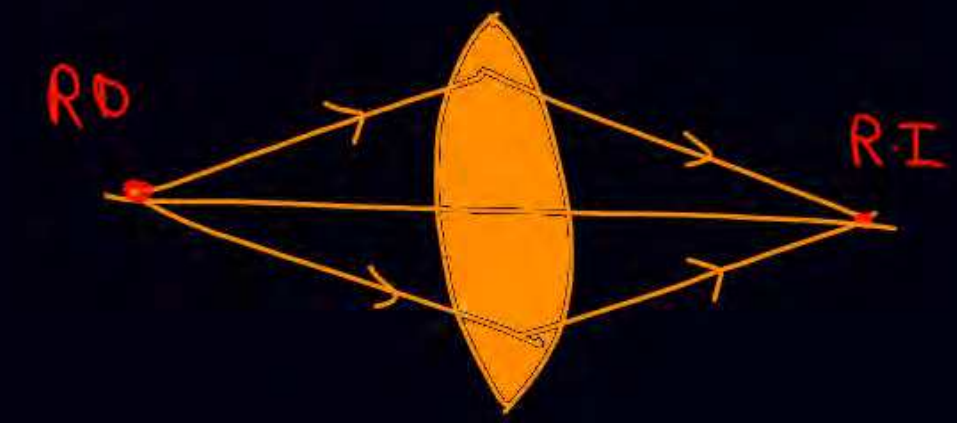
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Image .  $\longrightarrow$  point of intersetion of reflected/refracted ray



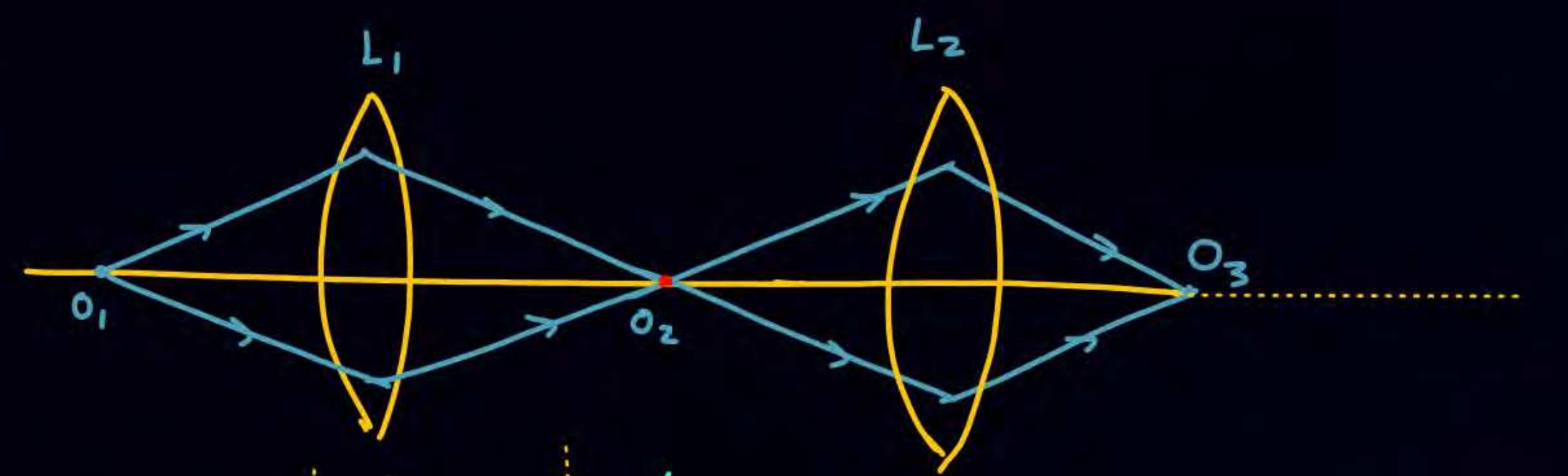
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Plane Mirror  
V.O  $\longrightarrow$  R.I  
R.O  $\longrightarrow$  V.I

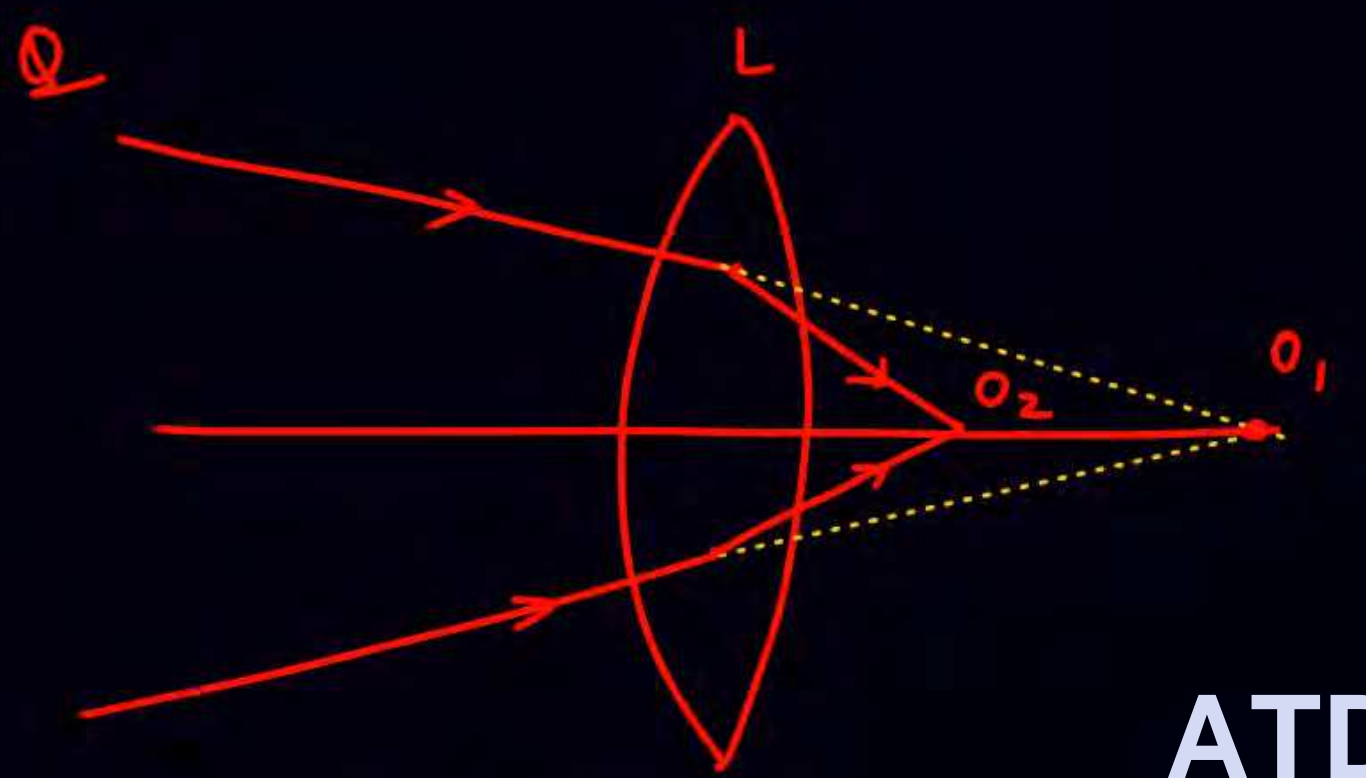


①

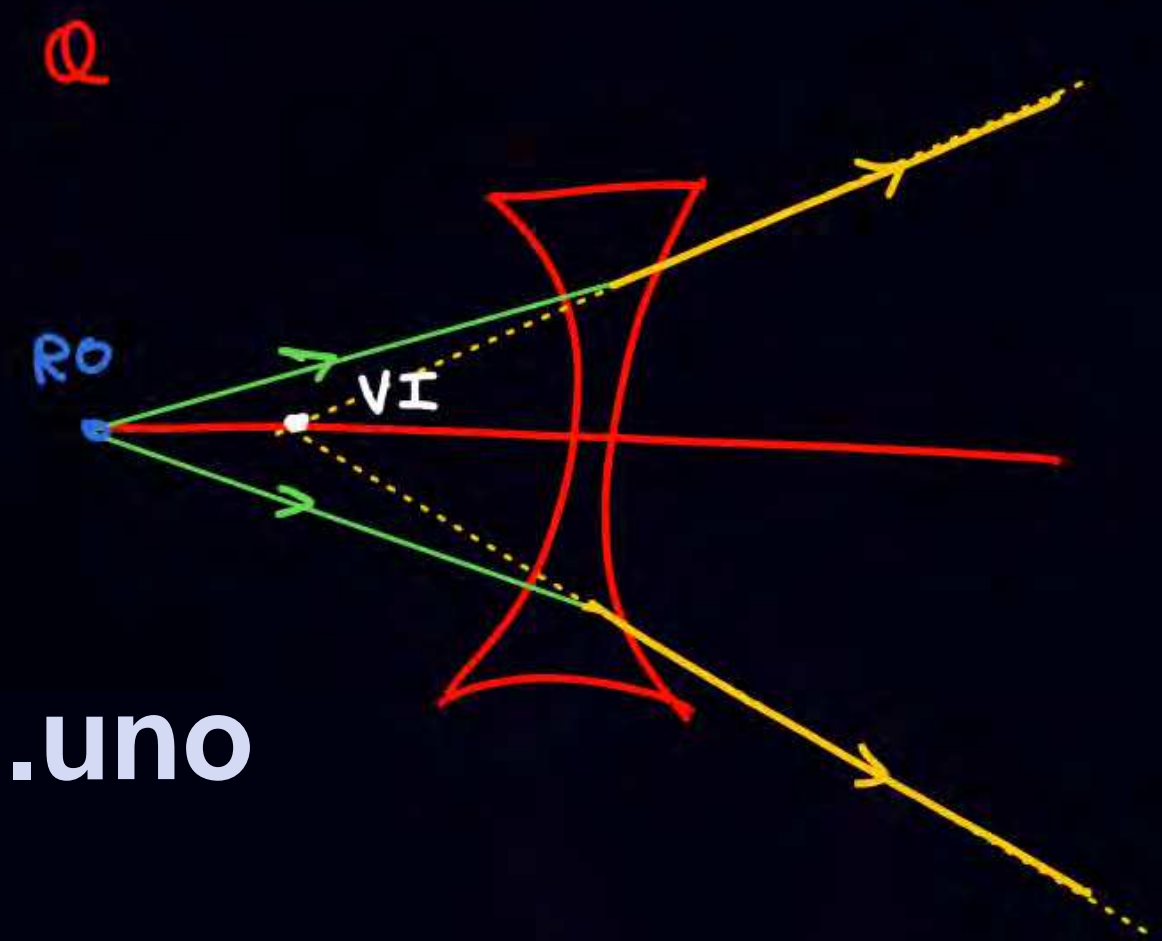


	$L_1$	$L_2$
$O_1$	RO	-
$O_2$	RI	RO
$O_3$	-	RI

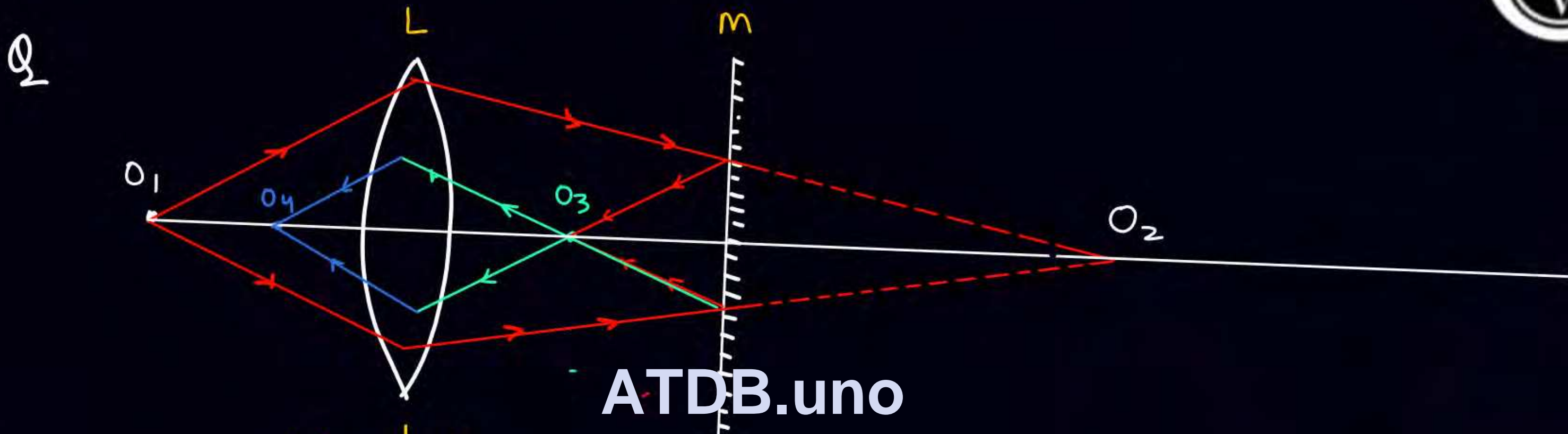
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$O_1 \rightarrow V.O.$   
 $O_2 \rightarrow R.I.$



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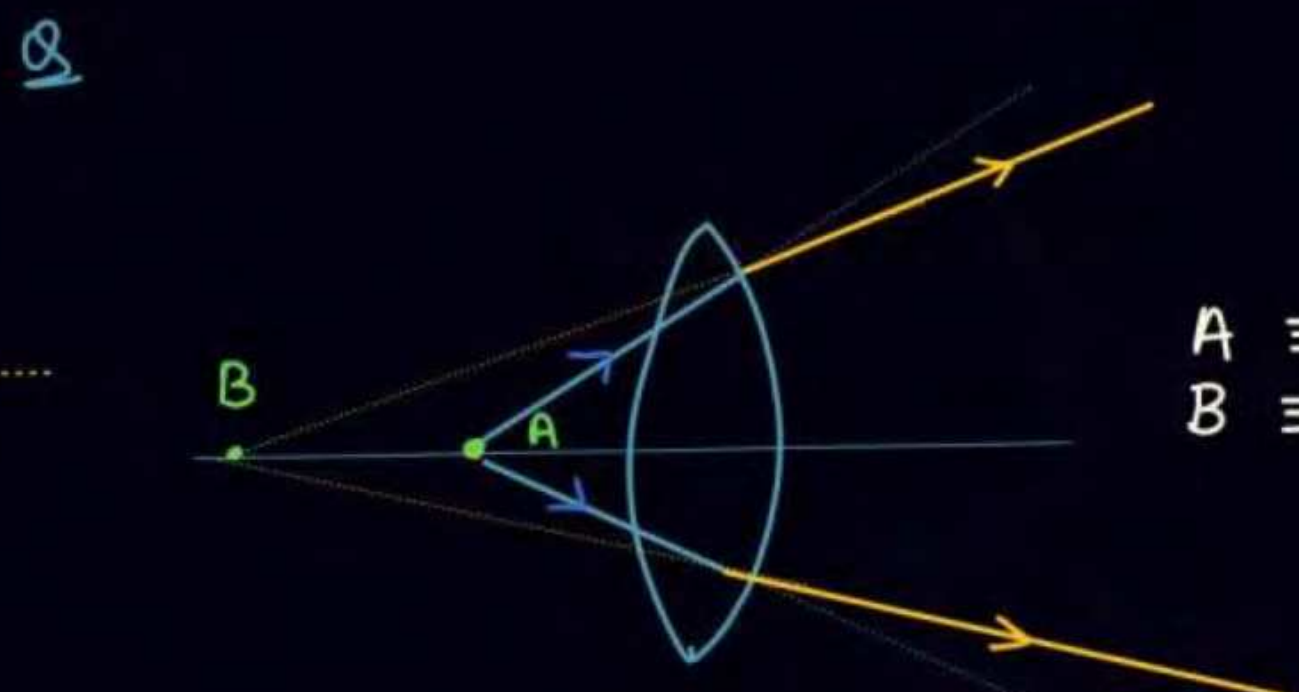


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	L	M
$O_1$	RO	-
$O_2$	RI	VO
$O_3$	RO	RI
$O_4$	RI	-

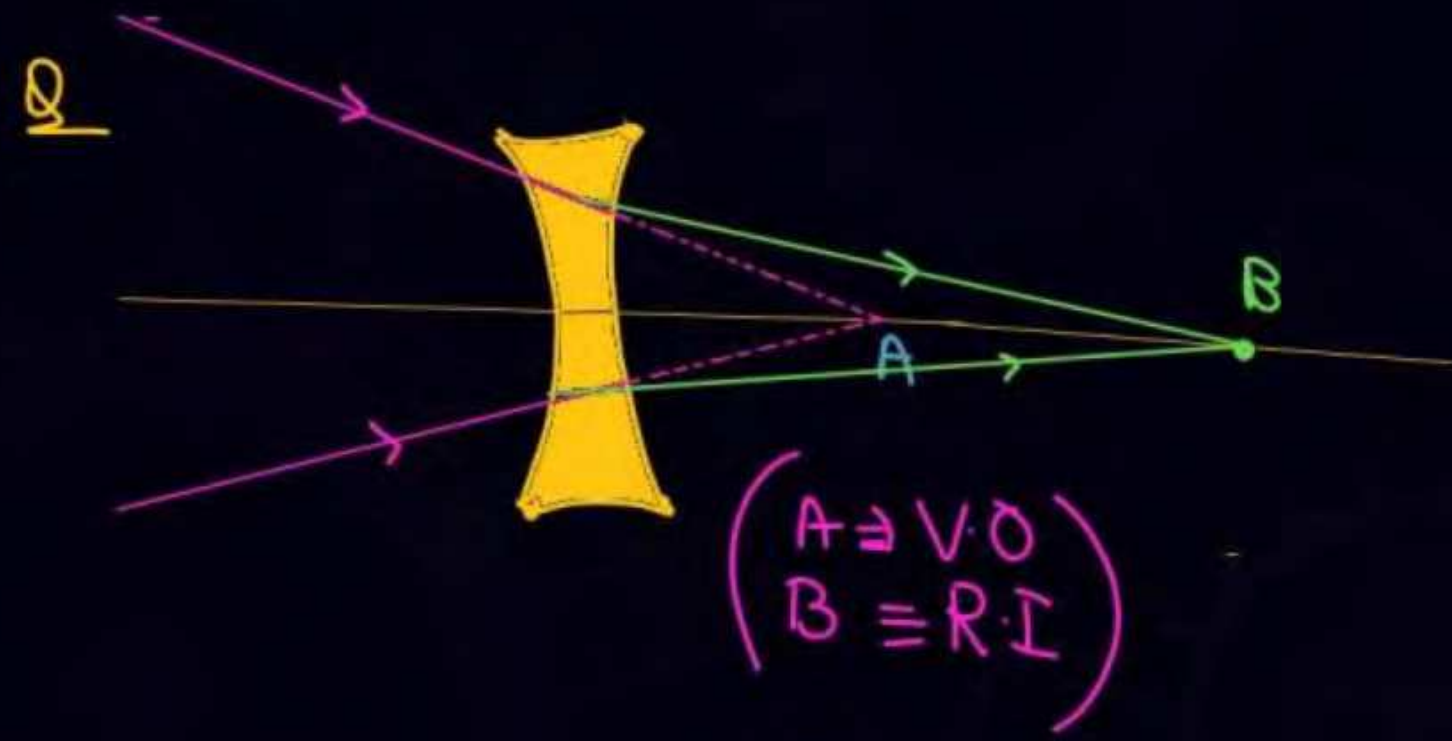


$A \rightarrow R.O$   
 $B \rightarrow R.I$



$A \equiv R.O$   
 $B \equiv V.I$

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$A \equiv V.O$   
 $B \equiv R.I$



Home work

- P40 AC.

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# THANK YOU

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