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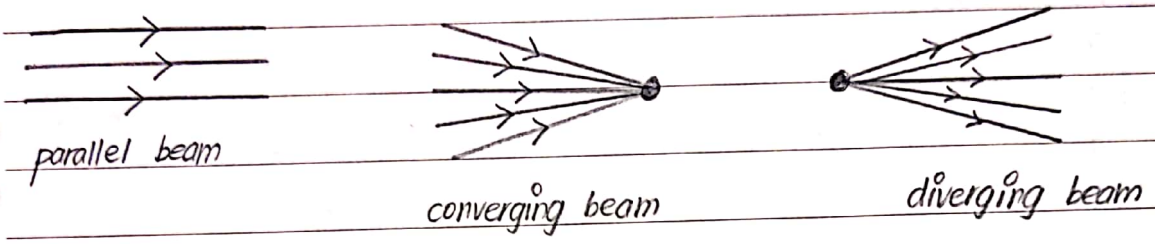
LIGHT

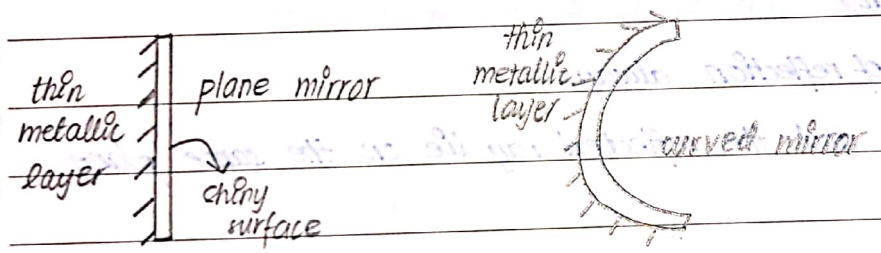
ray: a straight line with an arrow head which represents path of travel of light

→

beam: a bundle of rays of light



mirror: a piece of glass whose side is coated with a thin metallic layer



→ light changes its path when it hits a shiny surface or when it moves from one medium to another (only)
↳ otherwise the path remains the same straight

Reflection:

→ a change in the direction of light after hitting a shiny surface is called reflection of light

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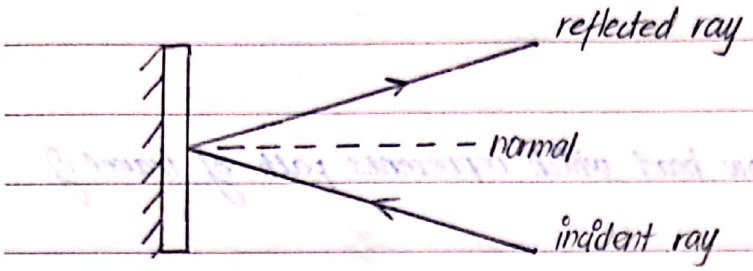
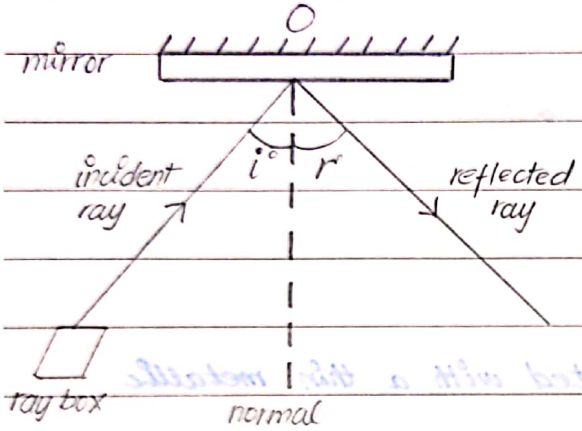


Experiment to study reflection of light by a plane mirror:



(diagram with respect to top view)

O: point of intersection

i : angle of incidence

r : angle of reflection

Observations: (Laws of Reflection)

1. angle of incidence = angle of reflection always
2. the incident ray, normal and the reflected ray lie on the same plane

Steps:

→ place a plane mirror perpendicularly on the paper sheet

→ draw a perpendicular line with respect to the mirror on the paper sheet and label this line as the 'normal'

→ label point of intersection of normal line with mirror as point 'O'

→ adjust the ray box in such a way that incident ray hits point O

→ lable angle b/w incident ray and the normal as 'angle of incidence' or 'i'

→ lable angle b/w reflected ray and the normal as 'angle of

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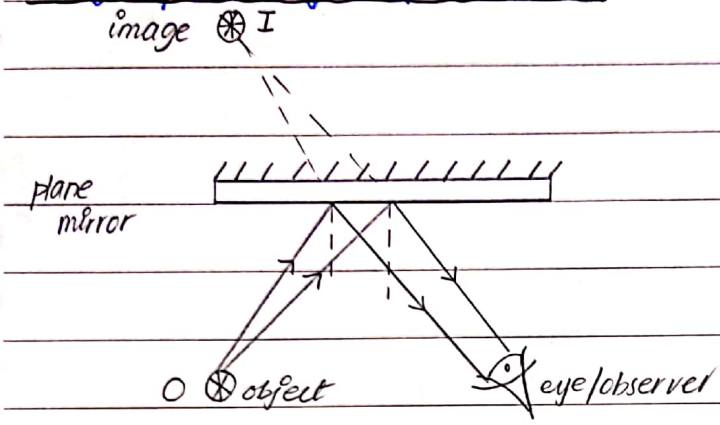
reflection' or 'r'

→ note angle of incidence and angle of reflecting using a protactor

→ move the ray box to increase incident angle and note the angles

Image formed by a plane mirror:



Properties: i). image produced by the plane mirror has the same size as that of the object

ii). both, image and the object, have the same distance from the mirror

iii). image is upright

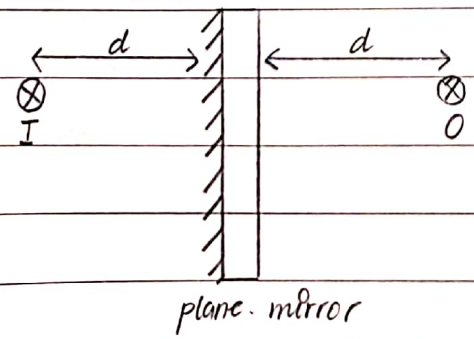
iv). image is virtual (appear ese ho kay ek side pay mirror kay object hair aur opposite side pay image produce horahi hai)

v). the image is laterally inverted (left-right reversed)

AMBULANCE —— ƎDNAJUƎMA

Steps to draw image formed by a plane mirror: (Ray diagram)

①



→ place a plane mirror vertically upright on the page

→ draw the object and image at the same distance from mirror (on opp. sides)

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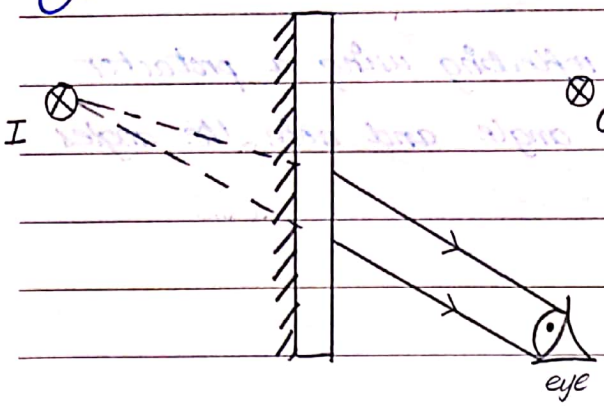
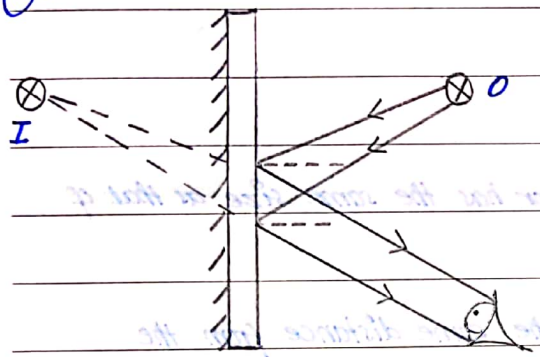
(2).



→ extend dotted lines from image to the mirror →

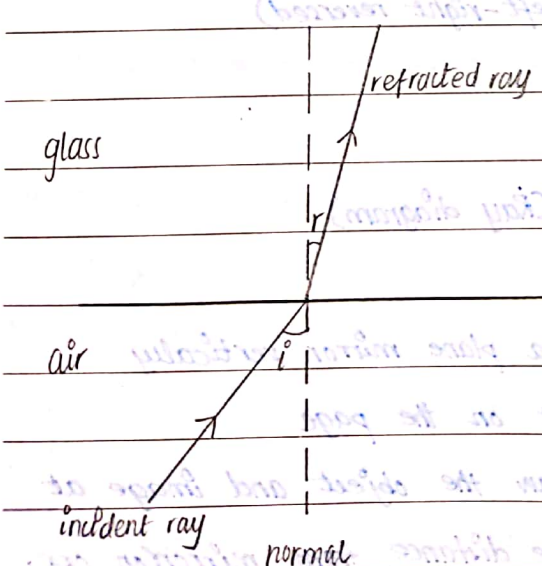
(3).



→ extend the lines to the object in such a way that the angle of incidence is equal to angle of reflection.

Refraction:

→ bending of light when it moves from one medium to another medium



i = angle of incidence

r = angle of refraction

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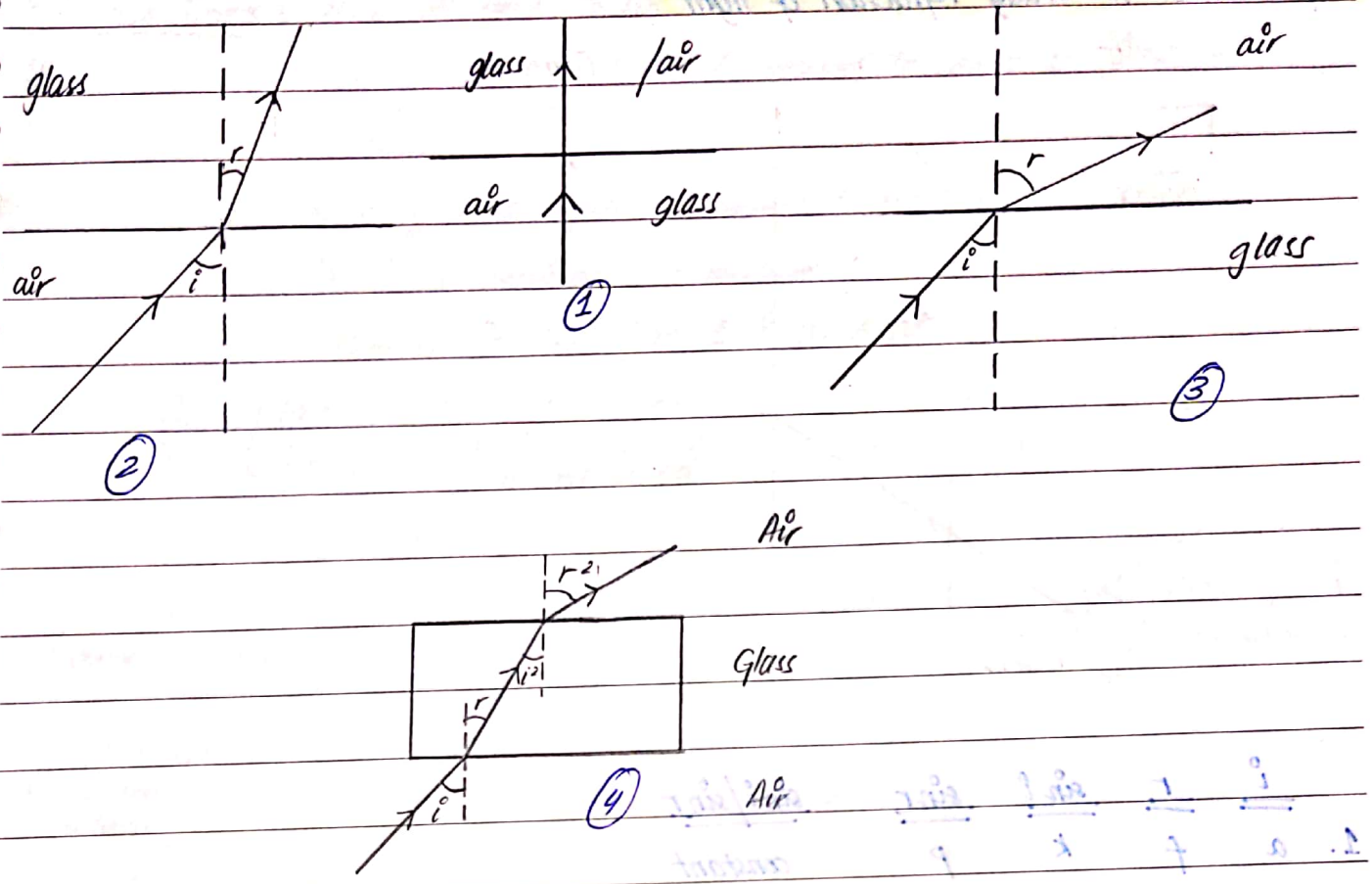

1 → when light passes from one medium to another perpendicularly then there is no refraction

2 → when light passes from a less dense medium to a denser one, then it bends towards normal $\hat{r} < \hat{i}$

3 → when light passes from a more dense medium to a less dense one, then it bends away from the normal $\hat{r} > \hat{i}$

4 → when light passes through a parallel sided glass then the angle at which the light enters the glass is equal to the angle at which the light moves out of the glass but it is slightly shifted to one side of the glass

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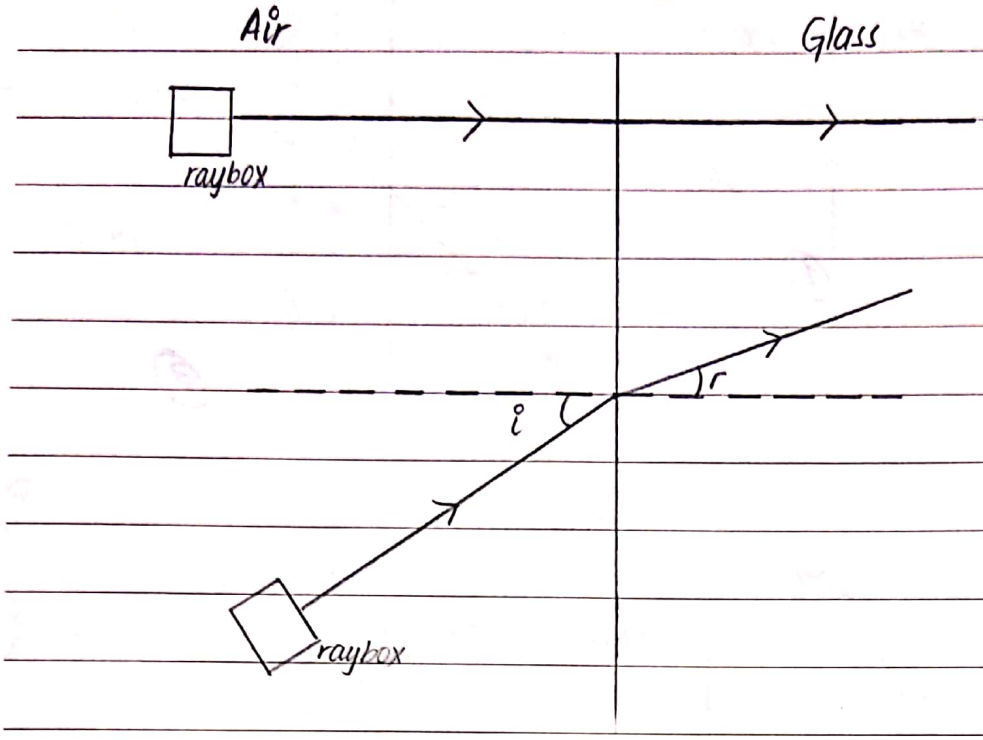
Experiment to study refraction of light



	i°	r	sin i	sin r	sin i / sin r
1.	a	f	k	p	constant
2.	b	g	l	q	constant
3.	c	h	m	r	constant
4.	d	i	n	s	constant
5.	e	j	o	t	constant

Observations: Claws of Refraction)

① · incident ray, refracted ray and normal lie on the same plane

② · for each value of 'i' & 'r', the ratio of 'sin i' to 'sin r' remains constant.

Also called Snell's law

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refractive index : ratio of $\sin i$ to $\sin r$ for a medium

(n) rate of speed of light in vaccum to speed of light in medium

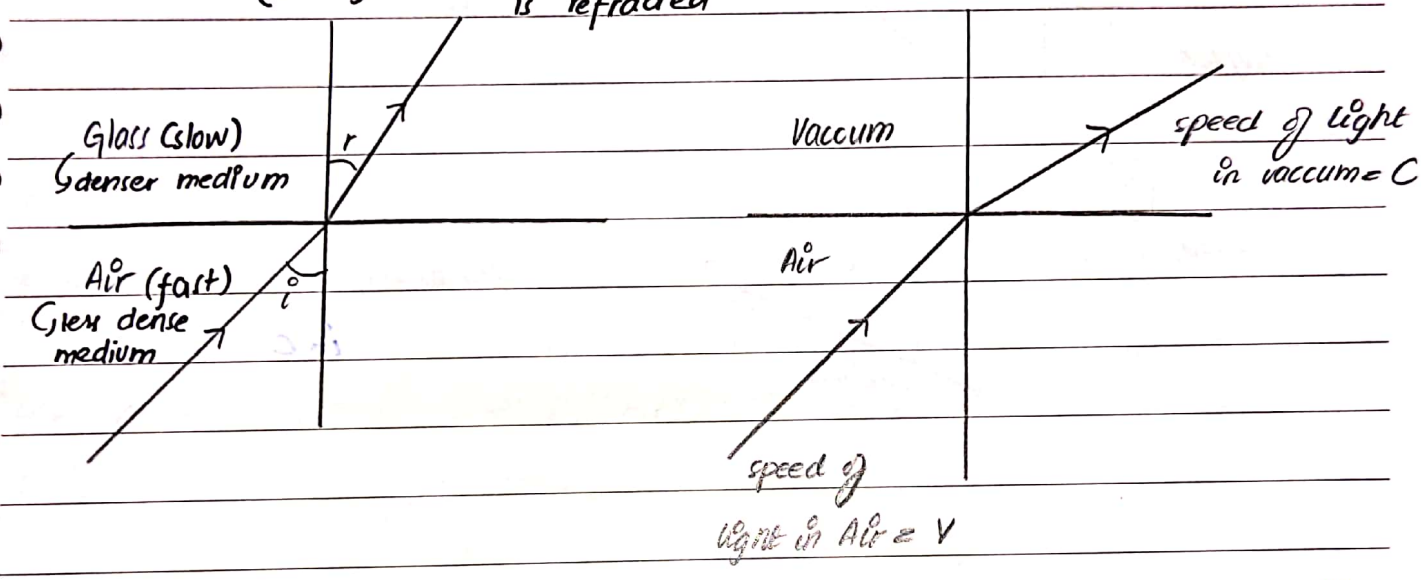
rate of real depth to apparent depth in a medium

it is a property of a medium

always greater than 1 & constant

$n = \frac{\sin i}{\sin r}$ $\left(\frac{\text{fast}}{\text{slow}}\right)$ → regardless of what is incident & what is refracted

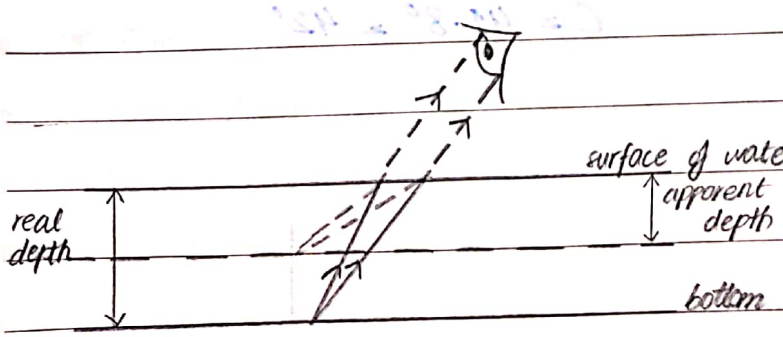
$n = \frac{C}{V}$



$n = \frac{\text{real depth}}{\text{apparent depth}}$

★ jis medium say light bahir nikal rahi hoti hai uska refractive index milta hai hamein

★ ~~faster~~ less dense medium mein light transfers faster



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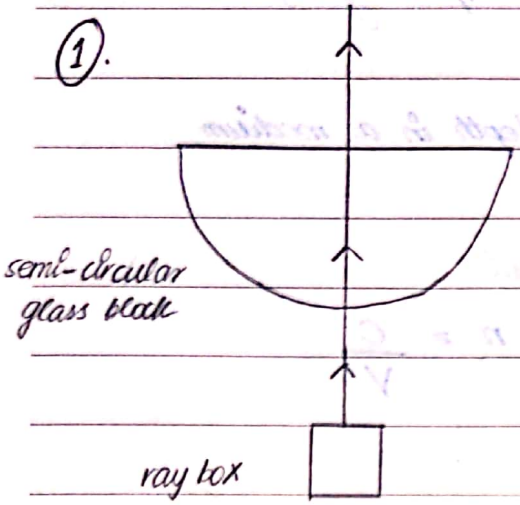
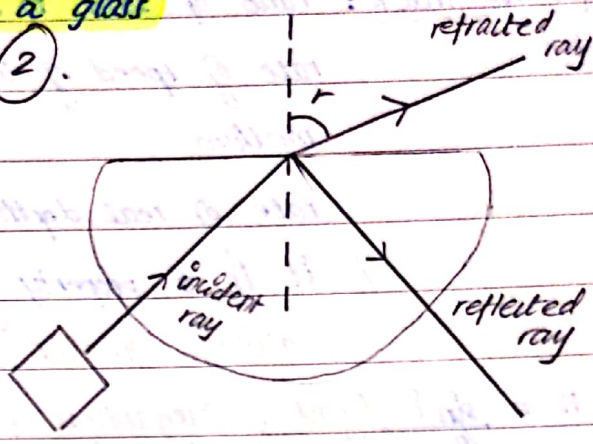
Experiment to determine critical angle of a glass

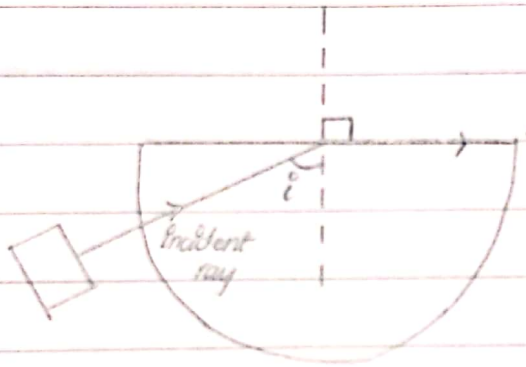
1.



2.



3.



$i = C$

critical angle : angle of incidence, in the denser medium, at which angle of refraction becomes 90°

(c)

$$\frac{\sin r}{\sin i} = n$$

$$\frac{\sin 90^\circ}{\sin C} = n$$

$$\sin C = \frac{1}{n}$$

$$\therefore \quad C = \sin^{-1}\left(\frac{1}{n}\right)$$

$$C = \sin^{-1}\left(\frac{1}{1.5}\right)$$

$$C = 41.8^\circ = 42^\circ$$

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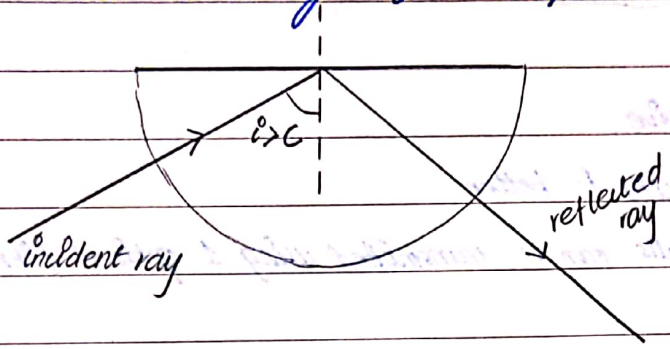
Total Internal Reflection :

→ a process in which light tries to move from more dense medium to less medium and angle of incidente is greater than the critical angle of the more dense medium then all of light is reflected internally



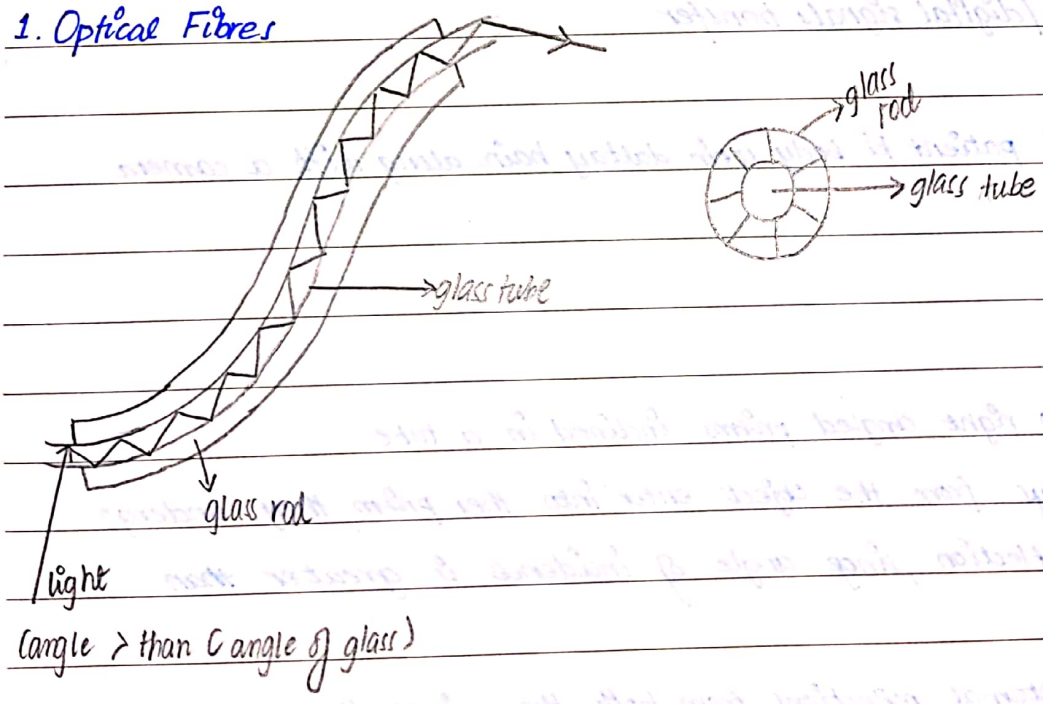
conditions :

★. light should move from more to less dense medium

★. angle of incidence must be greater than critical angle of dense medium

APPLICATION OF TOTAL INTERNAL REFLECTION

1. Optical Fibres



→ consists of a glass tube of high density which is placed in a glass rod which is less dense

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→ it is used to transfer light from one place to another place using total internal reflection

→ it is thinner than human hair

advantages of using optical fibres:

(i). low cost

↳ copper wires are expensive

(ii). signal carrying capacity is better

↳ thousands of telephone calls can be transmitted using 1 optical fibre

(iii). high security

↳ as compared to copper wire more secure

(iv). less signal degradation/loss

uses of optical fibres:

(i). Tele communication

↳ telephone signals/digital signals transfer

(ii). Medicine

↳ endoscopy (of patient ki body mein dalte hain along with a camera to observe body)

2. Periscope

→ consists of two right angled prisms inclined in a tube

→ when the rays from the object enter into the prism, they undergo total internal reflection, since angle of incidence is greater than critical angle

→ due to total internal reflections from both the prisms, the rays emerge out from lower end of periscope to an observer, which observes the

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the image of an object

→ the image formed is upright & virtual