UDAAN

2025

Lec-08 : PYQ, V.I.Q

LIGHT

- Reflection & Refraction

PHYSICS | Lecture - 07

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Topics to be covered

1. Power of the Lens
2. Combination of Lenses

} 5-10min

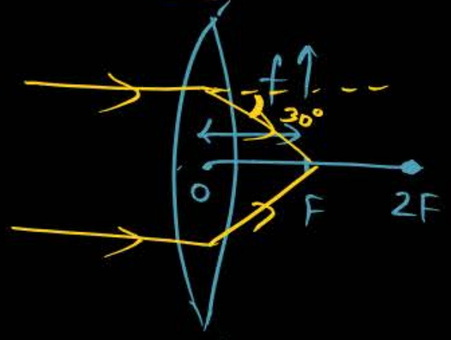
3. Questions on Power of the Lens
4. Numerical - NCERT in ONE SHOT

Lenses : 'Power' → SI unit = Watt ✗
SI unit = Dioptre (D) ✓

→ defines as "the degree of convergence or divergence of a lens."

Thin

P↓ f↑



Thick

P↑ f↓

$$\text{Power} \propto \frac{1}{\text{focal length}}$$

याद

$$\boxed{P = \frac{1}{f}}$$

(D) (m)

OR

याद

$$\boxed{P = \frac{100}{f\,(cm)}}$$

(D)

Note :- Jo sign f ka hoga } f− and f+
Wahi P ka hoga } P− and P+

मोटा Mota lens Thick $P \uparrow$ $f \downarrow$

पतला Patla lens Thin $P \downarrow$ $f \uparrow$

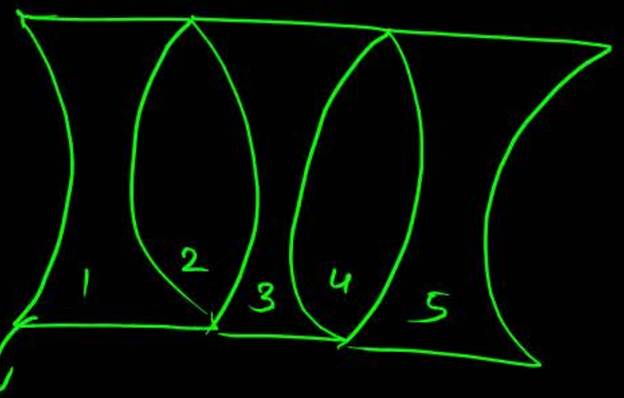
$$P = \frac{1}{f(m)}$$

D

$$P = \frac{100}{f(cm)}$$

D

Ques



find i) Total Power of Combination
ii) " focal length of Combination
iii) Nature of Combination

Given

Concave → $P_1 = -3D$

Convex → $P_2 = +2.5D$

$P_3 = -1.5D$

$P_4 = +6D$

$P_5 = -0.5D$

Sol

i) $P_{Total} = P_1 + P_2 + P_3 + P_4 + P_5$

$= -3 + 2.5 - 1.5 + 6 - 0.5$

$= -5 + 8.5 = 3.5D$

$\boxed{P_{total} = +3.5D}$ → Convex

ii) $\boxed{P = \frac{100}{f(cm)}}$

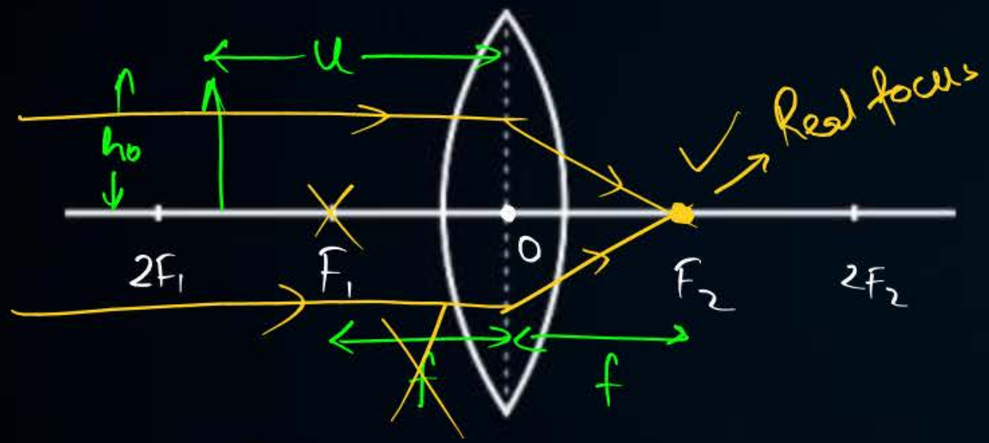
$3.5 = \frac{100}{f(cm)}$

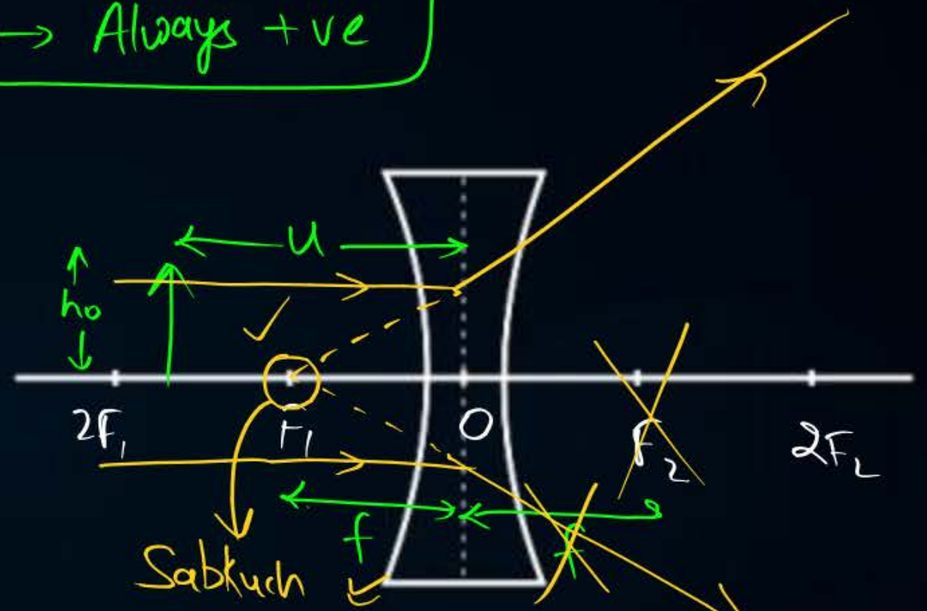
$f = \frac{100}{3.5} = 28.5\ cm$ ✓

iii) Converging nature

One Step Ahead : Sign Convention in Lenses

① u → Always - ve
② h_o → Always + ve





R ⇒ +ve — Convex ⟹ f = +ve

Concave
f = -ve
R ⇒ -ve

ONE STEP AHEAD : FORMULAE

M = 0.2 → Diminished

Real + Inverted

Weapons (m) → Nature ≥

☐ Lens Formula :

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

0 < m < 1 : Diminished

m = 1 : Same size

m > 1 : Enlarged

☐ Magnification Formula :

$$m = \frac{v}{u}$$

$$m = \frac{h_{image}}{h_{object}}$$

$m = \frac{h_i}{h_o}$

m → + : ERECT + Virtual

m → – : INVERTED + Real

QUESTION

An object is placed at a distance of 10 cm from a converging lens of focal length 5 cm. find the nature and position of the image.

Convex

Given :-

Always → $u = -10\,cm$

Convex → $f = +5\,cm$

$V = ?$

$m = ?$

$$\frac{1}{f} = \frac{1}{V} - \frac{1}{u}$$

$$\frac{1}{5} = \frac{1}{V} - \left(\frac{1}{-10}\right)$$

$$\frac{1}{5} = \frac{1}{V} + \frac{1}{10}$$

$$\frac{1}{5} - \frac{1}{10} = \frac{1}{V}$$

$$\frac{2-1}{10} = \frac{1}{V}$$

$$\frac{1}{10} = \frac{1}{V}$$

$$V = 10\,cm$$

$$m = \frac{V}{u}$$

$$m = \frac{10}{-10}$$

$$m = -1$$

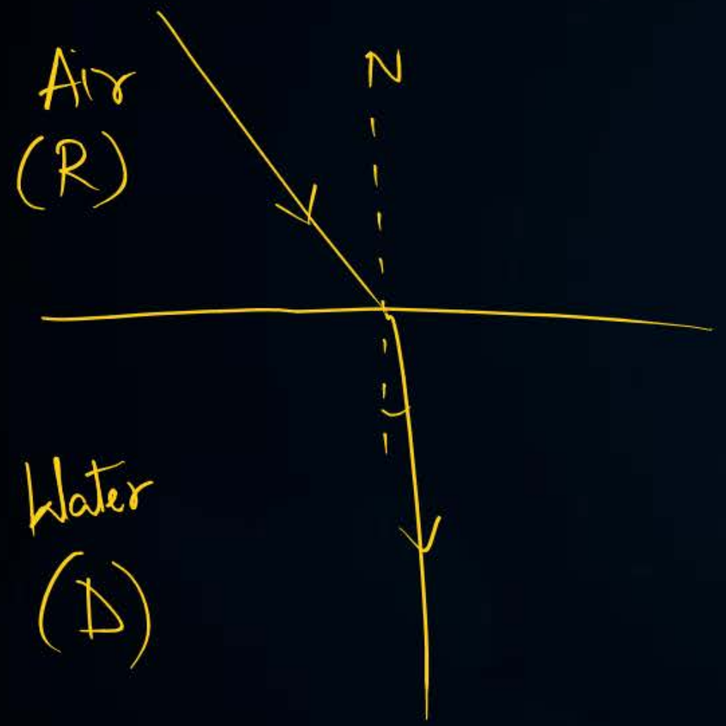
$m = -1$ → Real + Inv, Same Size

NCERT IN ONE SHOT

REFRACTION

Page No. 176 (Q. 01)

A ray of light travelling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Why?



It will bend towards Normal.

Due to refraction of light

Page No. 176 (Q. 02)

Absolute

Light enters from air to glass having refractive index 1.50. What is the speed of light in the glass? The speed of light in vacuum is 3×10^8 m s^{-1}.

$n_g = 1.5$

$V_g = ?$

$c = 3 \times 10^8$ m/s

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

$1.5 = \frac{3 \times 10^8}{V}$

$V = \frac{3 \times 10^8}{1.5} = 2 \times 10^8$ m/s

Page No. 176 (Q. 03)

Find out, from Table 10.3, the medium having highest optical density. Also find the medium with lowest optical density.

Vacuum = 1

Air = 1.003

Diamond = 2.42

Page No. 176 (Q. 04)

1.33
$n \downarrow$ $v \uparrow$

You are given kerosene, turpentine and water. In which of these does the light travel fastest? Use the information given in Table 10.3.

$v \uparrow$ $n \downarrow$

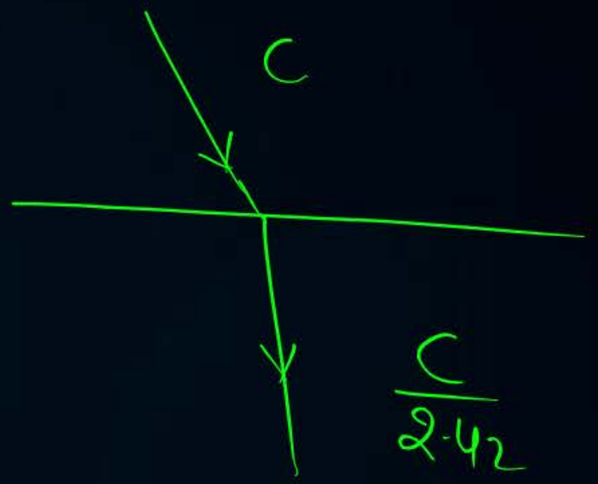
$$n = \frac{c}{v}$$ → Constant

$n \propto \frac{1}{v}$

Page No. 176 (Q. 05)

The refractive index of diamond is 2.42. What is the meaning of this statement?

When light enters diamond its velocity decreases by a factor of 2.42 as compared to air



Page No. 184 (Q. 01)

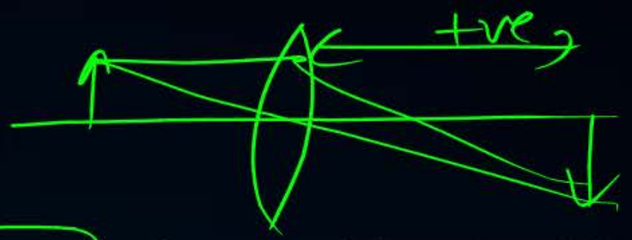
Define 1 dioptre of power of a lens.

$$P = \frac{1}{f}$$

When focal length of a lens is 1 m
then Power of the lens is 1 D.

$$P = \frac{1}{1} = 1D$$

Page No. 184 (Q. 02)



A convex lens forms a real and inverted image of a needle at a distance of 50 cm from it. Where is the needle placed in front of the convex lens if the image is equal to the size of the object? Also, find the power of the lens.

$P = \frac{1}{f}$

$v = +50\,cm$

$u = ?$

$m = -1$

$m = \frac{v}{u}$

$-1 = \frac{50}{u}$

$u = -50\,cm$

$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$\frac{1}{f} = \frac{1}{50} - \left(\frac{1}{-50}\right)$

$\frac{1}{f} = \frac{1}{50} + \frac{1}{50} = \frac{2}{50}$

$f = \frac{50}{2}\,25\,cm$

$f = 25\,cm$

$P = \frac{100}{f(cm)}$

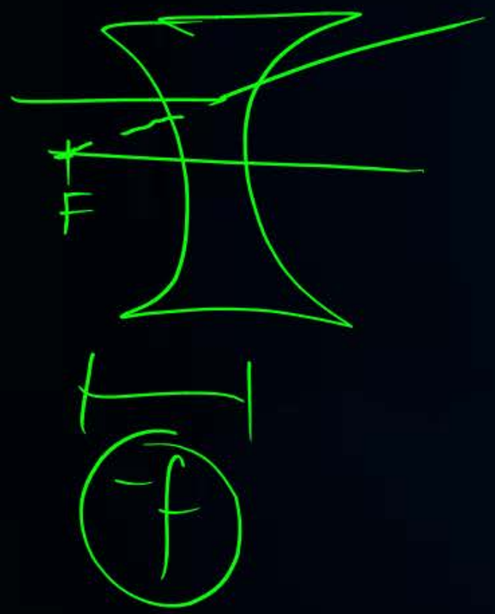
$= \frac{100}{25}\,4$

$P = 4D$

Page No. 184 (Q. 03)

Find the power of a concave lens of focal length 2 m.

$f = -2m$



$$P = \frac{1}{f(m)}$$

$$P = \frac{1}{-2} = -0.5\,D$$

Page No. 185 (Ex. 01)

Which one of the following materials cannot be used to make a lens?

A Water

B Glass

C Plastic

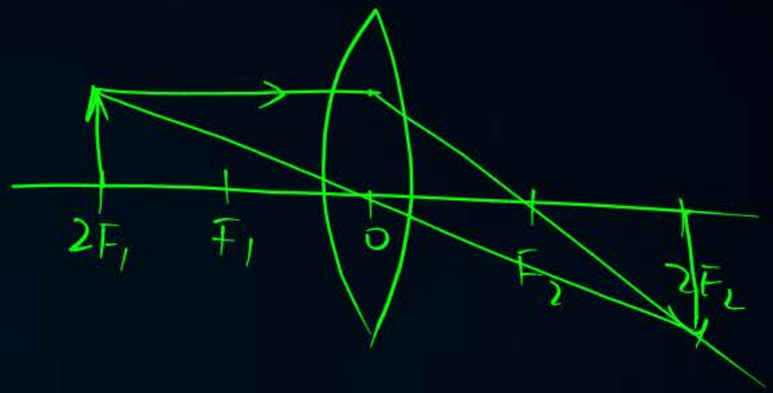
D Clay

Page No. 185 (Ex. 03)

Where should an object be placed in front of a convex lens to get a real image of the size of the object?

A At the principal focus of the lens

B At twice the focal length

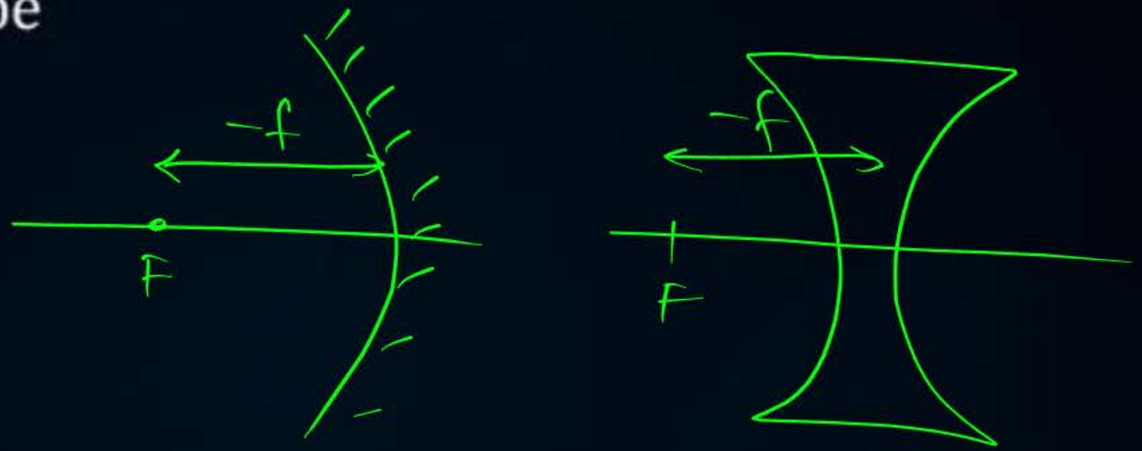


C At infinity

D Between the optical centre of the lens and its principal focus.

Page No. 185 (Ex. 03)

A spherical mirror and a thin spherical lens have each a focal length of –15 cm. The mirror and the lens are likely to be



(A) both concave.

(B) both convex.

(C) the mirror is concave and the lens is convex.

(D) the mirror is convex, but the lens is concave.

Page No. 186 (Ex. 06)

Concave lens → V.E(D)

Which of the following lenses would you prefer to use while reading small letters found in a dictionary?

A. A convex lens of focal length 50 cm. f↑ P↓

B. A concave lens of focal length 50 cm.

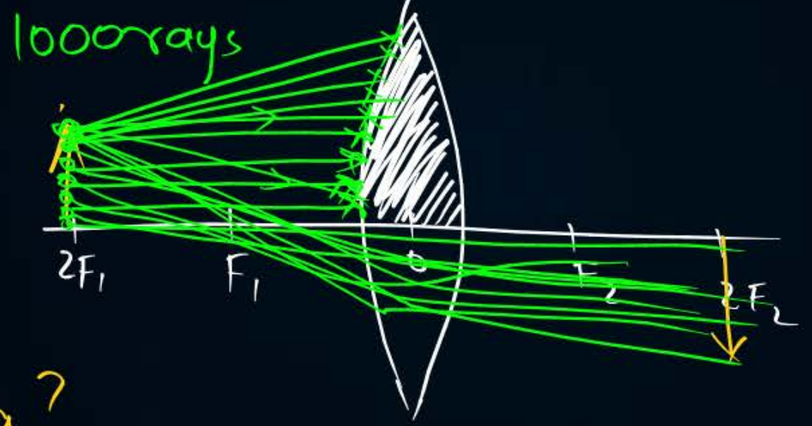
C. A convex lens of focal length 5 cm. f↓ P↑

D. A concave lens of focal length 5 cm.

Page No. 186 (Ex. 09)

One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations.

Black paper / Black Paint / Aadha Tod Do



1000 rays ✗
500 rays ✓

① Kaisi Banegi ?

Ans → Complete Image

② Farq. Kya Padega ?

Ans → Padega !!! ⇒ half Intensity ⇒ half Bright

Half amount of rays are travelled further

Page No. 186 (Ex. 10)

H.W.

An object 5 cm in length is held 25 cm away from a converging lens (Convex) of focal length 10 cm. Draw the ray diagram and find the position, size and the nature of the image formed.

$h_o = 5\,cm$

$u = -25\,cm$

$f = +10\,cm$

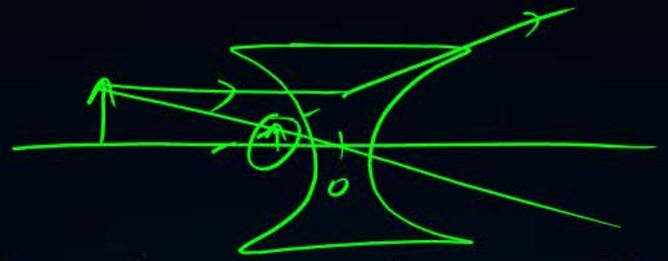
$V = ?$

$m = ?$

$h_i = ?$

Page No. 186 (Ex. 11)

H.W.



A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram.

'Concave' lens $f = -15\,cm$

$V = -10\,cm$

$u = ?$

Page No. 186 (Ex. 16)

Find the focal length of a lens of power – 2.0 D. What type of lens is this?

$$P = \frac{100}{f(cm)}$$

Name – Concave lens

Type – Diverging

$$-2 = \frac{100}{f}$$

$$f = \frac{100}{-2} = -50\,cm$$

Page No. 186 (Ex. 17)

A doctor has prescribed a corrective lens of power +1.5 D. Find the focal length of the lens. Is the prescribed lens diverging or converging?

$P = +1.5\,D$

$P = \frac{100}{f(cm)}$

$+1.5 = \frac{100}{f(cm)}$

$f = \frac{\cancel{1000}\ \cancel{200}\ 66.66}{\cancel{1.5}\ \cancel{3}}$

$\boxed{f = +66.67\,cm}$

Convex | Converging

HOMEWORK

→ Aap har Sawaal Retry Kariye Sone Se Pehle

THANK YOU