□ Chapter: Lenses

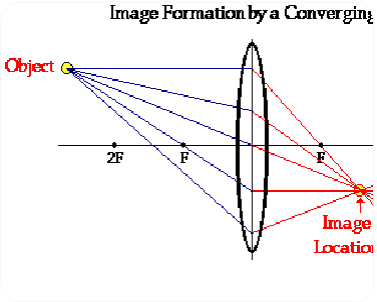
□ 1□ What is a Lens?

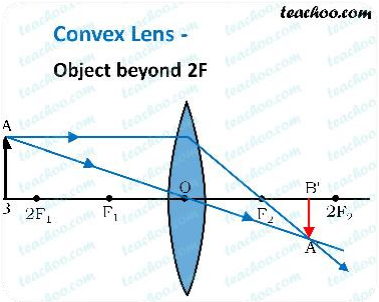
A **lens** is a transparent optical medium bounded by two surfaces, at least one of which is spherical, that refracts light rays.

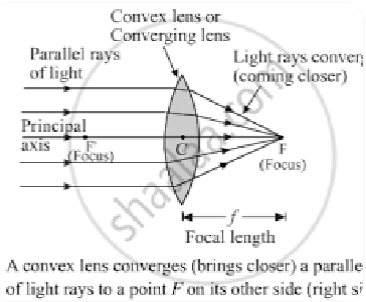
Types of Lenses:

1. Convex Lens (Converging lens)
2. Concave Lens (Diverging lens)

□ 2□ Convex Lens (Converging Lens)







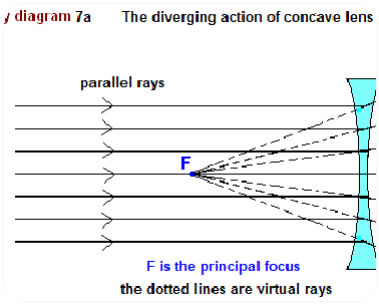
Characteristics:

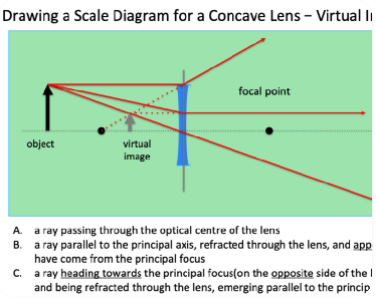
- Thicker at centre
- Converges parallel light rays
- Can form **real and inverted images**
- Sometimes forms **virtual image** (when object inside focal length)

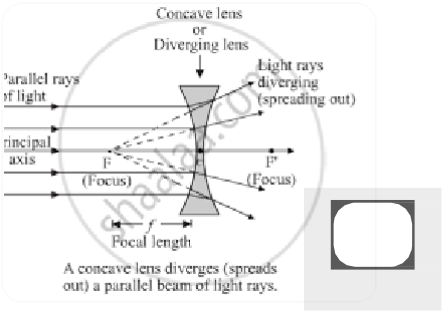
Uses:

- Magnifying glass
- Camera
- Human eye
- Projectors

🔹 3️⃣ Concave Lens (Diverging Lens)







Characteristics:

- Thinner at centre
- Diverges light rays
- Always forms **virtual, erect and smaller image**

Uses:

- Spectacles for Myopia
- Door viewers (peepholes)

🔹 4️⃣ Important Terms

Principal Axis

Straight line passing through optical centre and centres of curvature.

Optical Centre

Point inside lens through which light passes undeviated.

Principal Focus

Point where parallel rays meet (convex) or appear to diverge from (concave).

□ 5□ Important Formulae

Lens Formula

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

Magnification

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

Where:

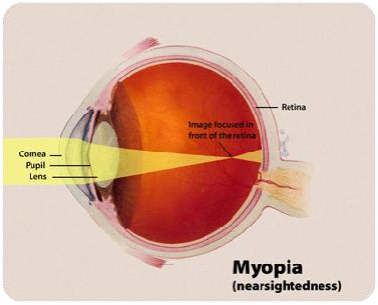
- f = focal length
- v = image distance
- u = object distance

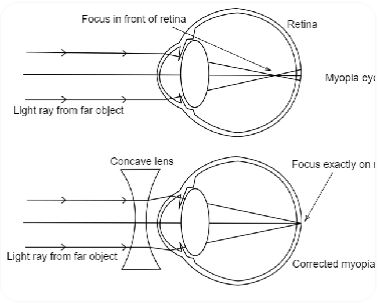
□ 6□ Defects of Vision

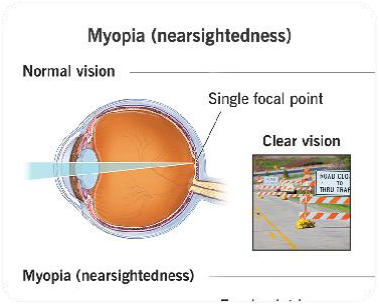
Main defects:

- Myopia (Short sightedness)
- Hypermetropia (Long sightedness)

□ 7□ Myopia (Short Sightedness)







Meaning:

Person can see **near objects clearly** but **far objects appear blurred**.

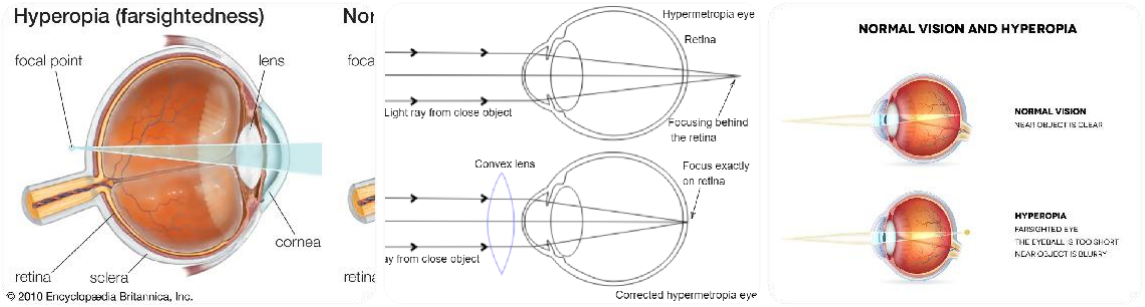
Cause:

- Eyeball elongated OR
- Eye lens too powerful

Correction:

Using **Concave lens**

□ 8□ Hypermetropia (Long Sightedness)



Meaning:

Cause:

- Eyeball shorter OR
- Eye lens weak

Correction:

Using **Convex lens**

□ 9□ Distinguish Between Myopia and Hypermetropia (Very Important ☆)

Point	Myopia	Hypermetropia
Meaning	Near objects clear	Distant objects clear
Image forms	In front of retina	Behind retina
Cause	Eyeball long / lens strong	Eyeball short / lens weak
Correction	Concave lens	Convex lens

□ □ Important 4-Mark Long Answer (Exam Ready)

Explain defects of vision and their correction.

Defects of vision occur when eye lens fails to focus image properly on retina.

Myopia:
In this defect, distant objects are not seen clearly. Image forms in front of retina. It is corrected using concave lens.

Hypermetropia:
In this defect, near objects are not seen clearly. Image forms behind retina. It is corrected using convex lens.

Thus, defects of vision can be corrected using suitable lenses.

☆ Exam Tips

- Always draw **ray diagram** if question asks defect
- Remember:
  - Myopia → Concave lens
  - Hypermetropia → Convex lens
- Use proper sign convention in numericals