

Class 12 Physics • Ray Optics

Power of a Lens

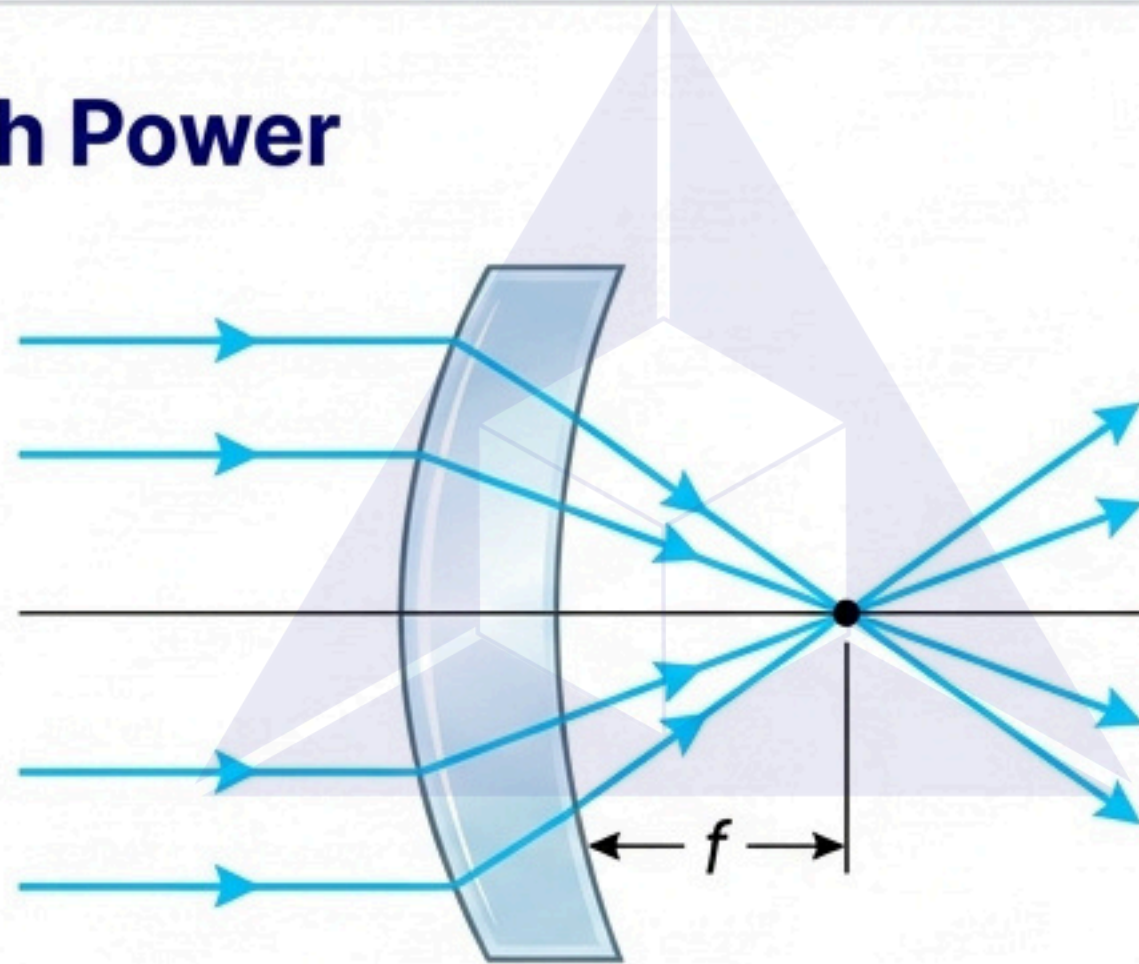
Understanding convergence, divergence,
and the unit dioptre.

The Measure of Bending Strength

Power measures how strongly a lens converges or diverges light.

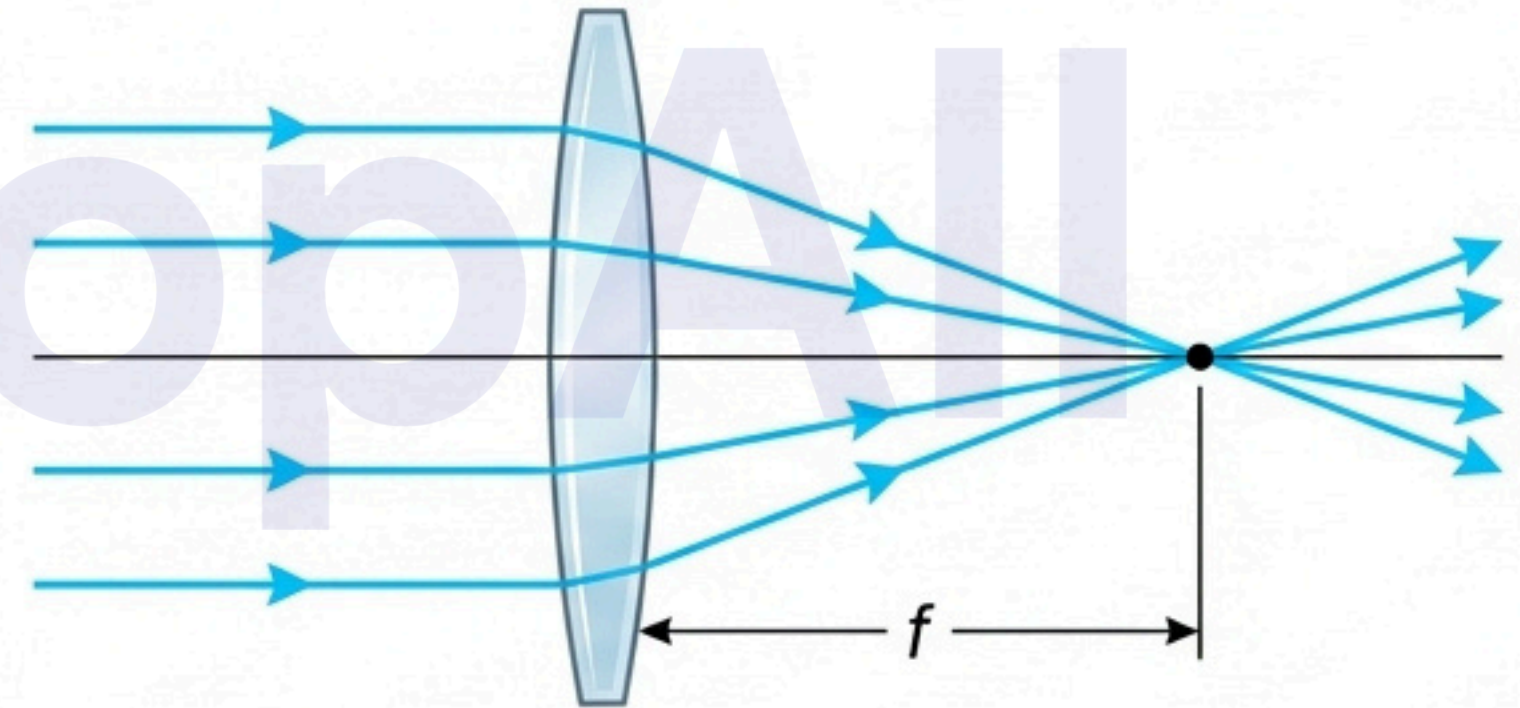
More bending = Higher Power.

High Power



Shorter focal length (f) → Greater bending
→ Higher Power.

Low Power



Longer focal length (f) → Lesser bending
→ Lower Power.

The Mathematical Definition

$$P = 1/f$$

Power of the lens

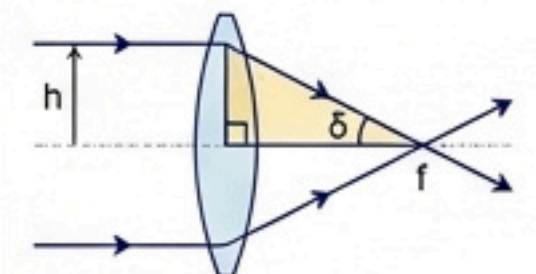
Focal length (MUST be in meters)

SI Unit: Diopetre (D)

1 D = 1 m⁻¹. The power of a lens with a focal length of 1 meter is 1 Diopetre.

Derivation Note

Power is the tangent of the deviation angle δ for a ray at unit distance from the optical center ($P = \tan \delta = h/f \rightarrow 1/f$).





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Sign Convention & Prescriptions

Converging Lens

Focal Length (f):	Positive (+)
Power (P):	Positive (+)



Rx: +2.5 D

Requires a convex lens of focal length +40 cm.

Diverging Lens

Focal Length (f):	Negative (-)
Power (P):	Negative (-)



Rx: -4.0 D

Requires a concave lens of focal length -25 cm.

Chapter 9.5.3 Summary

Definition: Power is the degree of convergence or divergence a lens introduces to light.

Inverse Relation: $P = 1/f$. A shorter focal length means a more powerful lens.

Unit: The SI unit is the **Diopetre (D)**. Remember to always convert f to meters before calculating!

Signs: Convex lenses have Positive (+) power; Concave lenses have Negative (-) power.



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