

State Examination Commission – Physics Higher Level, 2006

Question 7

What is meant by the refraction of light? (6)

A converging lens is used as a magnifying glass. Draw a ray diagram to show how an erect image is formed by a magnifying glass. (12)



A diverging lens cannot be used as a magnifying glass. Explain why. (5)

The converging lens has a focal length of 8 cm. Determine the two positions that an object can be placed to produce an image that is four times the size of the object? (15)

The power of an eye when looking at a distant object should be 60 m^{-1} . A person with defective vision has a minimum power of 64 m^{-1} .

Calculate the focal length of the lens required to correct this defect. (12)

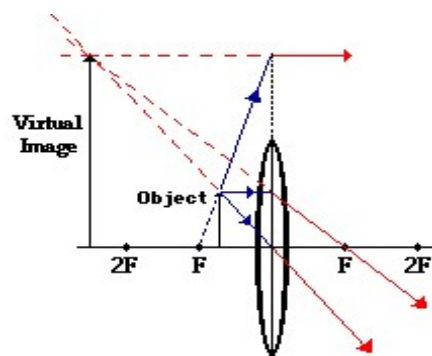
What type of lens is used? Name the defect. (6)

What is meant by the refraction of light? (6)

Basic definition

Draw a ray diagram to show how an erect image is formed by a magnifying glass. (12)

An erect image is formed when the object is inside F for a convex lens.



A diverging lens cannot be used as a magnifying glass. Explain why. (5)

The image formed by a diverging lens is diminished for all positions of the object.

The converging lens has a focal length of 8 cm. Determine the two positions that an object can be placed to produce an image that is four times the size of the object? (15)

$$\begin{aligned} \frac{1}{u} + \frac{1}{v} &= \frac{1}{f} \\ |\text{magnification}| = 4 &= \frac{|v/u|} \Rightarrow v = 4u \quad (\text{for real image}) \\ \frac{1}{u} + \frac{1}{4u} &= \frac{1}{8} \\ \Rightarrow \frac{5}{4u} &= \frac{1}{8} \end{aligned}$$

$$\begin{aligned} |\text{magnification}| = 4 &= \frac{|v/u|} \Rightarrow v = -4u \quad (\text{for virtual image}) \\ \frac{1}{u} - \frac{1}{4u} &= \frac{1}{8} \\ \Rightarrow \frac{3}{4u} &= \frac{1}{8} \end{aligned}$$

The power of an eye when looking at a distant object should be 60 m^{-1} . A person with defective vision has a minimum power of 64 m^{-1} . Calculate the focal length of the lens required to correct this defect. (12)

$$\begin{aligned} P &= P_1 + P_2 \\ 60 &= 64 + P_2 \\ P_2 &= -4 \text{ m}^{-1} \end{aligned}$$

$$\begin{aligned} \frac{P}{f} &= \frac{1}{f} = -\frac{1}{4} \text{ m} \end{aligned}$$

What type of lens is used? Name the defect. (6)

A concave lens (f negative) is used to correct this defect called myopia.