What are Lenses?

Worksheet

A lens refracts light at two curved surfaces to form an image; the thin lens equation 1/f = 1/do + 1/di relates focal length, object distance and image distance.

$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

Questions

1. Which lens is thicker at the center than the edges?

A) Diverging lens
B) Converging lens
C) Flat lens
D) Neither

2. An object placed inside a converging lens's focal length produces

A) A real, inverted image
B) A virtual, upright, magnified image
C) No image at all
D) A real, reduced image

3. For f = 10 cm and do = 30 cm, what is di?

A) 7.5 cm
B) 15 cm
C) 20 cm
D) 15 cm

4. A diverging lens always produces

A) A real image
B) A virtual, upright, reduced image
C) A magnified real image
D) No refraction

5. An object sits 30 cm from a converging lens with f = 10 cm. Find the image distance.

6. An object sits 5 cm from the same lens (f = 10 cm), inside the focal length. Find the image.

7. An object is 20 cm from a diverging lens with f = 15 cm. Find the image distance.

8. Define: Converging vs diverging lens?

9. Define: What is the focal point?

10. Define: Real vs virtual image?

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Answer Key

1. B) Converging lens - Converging (convex) lenses bulge outward and are thickest at the center.

2. B) A virtual, upright, magnified image - Inside f, the lens acts like a magnifying glass - image is virtual, upright and enlarged.

3. B) 15 cm - di = (1030)/(3010) = 15 cm.

4. B) A virtual, upright, reduced image - Diverging lenses only ever form virtual, upright, reduced images.

5. di = fdo/(dof) di = (1030)/(3010) = 300/20 di = 15 cm (real image)

6. di = (105)/(510) = 50/5 di = 10 cm virtual, upright, magnified image (like a magnifying glass)

7. di = (1520)/(20(15)) = 300/35 di 8.6 cm virtual, reduced image

8. A converging (convex) lens bends light inward to a focal point; a diverging (concave) lens spreads light outward.

9. The point where parallel rays meet (or appear to originate) after passing through the lens.

10. A real image forms where light rays actually meet and can be projected; a virtual image only appears to form and can't be projected.

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