

Ray Optics Formulas



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Ray optics formulas

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The images you have shared contain important formulas related to **Ray Optics**. Here's a breakdown of some key formulas and their context based on the images:

1. Lens and Mirror Formula:

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

Where:

- v : Image distance
- u : Object distance
- f : Focal length

2. Magnification Formula for Mirrors:

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

Magnification m is defined as the ratio of image height to object height and is related to the distances of the image and the object.

3. Focal Length for a Spherical Mirror:

$$f = \frac{R}{2}$$

Where R is the radius of curvature.

4. Magnification for a Lens:

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

Magnification relates the image height h_i to the object height h_o , and also to the distances from the lens.

5. Apparent Depth:

$$\mu = \frac{\text{Real depth}}{\text{Apparent depth}}$$

This formula is used to determine the apparent depth when an object is viewed through a medium like water.

6. Normal Shift:

$$d = t \left(1 - \frac{1}{\mu} \right)$$

Where:

- t : Thickness of the medium
- μ : Refractive index of the medium

7. Refractive Index and Critical Angle:

$$\mu = \frac{1}{\sin i_c}$$

Where i_c is the critical angle for total internal reflection.

8. Thin Lens Equation:

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

A general formula relating the object distance u , image distance v , and the focal length f of a lens.

9. Linear Magnification of a Lens:

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

10. Lens Combination Formula:

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3}$$

Used when multiple lenses are combined in series.

11. Microscope Magnification (SM and Normal Adjustment):

- For **normal adjustment**:

$$m = \frac{v_o}{u_o} \times \frac{D}{f_e} = \frac{L}{f_o} \times \frac{D}{f_e}$$

Where v_o , u_o , f_e , and D are relevant parameters for magnification in a microscope setup.

These formulas cover key concepts in ray optics, including image formation, magnification, refraction, and lens combinations. Let me know if you need further details or examples for any specific concept!