

33. (a) If L is the distance between the lenses, then according to Fig. 35-17, the tube length is $s = L - f_{\text{ob}} - f_{\text{ey}} = 25.0 \text{ cm} - 4.00 \text{ cm} - 8.00 \text{ cm} = 13.0 \text{ cm}$.
- (b) We solve $(1/p) + (1/i) = (1/f_{\text{ob}})$ for p . The image distance is $i = f_{\text{ob}} + s = 4.00 \text{ cm} + 13.0 \text{ cm} = 17.0 \text{ cm}$, so

$$p = \frac{if_{\text{ob}}}{i - f_{\text{ob}}} = \frac{(17.0 \text{ cm})(4.00 \text{ cm})}{17.0 \text{ cm} - 4.00 \text{ cm}} = 5.23 \text{ cm} .$$

- (c) The magnification of the objective is

$$m = -\frac{i}{p} = -\frac{17.0 \text{ cm}}{5.23 \text{ cm}} = -3.25 .$$

- (d) The angular magnification of the eyepiece is

$$m_{\theta} = \frac{25 \text{ cm}}{f_{\text{ey}}} = \frac{25 \text{ cm}}{8.00 \text{ cm}} = 3.13 .$$

- (e) The overall magnification of the microscope is

$$M = mm_{\theta} = (-3.25)(3.13) = -10.2 .$$