$$= \frac{3.00\times10^{8}\ \text{m/s}}{5.88\times10^{14}\ \text{Hz}}$$

$$= 5.10 \times 10^{-7}\ \text{m}$$

$$\frac{\lambda_a}{\lambda_w} = \frac{n_w}{n_a}$$

$$\frac{5.10\times10^{-7}}{\lambda_w} = \frac{1.33}{1.00}$$

$$\lambda_w = 3.83 \times 10^{-7}\ \text{m}$$

Lesson 8–Lenses

1. a) real, inverted, larger

b) real, inverted, same size

c) virtual, erect, smaller

d) real, inverted, smaller

e) virtual, erect, larger

f) no image

g) virtual, erect, smaller

2. a) $\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$

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

$$= \frac{1}{8.0\ \text{cm}} - \frac{1}{9.0\ \text{cm}}$$

$$d_i = 72\ \text{cm}$$

b) $\frac{h_i}{h_o} = -\frac{d_i}{d_o}$

$$\frac{h_i}{6.0\ \text{cm}} = -\frac{72\ \text{cm}}{9.0\ \text{cm}}$$

$$h_i = -48\ \text{cm}$$

c) real, inverted, larger

3. a) $\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$

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

$$= \frac{1}{-4.5\ \text{cm}} - \frac{1}{4.5\ \text{cm}}$$

$$d_i = -2.3\ \text{cm}$$

b) $\frac{h_i}{h_o} = -\frac{d_i}{d_o}$

$$\frac{h_i}{5.0\ \text{cm}} = -\frac{-2.2\ \text{cm}}{4.5\ \text{cm}}$$

$$h_i = 2.4\ \text{cm}$$

c) virtual, erect, smaller

4. $\frac{h_i}{h_o} = -\frac{d_i}{d_o}$

$$\frac{1.0\ \text{cm}}{3.0\ \text{cm}} = -\frac{d_i}{6.0\ \text{cm}}$$

$$d_i = -2.0\ \text{cm}$$

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

$$= \frac{1}{6.0\ \text{cm}} + \frac{1}{-2.0\ \text{cm}}$$

$$f = -3.0\ \text{cm}$$

5. $\frac{h_i}{h_o} = -\frac{d_i}{d_o}$

$$\frac{4.0\ \text{cm}}{2.0\ \text{cm}} = -\frac{d_i}{5.0\ \text{cm}}$$

$$d_i = -10\ \text{cm}$$

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

$$= \frac{1}{5.0\ \text{cm}} + \frac{1}{-10.0\ \text{cm}}$$

$$f = 10\ \text{cm} \text{ or } 1.0 \times 10^{1}\ \text{cm}$$

convex

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

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

$$= \frac{1}{5.5\ \text{cm}} - \frac{1}{11\ \text{cm}}$$