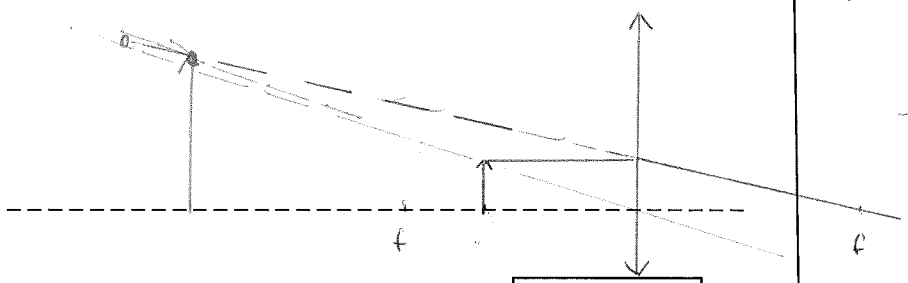
Mirror and Lenses Practice TEST KEY

1. A microscope uses a converging lens with a focal length of 3 cm. A 0.6 cm tall insect is placed 2 cm from the lens. Find the q and hi using both a diagram and equations:

RAY DIAGRAM:

ho = 0.6
p = 2cm
f = 3



negative q because object on SAME side of lens as image

q = -6.1 cm
hi = 2.0 cm

EQUATIONS:

$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$

$\frac{1}{3} = \frac{1}{2} + \frac{1}{q}$

$-0.1667 = \frac{1}{q}$

$q = -6$

$\frac{hi}{ho} = \frac{-q}{p}$

$\frac{hi}{0.6} = \frac{+6}{2}$

$hi = 1.8$

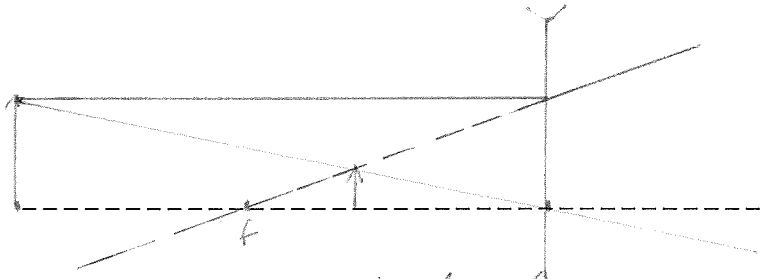
q = -6cm
hi = 1.8cm

1. An object 1.5 cm tall is placed 7.0 cm in front of a diverging lens with a focal length of 4 cm. Find the q and hi using both a diagram and equations.

RAY DIAGRAM:

ho = 1.5
p = 7
f = 4

F = negative



negative q because object + image on SAME side of lens

q = -2.5cm
hi = 0.5cm

EQUATIONS:

$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$

$\frac{1}{-4} = \frac{1}{7} + \frac{1}{q}$

$-0.393 = \frac{1}{q}$

$q = -2.5cm$

$\frac{hi}{ho} = \frac{-q}{p}$

$\frac{hi}{1.5} = \frac{+2.5}{7}$

$hi = 0.54$

q = -2.5cm
hi = 0.54cm

Why is there a focal point on both sides of a lens? transparent - light can go through either side

When is magnification negative? inverted

When is q negative with mirrors? behind mirror

When is q negative for lenses? object + image on SAME side of lens

What kind of mirror AND lens can make a REAL image? concave + converging

What type of mirror AND lens has a negative focal length? convex + diverging

What type of image can be projected? real

Which type of lens is thicker in the middle? converging

Which type of lens is used to correct nearsightedness? diverging

What is the difference between reflection and refraction? reflect - light bounces back refract - light bends

What is the frequency of light with a wavelength of 450 nm? 6.67×10^{14} Hz

$450nm \times \frac{10^{-9}m}{1nm} = 4.5 \times 10^{-7}m$

$v = f\lambda \quad c = 3 \times 10^8 = f(4.5 \times 10^{-7}m) \quad f = 6.67 \times 10^{14} Hz$