Name: _____

LET THERE BE LIGHT

1. Why do windows on a building look darker during the daytime than the building itself?

2. Why does wet sand look darker than dry sand?

3. What is TIR? How does it apply to optical fibers? Sketch the cross-section of a typical fiber.

4. Why does a diamond sparkle? Calculate its critical angle (assume it's surrounded by air).

5. Calculate the critical angle for light passing from crown glass to air. Compare to diamond.

6. Define dispersion. Draw a sketch and explain what happens to white light entering a prism.

7. What conditions are necessary for viewing a rainbow? Draw a sketch and explain how it is formed.

8. What conditions are necessary for viewing an inferior mirage? How is it formed? Is it a result of reflection or refraction? Draw a sketch and explain.

9. Some eyeglasses are clear indoors but darken upon exposure to daylight. The process is reversed when the exposure to sunlight is removed (so-called "transition lenses"). What causes this reversible change?

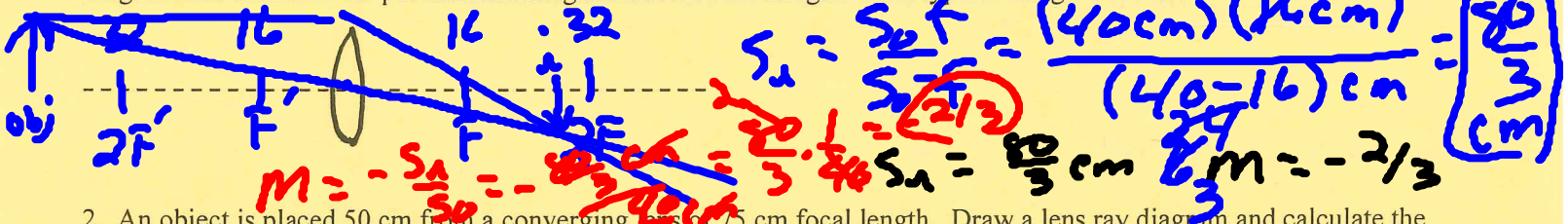
10. H.G. Wells' Invisible Man was invisible because he changed his body's index of refraction to an appropriately chosen value. What was this value? Could such an invisible man see anything at all?

11. Can you can get a sunburn or otherwise damage your skin on a cloudy day or through glass? Explain.

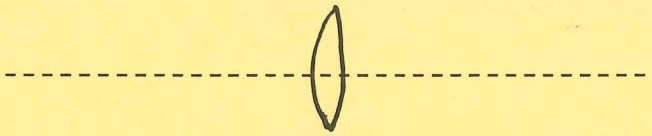
Name: _____

HOCUS FOCUS

1. A converging lens has a focal length of 16 cm. An object is placed 40 cm in front of the lens. Draw a lens ray diagram and calculate the position and magnification of the image. What type of image is formed?



2. An object is placed 50 cm from a converging lens of 75 cm focal length. Draw a lens ray diagram and calculate the position and magnification of the image. What type of image is formed?

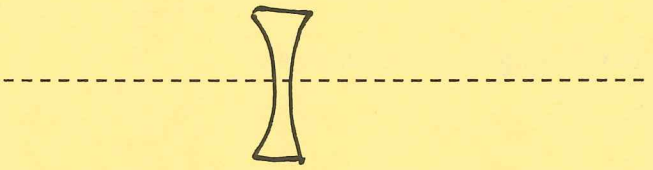


$S_i = -150cm \quad M = +3$

3. An object 60 cm from a lens produces a real image 40 cm from the lens. Calculate the focal length of the lens.

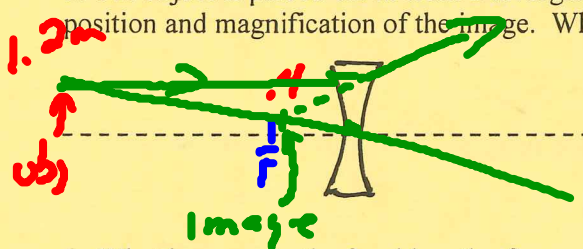
$f = 24cm$

4. An object is placed 108 cm from a diverging lens of -36 cm focal length. Draw a lens ray diagram and calculate the position and magnification of the image. What type of image is formed?



$S_i = -27cm \quad M = \frac{1}{4}$

5. An object is placed 1.2 m from a diverging lens of -0.40 m focal length. Draw a lens ray diagram and calculate the position and magnification of the image. What type of image is formed?



$S_i = \frac{S_o f}{S_o - f} = \frac{(1.2m)(-.4m)}{1.2m - -.4m} = -.3m$

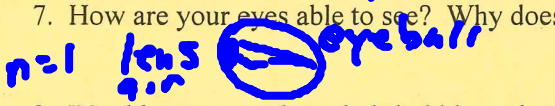
$M = -\frac{S_i}{S_o} = -\frac{-.3m}{1.2m} = \frac{1}{4}$

$S_i = -30cm \quad M = \frac{1}{4}$

6. What happens to the focal length of a magnifying glass when placed under water? Why?

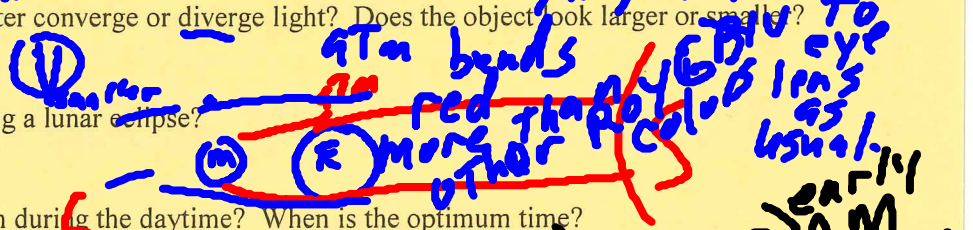
f lengthened because light going from 1.333 to 1.52 instead of 1 to 1.52 so refracts less.

7. How are your eyes able to see? Why does it help to wear a mask underwater?



with mask light goes from air to eye

8. Would a convex-shaped air bubble under water converge or diverge light? Does the object look larger or smaller?



9. Why does the moon have a reddish hue during a lunar eclipse?

10. Why is it not a good idea to water your lawn during the daytime? When is the optimum time?