Physics: Lab F3 - Images in Concave Mirrors

The purposes of this lab are to relate ray diagrams to actual images in concave mirrors and to obtain a mathematical relationship among distance variables.

Complete the Experimental Design, Evidence, Analysis and Evaluation sections in your lab report.

Problem

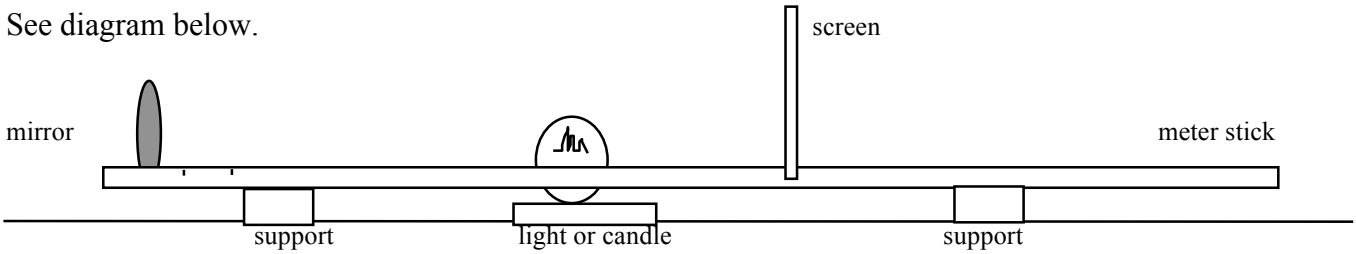
What is the relationship between d_o and d_i for a concave mirror?

Experimental Design (2 marks)

Write a brief summary outlining the plan used to answer the problem. Identify the manipulated, responding, and controlled variables.

Materials

See diagram below.



Procedure

1. Complete the pre-lab exercise by drawing ray diagrams to scale.
2. Set up the apparatus similar to shown above, making sure that the mirror holder is at 5.0 cm. A clamp and lab stand can be used to hold the meter stick if no stands are available.
3. Record the focal length, *f*, of your mirror.
4. Set the filament of your light source at a distance (d_o) equal to approximately 3*f* from the mirror. Move the screen until the image is in focus (i.e. as clear as possible). The whole image need not be on the screen and the screen may be tilted sideways.
6. Record the position of the image (d_i) and note the orientation of the image.
7. Repeat steps 4-6 using distances, d_o, between 3*f* and 2*f*, 2*f*, between 2*f* and *f*, *f* and less than *f*. (It may not be possible to measure an image in all cases.) Use Exercise F1 to assist you in finding the image.
8. Repeat steps 4-7 for a second trial.

Evidence (5 marks) focal length, $f =$ _____

d_o (cm)	d_i (cm)		Relative Size of Image	Orientation of Image	Type of Image
3*f (or approx.)* =					
2*f* =					
f =					

Analysis (5 marks)

d_o	average d_i	$\frac{1}{}$	$\frac{1}{}$	$\frac{1}{} + \frac{1}{}$	$f_{(exp)}$	%

(cm)	(cm)	d_o (cm^{-1})	d_i (cm^{-1})	d_o d_i (cm^{-1})	(cm)	difference

1. Does the total, $\frac{1}{d_o} + \frac{1}{d_i}$, appear to be a constant?

2. How does this total relate to the focal length?

3. What are the conditions necessary for the image to be larger than the object?

4. Compare the experimental focal length calculated ($f_{(exp)}$) with the accepted value of the focal length by finding the percent difference. Provide one sample calculation.

Evaluation (4 marks)

1. What are some of the improvements that can be made in the design, materials or procedure?

2. What are some sources of uncertainty in this experiment?

3. How confident are you with the answer you obtained? Justify.

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