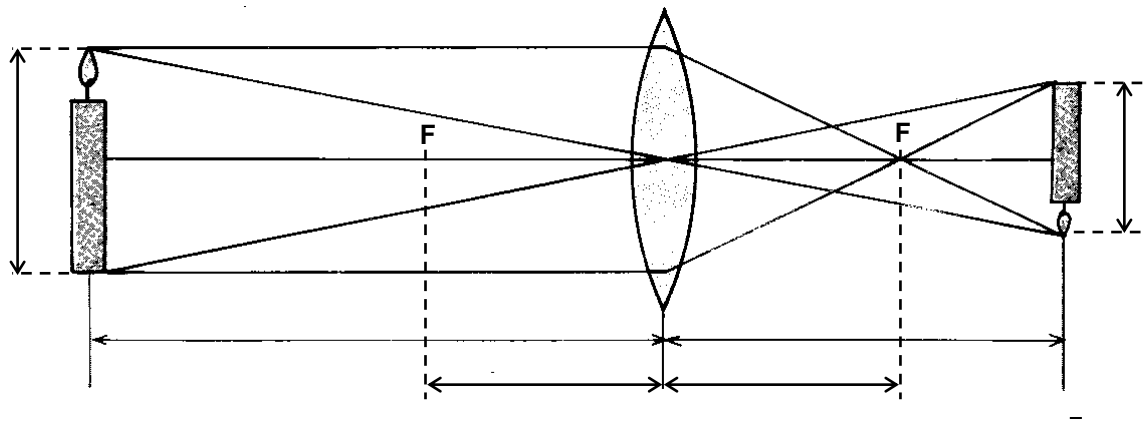
Thin lens equation

Introduction

In the picture below you can see a candle (to the left) and its image (to the right) formed by a converging lens.

Please label the following concepts in the picture:

***d*o**: Object distance (distance from the object to the center of the lens)
***d*i**: Image distance (distance from the image to the center of the lens)
***h*o**: Object height (lateral size of the object)
***h*i**: Image height (lateral size of the image)
f: Focal length (distance from the center of the lens to its focal point F)



Thin lens equation

The lens equation gives the relationship between the focal length, the object distance and the image distance:

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

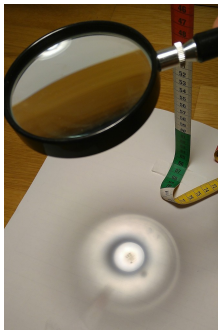
Please note:

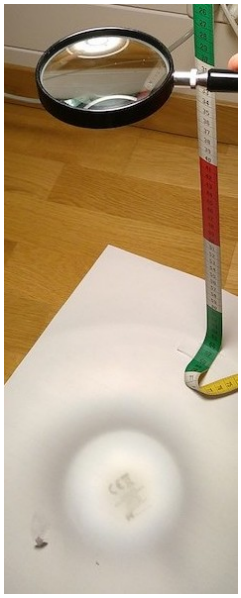
- Distances to objects and real images are positive
- Distances to virtual images are negative
- The focal length of a converging lens is positive
- The focal length of a diverging lens is negative

Thicker lenses are more powerful and thus bend the light more. Their focal length is shorter.

Experiments

1. Using a reading glass, project a real image of the ceiling lamp onto the table. You can also use your phone - choose a bright image and project it onto the table. There are two positions for a sharp image. Move the reading glass up and down to locate them.





Compare the image sizes in the two positions.
When is the image smaller than the object: when the reading glass is closer to the image or further away?

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2. Measure the image distance and the object distance in one of the two positions mentioned above. Calculate the focal length of the lens, using the thin lens equation.

d_o = d_i =

f =