The Focal Length converging Lens (Displacement Method)

Purpose: determine the focal length of a converging lens by the lens displacement method.


Method:

1. Place the object (o) at one end of meter scale and the image screen (I) at the end so that distance apart is about 90 cm. 
   [The distance between the object and screen is (D)]
2. Place the lens between then and near to the object.
3. Adjust the position of the lens until MAGNTIEF IMAGE is sharply focus on the screen.
4. Record the position of the lens along scale. 
   The distance between the lens and object is = \(d_1\).
5. Move the lens toward the screen and adjust its position one again a diminished image is sharply in, focus on the screen.
6. Record the new position of the lens along scale. 
   The distance between the lens and object is = \(d_2\).
7. Repeat the observation with the distance between the object and screen (D) equal to, 80.70.60.50 cm.

Reading:

<table>
<thead>
<tr>
<th>Distance between object and image D (cm)</th>
<th>First position of lens (d_1)</th>
<th>Second position of lens (d_2)</th>
<th>Lens displacement (d = d_1 - d_2)</th>
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<tbody>
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** Plot the graph between \((D^2 - d^2)\) against D will be a straight line through the origin whose slop is the numerical value \((4F)\).
\[ \text{Slop} = \frac{D^2 - d^2}{D} \]

\[ F = \frac{D^2 - d^2}{4D} \]

Therefore, \( F = \frac{\text{Slope}}{4} \)

**Medical Applications:**

You can also easily check whether glasses have positive or negative lenses by looking at an object through one lens held some distance away. When you move the lens, the object also appears to move. If it moves in the same direction as the motion of the lens, it is negative lens; if it moves in the opposite direction, it is a positive lens. Another test is to hold the lens over some printing. If it enlarges the printing, the lens is positive; if it makes the printing smaller, the lens is negative.

In astigmatism, the curvature of the cornea is uneven. Astigmatism cannot be corrected by a simple positive or negative lens. A simple test for astigmatism is to look at a pattern of radial lines Fig. (1). An astigmatic eye will see lines going in one direction more clearly than lines going in other directions. Astigmatism is corrected with an asymmetric lens in which the strength is greater in one direction than in the perpendicular.