مدونة المناهج السعودية

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الموقع التعليمي لجميع المراحل الدراسية

في المملكة العربية السعودية

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Concave Mirror Experiment

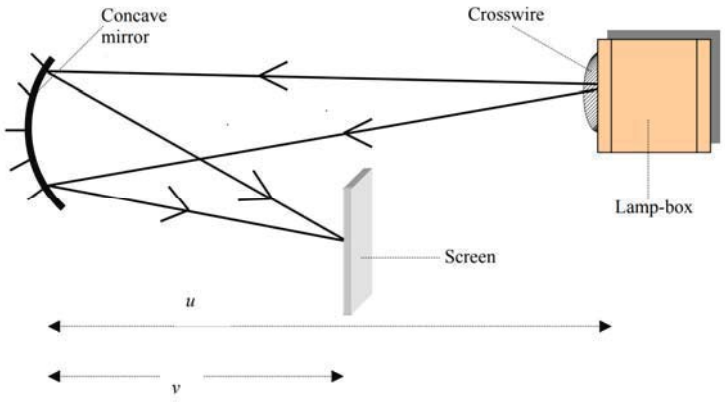
1 Objective

Determination of the focal length a concave mirror by:

(i) by u-v method.

(ii) From 1/u - 1/v graph.

2 Theoretical background



The equation connecting the distance between mirror and object (u), distance between mirror and image (v), and the focal length of the mirror (f) is called mirror equation**:**

$$\frac{1}{f} = \frac{1}{U} + \frac{1}{V}$$

All the distances are measured from the center (pole) of the mirror.

3 Equipment

- A concave mirror
- Stand
- Screen
- Illuminated wire gauze.

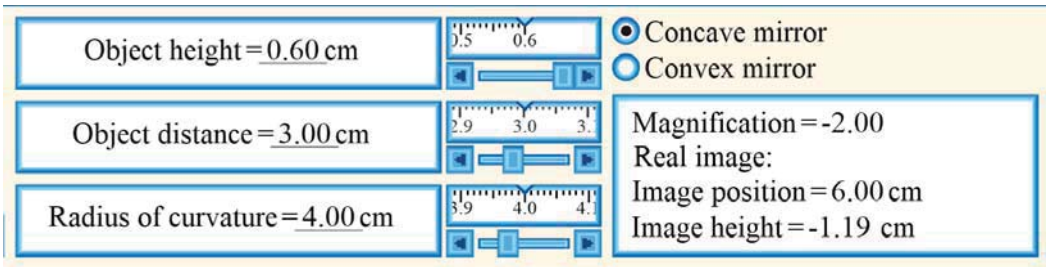
- Metre scale

4 Method

1. Chose the type of a spherical mirror to be the concave mirror.
2. Set up the equipment as in the diagram. The object should be placed between C and F points.
3. Adjust the distance u which is between mirror and the object as in the first value of u tabular column in the result table.
4. Record the value of v, which the distance between the mirror and the image, in its tabular column.
5. Calculate the focal length of the given concave mirror by using the relation, f = uv/(u+v).
6. Repeat the experiment for different values of u and in each time, record v and calculate the focal length (f) of the concave mirror.
7. Calculate the mean of all focal lengths to get the correct focal length of the given concave mirror.
8. Plot a graph with 1/u along X axis and 1/v along Y axis by taking same scale for drawing the X and Y axes. The graph is a straight line intercepting the axes at A and B.
9. Determine the values of A and B points and calculate the mean of focal length by using the relation, f= 2/(A+B).

5 Results

Set the parameters of the simulator as the following:



No.	Distance between the mirror and		1/u (cm^{-1})	1/v (cm^{-1})	$f = \frac{uv}{u+v}$ (cm)
	Object, u (cm)	Image, v (cm)			
1	2.50	10	0.40	0.10	2.0000000
2	2.75	7.33	0.36	0.14	1.9997520
3	3.00	6	0.33	0.17	2.0000000
4	3.25	5.2	0.31	0.19	2.0000000
5	3.50	4.67	0.29	0.21	2.0006120
6	3.75	4.29	0.27	0.23	2.0009328

the mean calculation of the concave mirror focal length by:

I. U-V method.

$f_{average} = 2 \quad cm$

Errors Analysis: $f_T = 2\ cm$

$Error\ \% = \frac{|f - f_T|}{f_T} \times 100\%,$

$Error\ \% = \frac{|2 - 2|}{2} \times 100\%$

,

$Error\ \% = 0 \text{ x } 100\%$

II. 1/u – 1/v graph.

6 Graph

Plot the relation between 1/u (on x axis) and 1/v (on y axis) in sperate squares paper sheet.

7 Calculations

Intercept of 1/u = B =0.5
Intercept of 1/v = A =0.5

$$f_{average} = \frac{2}{A+B} = \frac{2}{0.5+0.5} = 2 \quad cm$$

Errors Analysis: $f_T = 2\ cm$

$$Error\ \% = \frac{|2-2|}{2} \times 100\%$$

$$Error\ \% = 0 \times 100\%$$