MOHAMED KHIDER UNIVERSITY – BISKRA-
FACULTY EXACT SCIENCES AND SCIENCES OF THE NATURE AND LIFE
DEPARTMENT OF SCIENCES OF THE NATURE AND LIFE
1st year common core Biology
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TP N°:4

Modeling the behavior of a concave spherical mirror

1. Objectives:

- We propose to find the formula conjugate of the concave spherical mirror.
- Determination of focal length of concave spherical mirror.

2. Theoretical

In the case of spherical mirrors, the principle of inverse return of light implies: $f = f'$

- The conjugation relation for a spherical mirror:

$$\frac{1}{\overline{SA'}} + \frac{1}{\overline{SA}} = \frac{1}{\overline{SF}} = \frac{1}{f'} \qquad \overline{SF} = \overline{SF'} = f'$$

$$\frac{1}{\overline{SA'}} + \frac{1}{\overline{SA}} = \frac{2}{\overline{SC}} \quad or \quad \frac{1}{P'} + \frac{1}{P} = \frac{2}{R}$$

- The magnification

$$\gamma = \frac{\overline{A'B'}}{\overline{AB}} = -\frac{\overline{SA'}}{\overline{SA}} = -\frac{P'}{P}$$

- The focal lengths $\overline{SF}$ and $\overline{SF'}$ have the expressions:

$$\overline{SF} = \overline{SF'} = \frac{\overline{SC}}{2}$$

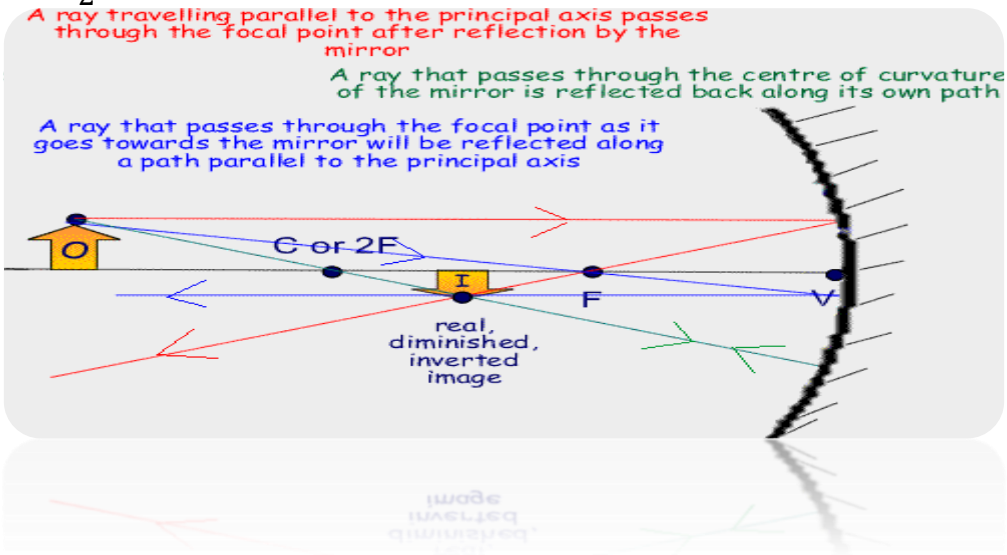


Figure 1: Image construction

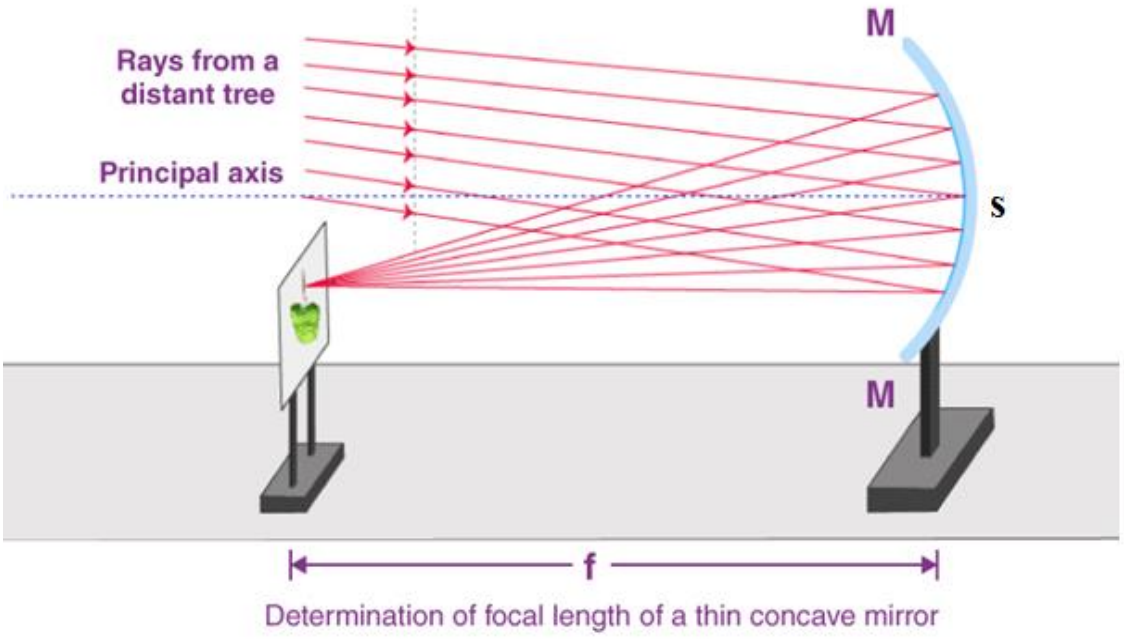
Materials Required

1. A concave mirror
2. A measuring scale
3. A screen holder
4. A mirror holder
5. A mirror stand

Procedure

1. The concave mirror placed on the mirror stand and the distant object should be facing each other.
2. The screen should be placed in front of the reflecting surface of the mirror. To obtain a clear, sharp image the screen should be adjusted.
3. Using a metre scale the distance between the concave mirror and screen can be determined. The distance is the same as the focal length of the given concave mirror.

Experimental Setup



Determination of focal length of a thin concave mirror

This data is presented in the table below (**The size of the object is $\overline{AB}$=2.1 cm**)

measures	$P = \overline{SA}(cm)$	$P' = \overline{SA}^{"}\ (cm)$	$\overline{A'B'}(cm)$
1	-180	-68,5	-0.80
2	-170	-69,5	-0.85
3	-160	-71,1	-0.80
4	-150	-74.5	-1.00
5	-140	-76.7	-1.10
6	-130	-80.0	-1.20
7	-120	-84.3	-1.40
8	-110	-90.1	-1.60

Work required :

For different positions $\overline{SA}$ of the object, the experiment gave images of net distances $\overline{SA'}$ (see the table above)

1- Complete the table below

Measures	$\frac{1}{\overline{SA}} = \frac{1}{P}(cm^{-1})$	$\frac{1}{\overline{SA'}} = \frac{1}{P'}(cm^{-1})$	$\gamma_1 = \frac{\overline{A'B'}}{\overline{AB}}$	$\gamma_2 = -\frac{\overline{SA'}}{\overline{SA}} = -\frac{P'}{P}$	$f = f'$ (cm)	$\left\|\frac{\gamma_2 - \gamma_1}{\gamma_2}\right\|$
1						
2						
3						
4						
5						
6						
7						
8						

To calculate the **focal length** of the spherical mirror, use the following conjugation formula:

$$\frac{1}{\overline{SA'}} + \frac{1}{\overline{SA}} = \frac{1}{\overline{SF}} = \frac{1}{f'} \text{ or } f' = \frac{\overline{SA}.\overline{SA'}}{\overline{SA'}+\overline{SA'}}$$

2- Draw the curve: B = f(A).

To show that the equation obtained has the form of the conjugation relation of a spherical mirror (y = ax + b), we need to express the variables B and A in terms of y and x, respectively.

3. Show that the obtained equation has the same form as to the formula conjugate of the concave spherical mirror.
4. conclusion

Report of Practical work N^0 4

GROUP	
STUDENTS	

1.Complete the table below

Measures	$\frac{1}{\overline{SA}} = \frac{1}{P}(cm^{-1})$	$\frac{1}{\overline{SA'}} = \frac{1}{P'}(cm^{-1})$	$\gamma_1 = \frac{\overline{A'B'}}{\overline{AB}}$	$\gamma_2 = -\frac{\overline{SA'}}{\overline{SA}} = -\frac{P'}{P}$	$f = f'$ (cm)	$\left\|\frac{\gamma_2 - \gamma_1}{\gamma_2}\right\|$
1						
2						
3						
4						
5						
6						
7						
8						