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
2023/2024

Practical work N° 4: Modeling the Behavior of a Converging Thin Lens

I.1. Descartes' conjugate relationship is as follows:

$$\frac{1}{\overline{OA'}} - \frac{1}{\overline{OA}} = \frac{1}{f'} = -\frac{1}{f}$$

Position de l'image A'   Position de l'objet A   Distance focale Image f' Distance focale Objet f

$\overline{OA}$ is an algebraic quantity indicating the position of the light object (relative to the lens).

$\overline{OA'}$ is an algebraic quantity indicating the position of the corresponding image (relative to the lens).

$\overline{OF'}$ is the position between the lens and the image focal point. This distance is called the focal length, also denoted as f'.

To simplify calculations, let's set $\overline{OA} = x$ and $\overline{OA'} = x'$, allowing the use of the simplified relationship:
1/f = 1/x – 1/x'

I.2. Equipment used (see diagram below) to verify Descartes' relationship includes: – An optical bench – A light object (light source with letter F) – A converging thin lens with focal length f'th = 100 mm + its support – A screen + its support

light source with letter F   object   lens   screen+ its support
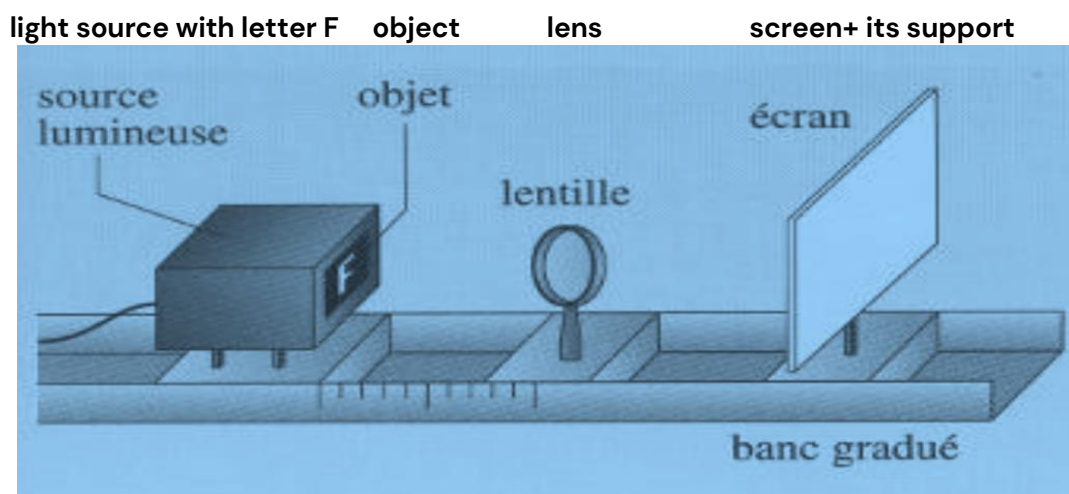
I.3. Modeling of the experimental situation

The letter F will be modalized below by the object AB.

B

object   converging lens   screen

A   O   A'
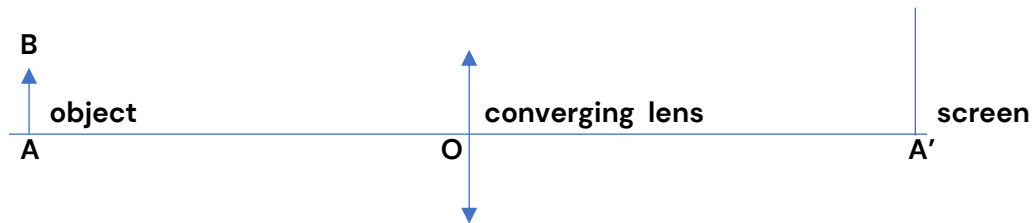
I.4. Elaboration

Using Descartes' equation and your knowledge from the course, complete the table below and rediscover Descartes' conjugate relationship.

X(m)	−0.400	−0.300	−0.250	−0.200	−0.150
X'(m)					

1. Create the quantity A = 1/x and B = 1/y with y = 1/x'
    A = 1/x
    B = 1/y

$A = \dfrac{1}{x}(m^{-1})$					
$B = \dfrac{1}{y}(m^{-1})$					

2. Plot the curve: B = f(A).
3. Show that the obtained equation has the same form as Descartes' conjugate relationship.
4. The statement mentions a lens with a focal length f'th = 100 mm. Calculate the relative deviation $\eta = 100*(f'exp - f'th) / f'th$.

Reminder: The vergence C is defined as C = 1/f'. If f' is in meters (m), C is in diopters (D), with C = 9.713 δ.

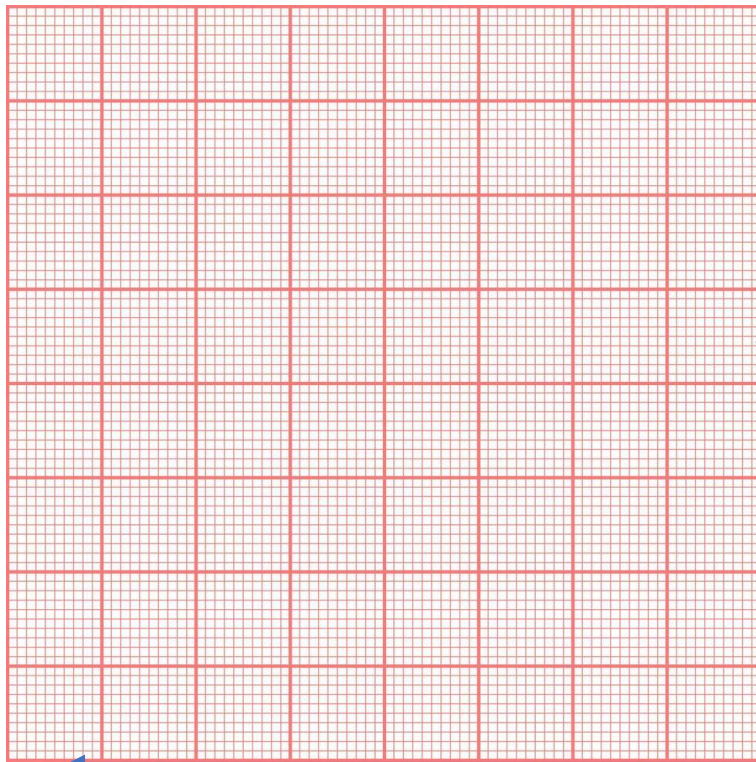5. conclusion.

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GROUP	
STUDENTS	

complete the table below

X(m)	-0.400	-0.300	-0.250	-0.200	-0.150
X'(m)					

1. Create the quantity A = 1/x and B = 1/y with y = 1/x', A = 1/x,B = 1/y

$A = \dfrac{1}{x}\,(m^{-1})$					
$B = \dfrac{1}{y}\,(m^{-1})$					

B(m⁻¹)

A(m⁻¹)