2. Étude d'un microscope ☺☺

a)

$$A_0 \xrightarrow{L_1} A_1 = F_2 \xrightarrow{L_2} \infty$$

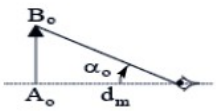
D'après la relation de Descartes $\frac{1}{\overline{O_1F_2}} - \frac{1}{\overline{O_1A_0}} = \frac{1}{f'_1}$ donc $\overline{O_1A_0} = \frac{f'_1 \times \overline{O_1F_2}}{f'_1 - \overline{O_1F_2}}$.

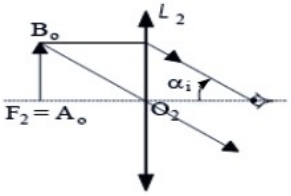
Or $\overline{O_1F_2} = \overline{O_1F'_1} + \overline{F'_1F_2} = f'_1 + \Delta$ donc $\overline{O_1A_0} = \frac{f'_1 \times (f'_1 + \Delta)}{f'_1 - (f'_1 + \Delta)}$ d'où $\boxed{\overline{O_1A_0} = \frac{-f'_1 \times (f'_1 + \Delta)}{\Delta}}$.

AN : $\boxed{\overline{O_1A_0} = \frac{-4 \times (4 + 160)}{160} = -4{,}1\ mm}$.

b) Le grandissement de l'objectif est

$$\boxed{\gamma_{ob} = \frac{\overline{A_1B_1}}{\overline{A_0B_0}} = \frac{-\overline{F'_1A_1}}{f'_1} = \frac{-\Delta}{f'_1} = \frac{-160}{4} = -40}$$



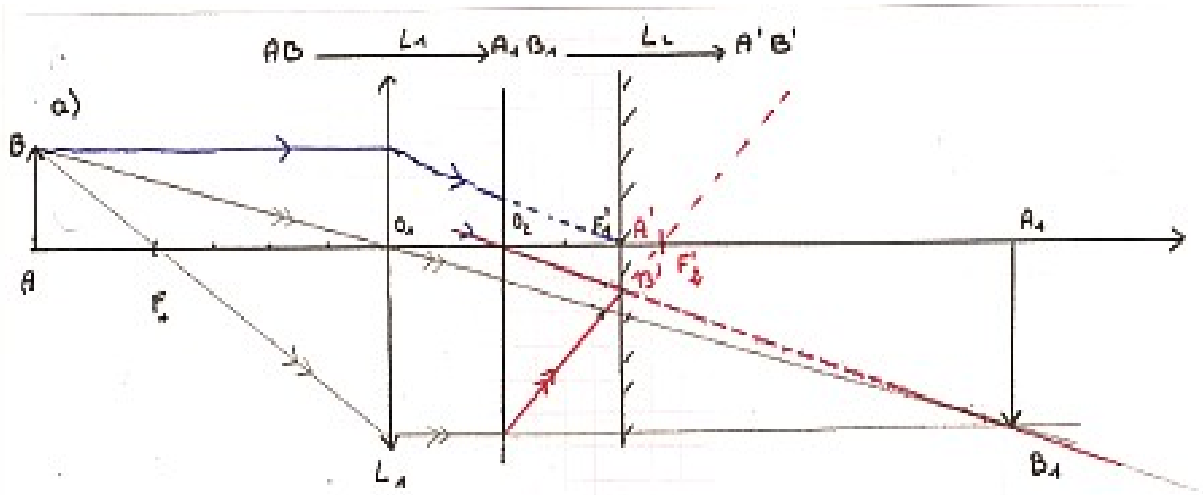


c) La figure ci-contre montre le grossissement commercial de l'oculaire :

$$\boxed{G_{0C} = \frac{\alpha_i}{\alpha_0} = \frac{\overline{A_0B_0}}{f'_2} \times \frac{d_m}{\overline{A_0B_0}} = \frac{d_m}{f'_2} = \frac{250}{25} = 10}$$

d) $\boxed{G_m = \frac{\alpha'_i}{\alpha_0} = \frac{\overline{A_1B_1}}{f'_2} \times \frac{d_m}{\overline{A_0B_0}} = \gamma_{ob} \times G_{OC} = 10 \times (-40) = -400}$.

3. Projection à l'aide de 2 lentilles ☺☺☺



b) $\frac{1}{\overline{O_1A_1}} - \frac{1}{\overline{O_1A}} = \frac{1}{f'_1}$ $\Rightarrow$ $\frac{1}{\overline{O_1A_1}} = \frac{1}{f'_1} + \frac{1}{\overline{O_1A}} = \frac{\overline{O_1A} + f'_1}{f'_1 \times \overline{O_1A}}$ $\Rightarrow$ $\boxed{\overline{O_1A_1} = \frac{f'_1 \times \overline{O_1A}}{f'_1 + \overline{O_1A}}}$

AN : $\overline{O_1A_1} = \frac{20 \times -30}{-30 + 20} = \frac{-60}{-1} = 60$ cm

$\frac{1}{\overline{O_2A'}} - \frac{1}{\overline{O_2A_1}} = \frac{1}{f'_2}$ $\Rightarrow$ $\frac{1}{f'_2} = \frac{\overline{O_2A_1} - \overline{O_2A'}}{\overline{O_2A_1} \times \overline{O_2A'}}$ $\Rightarrow$ $\boxed{f'_2 = \frac{\overline{O_2A_1} \times \overline{O_2A'}}{\overline{O_2A_1} - \overline{O_2A'}}}$

or $\overline{O_2A_1} = \overline{O_2O_1} + \overline{O_1A_1} = -10 + 60 = 50$ cm

$\overline{O_2A'} = 10$ cm

$\boxed{f'_2 = \frac{50 \times 10}{50 - 10} = \frac{50}{4} = 12,5 \text{ cm}}$