Grade: 9
physics
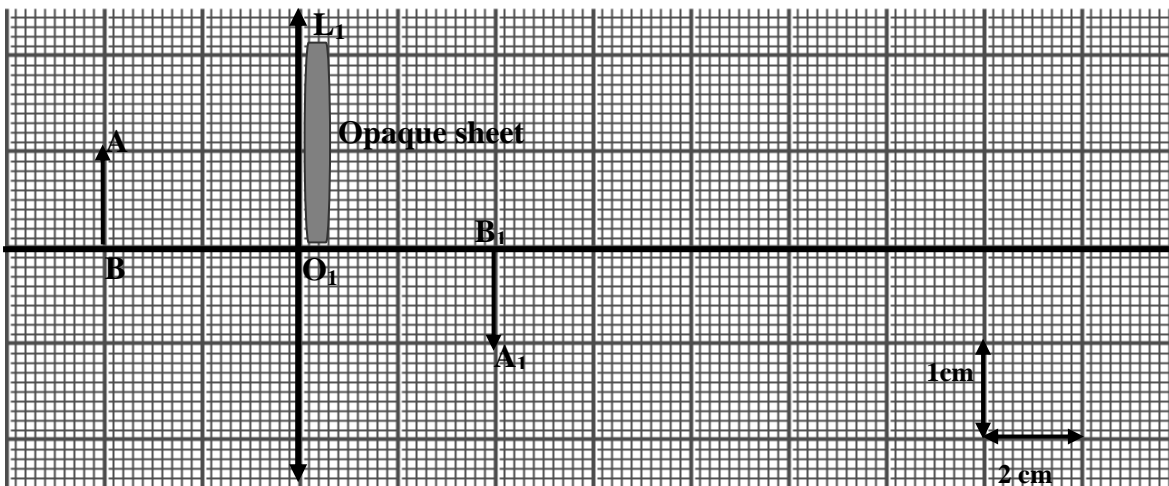
## Optics

A) An opaque sheet is placed to cover the upper part of a convergent lens (L_1) which gives to a luminous object AB= 1cm, an image A_1B_1 placed at 4 cm from (L_1). Observe the following figure.

1) Reproduce, to a scale, the above figure.
2) Determine, by construction, the position of the object focus F of the lens (L_1).
3) Compare the brightness of A_1B_1 to that of AB. Justify your answer.
4) Indicate the nature and the direction of A_1B_1.

B) Another convergent lens (L_2) of focal length OF'=2cm, is placed at 7cm from (L_1), as is shown by the figure. A_1B_1 is considered now as a luminous object for (L_2).
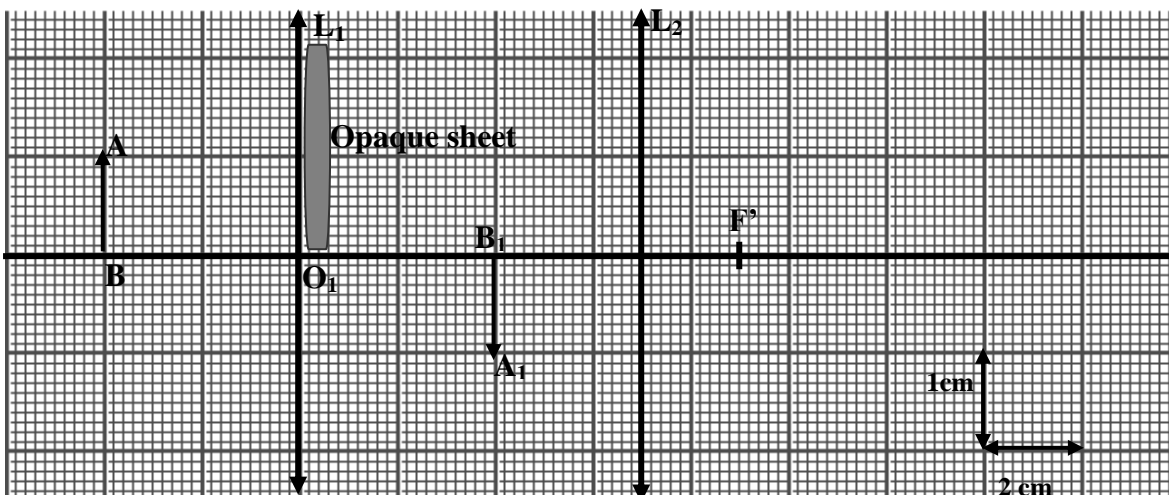

1) Place, on your same figure, the lens (L_2) and the image focus F'.
2) Construct, without justification, A_2B_2 the image of A_1B_1 obtained by (L_2).
3) What is the nature of A_2B_2? Justify your answer.
4) What is the direction of A_2B_2 with respect to the object AB?
5) Compare the size of A_2B_2 to that of AB.

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(5.5 pts)

Electrical circuit

Consider the electrical circuit shown in the adjacent figure.
The circuit contains a dry cell that provides a direct voltage U_{PN}=6V
and three resistors of resistance : R_1=20 Ω , R_2=30Ω and R_3=8Ω.
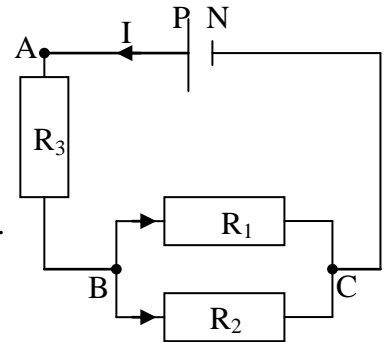
1) Calculate the resistance of the equivalent resistor R_{BC} between B and C.
2) Calculate the resistance of the equivalent resistor R_e between A and C.
3) Calculate the voltage across R_1 and R_3 Knowing that the voltage across R_2 is 3.6 V.
4) Calculate the intensity of the electrical current across R_3. Deduce the intensity of the main current I.
5) We short-circuit R_1. Determine the new voltage across R_1, R_2 and R_3.

(7.75 pts)

Joules' Effect

A) The following inscriptions are printed on a water boiler: 605W, 220 V, AC.
1) What does each inscription represents?
2) How is the boiler connected with the other appliances at home? Justify your answer.
3) Calculate the current intensity passing through the water boiler during a normal functioning.
4) Choose from the list of fuses below, a convenient fuse to protect the water boiler. Justify your answer.
     i- Fuse 1: **1.5A**   ii- Fuse 2: **3A**   iii- Fuse 3: **5A**
5) Define the Joule's effect and indicate if it is for advantage or disadvantage across this water boiler.
6) Calculate the electrical energy received by this water boiler during a normal functioning of 3 hours. .
7) Calculate the cost of the energy consumed by the boiler if each 1kwh costs 50 L.P.

B) An oscilloscope is branched across the terminals of the boiler when the last one is connected to the E.D.L which provides an effective voltage of 220 V and a frequency of 50 Hz.
1) Calculate the period of this obtained signal.
2) Calculate the number of horizontal divisions (x) that will represent this period. Knowing that the horizontal sensibility is S_h= 5ms/div.
3) Calculate the maximal voltage across the boiler.
4) Calculate the amplitude (Y) of the obtained signal when the vertical sensibility S_V = 103.7 V/div.
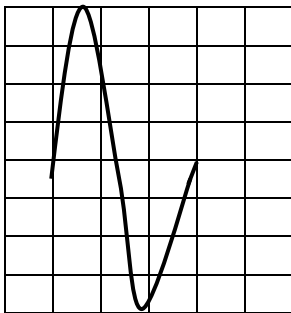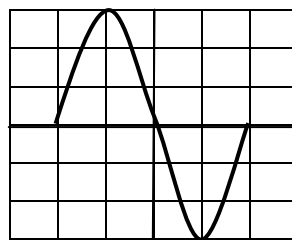5) Which of the following figures represents the voltage across this water boiler?
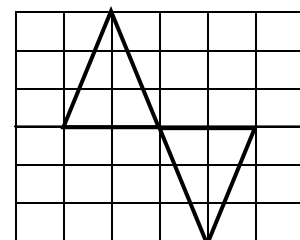
Figure 1   Figure 2   Figure3

Good Work

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