Grade: 9
physics

First Exercise (4.25 pts)

Converging Lens

A converging lens (L) gives for a luminous object AB, of size 1cm, a real image A'B' of size 2cm. A is on the optical axis of the lens. The distance AA' is 9cm.

1-"The image A'B' is inverted". Justify this statement.
2- Draw a diagram, with the real scale, on a graph paper, showing AB, A'B' and the optical axis.
3- Determine, by a geometrical construction, the position of the optical center O of (L).
4- Represent the lens (L) on the diagram.
5- Determine, by a geometrical construction, the position of the image focus F' of (L).
6- Determine the focal length of (L).

Second Exercise (7.25pts)
Domestic Installation

A domestic installation in a kitchen (in Lebanon) is fed by the mains of voltage 220V.
It consists of 4 lamps; each one carries the following indications (220V, 25W), a heater of power 2000W and a washing machine that consumes 980W during normal functioning.
This section of the house's installation is being protected by means of a circuit breaker that supports a maximum intensity of 15A.

1- What do the inscriptions carried by each lamp represent?
2- If these 4 lamps are turned on, do they function normally? Justify your answer.
3- Determine the voltage across the heater and across the washing machine.
4- Draw a schema that shows the circuit of this domestic installation.
5- Determine the intensity of the current passing through each electrical device.
6- Can these devices function simultaneously (together). Justify your answer.
7- What is the role of the circuit breaker?

Third Exercise (8.5pts)
Interactions and Upthrust Force

A solid (S) of mass m=450g is hung to a dynamometer. Given: g=10N/kg.

A- The solid (S) is in air and at equilibrium. (Fig 1)

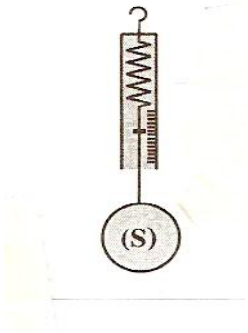

Fig1

1- Name the forces acting on (S).
2- Represent by an equation the condition of equilibrium of this solid. Deduce the magnitudes of the forces of part 1.
3- Represent, to the scale 1cm for 1.5 N, the forces acting on (S).

B- The dynamometer used above consists of a spring of stiffness constant K=100N/m. The maximum elongation of this spring just before permanent deformation takes place is 10 cm.

1- Calculate, at equilibrium, the elongation of the spring. State the corresponding Law.
2- What maximum forces may the spring support without permanent deformation?
3- Trace the elongation curve of the spring according to a scale of your choice.

C- The same solid (S) hung to the dynamometer is totally immersed in a liquid (L), as shown in figure (2). 200 cm^3 of liquid (L) in the container are thus displaced.

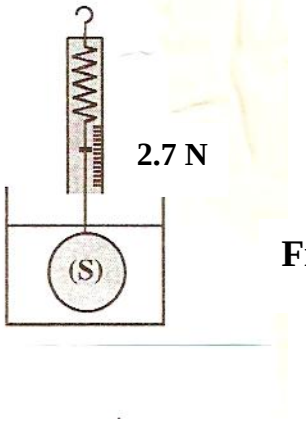

Fig2

1- What does the indication of the dynamometer in (fig 2) represent?
2- Verify that the upthrust force exerted by liquid (L) on (S) is equal to 1.8N.
3- Deduce the density of liquid (L).
4- By referring to the table below, specify the nature of liquid (L).

Liquid	Alcohol	Oil	Water
Density (g/cm^3)	0.8	0.9	1

Good Work