المادة: الفيزياء الشهادة: المتوسطة نموذج رقم 2 المدّة: ساعة واحدة	الهيئة الأكاديميّة المشتركة قسم: العلوم	المركز التربوي للبحوث والإنماء

نموذج مسابقة (يراعي تعليق الدروس والتوصيف المعدّل للعام الدراسي 2016-2017 وحتى صدور المناهج المطوّرة)

This test includes four mandatory exercises in two pages.
The use of non-programmable calculators is allowed.

Exercise 1 (4 points) Reading an information plate

Document 1 shows the information plate of a food steamer.

Choose, *with justification*, the correct answer.

1- The voltage under which the steamer functions normally is:
a- alternating **b-** direct **c-** both

We consider now that the steamer **functions normally**.

2- The power rating, in Watt, of the steamer is:
a- 11 **b-** 110 **c-** 1100

3- When the steamer is being used, the electric current, in ampere, is:
a- 5 **b-** 242 **c-** 50

4- The best caliber (scale) of the fuse that should be used with this appliance is:
a- 1 A **b-** 6 A **c-** 10 A

FOOD STEAMER

MODEL: 5446

220 V ~ , 50 Hz, 1.1 kW

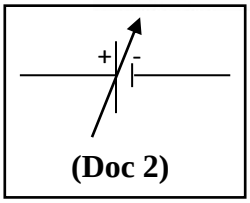
DO NOT IMMERSE IN WATER
FOR HOUSEHOLD USE ONLY

(Doc 1)

Exercise 2 (6 points) A filament lamp

A student investigates how the current flowing through a filament lamp changes with the voltage across it. She is given a filament lamp and connecting wires. She decides to use a power supply of adjustable voltage, an ammeter, a voltmeter and a switch.

1- Complete the circuit diagram, started in document 2, to show how she should set up the circuit.



(Doc 2)

2- The student obtains the following results.

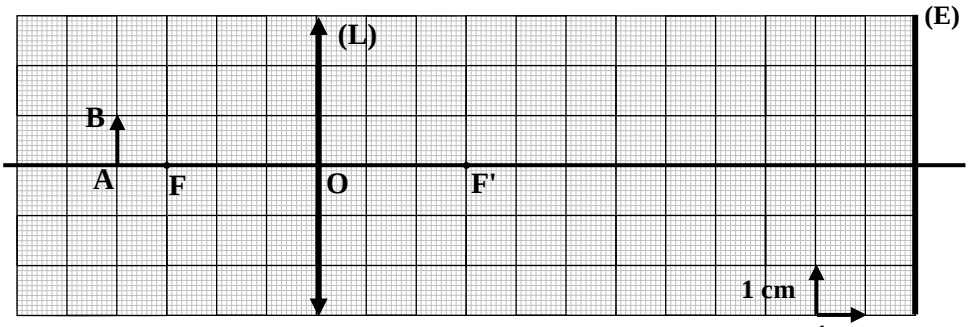
Current (A)	0	1	1.4	1.7	1.9	2.1
Voltage (V)	0	3	5	7	9	11

2.1- Plot a graph of voltage as a function of current using the scale:
Abscissa: 1 cm ↔ 0.5 A ; Ordinate: 1 cm ↔ 2 V

2.2- Does the lamp act as a resistor (ohmic conductor)?

Exercise 3 (6 points) Overhead projector

An overhead projector is a device that displays on a wall or a screen magnified images by shining a light through a sheet with the information or pictures on it.
A student of Grade 9 wishes to show his classmates the details of a small object (AB). He uses a converging lens (L) and a screen (E). He places the object (AB) in front of (L) as in document 3 so that its image (A'B') is formed on the screen (E).

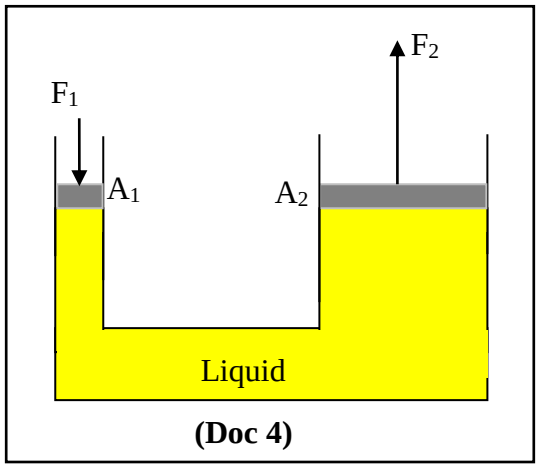


Doc.3

1- Redraw, in a real scale, document 3 on the graph paper.
2- Trace the path of a luminous ray issued from B and passing through the object focus F.
3- Specify on the redrawn figure, with justification, the position of the image B' of B.
4- Draw the image (A'B').
5- Identify the nature and the size of (A'B').
6- Has the student set up an optical instrument similar to the overhead projector? Explain.

Exercise 4 (4 points) Hydraulic jack

A hydraulic jack is used to lift cars. Document 4 shows the principle on which it works.



(Doc 4)

Suppose that a downward force of magnitude $F_1 = 1$ N acts on a piston of area $A_1 = 0.01\ m^2$. The area of the other piston is $A_2 = 0.5\ m^2$.

1- State Pascal's theorem.
2- Calculate the variation of pressure transmitted through the liquid.
3- Determine the magnitude F_2 of the force $\overrightarrow{F_2}$ acting on the other piston due to this variation.

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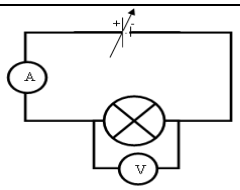
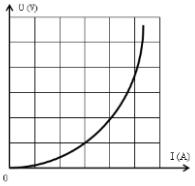
أسس التصحيح (تراعي تعليق الدروس والتوصيف المعدّل للعام الدراسي 2016-2017 وحتى صدور المناهج المطوّرة)

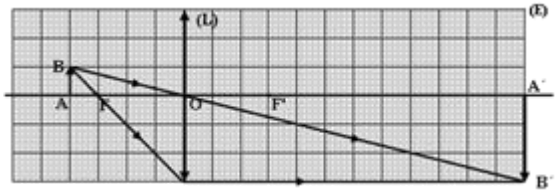
Exercise 1 (4 points)

Question	Answer	Mark
1.	(a) Alternating. The symbol of the voltage is ~	1
2.	(c) 1100 W. 1.1 kW = 1.1 × 1000 = 1100 W	1
3.	(a) 5 A. I = P/U = 1100/220 = 5 A	1
4.	(b) 6 A. It is slightly larger than 5 A.	1

Exercise 2 (6 points)

Question	Answer	Mark
1.		2½
2.1		2
2.2	No. The curve is not a straight line passing through the origin.	1½

Exercise 3 (6 points)

Question	Answer	Mark
1.	Redrawing	½
2.		1½
3.	Figure. The intersection between the emergent ray and the screen.	½ + ½
4.	Drawing of (A'B').	½
5.	Nature: Real. Size: 3 cm	1
6.	Yes. The image is real and its size is larger than that of the object.	½ + 1

Exercise 4 (4 points)

Question	Answer	Mark
1.	Liquids transmit wholly to all points and in all directions any pressure variations they undergo.	1
2.	$P = F_1 / A_1 = 1/0.01 = 100$ Pa	1½
3.	$F_2 = P \times A_2$, P is constant because liquid transmits pressure equally in all directions (Pascal's theorem) so $F_2 = 100 \times 0.5 = 50$ N.	1½