This is a Class 1 exam

Lebanon Evangelical School
for Boys and Girls
Loueizeh - Baabda

Mock Exams : Pt2

13, 14, 15 JUN2022

Do NOT write in this box. Your MARK will be placed here.

Subject :	Physics	
Class :	9B and 9C	
Teacher :	Mr. Ali Moukalled	
Duration :	1 hour	
Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

EXERCISE 1 (4points)

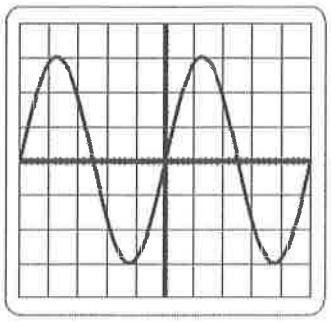
Study of a voltage

Document 1 represents the waveform of a voltage **u** delivered by a generator. In the absence of any voltage, the horizontal luminous line passes through the center of the screen of the oscilloscope.
Calibration of the oscilloscope:

- vertical sensitivity : $S_V = 5V/div$;
- horizontal sensitivity: $S_h = 2ms/div$.

Choose, with justification, the best answer.

1. The voltage **u** is:
   a. variable and positive **b.** constant **c.** alternating
2. The maximum voltage U_m of **u** is:
   a. 15V **b.**6V **c.** 6mV
3. The effective voltage U_{eff} of **u** is approximately :
   a. 10.6V **b.**4.2V **c.** 4.2mV
4. The period **T** of **u** is:
   a. 5ms **b.** 10ms **c.** 10s



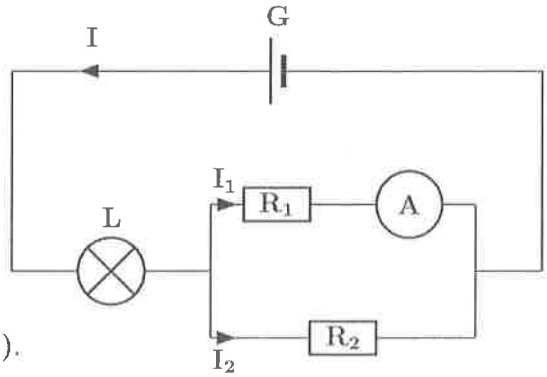
Doc.1

EXERCISE 2 (6points)

Normal Functioning of the Lamp

A lamp (L), carrying the inscriptions **(6W; 12V)**, is assumed as a resistor (ohmic conductor) of resistance **r**.

1. Show that the current carried by the lamp **(L)** while functioning normally is $I_0 = 0.5A$.
2. Calculate **r**.
3. The lamp **(L)** is placed in an electric circuit as shown in document 2. The resistors (R_1) and (R_2) have resistances $R_1 = 10V$ and $R_2 = 20V$ respectively. The ammeter **(A)**, of negligible resistance, displays **0.1A**.
   (a) Calculate the value of the voltage U_1 across (R_1).
   (b) Show that the current I_2 carried by (R_2) is **0.05A**.
   (c) Deduce the current **I** through the lamp **(L)**.
   (d) Does **(L)** function normally in this circuit ? Why ?



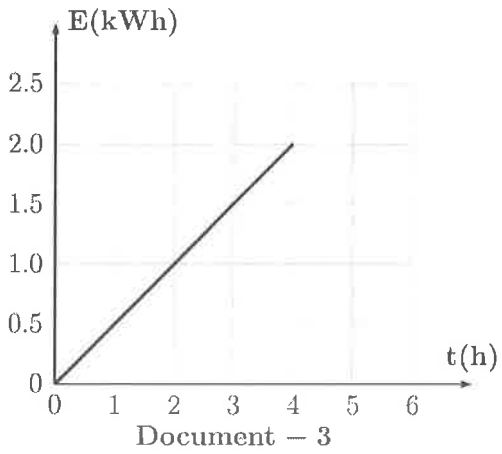
Doc. 2

EXERCISE 3 (5points)

Electric Heater

An electric heater (H) carries two inscriptions. The first one is **220V** and the other is expressed in watt but its numerical value is erased. (H) functions normally when it is connected to the wall outlet of a domestic installation.

Document 3 represents the variations of the electric energy E consumed by (H) as a function of time t.



Document – 3

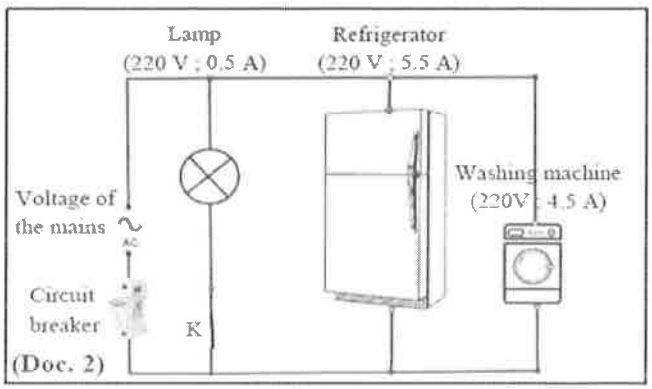
1. The electric energy consumed by this electric heater is given by the relation : $\mathbf{E = a \times t}$, where "a" is a physical quantity that characterizes (H).
   (a) Show that the shape of the curve of the document 6 is in agreement with the given relation.
   (b) By referring to the graph of document 6, give the value of E during 5 hours of functioning.
   (c) Deduce the value and the unit of "a".
   (d) What does "a" represent ?
   (e) Give then the numerical value of the erased inscription.
2. (H) is considered as a resistor (ohmic conductor) of resistance R. Determine R.

EXERCISE 4 (5points)

Electric Installation of a kitchen

The electric installation of a kitchen, represented in **(Doc.2)**, is fed by an alternating sinusoidal voltage, of effective value $\mathbf{U = 220V}$.
This installation contains the following electric devices:

- A lamp ;
- A refrigerator ;
- A washing machine.



(Doc. 2)

Turn the page

1. All the electric devices function normally. Justify.
2. All the devices are functioning normally at the same tine. Specify, among the circuit breakers marked **10A, 15A** and **30A**, the one that is the most convenient to protect this installation.
3. At the end of **24 hours**, the refrigerator, of power **990W**, consumes an electric energy of **9.9kWh**.
   Specify whether the compressor of this refrigerator is working permanently.

GOOD LUCK

Mocks Pt 2/2021 2022/Physics/9BC "Solution"

Exercise 1

$S_v = 5\,V/div$

$S_h = 2\,ms/div$

1) The voltage u is alternating since it varies between positive and negative values and the average voltage is 0. (c)

2) $U_m = Y_{max} \times S_v$

$= 3\,div \times 5\,V/div$

$= 15\,V$ (a)

3) $U_{eff} = \frac{U_{max}}{\sqrt{2}} = \frac{15}{\sqrt{2}} = 10.6066\,V$

$= 10.6066\,V$ (a)

4) $T = x \times V_b$

$= 5\,div \times 2\,ms/div$

$= 10\,ms$

$T = 10\,ms = 0.01\,s$ (b)

Exercise 2

(6W; 12V)

1) $P = U \times I_0$

$I_0 = \frac{P}{U} = \frac{6}{12}$

$I_0 = 0.5\,A$ verified

2) Due to Ohm's law

$U = r I_o$

$r = \frac{U}{I_o} = \frac{12}{0.5} = 24\,\Omega$ (1)

$r = 24\,\Omega$

3) $R_1 = 10\,\Omega$ $\quad I_1 = 0.1\,A$

$R_2 = 20\,\Omega$

a) Due to Ohm's law

$U_1 = R_1 \times I_1$

$= 10 \times 0.1$ (1)

$= 1\,V$

$U_1 = 1\,V$

b) $I_2 = 0.05\,A$??

$U_1 = U_2 = 1\,V$ (1)

$U_2 = R_2 \times I_2$

$I_2 = \frac{U_2}{R_2} = \frac{1}{20} = 0.05\,A$

$I_2 = 0.05\,A$ verified (1)

c) $I = ?$

$I = I_1 + I_2$ (law of addition of current in parallel connection)

$I = 0.1 + 0.05$

$I = 0.15\,A$

d) $N_o . I_o = 0.5\,A > I_L = 0.15\,A$ (1)

So the lamp will not function normally

(2)

Exercise 3

1) a) $E = q \times t$ is an equation of straight line which is in agreement with the Document represented. (1)

b) at $t = 5$ hours

$E = 2.5$ kwh (graphically) (0.5)

c) $E = q \times t$

$q = \frac{E}{t}$ s.i. $= \frac{2.5\ kwh}{5\ h} = 0.5\ KW = 500\ W$ (1)

$\frac{kwh}{h}$

So q is expressed in KW

d) q represents the rated power of the Heater (0.5)

e) $P = q = 0.5\ KW = 500W$ (1)

2) $P = \frac{U^2}{R} \Rightarrow R = \frac{U^2}{P} = \frac{220^2}{500} = 96.8\ \Omega$ (1)

Exercise 4

$U_{eff} = 220V$

1) $U_{rated\ Lamp} = U_{rated\ Refrig} = U_{rated\ washing\ machine} = U_{eff} = 220V$ (1)

2) The main current is written as

$I = I_1 + I_2 + I_3$ (2)

$= 0.5 + 5.5 + 4.5 = 10.5A$

The most convenient circuit breaker should be marked 15A, because the current 15A is larger than the maximum current carried by the circuit when all devices function normally and it's the nearest value to it.

3) $P = 990W$

$t = 24$ hours

$E = P \times t = 23.76$ Kwh (1)

$E = 23.76$ Kwh if the compressor is working permanetly in the 24 hours (1)

$E = 23.76$ Kwh $\neq$ $E = 9.9$ Kwh