This is a Class 1 exam

Lebanon Evangelical School
for Boys and Girls
Loueizeh - Baabda

Stage Exam 05

12MAY2023

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 (4 points)

A resistor (D_1), of resistance R_1, is subjected to a constant voltage of adjustable value U. Choose the correct answer. Justify.

1. The voltage U across the terminals of (D_1) and the current I through it are:
   a. inversely proportional **b. proportional** **c.equal**
2. (D_1) receives during a certain time t an electric energy of **3000J**. The thermal energy furnished by (D_1) during t is:
   a. practically equal to 3000J **b. greater than 3000J** **c. less than 3000J**
3. By decreasing the voltage U, the resistance R_1:
   a. increases **b. remains the same** **c. decreases**
4. (D_1) is connected in series with another resistor (D_2) of resistance R_2 greater than R_1. The resistance R of the resistor equivalent to (D_1) and (D_2) is:
   a. smaller than R_1 **b. greater than R_2** **c. between R_1 and R_2**

EXERCISE 2 (6 points)

An iron ball (A), of mass $m = 200g$, is connected to the free end of a string. $g = 10N/kg$.



Fig.1

I- The ball (A) is in equilibrium (Fig.1).

1. Give the names of the two forces acting on (A). Then, classify them, if they are contact forces or forces acting from a distance.
2. Calculate the weight of the ball.
3. Represent the forces according to the scale: **1cm ⟶ 1N**

II- A magnet (SN) approached to (A) attracts it by a force $\vec{F}$ (Fig.2).

1. What is the new force acting on the ball.
2. Give the characteristics of this force.
3. Classify this force to a contact force or to a force acting from a distance.

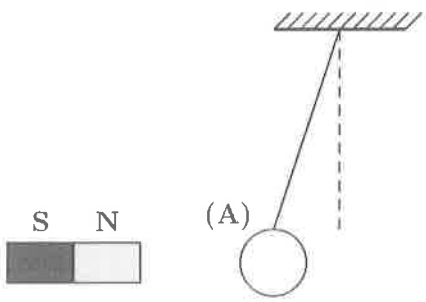


Fig.2

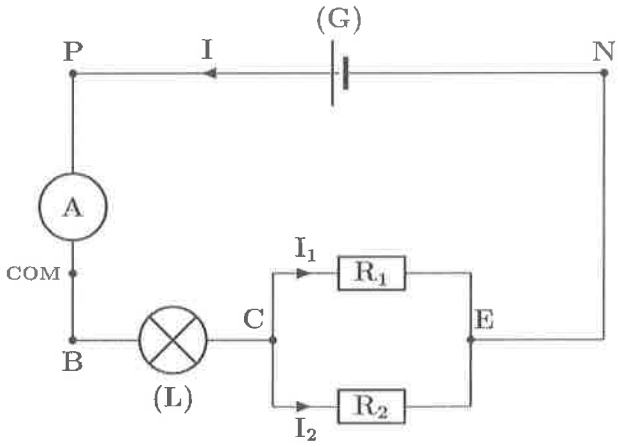
Turn the page

EXERCISE 3 (6 points)

The circuit of the below figure consists of:

- a generator (G) delivering across its terminals a constant voltage $\mathbf{U_{PN} = 12V}$.
- two resistors $\mathbf{R_1}$ and $\mathbf{R_2}$ of respective resistances $\mathbf{R_1 = 40\Omega}$ and $\mathbf{R_2 = 60\Omega}$.
- a lamp (L) that bears the inscription 3V.
- an ammeter (A) of negligible resistance.

1. $\mathbf{U_{PB} = 0V}$. Why ?
2. The lamp (L) glows normally.
   (a) Determine the value of the voltage $\mathbf{U_{CE}}$.
   (b) Calculate $\mathbf{I_1}$ and $\mathbf{I_2}$, the electric current flowing through $(\mathbf{R_1})$ and $(\mathbf{R_2})$ respectively.
   (c) Deduce the reading of the ammeter.
3. The lamp (L) is short-circuited.
   (a) Give the value of the voltage $\mathbf{U_{BC}}$ across the terminals of (L).
   (b) Deduce the new value of the voltage $\mathbf{U_{CE}}$.
   (c) Calculate the equivalent resistance $\mathbf{R_{eq}}$ of $(\mathbf{R_1})$ and $(\mathbf{R_2})$.
   (d) Deduce the new reading of the ammeter.



EXERCISE 4 (4 points)

A baker buys an electric stove acting as a resistor. On its rating plate, he reads the following indications: 220V–2200W.

1. Give the meaning of each indication written on the plate.
2. A resistor converts electrical energy into another form of energy. What is the form of this energy ?
3. The electric power consumed by the resistor is equal to the product of the voltage U across its terminals, by the current I traversing it: $\mathbf{P = U \times I}$.
   Calculate the current I traversing this stove in normal functioning.
4. The stove is used at the rate of two hours per day.
   (a) Determine, in kWh, the electric energy $\mathbf{E_1}$ consumed by this stove in two hours.
   (b) Show that the electric energy $\mathbf{E_2}$ consumed by this stove during one month (30 days) is 132 kWh.
   (c) Calculate the monthly cost to be paid by the baker, knowing that the average price of one kWh is 100L.L

GOOD LUCK

SE05/2022 2023/ Physics /9BC SOLUTION

Exercise 1

1) $U = R \times I$ (ohm's law)
U and I are directly proportional (b) (1)

2) The resistor is an electric component that converts electric energy into Heat energy (a) (1)

3) $U = R \times I \Rightarrow R = \frac{U}{I}$ = constant

(b) (1)

4) $R_{eq} = R_1 + R_2 > R_2$

(b) (1)

Exercise 2

$m = 200\,g = 0.2\,kg$ $\quad g = 10\,N/kg$

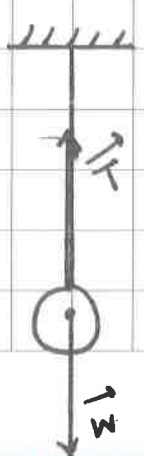
I- 1) The forces acting on the ball: (1)

- $\vec{W}$ (weight) → force acting from a distance
- $\vec{T}$ (tension) → contact force.

2) $W = m \times g$
$= 0.2 \times 10$
$= 2\,N$ (1)

$\boxed{W = 2\,N}$

3) 1cm → 1N ? = 2cm (1)
? → 2N



(1)

II - 1) $\vec{F_M}$ (magnetic force) (1)

2) Characteristics of $\vec{F_M}$

- point of application: center of gravity
- line of action: Horizontal
- Direction: Horizontal to the left (1)
- magnitude: expressed in Newton

3) Fora acting from a distance (1)

Exercise 3

$U_{PN} = 12V$ $R_1 = 40\Omega$ $R_2 = 60\Omega$ L(3V)

1. $U_{PB} = 0V$ (the ammeter has negligible resistance) (0.5)
2. The lamp (L) glows normally

a) $U_{PN} = U_{PB} + U_{BC} + U_{CE} + U_{EN}$ (law of addition of voltages in series connection)

$12 = 0 + 3 + U_{CE} + 0$

$U_{CE} = 12 - 3$ (1)

$\boxed{U_{CE} = 9V}$

b) $U_{CE} = U_1 = U_2 = 9V$ (law of uniqueness of voltages in parallel connection)

Due to ohm's law

$U_1 = R_1 \times I_1$ (0.5)

$I_1 = \frac{U_1}{R_1} = \frac{9}{40} = 0.225A$

$\boxed{I_1 = 0.225A}$

$I_2 = \frac{U_2}{R_2} = \frac{9}{60} = 0.15A$ (0.5)

$\boxed{I_2 = 0.15A}$

c) $I = I_1 + I_2$

$= 0.225 + 0.15$

$= 0.375\ A$

(1)

$\boxed{I = 0.375\ A}$

3) a) $U_{BC} = 0V$ (the lamp is short-circuited) (0.5)

b) $U_{CE} = ?$

$U_{PN} = U_{PB} + U_{BC} + U_{CE} + U_{EN}$

$12 = 0 + 0 + U_{CE} + 0$

$U_{CE} = 12V$

$\boxed{U_{CE} = 12V}$ (1)

c) $R_{eq} = \frac{R_1 \times R_2}{R_1 + R_2} = \frac{40 \times 60}{40 + 60}$

$\boxed{R_{eq} = 24\ \Omega}$ (1)

d) $I = \frac{U_{CE}}{R_{eq}} = \frac{12}{24}$

$\boxed{I = 0.5\ A}$ (1)

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...lighting the fires that burn for eternity...
Loueizeh - Baabda

Exercise 4

220V - 2200W

1) 220V: rated voltage (0.5)
   2200 W: rated power

2) Heat energy (0.5)

3) $P = U \times I$

$$I = \frac{P}{U} = \frac{2200}{220}$$

$\boxed{I = 10A}$ (1)

4) 2 hours per day

a) $E_1 = P \times t$

$= 2.2\ KW \times 2h$

$= 4.4\ Kwh$ (1)

$\boxed{E_1 = 4.4\ Kwh}$

b) $E_2 = E_1 \times 30$

$E_2 = 132\ Kwh$ (0.5)

c) $1\ Kwh \longrightarrow 100\ L.L$

$132\ Kwh \longrightarrow x$

$\boxed{x = 13200\ L.L}$ (0.5)