Mila University Center

Option: *Electromechanics*

Institute of Science and Technology

Nom et Prénoms			***Groupe***	***Note***
Nom et Prénoms				
Date:		***Horaire:***	***Lab. N°***	

Practical work: 2 Diode characteristics and rectification

I. Objectives

1. Study of diode characteristics.
2. Study of single-phase rectification.

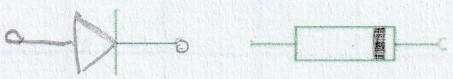
II. Equipment used: The following equipment is used for this *practical work:*

- A stabilized power supply.
- Two digital multimeters.
  Connection cables and probes.
- Two resistors of **1kΩ** and **100Ω.**
- One oscilloscope.
- Rectifier diodes.
- Two capacitors, 100µF and 1000µF.

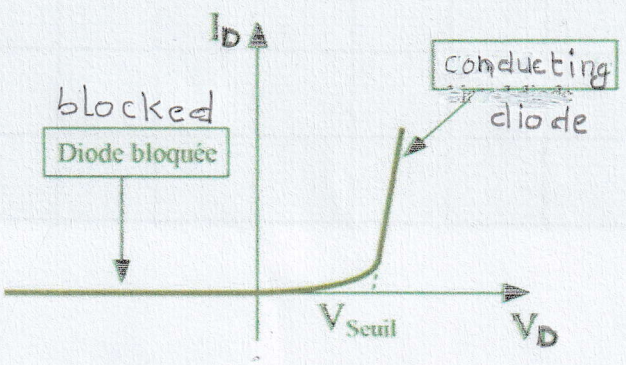
III. Theoretical supplement:

III.1) Definition:

A diode is a non-linear, polarized (or non-symmetrical) dipole. A diode consists of a PN junction, in which current flows from the p-type material (anode) to the n-type material (cathode). The diode is the basic **semiconductor component**. Its operation is similar to that of a switch (which only allows current to flow in one direction) controlled by a voltage.



The typical characteristic of a diode is shown in the following diagram:



$r_d = \frac{\Delta V}{\Delta I}$ (rd: dynamic resistance)

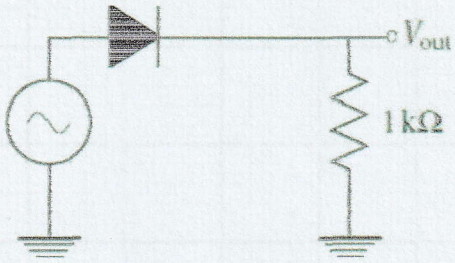
III.2) *Applications:*

One of the main applications of diodes is to convert an alternating signal, in which the direction of electron flow reverses every half-cycle, into a signal in which electrons flow in one direction only.

We have:

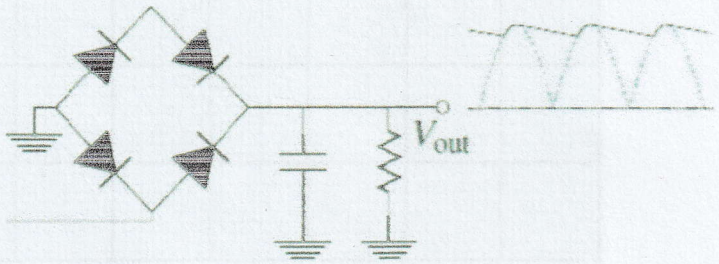
$V_0(V_{moy}) = \frac{1}{T}\int_0^T K\{t)dt$, $V2_{ff} = {}^{1}J_{T0}U(t)dt$, $f = \frac{1}{T}$, $\omega = 2\pi f$, $\theta = \omega t$

III.2.1) *Simple rectification irlternanee.*



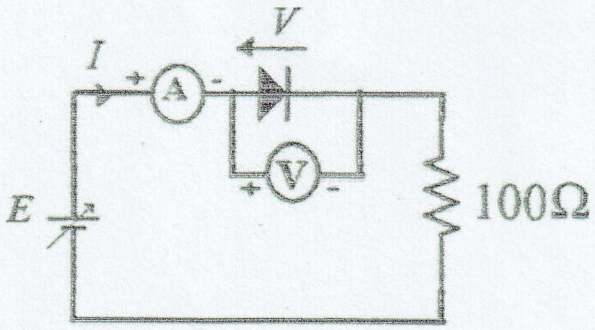
$V_0 = \frac{1}{2\pi}\int_0^{2\pi} SIR\ (\theta)d\theta$; $\theta = \omega t$

III.2.2) *Full-wave rectification and filtering:*



-Le taux dRipple.- $\frac{\delta Y}{V_m} = \frac{1}{2RCf}$, $V_0 = r_m - \frac{\Delta v}{2}$, $(V_m = V_{max})$

IV) *Experimental study*



1. Diode characteristics:

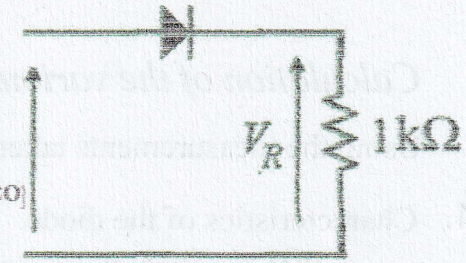
- Assemble the following diagram:

Complete the following table:

V(volts)	0	0.55	0.60	0.65	0.67	0.69	0.71	0.73	0.75	0.77
I(mA)										

2. . Single-phase rectification

→ assembly of the following figure:



- Supply voltage: $V_e(t) = V_{e\_m} \sin(314t)$,

→ Observe the AC supply voltage $V_e(t)$ on the oscilloscope then the voltage $V_R(t)$.
Record the following values.

- La valeur maximale de $V_e(t)$: $V_{e\_m} =$
- The period of $V_e(t)$: $T_e =$
- The maximum value of $VR(t)$: $V_m =$
- The period of $V_R(t)$: $T =$

→ Reproduce the observed curves qualitatively (V_e and V_p on graph paper.

→ Using the digital multimeter, measure

- The average value of $V_e(t)$ (DC mode) $V_{e.moy} =$

= The effective value of $V_e(t)$ (AC mode) $V_{e\_eff} =$

The average value $V_R(t)$ (DC mode) $V_a =$

V. *Calculation of the various parameters of the setup in the previous steps.*

Using the measurements taken and the values recorded

"1. Characteristics of the diode.

- Plot the characteristics of the diode on graph paper: $I = f(V)$.
- From this characteristic, deduce :

. the threshold voltage of the diode and $V_d =$

the dynamic resistance $r_d =$

2.. single-phase rectification

→ Calculate :

- The effective value, average value, and frequency of $V_e(t)$.

$V_{eff} =$ $V_{e\text{-}moy} =$ $f_e =$

- Calculate the effective value, average value, and frequency of Uq iÿ.

$V_{eff} =$ $V_0 =$ $f =$

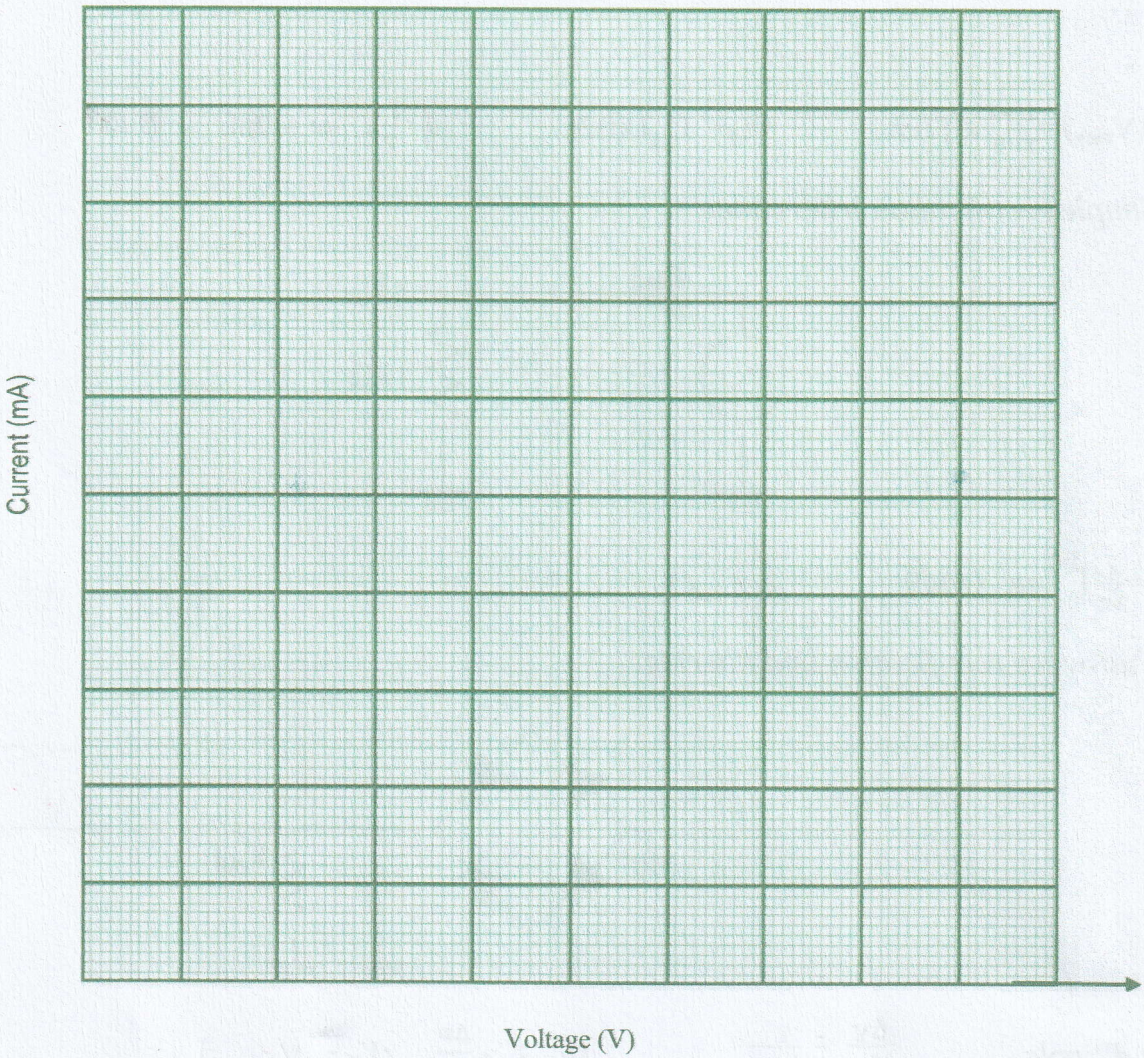
- Compare these calculated values with those measured with the multimeter and with the given frequency (of $V_e(t)$).

- Compare the calculated values of U with those measuredwiththemultimeter.

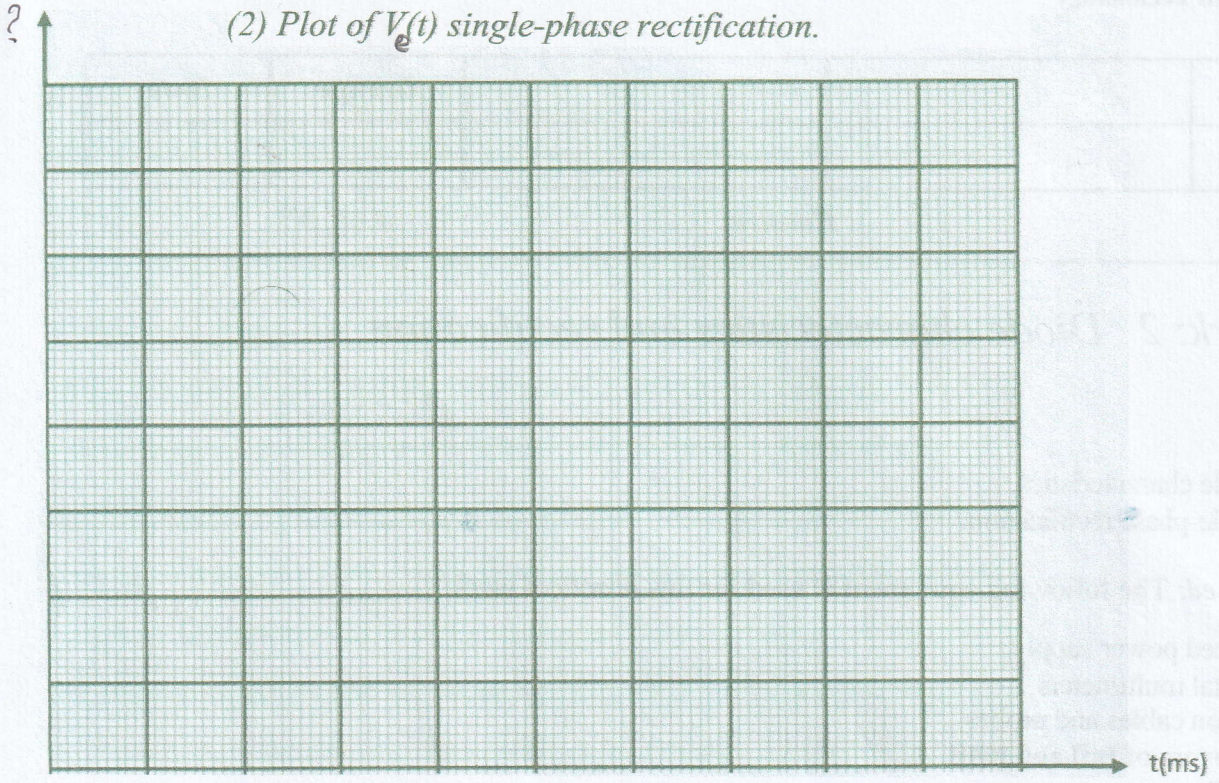
VI. *Conclusion*

Drawan appropriate conclusion regarding thisTP.

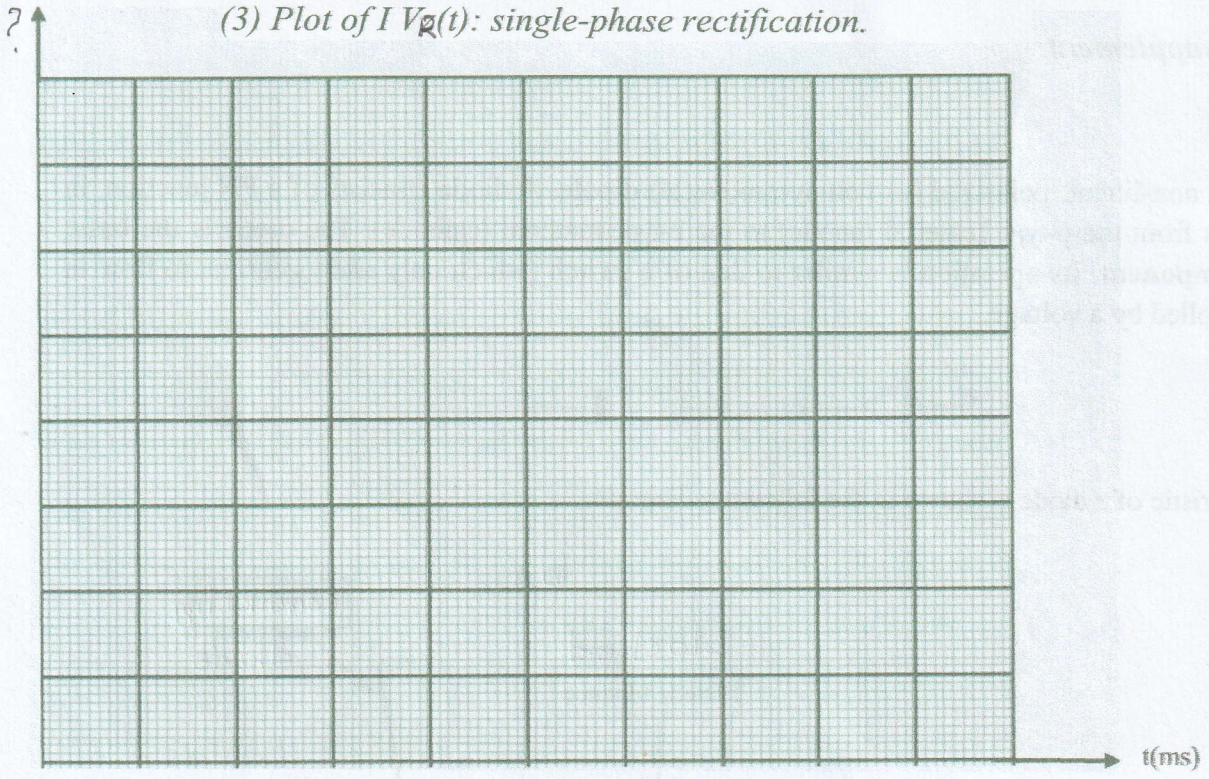
(1) : Plot of the characteristic of iodine: I=f(V).



(2) Plot of $V_c(t)$ single-phase rectification.



(3) Plot of I $V_R(t)$: single-phase rectification.



VI) Comparison between theoretical and practical results

VII) Conclusion: draw an appropriate conclusion regarding this practical assignment.