Gr:	***First name :***	
	Last name:	
	N°	

TPN°4-
Charging and Discharging of a Capacitor

<u>Manipulation 1:</u> Charging a Capacitor

Assemble the circuit shown in Figure 1 with a resistor **R=100KΩ** and a capacitor with capacitance **C=68µF**. Start timer simultaneously when placing the switch in position **1**, powering the circuit with a continuous voltage source **E=5V**.

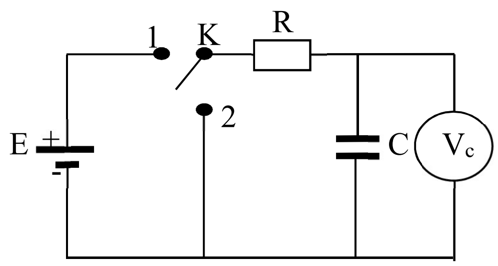
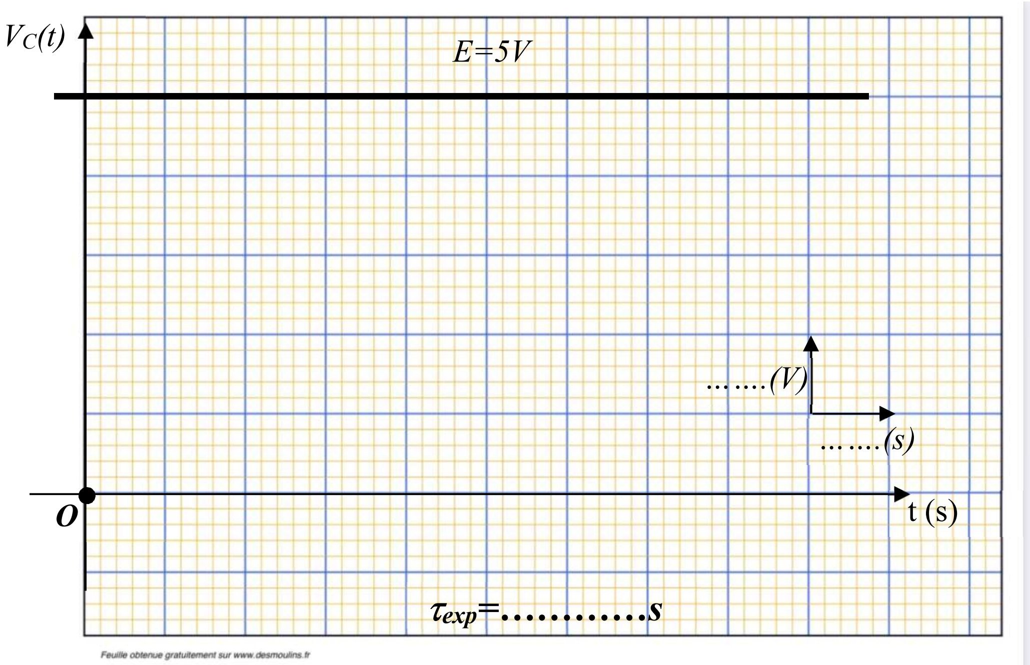


Figure.1

complete the following table:

t (s)	*05*	*10*	*15*	*20*	*25*	*30*	*35*	*40*	*45*	*50*	*55*	*60*
V_C(volt)												

- Plot the voltage $V_C=f(t)$.
- Draw the tangent at the load point ***O*** and graphically determine the time constant τ_{exp} (*the abscissa of the point of intersection of the tangent with the load limit voltage*).



- Compare this value with that calculated theoretically $\tau_{thé}=RC$.

τ_{exp}=…………………., $\tau_{thé}$=……………………………………………………………………………………

………

....

....

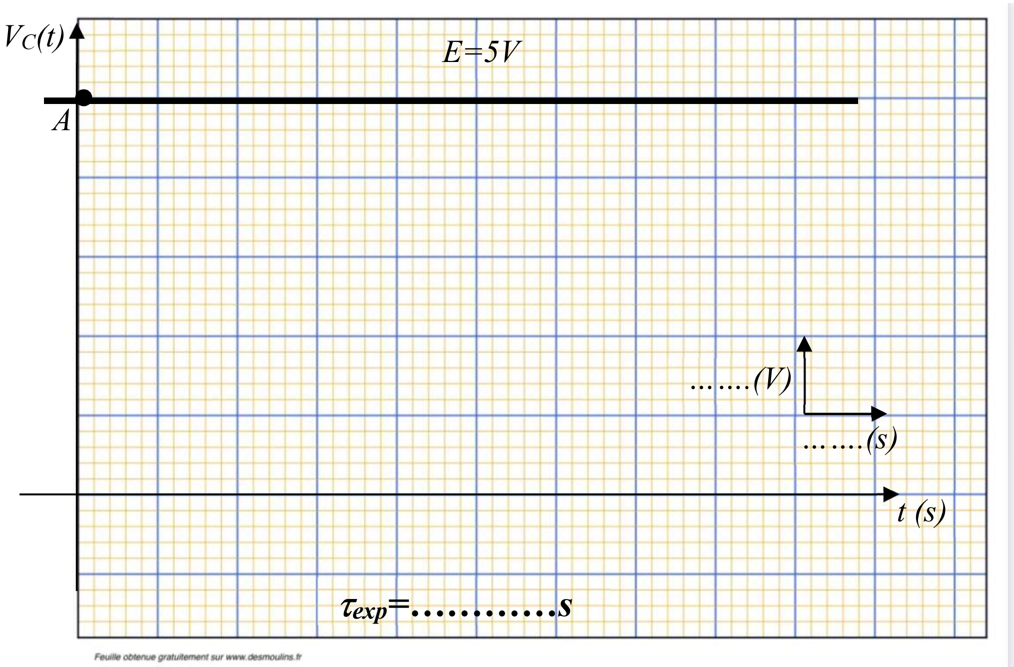
<u>Manipulation 2:</u> Discharge of a capacitor

Assemble the circuit shown in Figure 1 using a resistor **R = 100KΩ** and a capacitor with a capacitance **C = 68µF**. Place the switch in position 2.

Complete the following table :

t (s)	*0*	*5*	*10*	*15*	*20*	*25*	*30*	*35*	*40*	*45*	*50*	*55*	*60*
V_C*(volt)*													

- Plot the voltage $V_C=f(t)$.
- Tracer la tangente au point de décharge ***A*** et déterminer graphiquement la constante du temps τ_{exp} *(l'abscisse du point d'intersection de la tangente avec la tension limite de décharge).*



- Compare this value with that calculated theoretically $\tau_{thé}=RC$.

$\tau_{exp}=$ ………………, $\tau_{thé}=$ ....

....

....

....

<u>Manipulation 3:</u> Association of capacitors in parallel

Set up the circuit as shown in Figure. **2** for a resistor **R=100KΩ** and two capacitors connected in parallel with capacitances **C_1=68µF** and **C_2=47µF**. Start the timer simultaneously with the application of a continuous voltage source E=5V to the circuit. Both capacitors will charge over time.

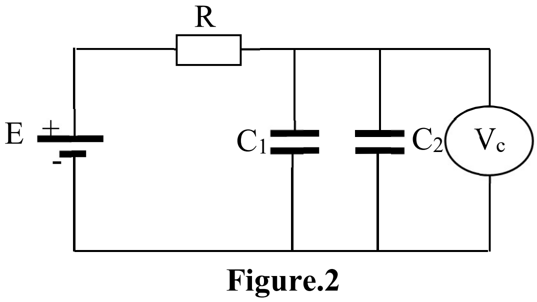
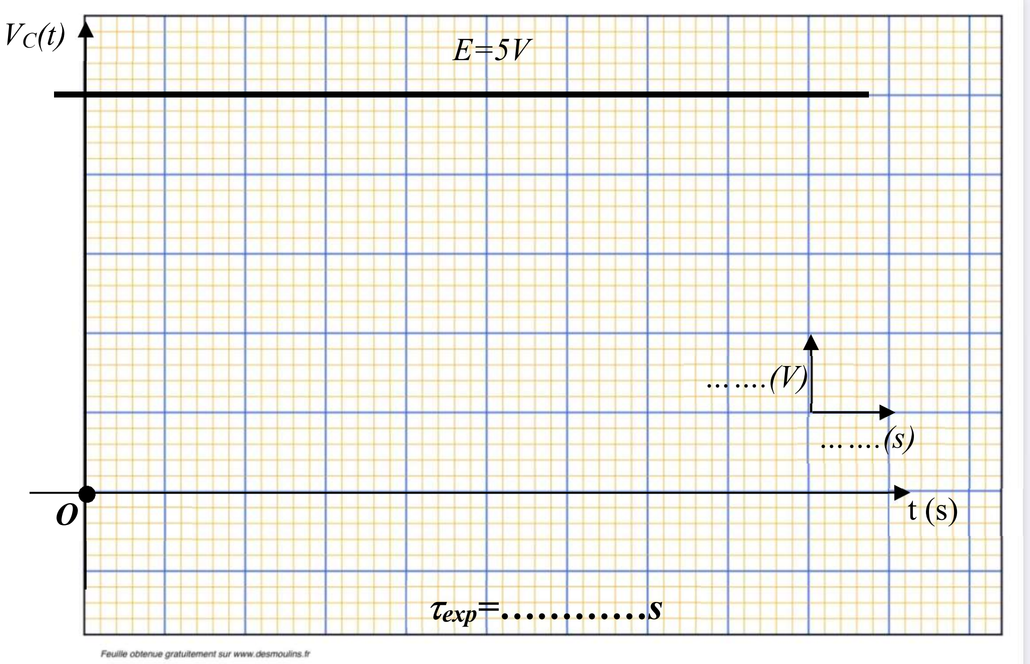


Figure.2

complete the following table:

t (s)	*05*	*10*	*15*	*20*	*25*	*30*	*35*	*40*	*90*	*100*	*110*	**120**
V_C*(volt)*												

- Plot the voltage $V_C=f(t)$.
- Draw the tangent at the charging point **O** and determine graphically the time constant τ_{exp} (*the abscissa of the intersection point of the tangent with the charging limit voltage*).



- Based on the experimental value of the time constant τ_{exp} , deduce the value of C_{eq}.

....

....

- Compare this value with the theoretically calculated value $C_{eq}=C_1+C_2$.

....

....

....

Manipulation 4: Association of capacitors in series

Assemble the circuit shown in Figure **3** using a resistor **R=100KΩ** and two capacitors connected in series with capacities **C_1=68µF** and **C_2=47µF**. Start the timer simultaneously when powering the circuit with a constant voltage source **E=5V**. The two capacitors charge over time.

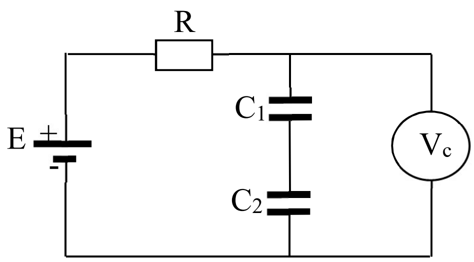
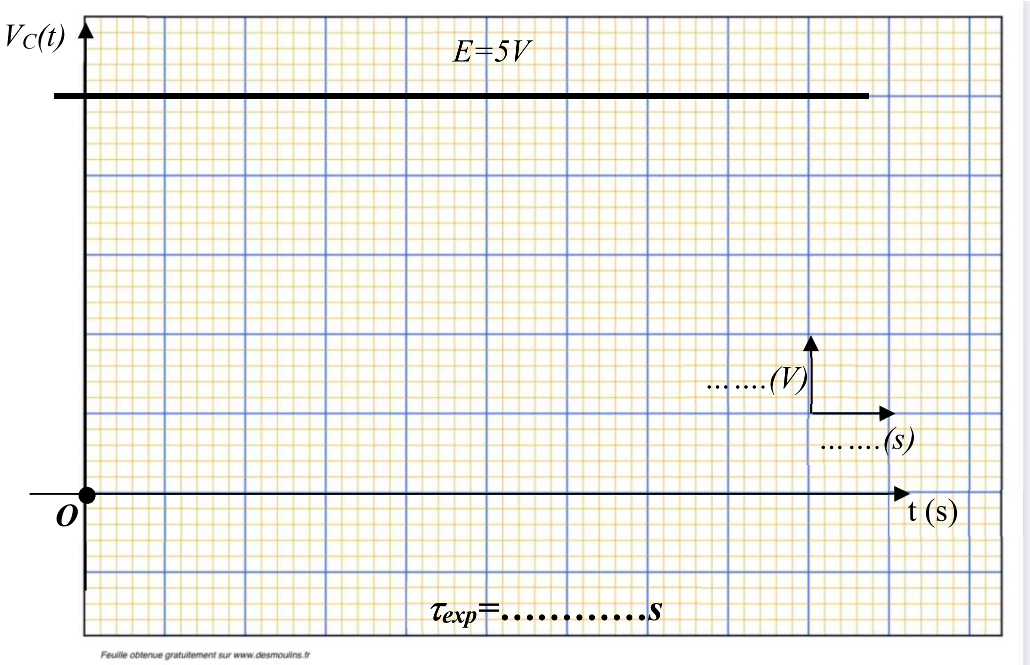


Figure.3

complete the following table:

t (s)	*05*	*10*	*15*	*20*	*25*	*30*	*35*	*40*	*45*	*50*	*55*	*60*
V_C(volt)												

- Plot the voltage $V_C=f(t)$.
- Draw the tangent at the charging point **O** and determine graphically the time constant τ_{exp} (*the abscissa of the point where the tangent intersects with the charging voltage limit*).



- Based on the experimental value of the time constant τ_{exp}, deduce the value of C_{eq}.

……

……

- Compare this value with that calculated theoretically $C_{eq} = \frac{C_1 C_2}{C_1 + C_2}$.

……

……

Conclusion :

……

……

……

……

……

……

……

……