Faculty of sciences and technology (University of Khenchela) 1 ST
Physics 2 (Electricity) 2023/2024

Final Exam (1h, 30')

Exercise N° 01: (7pts)

Three point charges: $q_A = +4\mu C$, $q_B = -10\mu C$ and $q_D = -6\mu C$ are placed respectively on three points on (*Oy*) axis; *A(-a); B(2a)* and *D (a)*, with *a = 10 cm.*

1- Calculate and represent the electric field vector at the origin O.
2- Calculate the electric potential in the origin.

Now; a fourth charge $q_O = -2nC$ is placed at the origin O.

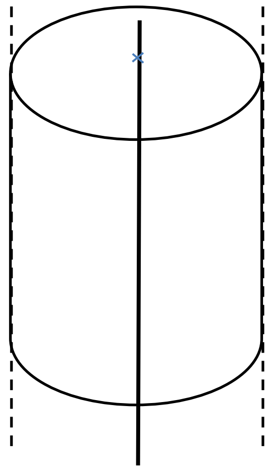
3- Deduce the force vector acting on the charge q_O.
4- Find the potential energy of the charge q_O.

We give: $K = \frac{1}{4\pi\varepsilon_0} = 9.10^9 Nm^2/C^2$

Exercise N° 02: (7pts)

Consider a charge Q_1 distributed on a rectilinear line of infinite length ***L*** with a uniform charge density $\boldsymbol{\lambda > 0}$.

Another charge Q_2 (where: $Q_1 = -2Q_2$) distributed on the surface of a cylinder coaxial on the charged rectilinear line, we consider that, the cylinder has the same length ***L*** and a radius ***R*** (with ***R<< L***) and it charged with a uniform charge density $\boldsymbol{\sigma}$.



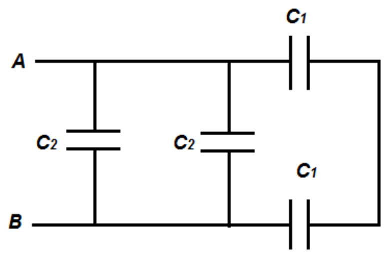
1- Give the relationship between $\boldsymbol{\sigma}$ and $\boldsymbol{\lambda}$.
2- Using Gauss's law; calculate the electric field as a function of ($\boldsymbol{\lambda}$, ***r***, ***R*** *and* $\boldsymbol{\varepsilon_0}$) at any point "***r***" in space.
3- Knowing that $\boldsymbol{V(R) = V_0}$, calculate the potential in the two regions: $\boldsymbol{r < R}$ and $\boldsymbol{r > R}$.

Exercise N° 03: (6pts)

I) Calculate the equivalent capacity between A and B.

Numerical application:

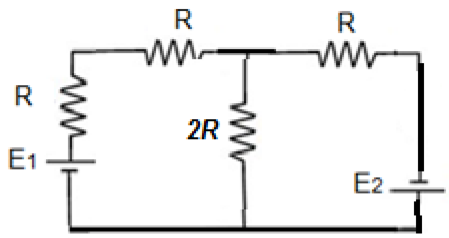
C_1 =2nF and C_2 = 3nF



II) Consider the opposite circuit.

Using Kirchhoff's laws; Calculate and represent (in the figure) the currents flowing through each branch.

Numerical application: R= 5Ω, E_1= 20V and E_2= 10V.



Good luck