BADJI MOKHTAR UNIVERSITY -ANNABA
FACULTY OF TECHNOLOGY
SCIENCES AND TECHNOLOGY DEPARTMENT (ST)
1st year LMD 2024/2025

Physics 2: Series 1: Coulomb's law, electrostatic field and potential

Exercise 1

1- Calculate the ratio between the electrostatic force and the gravitational attraction force for the:

a) electron/proton system.

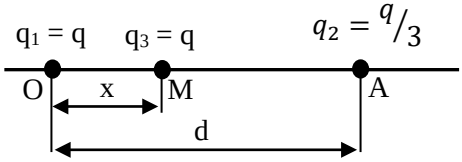
b) electron/electron system

2- What can be concluded?

Data: $m_e = 9{,}1091.10^{-31}$ Kg, $m_P = 1{,}6725.10^{-27}$ Kg, $e^- = -1{,}6.10^{-19}$ C, $e^+ = +1{,}6.10^{-19}$ C and $G = 6{,}67.10^{-11}$ N.m^2/kg^2, $K = 9.10^9$ Nm^{2}C^{-2}.

Exercise 2

We consider a system of point charges, represented by the Figure opposite. The positive charges q_1 and q_2 are fixed respectively at points O and A separated by d = 4 cm.



Consider a charge $q_3 > 0$, subject to moving along the segment OA.

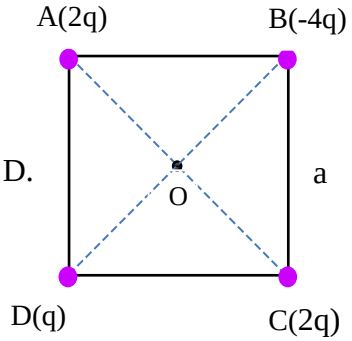
1) Calculate the force F exerted by q_1 and q_2 on q_3 as a function of x.

2) Calculate the abscissa x_0 for which the charge q_3 is in equilibrium position.

We give: $q_1 = q_3 = q$; and $q_2 = q/3$

Exercise 3

Four point charges 2q, -4q, 2q and q are placed respectively at the vertices of a square ABCD of side a.



1) Draw the electric force vectors at each vertice of the square A, B, C and D.

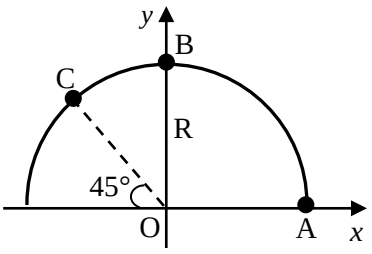
2) Calculate the modulus of the field *E* at the point O intersection of the diagonals.

3) Calculate the electric potential created by the four charges at point O.

We give: q=1 µC and a=1cm

Exercise 4

We consider three point charges q_A, q_B and q_C placed at points A, B and C, respectively, on the circumference of a circle with center O and radius R, where: $q_A = -q$, $q_B = +2q$ *and* $q_C = -2q$.



1) Calculate the field *E* and the potential *V* created by the charges in O.

2) We place at point O a charge $q_0 = +2q$. Deduce the force exercised on this charge.

3) Calculate the potential energy of q_0 at point O.

Numerical application: q=0.5. µC and R=1 cm