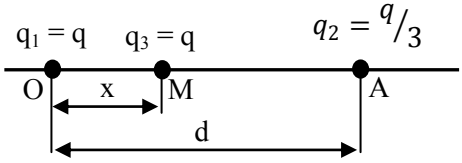
BADJI MOKHTAR UNIVERSITY -ANNABA
FACULTY OF TECHNOLOGY
SCIENCES AND TECHNOLOGY DEPARTMENT (ST)
1st year LMD 2023/2024

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

Exercise 1



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.

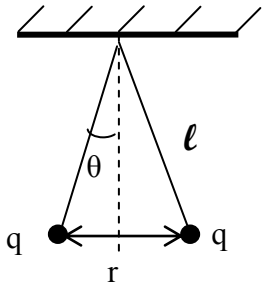
Consider a charge $q_3 > 0$, subject to moving along the segment OA.

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 2

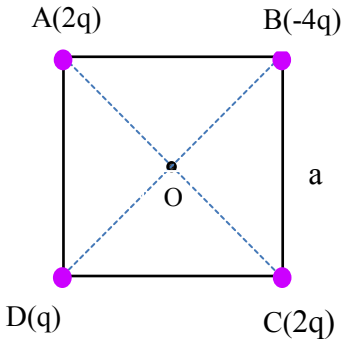


Two identical balls of mass m and positive charge q are suspended from the same point using a wire of length ℓ and form two simple pendulums. After the repulsion each ball deviates from an angle θ.

-Find the distance r which separates them.

Data: tg θ ≈ sinθ, m = 10 g, ℓ = 120 cm, q = 2,4.10^{-8} C, K = 9.10^{9} Nm^2C^{-2}, g = 10 m/s^2

Exercise 3



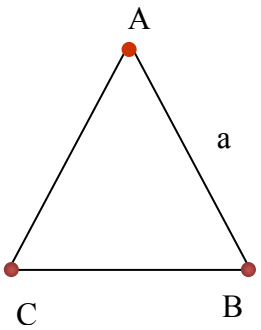
Four point charges 2q, -4q, 2q and q are placed respectively at the vertices of a square ABCD of side a.

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

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

We give: q=1 µC and a=1cm

Exercise 4



Consider an equilateral triangle ABC with sides *a* and two charges (-2q) and (+q) in B and C.

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

2) We place a third charge (-3q) at point A.

Deduce the force exercised on this charge.

3) Calculate the potential energy of (-3q) at point A.

Numerical application: q=0.5.10^{-3} C and a=5 mm