PHYSICS 12 ELECTROSTATICS WORKSHEET 1

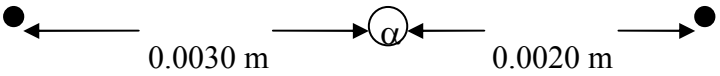
1. How much force is exerted between two charged objects that are separated by a distance of 1.5 m if both objects have a charge of +3.0 C?

2. Deuterium atoms contain one proton and one neutron in the nucleus with one electron orbiting at a distance of 5.10×10^{-11} m.
   a) Calculate the magnitude of the gravitational force of attraction between the nucleus and the electron.
   b) Calculate the magnitude of the electrical force of attraction between the nucleus and the electron.

3. A metal sphere has a net charge of -4 C. How many excess electrons does the metal sphere contain?

4. What is the total charge of 1 gram of electrons?

5. An *alpha* particle (2 protons, 2 neutrons) is placed between two stationary, charged objects as shown. It is 0.0030 m to the right of the object carrying a $+1.0 \times 10^{-12}$ C charge and 0.0020 m to the left of the object carrying a -2.0×10^{-12} C charge, as shown below.



$+1.0 \times 10^{-12}$ C $\qquad$ -2.0×10^{-12} C

   a) What is the net magnitude and direction of the electrical force acting on the α particle?
   b) At what rate and in what direction will the α particle accelerate?

6. The force of attraction between two equal but opposite 3.0μC charges is 4.0×10^{-3} N. What distance separates the charges?

7. In each of the following diagrams, solve for the new force F_{AB}:

a) 1.0 cm: +q ● ⟷ ● -q
$F_{AB} = 3.0 \times 10^{-6}$ N

1.5 cm: +q ● ⟷ ● -q
F_{AB} = ?

b) 1.0 cm: +q ● ⟷ ● -q
$F_{AB} = 8.0 \times 10^{-4}$ N

1.0 cm: +q/2 ● ⟷ ● -3q/2
F_{AB} = ?

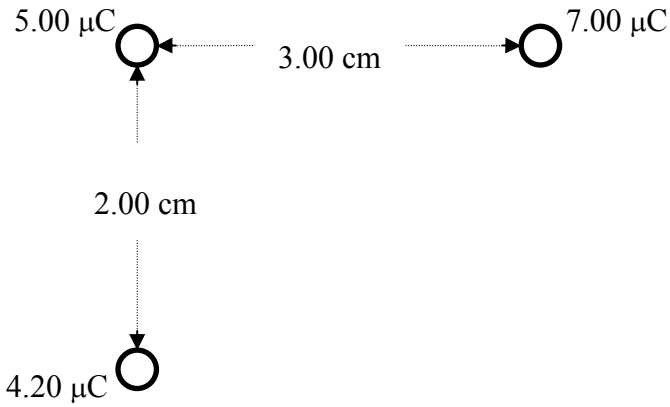
c) 1.73 m: +q ● ⟷ ● +2q
$F_{AB} = 1.0 \times 10^{-6}$ N

0.5 m: +q/4 ● ⟷ ● +6q
F_{AB} = ?

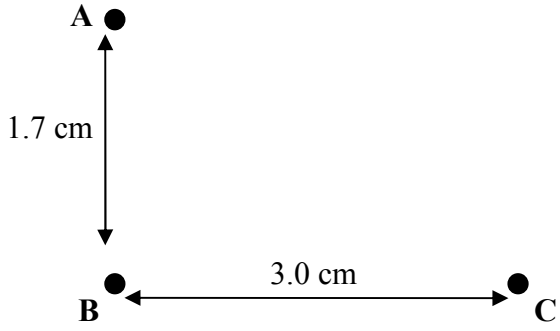
d) 3.0 cm: +q ● ⟷ ● +q
$F_{AB} = 2.4 \times 10^{-3}$ N

2.3 cm: +q ● ⟷ ● +q/2
F_{AB} = ?

8. Three charged particles are positioned as shown to the right.

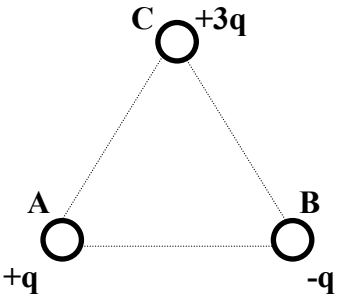


Determine the magnitude of the net force acting on:
a) the 5.00 μC charge;
b) the 7.00 μC charge.

9. 

If all charges **A**, **B** and **C** are identical, and if the force acting on charges **B-C** is $\mathbf{F_{BC} = 1.2 \times 10^{-3}\ N}$, then determine the net force on charge **B**, including direction.

10. Examine the position of the charges to the right. If the triangle shown is equilateral, and the force acting on charges **A-B** is $\mathbf{F_{AB} = 3.0 \times 10^{-3}\ N}$, then determine the magnitude and direction of :
a) the net force on **C**;
b) the net force on **B**.



1. 3.6×10^{10} N 2. a) 7.8×10^{-47} N b) 8.8×10^{-8} N 3. 2.5×10^{19} 4. -1.76×10^{8} C 5. a) 1.76×10^{-15} N right b) 2.63×10^{11} m/s^2 right 6. 4.5 m 7. a) 1.3×10^{-6} N b) 6.0×10^{-4} N c) 9.0×10^{-6} N d) 2.0×10^{-3} N
8. a) 588 N b) 532 N 9. 3.8×10^{-3} N @ 72° down to left 10. a) 9.0×10^{-3} N horizontal to right
b) 1.1×10^{-2} N @ 46° up to left