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Assignment #4: Coulomb's Law

1. A proton is 0.01 m from an electron. What is the force that is felt by the proton due to the electron?

2. Two charges, of $q_1 = 5 \times 10^{-6}$ C and 3×10^{-6} C are brought near each other. They experience a repulsive force of 0.25 N. What is the distance between the charges?

3. A particle of dust has a charge 3.2×10^{-19} C, and has a mass of 1×10^{-6} kg. . An ionizing air filter has a metal plate with a charge of 0.003C. If the dust particle is across the room (a distance of 4 meters),
   a) Find the force on the dust particle.

   b) Find the acceleration of the dust particle.

   c) Assuming the acceleration remains constant, how long will it take for the dust particle to reach the filter?

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4. Three point charges are placed along the X-axis. Charge 1 is located at x=-0.25 m, and has a change of q_1= 1 μC. Charge 2 is located at x=0 m, and has a charge of q2 = -2 μC. Charge 3 is located at x = 0.3 m, and has a charge of q_3 = 3 μc.
    a) What is the force on charge 3 due to charges 1 and 2?

    b) What is the net force on charge q_2?

    c) What is the force on q_1 due to q_2 and q_3?

5. Two identical spheres of iron have a mass of 10 grams, and are electrically neutral, and are placed one meter apart..
    a) Calculate the total number of atoms in one sphere of iron.

    b) Calculate the total number of electrons that are present in one sphere.

    c) One percent of the electrons are transfered from one sphere to the other. Calculate the charge of each sphere.

    d) Calculate the force that is felt by each sphere. Is the force attractive or repulsive?