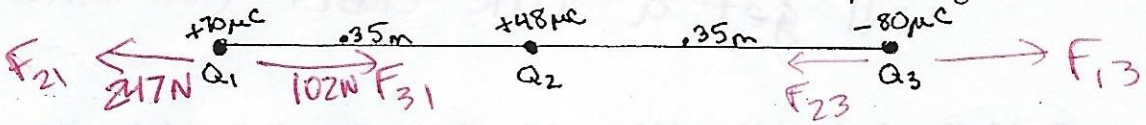
Coulomb's Law Practice

1) Particles of +70μC, +48μC, and -80μC are placed on a line as shown. The center of one is 0.35 m from the other. Find the total force on the +70μC charge.



145N (left)

2) Particles of +70μC, +48μC, and -80μC are placed on a line as shown. The center of one is 0.35 m from the other. Find the total force on the -80μC charge.

179N (left)

3) What net charge would an object with 1.0×10^6 excess electrons have?

$(1.0 \times 10^6)(-1.602 \times 10^{-19}) = 1.6 \times 10^{-13}$ C

4) In walking across a carpet, you acquire a net negative charge of 50 μC. How many excess electrons do you have?

$50 \times 10^{-6} = n(1.602 \times 10^{-19})$ $n = 3.1 \times 10^{14}$

5) A glass rod rubbed with silk acquires a charge of $+8.0 \times 10^{-10}$ C. a) What is the charge on the silk? B) How many electrons have been transferred to the silk?

a) -8×10^{-10} C b) $8 \times 10^{-10} = n(1.602 \times 10^{-19})$

$n = 5.0 \times 10^9$

6) A rubber rod rubbed with fur acquires a charge of -4.8×10^{-9} C a) What is the charge on the fur? B) How many electrons have been transferred? C) If each electron has a mass of 9.11×10^{-31} kg, how much mass has been transferred?

a) 4.8×10^{-9} C

b) $4.8 \times 10^{-9} = n(1.602 \times 10^{-19})$ $n = 3.0 \times 10^{10}$

c) $3 \times 10^{10}\text{e} \times \frac{9.11 \times 10^{-31}}{1\text{e}}\text{kg} = 9.3 \times 10^{-21}$ kg

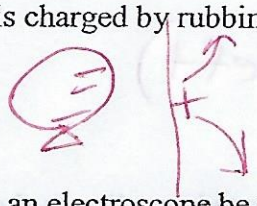
7) A rubber rod is rubbed with fur. The fur is then quickly brought near but not touching the bulb of an uncharged electroscope. What is the sign of the charge on the leaves of the electroscope?

positive

8) What will happen when a positively charged rod is brought near the bulb of a negatively charged electroscope?

will get a little closer (a little less negative)

9) A balloon is charged by rubbing and the clings to the wall. Explain how this happens.



electrons move away from balloon leaving the wall positive

10) How could an electroscope be positively charged by induction?

hold charged balloon near the electroscope the attach a ground wire

11) An electron is a certain distance from a proton. How would the electric force between them change if the electron were moved a) twice as far away b) one-third as far away?

a) $\frac{1}{4}$ as much

b) 9x greater

12) An electron and a proton are separated by 2.0 nm. What is the magnitude of the force between them?

$$F = \frac{(9\times10^{9})(1.602\times10^{-19})(1.602\times10^{-19})}{(2\times10^{-9})^{2}} = 5.8\times10^{-11}\ N$$

13) Two identical charges are at a fixed distance from one another. How would the force between them be affected if a) one of the charges was doubled while the other halved? B) one of the charges was halved and the other remains the same?

a) stays same

b) $\frac{1}{2}$ as much

14) Two charges are attracted by a force of 25 N when separated by 10 cm. What is the force between them when the distance is increased to 50 cm?

$\frac{1}{25}$ as much = 1 N

15) What is the magnitude of the force a +15 μC charge exerts on a + 3.0 μC charge 40 cm away?

$$F = \frac{(9\times10^{9})(15\times10^{-6})(3\times10^{-6})}{.40^{2}} = 25\ N$$