

Questions

1. A balloon gains a charge of -3.7 pC after being rubbed on your hair. How many excess electrons is this?

$$-3.7 \times 10^{-12} \text{ C} \left(\frac{1e}{1.60 \times 10^{-19} \text{ C}} \right) = 2.3 \times 10^7 e$$

2. In an experiment, moving a charge through an electric field requires 11 eV of work. How much work is this in Joules?

$$11 \text{ eV} \left(\frac{1.60 \times 10^{-19} \text{ J}}{1 \text{ eV}} \right) = +1.8 \times 10^{-18} \text{ J}$$

3. Calculate the electric force between two electrons if their centers are $2.7 \times 10^{-3} \text{ meters}$ apart.

$$F_e = \frac{kq_1q_2}{r^2} = \frac{(8.99 \times 10^9 \frac{\text{N}\cdot\text{m}^2}{\text{C}^2})(1.60 \times 10^{-19} \text{ C})(1.60 \times 10^{-19} \text{ C})}{(2.7 \times 10^{-3} \text{ m})^2} = 3.2 \times 10^{-23} \text{ N repel}$$

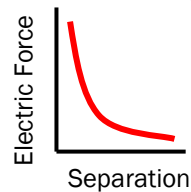
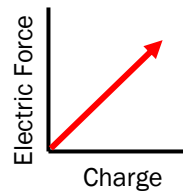
4. A charge of $+48 \text{ C}$ experiences a force of 0.8 N when located a certain position in the electric field produced by a second charge. What is the magnitude of the electric field strength at that point?

$$E = \frac{F}{q} = \frac{0.8 \text{ N}}{48 \text{ C}} = 0.02 \frac{\text{N}}{\text{C}}$$

5. If 56 joules of work is required to move 7.0 coulombs of charge between two plates, the potential difference between the two plates is

$$V = \frac{W}{q} = \frac{56 \text{ J}}{7.0 \text{ C}} = 8.0 \text{ V}$$

Sketch the following graphical relationships



Electrostatics



Definitions

1. Electrostatics - the study of electrical charges that can be collected and held in one place
2. Insulators - materials through which charges will not move easily
3. Conductors - materials that allow charges to move about easily.
4. Grounding - Removing excess charge from a charged body by connecting it to the Earth
5. Polarization - to cause one side of an object to become negative, and the other side to be positive
6. Conduction - charging a neutral object by touching it with a charged object
7. Induction - causing a neutral object to become charged without direct contact between the charged object and the neutral object
8. Electric Field - a vector quantity that relates the force exerted on a test charge to the size of the test charge
9. Electric Potential Energy - potential energy associated with an object due to its position relative to a source of electric force
10. Potential Difference - difference in potential energy between two points
11. Electronvolt - the energy that an electron (or proton) gains when accelerated through a potential difference of 1 Volt

Equations (on Reference Tables)

1. $1 e = 1.60 \times 10^{-19} C$

2. $F_e = \frac{kq_1q_2}{r^2}$

3. $E = \frac{F_{onq}}{q}$

4. $V = \frac{W}{q}$

5. $1 eV = 1.60 \times 10^{-19} J$

Equations (NOT on Reference Tables)

6. $E = \frac{kq_1}{r^2}$

7. $V = Ed$

8. $C = \frac{Q}{V}$

Draw the electric field around each case below.

