**Physics: Introduction to Electrostatics.**

* Electrostatics is the study of a new force, ***the electrostatic force*,** $\rightharpoonaccent{F}$**e,** that exists between objects with charge. Charge like mass is a **fundamental quantity,** which means we cannot describe it terms of simpler quantities. Some objects have charge; some do not, much like mass.
* There are two opposite types of charge. These are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charge is carried by a subatomic particle called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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 Two like charges will always \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 Two opposite charges will always \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 The SI unit for charge is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* When placed in a region with an **ELECTRIC FIELD** ($\rightharpoonaccent{E}$) the direction of electric force on a positive charge is always opposite the direction of force on a negative charge at the same point.
* The symbol for charge is \_\_\_\_ or \_\_\_\_.
* All matter is a combination of these two particles (and neutrons that carry zero charge). Most matter is neutral because of the very fine balance between \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Although a \_\_\_\_\_\_\_\_\_\_\_\_\_ has over 1800 times the mass of an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, they each carry the same magnitude of charge. Thus most matter has the exact same number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The elementary charge is equal to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. An object can attain a **net charge** if there is an imbalance between the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* This imbalance can be caused in two main ways; **contact** and **induction**.
* When an object becomes charged (by contact or induction) the transfer of charge is nearly always caused by the motion of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_. This is because the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are much more massive and are bound together in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The atomic (valence) structure of some materials allows the \_\_\_\_\_\_\_\_\_\_\_\_\_ to move through the material without losing any energy (or very, very little). These materials are called \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_. Materials that resist the movement of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are called \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_.

**Questions:**

1. Two neutral conducting spheres are in contact on insulating bases. As shown below a positively charged object is then brought near, but not into contact with, sphere A. While the charged object is in place the spheres are separated. How are the objects charged as a result?

**++++**

#  A B

**++++**

#  A B

2. An object carries a charge of +4.2x10-5C. How many electrons has it lost?

3. Three charges are arranged as shown below. What is the direction of the net electrical force on each? (Sketch an arrow for each on the diagram to the right.)

 A

 A B

 + -

 +

 C

 B

 C

4. A proton and an electron are placed on the x-axis. The proton is placed at 1.0cm the electron is placed at –1.0cm. The two are then released from rest. Which reaches the origin first? Explain.

5. A proton at a point in space experiences a force of 1.0x10-26N East. What force would an electron placed at the same point experience? Explain.

6. A proton at a point in space experiences an acceleration of 1.0N East. What acceleration would an electron placed at the same point experience? Explain.

7. Imagine two charges fixed in place as shown:

I II III IV

Where on the dotted line would you place an electron so that it would experience equilibrium?

Where on the dotted line would you place a proton so that it would experience equilibrium?