

## 20.2 ELECTRICAL FORCES

### Forces on Charged Bodies

The two kinds of electrical charges are \_\_\_\_\_ and \_\_\_\_\_. Charges exert \_\_\_\_\_ on \_\_\_\_\_ over a distance. \_\_\_\_\_ charges repel and \_\_\_\_\_ charges attract. A device called a(n) \_\_\_\_\_ is used to detect charges. When a negatively-charged rod touches the knob of the electroscope, \_\_\_\_\_ are added to the knob, and spread over all the \_\_\_\_\_ surfaces. The two leaves inside the electroscope become \_\_\_\_\_ charged, and \_\_\_\_\_ each other. Charging a neutral body by \_\_\_\_\_ with a charged body is called charging by conduction. If the electroscope is given a positive charge, the leaves become \_\_\_\_\_ charged, and \_\_\_\_\_ each other. To identify the charge on an electroscope, bring an object with known charge \_\_\_\_\_ the electroscope. If the leaves move farther apart, the charge on the electroscope is \_\_\_\_\_ the charge on the object. If the leaves move closer together, the charge on the electroscope is \_\_\_\_\_ the charge on the object.

### Separation of Charge and Charging by Induction

Electric forces can change insulators into \_\_\_\_\_. If an uncharged object is brought near a positively charged object, the \_\_\_\_\_ charges in the uncharged object will be \_\_\_\_\_ the positively charged object. The uncharged object will still be \_\_\_\_\_, but the charges will be \_\_\_\_\_. Causing charges to separate without touching the object is called charging by \_\_\_\_\_. The \_\_\_\_\_ charges on the bottom of thunderclouds can separate \_\_\_\_\_ in Earth.

### Coulomb's Law

Coulomb's law describes the \_\_\_\_\_ between two charged objects. The electric force varies \_\_\_\_\_ with the \_\_\_\_\_ of the distance between the two charged objects. The electric force varies \_\_\_\_\_ with the \_\_\_\_\_ of the charges on the objects. Coulomb's law can be written as an equation, \_\_\_\_\_. In this equation,  $F$  represents \_\_\_\_\_,  $q$  and  $q'$  represent the \_\_\_\_\_ on the objects,  $d$  represents the \_\_\_\_\_ between the objects, and  $K$  is a(n) \_\_\_\_\_. The force that one charged object exerts on a second is \_\_\_\_\_ the magnitude of the force the second object exerts on the first. The two forces are \_\_\_\_\_ in direction. This relationship between forces is an example of Newton's \_\_\_\_\_ law.

### The Unit of Charge: The Coulomb

Coulomb defined a(n) \_\_\_\_\_ quantity of charge in terms of the amount of \_\_\_\_\_ it produces. The SI unit of \_\_\_\_\_ is the Coulomb, abbreviated as \_\_\_\_\_. One coulomb is the charge of  $6.25 \times 10^{18}$  \_\_\_\_\_. The magnitude of the charge of one electron is called the \_\_\_\_\_ charge. The electric force is a(n) \_\_\_\_\_ quantity, which means it has both \_\_\_\_\_ and \_\_\_\_\_. A repulsive force has a(n) \_\_\_\_\_ sign and an attractive force has a(n) \_\_\_\_\_ sign.

### Using Electric Forces on Neutral Bodies

A charged object may either \_\_\_\_\_ or \_\_\_\_\_ another charged object. A charged object may only \_\_\_\_\_ an uncharged object. The uncharged object will then \_\_\_\_\_ the charged object. This relationship is an example of Newton's \_\_\_\_\_ law. Electric forces are used to collect \_\_\_\_\_ particles such as soot in smokestacks.