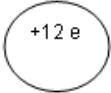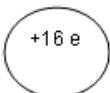Name: _____

Electric Force and Charge Worksheet

1) What is the *smallest* electric charge that can be put on an object?

    A) 6.25×10^{18} C   B) 1.60×10^{-19} C   C) 9.11×10^{-31} C   D) 9.00×10^{9} C

2) What is the magnitude of the charge, in coulombs, of a lithium nucleus containing three protons and four neutrons?

3) Metal sphere *A* has a charge of +12 elementary charges and identical sphere *B* has a charge of +16 elementary charges. After the two spheres are brought into contact, what is the charge on sphere *A*?

Sphere A   Sphere B

   (+12 e)   (+16 e)

4) What is the net charge of an object possessing an excess of 6.0×10^{6} electrons?

5) An object *cannot* have a charge of

    A) 3.2×10^{-19} C   B) 4.5×10^{-19} C   C) 9.6×10^{-19} C   D) 8.0×10^{-19} C

6) An alpha particle consists of two protons and two neutrons. The alpha particle's charge of +2 elementary charges is equivalent to

    A) 8.0×10^{-20} C   B) 3.2×10^{19} C   C) 3.2×10^{-19} C   D) 1.2×10^{19} C

7) An electroscope is a device with a metal knob, a metal stem, and freely hanging metal leaves used to detect charges. The diagram below shows a positively charged leaf electroscope.
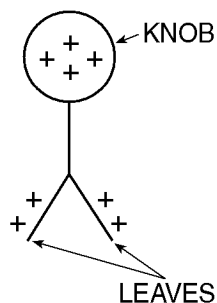
KNOB

LEAVES

As a positively charged glass rod is brought near the knob of the electroscope, the separation of the electroscope leaves will

    A) remain the same   B) decrease   C) increase

8) Which graph *best* represents the relationship between the magnitude of the electrostatic force and the distance between two oppositely charged particles?

A)

Force | Distance

C)

Force | Distance

B)

Force | Distance

D)

Force | Distance
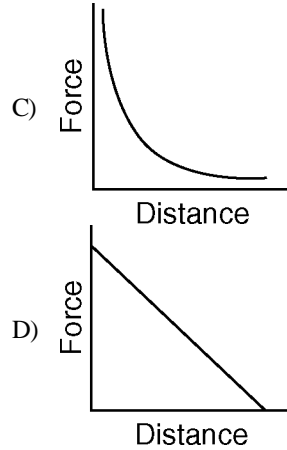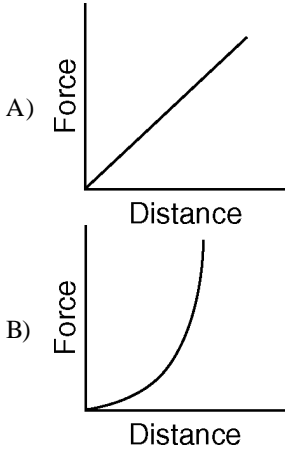
9) Two electrically neutral metal spheres, *A* and *B*, on insulating stands are placed in contact with each other. A negatively charged rod is brought near, but does not touch the spheres, as shown in the diagram below.

NEGATIVELY
CHARGED ROD

A B

INSULATING
STANDS
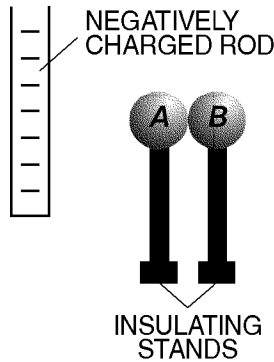
How are the spheres now charged?

A) *A* is negative and *B* is negative.

B) *A* is negative and *B* is positive.

C) *A* is positive and *B* is negative.

D) *A* is positive and *B* is positive.

10) Two protons are located one meter apart. Compared to the gravitational force of attraction between the two protons, the electrostatic force between the protons is

A) weaker and attractive

B) weaker and repulsive

C) stronger and attractive

D) stronger and repulsive

Questions 11 − 12 refer to the following:

A lightweight sphere hangs by an insulating thread. A student wishes to determine if the sphere is neutral or electrostatically charged. She has a negatively charged hard rubber rod and a positively charged glass rod. She does not touch the sphere with the rods, but runs tests by bringing them near the sphere one at a time.

- - - - - - - - - - - - - - - -   Rubber Rod

+ + + + + + + + + + + +   Glass Rod
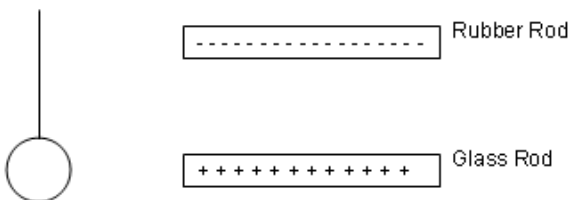
Questions →

11) Describe the test result that would prove that the sphere in the given situation is neutral.

12) Describe the test result that would prove that the sphere in the given situation is positively charged.

13) The diagram below shows two metal spheres charged to 1.0×10^{-6} coulomb and $+3.0 \times 10^{-6}$ coulomb, respectively, on insulating stands separated by a distance of 0.10 meter.

+1.0 x 10⁻⁶ C   +3.0 x 10⁻⁶ C

←—0.10 m—→
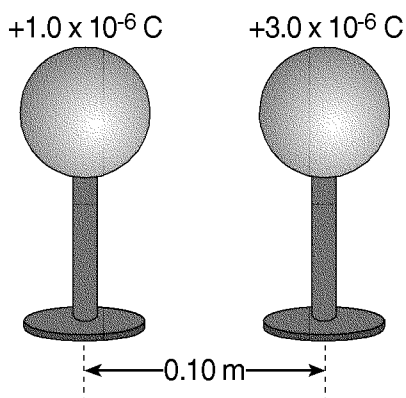
The spheres are touched together and then returned to their original positions. As a result, the magnitude of the electrostatic force between the spheres changes from 2.7 N to   Show all work below (including equations and units)

14) The diagram below shows two negatively charged balloons suspended from nonconducting strings being held by a student.
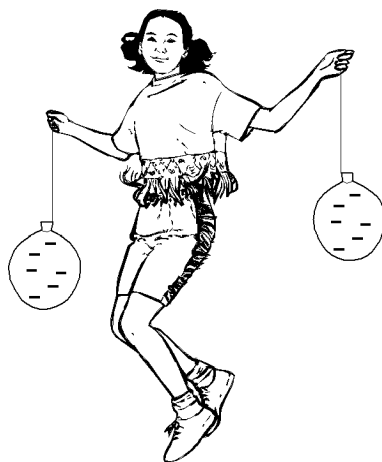
What occurs as the student brings the balloons closer to each other without allowing them to touch?
A) The magnitude of the electrostatic force between the balloons increases, and they repel each other.
B) The magnitude of the electrostatic force between the balloons increases, and they attract each other.
C) The magnitude of the electrostatic force between the balloons decreases, and they repel each other.
D) The magnitude of the electrostatic force between the balloons decreases, and they attract each other.

15) In the diagram below, a positive test charge is located between two charged spheres, *A* and *B*. Sphere *A* has a charge of $+2q$ and is located 0.2 meter from the test charge. Sphere *B* has a charge of $-2q$ and is located 0.1 meter from the test charge.
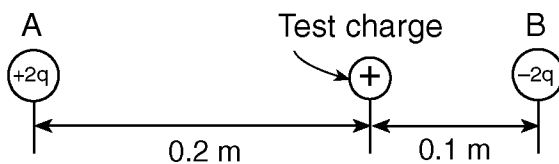
If the magnitude of the force on the test charge due to sphere *A* is *F*, what is the magnitude of the force on the test charge due to sphere *B*?

A) $4F$ B) $2F$ C) $\dfrac{F}{4}$ D) $\dfrac{F}{2}$

16) Four small metal spheres *R*, *S*, *T*, and *U* on insulating stands act on each other by means of electrostatic forces.

It was known that sphere *S* is negatively charged. The following observations were made:

- Sphere *S* attracts all the other spheres.
- Spheres *T* and *U* repel each other.
- Sphere *R* attracts all the other spheres.

Determine the charge on each sphere and complete the table below noting for each sphere if it is positive (+), negative (-), or neutral (0).

Sphere	Charge
R	
T	
U	

17) What is the net static electric charge on a metal sphere having an excess of +3 elementary charges?

A) 4.80×10^{19} C   B) 1.60×10^{-19} C   C) 4.80×10^{-19} C   D) 3.00×10^{0} C