<u>Directions:</u>   Choose only the one best answer to each question. DO NOT WRITE ON THIS PRE-TEST !
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1. When objects are charged by rubbing, the particles most likely to be added or removed are:
    a. Protons   b. electrons   c. neutrons   d. coulombs

2. Protons and electrons have:
    a. Unequal, opposite charges: equal masses
    b. Unequal, opposite charges: unequal masses
    c. Equal, opposite charges: equal masses
    d. Equal, opposite charges: unequal masses

3. Two tiny charged spheres, separated by 1.0 cm are attracted to each other by an electrostatic force
    of 20 units. If the charge on both of the objects is doubled, the force between them becomes:
    a.   80 units   b. 20 units   c. 10 units   d. 5 units

4. If you charge a comb by running it through your hair, the size of the charge on the comb might most
    reasonably be:
    a.   10 C   b. 1 C   c. 1×10^{-1} C   d. 1 µC

5. Two tiny charged spheres, separated by 1.0 cm are attracted to each other by an electrostatic force
    of 36 units. If the distance is increases to 3.0 cm, the force between them becomes:
    a.   18 units   b. 4 units   c. 9 units   d. 72 units

6. If you bring a negatively-charged object close to the knob of a negatively charged electroscope,
    without permitting the object to touch the knob or to get close enough for a spark to jump, the
    leaves of the electroscope will:
    a.   not move   c.   come closer together
    b.   come closer and then spread farther apart   d.   spread farther

7. Object A and Object B are rubbed together, thus producing a charge on each. The charge on object
    A is:
    a. Unequal and opposite to that on B
    b. Unequal to and of the same kind as than on B
    c. Equal and opposite to that on B
    d. Equal to and of the same kind as that on B

8. If the force between two objects is found to be positive, what does this indicate about the charge
    found on the objects?

    a. One positive, one negative   c.   both negative
    b.   both positive   d.   both choices "b" and "c"
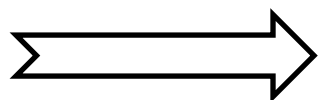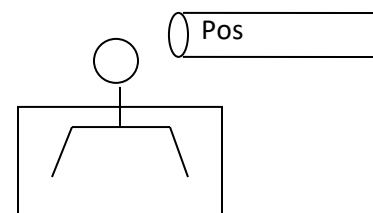
9. Spheres A and B are made of metal, are supported by insulating rods, and are in contact. Before the negatively-charged rod is brought near, both spheres are neutral. With the rod in place as shown, sphere A is moved to the left so that it no longer touches sphere B. The negatively-charged rod is then removed. The charge on A is now:
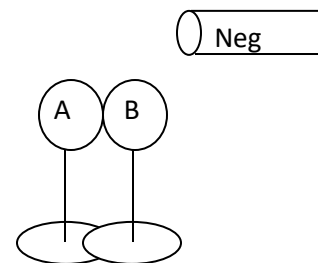
   a. zero   b. positive   c. negative   d. positive on one side, negative on the other

10. Coulombs Law for point charges can best be described as:
    a. The force between two charged objects is directly related to the square of the distance and inversely related to the product of the charges
    b. The force between two charged objects is directly related to the product of the charges and inversely related to the square of the distance.
    c. The force between two charged objects is directly related to the sum of the charges and inversely related to the square of the distance.
    d. The force between two charged objects is directly related to the product of the charges and inversely related to the distance.

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11. The positive charges in the electroscope foil leaves are due to:
    a. Electrons moving to the top of the electroscope and the protons moving into the foil leaves.
    b. Electron moving towards the glass rod, leaving the foil leaves deficient in electrons.
    c. Electrons in the electroscope being forced away from the glass rod
    d. Positive charges moving into the foil leaves, which illustrates the basic law of electrostatics

12. An electric force F exists between two charged spheres. If the quantity of charge on each sphere is doubled, the electric force between the two spheres will be equal to:

    a. F/4   b. 4 F   c. 2 F   d. F/2

13. If a positively charged metal rod touches a neutral metal sphere, the number of electrons on the rod will:
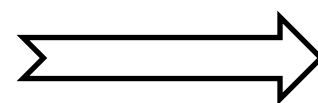   a. increase   b. decrease   c. remain the same

14. A metal sphere with +4 elementary charges touches an identical sphere with +20 elementary charges. After touching, the number of elementary charges on the first sphere is now:
   a. +24   b. +14   c. +12   d. -12

15. A pith ball may become charged by losing or gaining:
   a. Neutrons and protons   b. protons and electrons   c. electrons only   d. protons only

16. When an object is brought near the knob of a negatively charged electroscope, the leaves initially diverge. The charge on the object must be:
   a. Neutral or zero   b. positive   c. negative   d. cannot be determined

17. The diagram below shows three neutral metal spheres, *x*, *y*, and *z*, in contact and on insulating stands. Which diagram best represents the charge distribution on the spheres when a positively charged rod is brought near sphere *x*, but does not touch it?
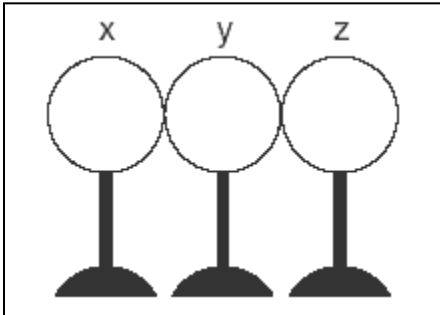

a.

b.

c.

d.

18. An electron and a proton are located one meter apart. Compared to the gravitational force, the electrical force between the two particles is:
   a. smaller   b. larger   c. the same

19. The coulomb is a unit of:
   a. charge   b. current   c. potential   d. capacitance

20. After two neutral solids, A and B, were rubbed together, solid A acquired a net negative charge. Solid B, therefore, experienced a net:
   a. loss of protons   c. loss of electrons
   b. increase in protons   d. increase in electrons

21. As body A charges body B by induction, the quantity of charge on body A:
   a. is decreased   b. is increased   c. remains the same
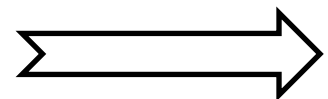
USE THE FOLLOWING DIAGRAM FOR QUESTIONS 22 – 25

$$A \underline{12\ m} B$$

-4 x 10^{-4} C   12 x 10^{-4} C
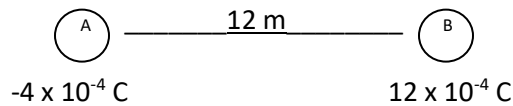
22. According to the above diagram, what is the magnitude of the electrostatic force exerted on sphere B?
    a. 360 N   b. 30 N   c. 16 x 10^{-4} N   d. 5.2 x 10^{-7} N

23. According to the above diagram, compared to the force exerted on sphere B at a separation of 12 meters, the force exerted on Sphere B at a separation of 24.0 meters would be:
    a. ½ as great   b. 2 times as great   c. ¼ as great   d. 4 times as great

24. According to the above diagram, if the two spheres were touched together and then separated, the charge on sphere A would be:
    a. -8.0 x 10^{-4} C   b. -4.0 x 10^{-4} C   c. 4.0 x 10^{-4} C   d. 1.6 x 10^{-3} C

25. According the diagram above, if spheres A and B, as represented in the diagram, were touched together and then separated, the net charge on the two spheres would be:
    a. decrease   b. increase   c. remain the same   d. zero