

Name _____

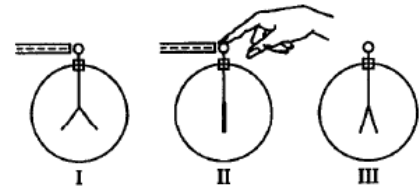
Homework Questions

Electric Forces + Fields #1

Multiple Choice Practice

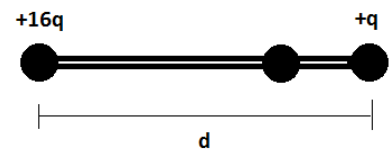
1. Two small spheres have equal charges q and are separated by a distance d . The force exerted on each sphere by the other has magnitude F . If the charge on each sphere is doubled and d is halved, the force on each sphere has magnitude

(A) F (B) $2F$ (C) $4F$ (D) $8F$ (E) $16F$



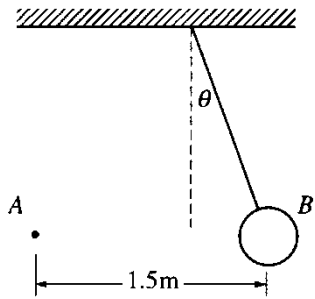
2. When a negatively charged rod is brought near, but does not touch, the initially uncharged electroscope shown above, the leaves spring apart (I). When the electroscope is then touched with a finger, the leaves collapse (II). When next the finger and finally the rod are removed, the leaves spring apart a second time (III). The charge on the leaves is

(A) positive in both I and III
(B) negative in both I and III
(C) positive in I, negative in III
(D) negative in I, positive in III
(E) impossible to determine in either I or III



Free Response Practice

3. Two small beads having positive charges $16q$ and q are fixed at the opposite ends of a horizontal insulating rod extending from the origin (the location of the larger charge) to the point $x = d$. A third small charged bead is free to slide on the rod. At what position is the third bead in equilibrium?



Note: Figure not drawn to scale.

4. The small sphere A in the diagram above has a charge of $120\ \mu\text{ C}$. The large sphere B_1 is a thin shell of nonconducting material with a net charge that is uniformly distributed over its surface. Sphere B_1 has a mass of $0.025\ \text{ kg}$, a radius of $0.05\ \text{ m}$, and is suspended from an uncharged, nonconducting thread. Sphere B_1 is in equilibrium when the thread makes an angle $\theta = 20^\circ$ with the vertical. The centers of the spheres are at the same vertical height and are a horizontal distance of $1.5\ \text{ m}$ apart, as shown.
- Calculate the charge on sphere B_1 .
 - Suppose that sphere B_1 is replaced by a second suspended sphere B_2 that has the same mass, radius, and charge, but that is conducting. Equilibrium is again established when sphere A is $1.5\ \text{ m}$ from sphere B_2 and their centers are at the same vertical height. State whether the equilibrium angle θ_2 will be less than, equal to, or greater than 20° . Justify your answer.