

Concept Items

18.1 Electrical Charges, Conservation of Charge, and Transfer of Charge 1.

Most objects contain incredibly large numbers of charged particles. Why do most objects not exhibit static electric effects?

- a. Most objects are neutral.
- b. Most objects have positive charge only.
- c. Most objects have negative charge only.
- d. Most objects have excess protons.

2.

Can an insulating material be used to charge a conductor? If so, how? If not, why not?

- a. No, an insulator cannot charge a conductor by induction.
- b. No, an insulating material cannot charge a conductor.
- c. Yes, an uncharged insulator can charge a conductor by induction.
- d. Yes, a charged insulator can charge a conductor upon contact.

3.

True or false—A liquid can be an insulating material.

- a. true
- b. false

18.2 Coulomb's law 4.

Two plastic spheres with uniform charge repel each other with a force of 10 N. If you remove the charge from one sphere, what will be the force between the spheres?

- a. The force will be 15 N.
- b. The force will be 10 N.
- c. The force will be 5 N.
- d. The force will be zero.

5.

What creates a greater magnitude of force, two charges $+q$ a distance r apart or two charges $-q$ the same distance apart?

- a. Two charges $+q$ a distance r away
- b. Two charges $-q$ a distance r away
- c. The magnitudes of forces are equal.

6.

In Newton's law of universal gravitation, the force between two masses is proportional to the product of the two masses. What plays the role of mass in Coulomb's law?

- a. the electric charge
- b. the electric dipole
- c. the electric monopole
- d. the electric quadruple

18.3 Electric Field 7.

Why can electric fields not cross each other?

- a. Many electric-field lines can exist at any given point in space.
- b. No electric-field lines can exist at any given point in space.
- c. Only a single electric-field line can exist at any given point in space.
- d. Two electric-field lines can exist at the same point in space.

8.

A constant electric field is $(4.5 \times 10^5 \text{ N/C})\hat{y}$. In which direction is the force on a -20 nC charge placed in this field?

- a. The direction of the force is in the $+\hat{x}$ direction.
- b. The direction of the force is in the $+\hat{y}$ direction.
- c. The direction of the force is in the $-\hat{y}$ direction.
- d. The direction of the force is in the $+\hat{y}$ direction.

18.4 Electric Potential 9.

True or false—The potential from a group of charges is the sum of the potentials from each individual charge.

- a. false
- b. true

10.

True or false—The characteristics of an electric field make it analogous to the gravitational field near the surface of Earth.

- a. false
- b. true

11.

An electron moves in an electric field. Does it move toward regions of higher potential or lower potential? Explain.

- a. It moves toward regions of higher potential because its charge is negative.
- b. It moves toward regions of lower potential because its charge is negative.
- c. It moves toward regions of higher potential because its charge is positive.

- d. It moves toward regions of lower potential because its charge is positive.

18.5 Capacitors and Dielectrics 12.

You insert a dielectric into an air-filled capacitor. How does this affect the energy stored in the capacitor?

- a. Energy stored in the capacitor will remain same.
- b. Energy stored in the capacitor will decrease.
- c. Energy stored in the capacitor will increase.
- d. Energy stored in the capacitor will increase first, and then it will decrease.

13.

True or false— Placing a dielectric between the plates of a capacitor increases the energy of the capacitor.

- a. false
- b. true

14.

True or false— The electric field in an air-filled capacitor is reduced when a dielectric is inserted between the plates.

- a. false
- b. true