Extended Response

18.1 Electrical Charges, Conservation of Charge, and Transfer of Charge 77.

Imagine that the magnitude of the charge on the electron differed very slightly from that of the proton. How would this affect life on Earth and physics in general?

a. Many macroscopic objects would be charged, so we would experience the enormous force of electricity on a daily basis.
b. Many macroscopic objects would be charged, so we would experience the small force of electricity on a daily basis.
c. Many macroscopic objects would be charged, but it would not affect life on Earth and physics in general.
d. Macroscopic objects would remain neutral, so it would not affect life on Earth and physics in general.

78.

True or false—Conservation of charge is like balancing a budget.

a. true
b. false

79.

True or false—Although wood is an insulator, lightning can travel through a tree to reach Earth.

a. true
b. false

80.

True or false—An eccentric inventor attempts to levitate by first placing a large negative charge on himself and then putting a large positive charge on the ceiling of his workshop. Instead, while he attempts to place a large negative charge on himself, his clothes fly off.

a. true
b. false

18.2 Coulomb's law 81.

Electrostatic forces are enormous compared to gravitational force. Why do you not notice electrostatic forces in everyday life, whereas you do notice the force due to gravity?

a. Because there are two types of charge, but only one type of mass exists.
b. Because there is only one type of charge, but two types of mass exist.

c. Because opposite charges cancel each other, while gravity does not cancel out.
d. Because opposite charges do not cancel each other, while gravity cancels out.

82.

A small metal sphere with a net charge of 3.0 nC is touched to a second small metal sphere that is initially neutral. The spheres are then placed 20 cm apart. What is the force between the spheres?

a. 1.02×10^{-7} N
b. 2.55×10^{-7} N
c. 5.1×10^{-7} N
d. 20.4×10^{-7} N

18.3 Electric Field 83.

Point charges are located at each corner of a square with sides of 5.0 cm . The top-left charge is $q_1 = 8.0$ nC The top right charge is $q_2 = 4.0$ nC. The bottom-right charge is $q_3 = 4.0$ nC. The bottom-left charge is $q_4 = 8.0$ nC. What is the electric field at the point midway between charges q_2 and q_3?

a. $(-2.1 \times 10^4 \text{ N/C})\hat{x}$
b. $(2.3 \times 10^4 \text{ N/C})\hat{x}$
c. $(4.1 \times 10^4 \text{ N/C})\hat{x}$
d. $(4.6 \times 10^4 \text{ N/C})\hat{x}$

84.

A long straight wire carries a uniform positive charge distribution. Draw the electric field lines in a plane containing the wire at a location far from the ends of the wire. Do not worry about the magnitude of the charge on the wire.

a. Take the wire on the x-axis, and draw electric-field lines perpendicular to it.
b. Take the wire on the x-axis, and draw electric-field lines parallel to it.
c. Take the wire on the y-axis, and draw electric-field lines along it.
d. Take the wire on the z-axis, and draw electric-field lines along it.

18.4 Electric Potential 85.

A square grid has charges of $Q = 10$ nC are each corner. The sides of the square at 10 cm . How much energy does it require to bring a $q = 1.0$ nC charge from very far away to the point at the center of this square?

a. 1.3×10^{-6} J
b. 2.5×10^{-6} J
c. 3.8×10^{-6} J

d. 5.1×10^{-6} J

86.

How are potential difference and electric-field strength related for a constant electric field?

a. The magnitude of electric-field strength is equivalent to the potential divided by the distance.
b. The magnitude of electric-field strength is equivalent to the product of the electric potential and the distance.
c. The magnitude of electric-field strength is equivalent to the difference between magnitude of the electric potential and the distance.
d. The magnitude of electric-field strength is equivalent to the sum of the magnitude of the electric potential and the distance.

18.5 Capacitors and Dielectrics 87.

A 12 F air-filled capacitor has 12 V across it. If the surface charge on each capacitor plate is = 7.2 mC / m^2, what is the attractive force of one capacitor plate toward the other?

a. 0.81×10^5 N
b. 0.81×10^6 N
c. 1.2×10^5 N
d. 1.2×10^6 N

88.

Explain why capacitance should be inversely proportional to the separation between the plates of a capacitor.

a. Capacitance is directly proportional to the electric field, which is inversely proportional to the distance between the capacitor plates.
b. Capacitance is inversely proportional to the electric field, which is inversely proportional to the distance between the capacitor plates.
c. Capacitance is inversely proportional to the electric field, which is directly proportional to the distance between the capacitor plates.
d. Capacitance is directly proportional to the electric field, which is directly proportional to the distance between the capacitor plates.