Conceptual Questions
Chapter 15
(Electric Fields and Forces)

1.) After a glass rod is rubbed against a silk cloth, the glass rod has a charge of +5 and the silk cloth has a charge of -7. What could the original charges of the glass rod and the silk cloth have been?

a. +2, -5
b. 0, -2
c. +5, 0
d. 0, -5

2.) You are given four objects, A, B, C, and D. You discover that A and B repel each other, and that C and D repel each other. If B and C attract each other, which of the following is a possible charge configuration for A, B, C, and D in that order?
a. A +, B +, C +, D +
b. A -, B +, C +, D -
c. A -, B -, C -, D +
d. A +, B +, C -, D -

3.) Andrea and Stefanie are wearing rubber soled shoes, but Ian is standing barefoot on a large metal platform. Dragging her feet along the carpet, Andrea accumulates a charge of -10. She taps Stefanie on the hand, transferring a charge of -8. Stefanie touches Ian's hand as she passes him a stick of gum, and giving him a charge of -4. He then hops down off the platform and puts his shoes back on. What is the final total charge carried by Ian, Andrea, and Stefanie?
a. -23
b. 0
c. -6
d. -10

4.) A rod with a charge of -10 is brought close to a neutral conducting sphere, which is then grounded. After a long time, the ground is removed, followed by the rod. What could be the net charge on the sphere?
a. -10
b. +13
c. +9
d. 0

5.) Object A has a charge of 5 and object B has a charge of 10. A third object, C, has an unknown charge. If object A exerts a force F on object C, what is the force of object B on C? Assume the same separation distance in each case.
a. 2F
b. 50F
c. –F
d. 5F

6.) Object A exerts a force, F, on object B. Object B has charge q, and object C has charge -2q. Object A will exert what force on object C? Assume the same separation distance in each case.
a. –F
b. 2F
c. F
d. -2F

7.) A metal marble has a charge of -1. A nearby ceramic marble has a charge of +1 and exerts a force on the metal marble of F. At the same time and the same distance from the metal marble is a rubber ball with a charge of +1. What is the net force exerted on the metal marble?
a. F
b. 2F
c. not enough information
d. 0

8.) A test charge of -q at point P is used to measure an electric field. The field is found to have a magnitude of 2 N/C. When the charge -q is removed, the electric field at point P:
a. changes in a way that cannot be determined from the information given
b. will have magnitude 2 N/C
c. will reverse direction
d. will change in magnitude

9.) Point A is close to an electron. On the same side of the electron, Point B is further from the electron. Points A and B and the electron are along a straight line. Which of the following statements are true?
a. The field is stronger at point A than B and is directed from B to A.
b. The field is weaker at point A than B and is directed from A to B.
c. The field is weaker at point B than A and is directed from A to B.
d. The field is stronger at point B than A and is directed from B to A.

10.) Object A has a charge of q, and object B has a charge of -2q. A drawing of each object's field lines will reveal that
a. object A has twice as many lines as B going in the opposite direction.
b. object B has twice as many lines as A going in the same direction.

c. objects A and B have the same number of lines, but go opposite directions.
d. object B has twice as many lines as A, going in the opposite direction.

11.) You can find the electric field at point P due to a group of point charges using just:
a. the magnitude of each charge's electric field at point P and the magnitude of the test charge.
b. the direction of each charge's electric field at point P and the test charge's magnitude.
c. the magnitude and direction of each charge's electric field at point P.
d. the total charge acting on point P and its average distance.

12.) In general, how can you relate the motion of a charged particle to the uniform electric field surrounding it?
a. By combining Newton's Law with Coulomb's Law.
b. By calculating the electric field caused by the charged particle.
c. They cannot be related with the information, charge and electric field, given.
d. By multiplying the uniform electric field by the charge of the particle

STOP HERE: The solutions to the above problems are: b, d, c, c, a, d, c, b, a, d, c, a.

Gauss's Law problems (not on test)

13.) The electric flux through the closed surface in Figure 1 is:

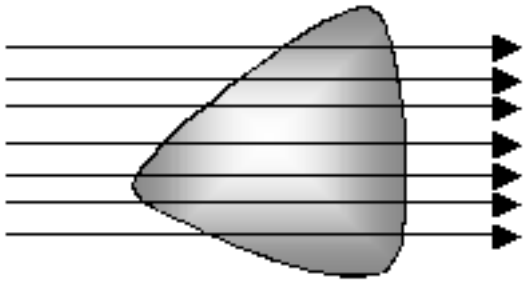

Figure 1

a. positive
b. negative
c. zero
d. impossible to determine with the information given

14.) In Figure 2 (next page), if the flux through the inner surface is $\frac{+5}{\varepsilon_o}$ and q in the region between the two surfaces has a charge of -3, what is the net flux through the outer surface?

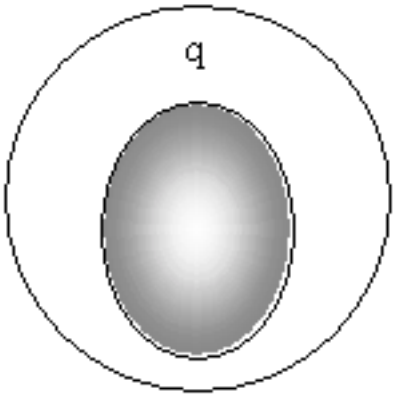

Figure 2

a. $\frac{-3}{\varepsilon_o}$

b. $\frac{+2}{\varepsilon_o}$

c. $\frac{+5}{\varepsilon_o}$

d. $\frac{-2}{\varepsilon_o}$

15.) Which of the following will change the flux through a Gaussian surface caused by a charge distribution:

a. Changing the shape of the Gaussian surface enclosing the charge distribution.

b. Changing the size of the Gaussian surface enclosing the charge distribution.

c. Changing the location of the charge distribution within the surface.

d. Changing the net charge within the Gaussian surface.

16.) Inside a surface S, there is a net charge q1. Outside the surface, there is another charge q2. Which of the following statements is NOT true?

a.) q_1 affects the flux through S.

b.) q_1 affects the electric field on the surface S.

c.) q_2 affects the flux through S.

d.) q_2 affects the electric field on the surface S.

17.) What Gaussian surface would be most appropriate for evaluating the electric field of a spherically symmetric charge distribution?
a.) a sphere.
b.) a cylinder.
c.) a rectangular box.
d.) None; this distribution is not appropriate for use with Gauss's Law.

18.) What Gaussian surface given below would be least appropriate for evaluating the electric field of an infinite charged plane?
a.) a sphere
b.) a cylinder.
c.) a rectangular box
e.) None: this distribution is not appropriate for use with Gauss's law.

19.) Consider a conducting sphere in electrostatic equilibrium with a total charge of +4. Which of the following is NOT true?
a.) there is no electric field inside the sphere.
b.) the electric field outside the sphere is perpendicular to the sphere.
c.) the charge is distributed solely on the surface.
d.) the electric flux through a Gaussian surface inside the sphere is +4/epsilon-not.

20.) A conducting sphere in electrostatic equilibrium with radius r has a surface charge density of alpha. A spherical Gaussian surface surrounds the sphere. What is the flux through the Gaussian surface?
a.) alpha/epsilon-not
b.) four pi r^2/epsilon-not
c.) four pi r^2 alpha/ epsilon-not
d.) four pi r^3/(3 alpha epsilon-not).

Solutions to problems 13-20: c, b, d, c, a, a, d, c.