Physics Unit 9: Electrostatics (Ch. 17 Textbook problems and questions p. 654-656)

1. How are conductors different from insulators?

2. When a conductor is charged by induction, is the induced surface charge on the conductor the same or opposite the charge of the object inducing the surface charge?

3. A negatively charged balloon has 3.5 μC of charge. How many excess electrons are on this balloon?

Conceptual questions

4. Which activity does not produce the same results as the other three?
   - **a.** sliding over a plastic-covered automobile seat
   - **b.** walking across a woolen carpet
   - **c.** scraping food from a metal bowl with a metal spoon
   - **d.** brushing dry hair with a plastic comb

5. Would life be different if the electron were positively charged and the proton were negatively charged? Explain your answer.

6. If a suspended object is attracted to another object that is charged, can you conclude that the suspended object is charged?

7. Explain from an atomic viewpoint why charge is usually transferred by electrons.

8. Because of a higher moisture content, air is a better conductor of charge in the summer than in the winter. Would you expect the shocks from static electricity to be more severe in summer or winter? Explain your answer.

9. A balloon is negatively charged by rubbing and then clings to a wall. Does this mean that the wall is positively charged?

10. Which effect proves more conclusively that an object is charged, attraction to or repulsion from another object? Explain.

ELECTRIC FORCE

Review questions

11. What determines the direction of the electric force between two charges?

12. In which direction will the electric force from the two equal positive charges pull the negative charge shown in **Figure 17-24**?

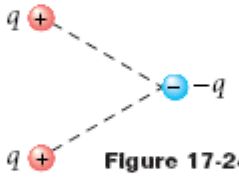

Figure 17-24

13. The gravitational force is always attractive, while the electric force is both attractive and repulsive. What accounts for this difference?

14. When more than one charged object is present in an area, how can the total electric force on one of the charged objects be found?

15. Identify examples of electric forces in everyday life.

Conceptual questions

16. How does the electric force between two charges change when the distance between them is doubled? How does it change when the distance is halved?

28. When electric field lines are being drawn, what determines the number of lines originating from a charge? What determines whether the lines originate from or terminate on a charge?

29. Draw some representative electric field lines for two charges of $+q$ and $-3q$ separated by a small distance.

30. Consider the electric field lines in **Figure 17-26.**
    a. Where is charge density the highest? Where is it the lowest?
    b. If an opposite charge were brought into the vicinity, where would charge on the pear-shaped object "leak off" most readily?

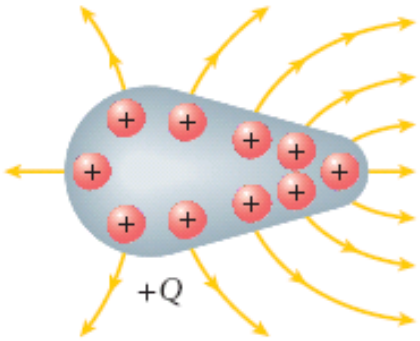

Figure 17-26

35. A student stands on a piece of insulating material, places her hand on a Van de Graaff generator, and then turns on the generator (see **Figure 17-21** on page 651). Is she shocked? Why or why not? The student finds that her hair stands on end. Why does this occur?

36. In **Figure 17-18** (page 649), where do the extra lines leaving the $+2q$ charge end?

37. A "free" electron and "free" proton are placed in an identical electric field. Compare the electric force on each particle. How do their accelerations compare?

Practice problems

38. Find the electric field at a point midway between two charges of $+30.0 \times 10^{-9}$ C and $+60.0 \times 10^{-9}$ C separated by a distance of 30.0 cm.
(See Sample Problem 17D.)