17. Why is it dangerous to touch the terminals of a high-voltage capacitor even after the potential difference has been removed? What can be done to make the capacitor safe to handle?

Practice Problems

For problems 18–19, see Sample Problem B.

18. A 12.0 V battery is connected to a 6.0 pF parallel-plate capacitor. What is the charge on each plate?

19. Two devices with capacitances of 25 μF and 5.0 μF are each charged with separate 120 V power supplies. Calculate the total energy stored in the two capacitors.

ELECTRIC CURRENT

Review Questions

20. What is electric current? What is the SI unit for electric current?

21. In a metal conductor, current is the result of moving electrons. Can charge carriers ever be positive?

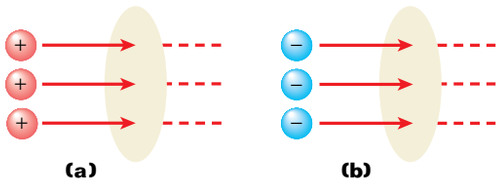
22. What is meant by the term *conventional current*?

23. What is the difference between the drift speed of an electron in a metal wire and the average speed of the electron between collisions with the atoms of the metal wire?

24. There is a current in a metal wire due to the motion of electrons. Sketch a possible path for the motion of a single electron in this wire, the direction of the electric field vector, and the direction of conventional current.

25. What is an electrolyte?

26. What is the direction of conventional current in each case shown below?



Conceptual Questions

27. In an analogy between traffic flow and electric current, what would correspond to the charge, *Q*? What would correspond to the current, *I*?

28. Is current ever "used up"? Explain your answer.

29. Why do wires usually warm up when an electric current is in them?

30. When a light bulb is connected to a battery, charges begin moving almost immediately, although each electron travels very slowly across the wire. Explain why the bulb lights up so quickly.

31. What is the net drift velocity of an electron in a wire that has alternating current in it?

Practice Problems

For problems 32–33, see Sample Problem C.

32. How long does it take a total charge of 10.0 C to pass through a cross-sectional area of a copper wire that carries a current of 5.0 A?

33. A hair dryer draws a current of 9.1 A.

a. How long does it take for 1.9×10^3 C of charge to pass through the hair dryer?

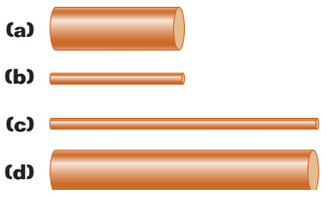
b. How many electrons does this amount of charge represent?

RESISTANCE

Review Questions

34 What factors affect the resistance of a conductor?

35. Each of the wires shown below is made of copper. Assuming each piece of wire is at the same temperature, which has the greatest resistance? Which has the least resistance?



36. Why are resistors used in circuit boards?

17 REVIEW

15. The plates should be close together, have a large surface area, and have a dielectric between them.

16. $PE_{electric}$ is doubled when d is doubled ($PE_{electric} = \frac{1Q^2}{2C} = \frac{1}{2}Q^2\frac{d}{\varepsilon_0 A}$).

17. The capacitor stores electrical potential energy that could be discharged through the body, a conductor. This could be prevented by first discharging the capacitor so that the potential across it is zero.

18. $\pm 7.2 \times 10^{-11}$ C

19. 0.22 J

20. rate of charge movement; ampere

21. yes

22. the current made of positive charge that has the same effect as the actual current

23. $v_{avg} >> v_{drift}$

24. The electron changes direction but slowly moves opposite **E** and conventional current.

25. a solution that conducts an electric current

26. **a.** to the right
b. to the left

27. cars; the rate at which cars pass a given point

28. no; Electrical energy, not current, is "used up."

29. because of collisions between charge carriers and atoms

30. Electrons in the wire move when the electric field reaches them.

31. zero

32. 2.0 s

33. **a.** 3.5 min
b. 1.2×10^{22} electrons

34. length, cross-sectional area, temperature, material

35. c (greatest); a (least)

36. to regulate current