13. What is another name for an insulator?

14. List the particles in the nucleus of an atom.

15. Explain the difference between electron flow and conventional current.

16. Define −3 C of charge and compare it to a charge of +3 C.

17. Why is it that protons are not considered a source of moving charges for current flow?

18. Write the formulas for each of the following statements: (a) current is the time rate of change of charge (b) charge is current accumulated over a period of time.

19. Briefly define each of the following: (a) 1 coulomb (b) 1 volt (c) 1 ampere (d) 1 ohm.

20. Describe the difference between direct and alternating current.

Problems

SECTION 1–4 THE COULOMB UNIT OF ELECTRIC CHARGE

1–1 If 31.25×10^{18} electrons are removed from a neutral dielectric, how much charge is stored in coulombs?

1–2 If 18.75×10^{18} electrons are added to a neutral dielectric, how much charge is stored in coulombs?

1–3 A dielectric with a positive charge of +5 C has 18.75×10^{18} electrons added to it. What is the net charge of the dielectric in coulombs?

1–4 If 93.75×10^{18} electrons are removed from a neutral dielectric, how much charge is stored in coulombs?

1–5 If 37.5×10^{18} electrons are added to a neutral dielectric, how much charge is stored in coulombs?

SECTION 1–5 THE VOLT UNIT OF POTENTIAL DIFFERENCE

1–6 What is the output voltage of a battery if 10 J of energy is expended in moving 1.25 C of charge?

1–7 What is the output voltage of a battery if 6 J of energy is expended in moving 1 C of charge?

1–8 What is the output voltage of a battery if 12 J of energy is expended in moving 1 C of charge?

1–9 How much is the potential difference between two points if 0.5 J of energy is required to move 0.4 C of charge between the two points?

1–10 How much energy is expended, in joules, if a voltage of 12 V moves 1.25 C of charge between two points?

SECTION 1–6 CHARGE IN MOTION IS CURRENT

1–11 A charge of 2 C moves past a given point every 0.5 s. How much is the current?

1–12 A charge of 1 C moves past a given point every 0.1 s. How much is the current?

1–13 A charge of 0.05 C moves past a given point every 0.1 s. How much is the current?

1–14 A charge of 6 C moves past a given point every 0.3 s. How much is the current?

1–15 A charge of 0.1 C moves past a given point every 0.01 s. How much is the current?

1–16 If a current of 1.5 A charges a dielectric for 5 s, how much charge is stored in the dielectric?

1–17 If a current of 500 mA charges a dielectric for 2 s, how much charge is stored in the dielectric?

1–18 If a current of 200 μA charges a dielectric for 20 s, how much charge is stored in the dielectric?

SECTION 1–7 RESISTANCE IS OPPOSITION TO CURRENT

1–19 Calculate the resistance value in ohms for the following conductance values: (a) 0.001 S (b) 0.01 S (c) 0.1 S (d) 1 S.

1–20 Calculate the resistance value in ohms for the following conductance values: (a) 0.002 S (b) 0.004 S (c) 0.00833 S (d) 0.25 S.

1–21 Calculate the conductance value in siemens for each of the following resistance values: (a) 200 Ω (b) 100 Ω (c) 50 Ω (d) 25 Ω.

1–22 Calculate the conductance value in siemens for each of the following resistance values: (a) 1 Ω (b) 10 kΩ (c) 40 Ω (d) 0.5 Ω.

Critical Thinking

1–23 Suppose that 1000 electrons are removed from a neutral dielectric. How much charge, in coulombs, is stored in the dielectric?

1–24 How long will it take an insulator that has a charge of +5 C to charge to +30 C if the charging current is 2 A?

1–25 Assume that 6.25×10^{15} electrons flow past a given point in a conductor every 10 s. Calculate the current *I* in amperes.

1–26 The conductance of a wire at 100°C is one-tenth its value at 25°C. If the wire resistance equals 10 Ω at 25°C calculate the resistance of the wire at 100°C.