Physics 260 Homework Solution 13

Chapter 27

1 PSE6 27.P.001

$$Q = Ne = I\Delta t$$
$$N = \frac{I\Delta t}{e}$$

2 PSE6 27.P.011

From equation $I = nqAv_d$ we get the drift speed of electrons,

$$v_d = \frac{I}{nqA}$$

where n is the number of charge carriers per unit volume, q is the charge carried by each electron, and A is the cross-sectional area of the aluminum wire. To find n, we need to first calculate the mass of each atom. Aluminum has a molar mass 27 grams. Therefore, the mass per atom is

$$\frac{27g}{N_A} = 4.49 \times 10^{-23} \text{g/atom}$$

Then, divide the density of Aluminum by mass per atom gives us n.

3 PSE6 27.P.013

$$I = \frac{\Delta V}{R}$$

4 PSE6 27.P.047

To solve this problem, first calculate the energy used by the fluorescent lamp and incandescent lightbulb ($\wp \Delta t$). Then multiply these two values by the cost per unit energy to find out the total cost and take the difference.

5 PSE6 27.P.058

The resistance of one wire is $R = (0.500\Omega/\text{mi}) \times \text{number of miles}$. Thus, the power loss due to resistive losses is $\wp = I^2 R$.

6 PSE6 27.QQ.002

It is a scalar. Explanations are given on page 857 in the textbook.

7 PSE6 23.QQx.003

 $I_A > I_B > I_C$ from the relation $I = \frac{\Delta V}{R}$.