$Q = ne^-$, $n = \frac{Q}{e^-} = \frac{55.08}{1.6\times10^{-19}C}$

$n = 3.44\times10^{20}$

## Worksheet 7.1

1) A current of 3.60 A flows for 15.3 s through a conductor. Calculate the number of electrons that pass through a point in the conductor in this time. ($3.44\times10^{20}$)

$I = \frac{Q}{t}$, $Q = I\cdot t = (3.6A)(15.3s) = 55.08C$

2) How long would it take $2.0\times10^{20}$ electrons to pass through a point in a conductor if the current was 10.0 A? (3.2 s)

$Q = ne = (2.0\times10^{20})(1.6\times10^{-19}C) = 32C$, $I = \frac{Q}{t}$, $t = \frac{Q}{I} = \frac{32C}{10A} = 3.2s$

3) Calculate the current if a charge of 5.60 C passes through a point in a conductor in 15.4 s. (0.364 A)

$I = \frac{Q}{t} = \frac{5.6C}{15.4s} = .364A$

4) What is the potential difference across a conductor to produce a current of 8.00 A if there is a resistance in the conductor of 12.0 Ω? (96 V)

$V = I\cdot R = (8)(12) = 96V$

5) What is the heat produced in a conductor in 25.0 s if there is a current of 11.0 A and a resistance of 7.20 Ω? (21 800 J)

$E = P\cdot t = (I^2R)\cdot t = (11^2)(7.2\Omega)(25s) = 21\,800J$

6) 150 J of heat are produced in a conductor in 5.50 s. If the current through the conductor is 10.0 A, what is the resistance of the conductor? (0.273 Ω)

$E = P\cdot t = I^2R\cdot t$

$150J = 10^2(R)(5.5s)$

$R = 1.273\Omega$

7) What is the current through a 400 W electric appliance when it is connected to a 120 V power line? (3.33 A)

$P = V\cdot I$ $I = \frac{P}{V} = \frac{400W}{120V} = 3.3A$

8) a. When an electric appliance is connected to a 120 V power line, there is a current through the appliance of 18.3 A. What is its resistance? (6.56 Ω)

$V = IR$, $R = \frac{V}{I} = \frac{120V}{18.3A} = 6.6\Omega$

b. What is the average amount of energy given to each electron by the power line? ($1.92\times10^{-17}$ J)

$E = P\cdot t = (V\cdot I)t = V(\frac{Q}{t})t = V\cdot Q = (120V)(1.6\times10^{-19}C)$

9) a. What potential difference is required across an electrical appliance to produce a current of 20.0 A when there is a resistance of 6.00 Ω? (120 V)

$V = I\cdot R = (20A)(6\Omega) = 120V$

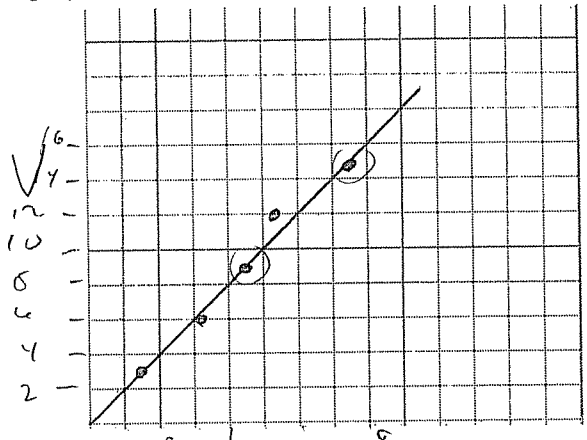
b. How many electrons pass through the appliance every minute? ($7.5\times10^{21}$)

$I = \frac{Q}{t}$ $Q = It = ne^-$ $n = \frac{It}{e^-}$

10) A student designed an experiment in order to measure the current through a resistor at different voltages. Given the following data:

| Voltage (V) | Current (I) |
|---|---|
| 3.0 | 0.151 |
| 6.0 | 0.310 |
| 9.0 | 0.448 |
| 12.0 | 0.511 |
| 15.0 | 0.750 |

a. Draw a graph showing the relationship between current and voltage (V vs. I)




$Slope = \frac{y_2 - y_1}{x_2 - x_1}$

$\frac{15-9}{.75-.448} = \frac{6}{.302}$

$= 19.9\Omega \approx 20\Omega$

b) Using the graph, what is the resistance of the resistor? (20.0 +/- 0.5 Ω)