Name: KEY Date: ______

Electric Current Problems

$I = \frac{Q}{t}$ $Q = It$ $t = \frac{Q}{I}$ $1C = 6.25\times10^{18} e^-$

1. The filament of a light has 3150 C of charge flow through it in 35 min. What is the current in the filament?

$35 \text{ min} \times \frac{60 s}{1 \text{ min}} = 2100 s$

$I = \frac{Q}{t} = \frac{3150C}{2100s} = \boxed{1.5 A}$

2. A load has a current of 88 mA flow through it. What quantity of charge flows through the load in 51 s?

$88 mA \times \frac{1A}{1000mA} = 0.088 A$

$Q = It = 0.088A \times 51s = 4.488 C = \boxed{4.9C}$

3. A heater has a current of 11 A flow through it. How many hours will it take for 80 kC of charge to flow through the heater?

$80kC \times \frac{1000C}{1kC} = 80000C$

$t = \frac{Q}{I} = \frac{80000C}{11A} = \frac{7272.72727s}{60s} = \frac{121.212121 min}{60 min} = 2.02 \text{ hours} = \boxed{2.0 \text{ hours}}$

4. How many electrons are in a charge of 33 C?

$33C \times \frac{6.25\times10^{18} e^-}{1C} = 2.0625\times10^{20} e^- = \boxed{2.10\times10^{20} e^-}$

5. A student from a different universe calculates that 4.6 μC of charge is 3.1×10^{13} electrons. What is the charge on an electron in that universe?

$4.6\mu C \times \frac{1C}{10^6 \mu C} = 0.0000046C$

$\frac{0.0000046C}{3.1\times10^{13} e^-} = 1.48387\times10^{-19} C/e^- = \boxed{1.5\times10^{-19} C/e^-}$

6. In a high voltage transmission line, 1.4×10^{22} electrons go past a tower in 25 s. What is the current in the transmission line?

$1.4\times10^{22} e^- \times \frac{1C}{6.25\times10^{18} e^-} = 2240C$

$I = \frac{Q}{t} = \frac{2240C}{25s} = 89.6A = \boxed{90A}$

7. A load has a current of 12 mA flow through it. How many electrons flow through the load in 35 s?

$12mA \times \frac{1A}{1000mA} = 0.012 A$

$Q = It = 0.012A \times 35s = 0.42C \times \frac{6.25\times10^{18} e^-}{1C} = 2.625\times10^{18} e^- = \boxed{2.6\times10^{18} e^-}$

Print | Edit In MsWord

Name: KEY Date: ________ **10.4**

Ohm's Law Problems

V = I R $\quad V = IR \quad I = \frac{V}{R} \quad R = \frac{V}{I}$

1. (a) What is the voltage across the resistor if the two cells are each 1.5 V in Figure 1?

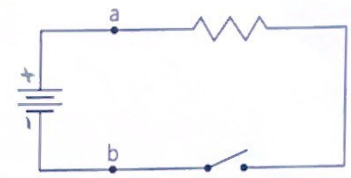

Figure 1

$1.5V + 1.5V = \boxed{3.0V}$ (series circuit)

(b) If a current of 0.10 A is measured at point *a*, what is the resistance of the resistor? What is the current at *b*?

$R = \frac{V}{I} = \frac{3.0V}{0.10A} = \boxed{30.0\,\Omega}$

current (I) at b = $\boxed{0.10A}$ because the circuit is in series

2. If a toaster has a resistance of 220 Ω, how much current will it draw from a 110 V outlet?

$I = \frac{V}{R} = \frac{110V}{220\Omega} = \boxed{0.50A}$

3. A calculator runs on two 6.0 V dry cells connected in parallel. If the calculator draws 0.001 A, how many milliamps (mA) does it draw? What is the effective resistance of the calculator?

$0.001A \times \frac{1000mA}{1A} = \boxed{1mA}$

$R = \frac{V}{I} = \frac{6.0V}{0.001A} = 6000\,\Omega$

4. A resistor has a value of 100 Ω. If a current of 5 mA passes through it, what is the applied voltage?

$5mA \times \frac{1A}{1000mA} = 0.005A$

$V = IR = 0.005A \times 100\Omega = \boxed{0.5V}$

5. A resistance has a voltage of 10 mV (millivolts) applied to it. The current through the resistance is 0.5 mA. What is the value of the resistance?

$10mV \times \frac{1V}{1000mV} = 0.01V$

$0.5mA \times \frac{1A}{1000mA} = 0.0005A$

$R = \frac{V}{I} = \frac{0.01V}{0.0005A} = \boxed{20\,\Omega}$

6. A hair dryer uses a current of 10 A when plugged into a 120 V outlet. What is the resistance of the hair dryer?

$R = \frac{V}{I} = \frac{120V}{10A} = \boxed{12\,\Omega}$