Circuits Review

1. What is meant by a complete circuit?

   A complete circuit exists when you have a closed conducting path from the positive terminal of a battery or power source to the negative terminal.

2. Find the missing quantities in each of the following:
   a) Potential difference is 120 V and the current is 25 A, what is the resistance?

   $R = \frac{V}{I} = \frac{120}{25} = 4.8\ \Omega$

   b) R = 30 Ω and the battery supplies 1.5 V, What it the current?

   $I = \frac{V}{R} = \frac{1.5}{30} = 0.05$ Amps

   c) If a 6 A current flows through a circuit with 100 Ω resistance, what is the potential difference across the circuit?

   $V = I \cdot R = 6(100) = 600$ Volts

3. a) Would you be electrocuted if you fell from a building but stopped your fall by catching hold of just one high voltage power line? Explain your answer.

   No, you need a potential difference (voltage) across your body in order to make the current flow through it. This is why birds can sit on a power line, as long as they don't touch two lines.

   b) Would it make a difference if the line sagged until your feet touched the ground? Explain your answer.

   Yes, if you become grounded you have a path (to the ground) for the electricity to flow through you.

4. a) What type of current is supplied by batteries such as those found in your car or a flashlight? Direct Current (DC) We will learn more about this next unit.

   b) What are some possible sources of voltage? Batteries, Power supplies, Solar

   c) What causes charges to move through a conductor? Potential Difference (Voltage)

   d) What are the appropriate units for voltage, current, resistance and power?

	Units	Symbol
Voltage (potential difference)	Volts	V
Current	Amps	I
Resistance	Ohms (Ω)	R
Power	Watts	P

5. Find the missing quantities in each of the following:
   a) What would the current be through a 102 W bulb that operated on a 120 v source?

$P = IV$

$102 = I(120)$ $\quad I = \frac{102}{120} = 0.85A$

   b) What is the power rating for a television that operates on 120 V at 5A?

$P = IV = (5)(120) = 600\,W$

   c) What is the voltage across a 70 W light bulb that has a current of 2 A?

$P = IV$

$70\,W = 2V$ $\quad V = \frac{70}{2} = 35$ Volts

6. Two 40 watt light bulbs are connected in parallel in a light fixture and powered by 120 volts of electricity. If the light is on for 5 hours a day, how much energy is used in a 30 day month? If the energy costs $0.12 per Kw-hr, what is the monthly cost of operating the light?

Energy = Power * Time $\quad P = 40\,W * 2 = 80$ watts

$E = 80\,\text{watts} \cdot 30\,\text{days}\left(\frac{5\,\text{hrs}}{\text{day}}\right)\left(\frac{1\,\text{kw}}{1000\,\text{w}}\right) = 12\,\text{kw-hrs}$

Cost = 12 kw-hr * (0.12/kw-hr) $= \$1.44$

7. What are the rules for a series circuit?

   Current stays the same, Voltage Drops add up, Resistors add up $R = R_1 + R_2 + \cdots R_n$

8. What are the rules for a parallel circuit?

   Current adds up, Voltage stays the same, Resistors $\rightarrow \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_1} + \frac{1}{R_1} + \cdots \frac{1}{R_N}$

9. Are the appliances in your home wired in parallel or series? How do you know?

   Parallel; We know this because if a light goes out or an appliance is turned everything else stays on.

10. Why are fuses usually placed in a series between the power supply and a parallel circuit?

    There are placed in series in front of a parallel circuit because this is the location with the greatest amount of current

11. For the following questions assume that all the resistors in the circuits below have the same resistance:

a) Which resistor in each circuit would have the most current?
A) They are all the same.
B) R_3
C) They are all the same
D) R_1

b) Which circuit has the largest total resistance? Circuit "A"

c) Which circuit has the largest total current? Circuit "C"