## Unit D Review - Electrical Principals \& Technology

## Topic 1

1. Compare and contrast static with current electricity. Why can we not use static electricity to power our homes?
2. Describe two ways by which you can neutralize the unbalanced charges associated with static electricity.
3. Differentiate between insulators and conductors and provide two examples of each. How could use a galvanometer or ammeter to determine if a material is a good conductor or insulator?

## Topic 2

1. Differentiate between cells and batteries.
2. Differentiate between current and potential difference (voltage).
3. Draw a circuit consisting of: a battery (2-cells), a switch in the open position, two bulbs, and a resistor. Show how you would add a voltmeter and an ammeter if you were required to determine the resistance of the resistor only.

## Topic 3

1. What is resistance? Where do we use tungsten filaments and Nichrome wire in our homes in order to produce resistance?
2. Use Ohm's Law to explain what happens to the current in a circuit when the resistance is reduced or increased. What happens to the resistance if you increase or decrease the voltage?
3. Calculate the following based on Ohm's Law:
a. An electric stove is connected to a 240 V outlet. If the current flowing through the stove is 20 A , what is the resistance of the heating element?
b. A bulb of $15 \Omega$ resistance is in a circuit powered by two 1.5 V batteries. What is the current in the circuit?
c. If a current of 800 mA runs through a bulb that is connected to 120 V , what is the resistance of the bulb?
4. Differentiate between resistors and variable resistors. Provide two examples of each.
5. Use water and highway analogies to describe current, voltage, resistance, and controls.
6. What is the relationship between the length of a conductor and the resistance generated? Diameter (gauge) of the wire and resistance?
7. Differentiate between series and parallel circuits by referring to number of possible paths, bulb brightness, and bulb removal etc.
8. Draw a parallel circuit consisting of a battery (3-cells), two bulbs within their own circuit, and three switches. Indicate where you should place the switches in order to turn off each bulb separately or both at the same time.
9. Compare and contrast fuses and circuit breakers.
10. Why does your service panel contain one main circuit breaker and many individual branch circuit breakers?

## Topic 4

1. Identify the energy conversions performed by thermocouples, photovoltaic cells, and batteries.

## Topic 5

1. Draw and label an electrochemical cell.
2. Explain what must be manipulated in order to produce the largest voltage possible? In other words, how would you create the best electrochemical cell possible?

## Topic 6

1. Oersted vs. Faraday: What did they show and how did they show it?
2. What are electromagnets? How can you increase the strength of the magnet?
3. What are generators used for? How do they work?
4. What are motors used for? How do they work? Identify and explain the parts of a St. Louis motor. Which part of the motor also an electromagnet?

## Topic 7

1. With respect to current, resistance, controls, and circuit distance, differentiate between microelectronic circuits and household branched circuits.
2. Differentiate between energy and power.
3. Convert 1000000000 J into kJ and MJ
4. Solve the following equations based on $\mathrm{P}=\mathrm{IV}$ and $\mathrm{E}=\mathrm{Pt}$
a. Eddie watches television for 3 hours. If the power rating of is T.V. is 200

W, how much electrical energy was consumed by his television?
b. A current of 16 A passes through a hair dryer when it is connected to a 110 V wall outlet. What is the power rating of the hair dryer?
c. A light bulb draws 1.5 A of current from a 120 V gas-powered generator. (i) How much power does the generator produce? (ii) If the generator runs for 5 minutes, how much energy will the lamp convert into light and heat?
5. What is efficiency and how is it calculated? What is the product of inefficiency?
6. Calculate the efficiencies of the following four devices and rank them in order of decreasing efficiency.

| Device | Input Energy (J) | Output Energy (J) |
| :---: | :---: | :---: |
| $\mathbf{1}$ | 10 | 3 |
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| $\mathbf{4}$ | 950 | 510 |

## Topic 8

1. Differentiate between renewable and non-renewable resources. Which type would be most advantageous to our society in the future?
2. At the moment, how does Alberta produce the majority of its electricity?
3. In our bodies, we produce energy through cellular respiration. Identify the reactants and products of this combustion reaction. Is this reaction endothermic or exothermic?
4. Complete the following chart:

| Method of <br> Energy <br> Production | Energy Conversions <br> Involved | Advantages and <br> Disadvantages |
| :---: | :---: | :---: |
| Hydroelectric |  |  |
|  |  |  |
|  |  |  |


| Fossil Fuel <br> (Gas, Coal, <br> Oil etc.) <br> Combustion |  |  |
| :--- | :--- | :--- |
|  |  |  |
| Nuclear |  |  |
| Fission |  |  |
| Solar |  |  |


| Biomass |  |  |
| :--- | :--- | :--- |
|  |  |  |
| Tidal |  |  |
| Geothermal |  |  |

## Science General

1. Identify the manipulated, responding, and both controlled variables in the following scenario:



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c. If a current of 800 mA runs through a bulb that is connected to 120 V , what is the resistance of the bulb?
4. Differentiate between resistors and variable resistors. Provide two examples of each.
5. Use water and highway analogies to describe current, voltage, resistance, and controls.
6. What is the relationship between the length of a conductor and the resistance generated? Diameter (gauge) of the wire and resistance?
7. Differentiate between series and parallel circuits by referring to number of possible paths, bulb brightness, and bulb removal etc.
8. Draw a parallel circuit consisting of a battery (3-cells), two bulbs within their own circuit, and three switches. Indicate where you should place the switches in order to turn off each bulb separately or both at the same time.
9. Compare and contrast fuses and circuit breakers.
10. Why does your service panel contain one main circuit breaker and many individual branch circuit breakers?

## Topic 4

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