**Instruments, Tools and Fasteners – Chapter 2**

Read chapter 2 and complete the following:

1. There are three different meters used to measure electrical properties. For the following properties, indicate which meter would be used to measure it.  
   a) voltage - voltmeter  
   b) amperage - ammeter  
   c) resistance - ohmmeter  
   d) voltage, amperage and resistance – multimeter

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1. Which meter would be best suited for general use?  
     
   Multimeter – performs multiple functions
2. Name the four most common screw head patterns and sketch each one.  
   Slot  
   Philips  
   Torx  
   Square
3. Which type of pliers would be best suited for making loop ends in wire?  
   needle nose
4. Why is it a good idea to use pliers which have plastic insulated handles?  
     
   as an extra layer of protections from shock
5. Why would nut drivers be found in an electrician’s tool belt as opposed to ratchets and sockets?  
     
   most nut drivers are able to handle long shafted bolts; not enough room to use ratchet and socket without extensions

Research

Which screwdriver pattern was invented by a Canadian? Explain, who, when, why and what has happened to his idea.  
Robertson – invented by P.L.Robertson in 1908. He refused to license it to Henry Ford and subsequently lost a lot of potential business. He had some very unsuccessful dealings with companies around the world while his patent was active.  
  
  
  
Use the internet to research tool kits for electricians. Find three different suppliers of basic tools for electricians and list the tools they include. Create what you feel would be a good, basic tool kit list based on tools common to all of the lists. Have your instructor initial your activity sheet when you are completed.

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Practical

Open the container of tools which comes with your workstation. Identify each of the tools and cross-reference the inventory with the inventory list. Complete a “Tool Inventory Sheet” for your work station and have your instructor initial it.

**Electrical Conductors, Insulators and Semiconductors – Chapter 3**

*Watch the video clips “How Electricity Works”, “Electric Currents AC & DC” and read chapter 3.*

1. Explain the difference between conductor, insulator and semiconductor.  
     
   conductor allows the free movement of electrons; conductors don’t allow the movement of electrons; semiconductors allow limited movement of electrons with a variety of specific materials allowing specific movement of electrons
2. What would a continuity tester be used for?  
     
   used for checking the presence of continuous paths for electrons in non-powered circuits
3. Explain the difference between “electrical” devices and “electronic” devices.  
   electrical devices are powered with electricity but electronic devices make use of semi-conductor or electron tube circuitry
4. What does the term “solid state” refer to?  
   electrical devices which make use of semiconductors as opposed to vacuum tubes.

**Sources of Electromotive Force – Chapter 4**

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1. Electricity is the flow of electrons. This requires a flow of voltage, which is also referred to as *electromotive force*. There are many primary sources of energy which can be converted into electrical energy. For each of the following primary sources, give an example of the equipment or item they would be used in.  
   light – solar or photovoltaic cells operate by creating moving electrons when exposed to light; used in security lights, solar chargers for electric fences  
     
     
   chemical reaction – batteries or voltaic cells create moving electrons through a chemical reaction. Electrons are transferred from electrode to electrode.; batteries in cars, toys, hand held electronic devices  
     
     
   heat – thermocouples create moving electrons when exposed to heat; used in electrical thermostats,   
     
     
     
   piezoelectric effect – certain crystals under pressure release electrons; microphones and sensors will use piezoelectric devices  
     
     
   mechanical-magnetic – passing a magnet through a coiled conductor will create a flow of electrons; alternators, generators

**Basic Electrical Units – Chapter 5**This chapter deals with the real meat and potatoes – as it were – of what this course is all about. By the end of this chapter, you should be fairly comfortable with the terminology, procedures and basic understandings of electricity and simple circuits. The last part of this chapter will be dealing with actually building some circuits and beginning to use some of the equipment you have in your workstation. Why mention this now? Because, it has been pretty boring till now and you need to know things are going to be changing soon.

Watch the videos “Resistance In Circuits” parts 1 & 2. Read chapter 5 in your text.

1. Complete the following chart:

|  |  |  |
| --- | --- | --- |
| **Term** | **Symbol** | **Definition**  **Definition** |
| Ampere  /20  /8 | A | Measurement of current; is the number of electrons passing a given point in one second |
| Volt | v | Potential energy between two points |
| Ohm | Ω | The friction in a circuit which slows the flow of current |
| Milli | m | One thousandth (1/1000 or .001) |
| Micro | µ | One millionth (1/1000000 or .000001) |
| Watt | W | The amount of electric energy converted to another form of energy in a given length of time. |
| Joule | J | Scientific measure of electrical energy |
| Watthour | Wh | The amount of power used over a given period of time. |
| Kilo | k | One thousand (1000) |
| Mega | M | One million (1000000) |

1. The formula for power is: Power =Voltage x Current or (P=VI). Calculate the following. Be sure to use the proper units.  
   a) V=12, I=24, P=\_288w\_\_\_\_\_\_\_\_\_\_ b) V=110, P=600, I=\_\_\_\_5.45A\_\_\_\_\_\_\_\_\_\_\_  
   c) V=1.5, I=.003, P=\_\_\_\_.0045w\_\_\_\_\_ c) V=3, P=250, I=\_\_\_\_83.3A\_\_\_\_\_\_\_\_  
   d) I=30mA, P=600w, V=\_\_\_20000v\_\_\_\_\_ e) V=45v, P=15w, I=\_\_\_\_.33A\_\_\_\_\_\_  
   f) P=1200w, V=2000v, I= \_\_\_.6A\_\_\_ g) V=115v, I=15mA, P= \_\_\_\_1.725w\_\_\_\_\_
2. Basic electric circuits contain at least three components: power source, conductor, and load. A control device, and protective device can also be added. Explain what each of the five parts of a circuit do and give examples for each.

|  |  |
| --- | --- |
| Power source – battery; provides electrons to do work  /5  /2  /7  /1 | Conductor – carries the electrons from the power source through the conductor to the load; wire |
| Load – any device which uses the electrical energy; lamp, motor, magnet | Control device – is something that interrupts the flow of current; switch |
| Protective device – is a device which prevents excessive flow of current which may damage components; fuse, circuit breaker |  |

1. \_\_\_\_\_Closed\_\_\_\_\_\_\_\_ circuits allow current to flow. \_\_\_\_\_\_open\_\_\_\_\_\_ circuits don’t allow current to flow.
2. The relationship between current, voltage and resistance is defined by *Ohm’s Law*: I =V/R (Current=Voltage/Resistance). The formula can be manipulated to solve for voltage (V=IR) and resistance (R=V/I). Complete the following chart using Ohm’s Law. Make sure to use the correct units.

|  |  |  |
| --- | --- | --- |
| **I (current)** | **V (voltage)** | **R (resistance)** |
| 4 A | 12 V | .33Ω |
| .5 mA | 115 V | .0000434Ω |
| .0000957A (95.7µA) | 4.5 V | 47 kΩ |
| 1 A | .01 V | 100 Ω |
| .00012 A (.12mA) | 12 V | 100 kΩ |
| 30 A | 110 V | .2727Ω |
| 10 µA | .2 mV | .005Ω |

6. What is the direction of current flow in a circuit? (using the electron flow model) Negative to positive

/86