



Electricity

Name _____

Electricity is a useful and efficient means of instantaneous delivery of power to our homes. It also is dangerous and can cause death if you become part of the electrical circuit. Our electrical system uses alternating current (AC) for transmission and distribution except for a few specialized long distance transmission wires using direct current (DC) at very high voltages for efficiency. Electricity is delivered to our homes typically through a three-wire arrangement that provides 120-volt alternating current (VAC) service and 240 VAC service.

Near the electrical service entry point to the house, there is a power meter and a circuit breaker box. The power meter measures our consumption of electricity usually expressed in units of kilowatt-hours (kWh). One kWh is consumed when you use a thousand watts of electricity continuously for one hour. The circuit breaker (fuse) box allows us to disconnect parts or the entire house from electricity service.

Many of our electronic devices are powered by direct current (DC) service. Our electrical system is designed to provide AC service at higher voltages. Electronic devices then contain transformers to step down the voltage and rectifiers to convert from AC to DC.

Do all of the following requirements (1-5)

- ____1. List the hazards of working with electricity and then do the following:
 - ____a. List safety rules for working with electricity.
 - ____b. Explain circuit overloading and how to avoid it.
 - ____c. Explain the term watt (W), why light bulbs have different wattage ratings, and why lamps and light fixtures limit the wattage of light bulbs to be used.
 - ____d. Demonstrate safe rescue of a person being electrocuted by contact with a downed power line or broken appliance.
 - ____e. Explain steps to take in response to an electrical fire.

- ____2. Describe where lightening comes from and the dangers it poses to people.
- ____a. List safety measures to take when lightning is present.
- ____b. Explain how a surge suppressor and an uninterruptible power supply (UPS) protect electronics from lightning and other storm related power surges and outages.
- ____3. Explain how electricity is transferred to your home and what types are available. Under appropriate adult supervision, do the following:
- ____a. Find the location of your home or meeting place power meter
- ____b. Read the power meter twice about a month apart and compute the power usage (kWh).
- ____c. Find the location of your home or meeting place circuit breaker (fuse) box.
- ____d. Explain the purpose of circuit breakers (fuses).
- ____e. Demonstrate how to shut off power and reset a breaker (or replace a fuse).
- ____f. Describe the function, testing, and resetting of a Ground Fault Interrupter (GFI) receptacle.
- ____g. Draw a circuit breaker (fuse) map of your house or meeting place.
- ____h. Explain color-coding of residential wiring.
- ____4. Explain the differences between incandescent, florescent and LED lighting, and compare the following about each:
- Cost factors: price, energy consumption, and lamp life
 - Technology factors: available color temperatures (Kelvins), conversions required to use home 120 Volt AC power, and disposal concerns
- ____5. Do three of the following projects under appropriate adult supervision:

- _____a. Rewire a table lamp including proper tying off of the cord using the underwriters knot.
- _____b. Build a rheostat and demonstrate it using flashlight batteries and a flashlight bulb or doorbell.
- _____c. Using proper wire color-coding, build models of a house circuit for a light switch and a switch loop using a switch, colored wires, flashlight batteries and a bulb or buzzer.
- _____d. Using proper wire color-coding, build a model of a house circuit for a three-way switch using two switches, colored wires, flashlight batteries and a bulb or buzzer.
- _____e. Using proper wire color-coding, build a model of a house circuit for a split circuit receptacle (half always on and half switched) using a switch, receptacle, colored wires, flashlight batteries and a bulb or buzzer.

Do two of the following requirements (6-10)

- _____6. We use electricity in our homes and schools and jobs every day. Make a list of ways you can save electricity at home or school. Implement at least two methods at home.
- _____7. Make a list of five electric appliances or devices in your home. Look at the labels, and determine how much energy each will use in a typical day. With **your parents' permission**, look at your electrical bill and determine the cost of using these appliances for a period of one month.
- _____8. List different power types available in other countries. Explain why many devices can use both U.S. and European power with just an outlet adapter.
- _____9. Lead a younger patrol in making a list of things that use electricity that you use every day and discussing how your day would change without electricity
- _____10. Make a list of careers that involve electricity. Interview two people with careers from this list. Discuss their day-to-day works and what training or education was required for their job. Present what you learned to your unit.

Trail Badge Mentor Signature

Date

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