Name _____

CASE

Activity 6.1.2 Electrical Power

Purpose

You use electrical energy every day. Cell phones, computers, and cars all need electrical energy to operate properly. Electricity energy is measured multiple ways. The electrical power used for work is calculated in watts. Watts are equal to the amperage multiplied by the voltage in an electrical circuit. Amperage is the electrical current moving through an electrical circuit, while the voltage is the pressure pushing the electrical energy through the circuit.

power (watts) = current (amperage) × electrical pressure (voltage)

Electrical energy can be stored chemically for later or generated for immediate use. Batteries are examples of stored electrical energy. Electrical generators and solar panels provide immediate access to electrical energy, but cannot store electrical energy. For example, an electrical generator must be spinning or a solar panel must be exposed to sunlight to produce electricity.

What factors determine electrical power? How is electrical power in a battery different from a generator?

Materials

Per pair of students:

- D size battery
- Battery case
- LabQuest2
- Vernier energy sensor
- Incandescent light-bulb
- Incandescent light bulb base
- LED light-bulb
- Electric motor
- 2 red wire leads
- 2 black wire leads

Per student:

- Pencil
- *Agriscience Notebook*

Procedure

Work with your partner to compare different sources of electrical power.

Part One – Battery Power

1. Turn on the LabQuest2.
2. Plug the energy sensor into Channel 1 and Channel 2 of the LabQuest2.
3. Connect the load terminals on the energy sensor with a wire lead.
4. On the LabQuest2, tap **Sensors**, choose **Zero**, and select **All sensors**.
5. Disconnect the wire from the load terminals.
6. Place the D size battery into the battery case.
7. Review Figure 1 displaying the battery and energy sensor connections. Attach a red wire to the positive side of the battery case.

8. Attach the other end of the red wire to the red source terminal on the energy sensor.
9. Attach a black wire to the negative side of the battery case.
10. Attach the other end of the black wire to the black source terminal on the energy sensor.
11. Record the potential volts, current, and power in Table 1 on *Activity 6.1.2 Student Worksheet*.
12. Review Figure 2 displaying a lamp added to the system.
13. Attach a black wire lead to the black load terminal and a red wire lead to the red load terminal.
14. Attach an incandescent light bulb into the lamp base.
15. Connect the other end of the black wire lead to the negative side of the incandescent lamp.
16. Connect the other end of the red wire lead to the positive side of the incandescent lamp.
17. Record the potential volts, current, and power in Table 1 on *Activity 6.1.2 Student Worksheet*.
18. Disconnect the lamp and replace it with the motor as seen in Figure 3.
19. Record the potential volts, current, and power in Table 1 on *Activity 6.1.2 Student Worksheet*.
20. Answer Part One analysis questions.

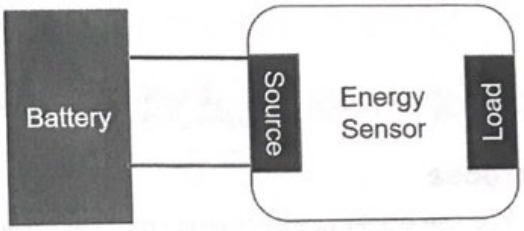

Figure 1. Battery and Energy Sensor

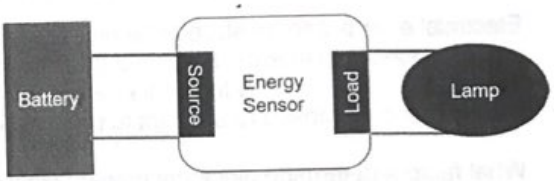

Figure 2. Lamp and Energy Sensor

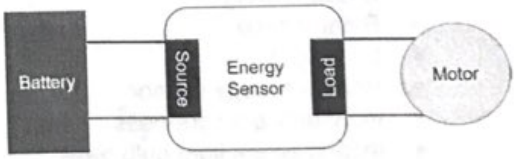

Figure 3. Motor and Energy Sensor

Part Two – Generating Power

1. Disconnect the battery from the energy sensor source terminals.
2. Attach the wire leads connected to the source terminals to the electric motor.
3. Replace the incandescent lamp connected to the energy sensor with the LED lamp. Connect the shorter lead on the LED to the black wire and the longer lead to the red wire.
4. Spin the axle of the motor clockwise with your fingers.
5. Observe the electrical readings on the LabQuest2 and the bulb while spinning the axle.
6. Answer Part Two analysis questions.

Conclusion

1. What are example sources of electrical energy?
   Solar, water, wind
2. How is electrical power different than potential voltage?
   power is being use, potential is waiting to be

Name_____

Activity 6.1.2 Student Worksheet

Table 1. ***Electrical Measurements*** Milliamperes Milliwatts

Appliance	Potential Volts	Current (Amperes)	Power (Watts)
Battery	1.3	.2 amps	0.1
Battery and bulb	1.22	94.1	114.8
Battery and motor	1.29	8.5	10.8

Part One Analysis Questions

- How much power was generated from the battery when it was not connected to the bulb or motor? What evidence supports this?
  There was 0 power because there was no work.
- Which appliance had the most electricity flowing through it?
  Bulb
- Did the bulb or motor use more energy? What evidence supports this?
  Bulb highest watts

Part Two Analysis Questions

- What happened to the bulb as you spun the axle?
  flickered / blinked
- What was powering the bulb?
  motor
- What was powering the motor?
  finger spinning the top
- What other types of energy sources could be used to power the motor?
  Wind, Solar, hydro