

Light Bulbs, Switches and Batteries

Name _____ Date _____

PURPOSE

Learn about electricity and how it works.

HOW TO DO THIS COURSE: Do the steps in order. Write your initials and the date on the sign-off line when you finish a step. Two lines means you get the step checked by another student or, if stated, by your teacher. Have them initial the second line. All written work is turned in to your teacher.

ESTIMATED TIME: 12 hours.

BOOK:

Light Bulbs, Switches and Batteries, Heron Books

A. WORK AND ENERGY

1. READ: *Light Bulbs, Switches and Batteries*, Chapter 1
Doing Work. _____
2. ACTIVITY: Sketch an example of energy being used to
do work. _____
3. ACTIVITY: Make a list of five things in the room that have
energy. For each one, explain what work that energy
is doing. _____

B. DIFFERENT KINDS OF ENERGY

1. READ: *Light Bulbs, Switches and Batteries*, Chapter 2 Different
Kinds of Energy, section "Heat Energy." _____

2. ACTIVITY: Look around the room and find things that have or give off heat energy. _____
3. READ: Chapter 2, section “Light Energy.” _____
4. ACTIVITY: Look around the room and find things that have or give off light energy. _____
5. READ: Chapter 2, section “Motion Energy.” _____
6. ACTIVITY: Look around the room and find things that have or give off motion energy. _____
7. READ: Chapter 2, section “Electrical Energy.” _____
8. ACTIVITY: Look around the room and find things that have or give off electrical energy. _____
9. ACTIVITY: Use objects to show electrons moving in a wire. _____
10. READ: Chapter 2, section “Summary.” _____

C. STORED ENERGY

1. READ: *Light Bulbs, Switches and Batteries*, Chapter 3 Stored Energy. _____
2. ACTIVITY: Use clay to show an example of stored energy.
Teacher pass. _____

D. ENERGY CHANGES

1. READ: *Light Bulbs, Switches and Batteries*, Chapter 4 Energy Changes, to the heading “Changing *What Kind* of Energy It Is.” _____
2. ACTIVITY: Think of a way to demonstrate energy moving from one thing to another. Show another student. _____

3. READ: Chapter 4, section “Changing *What Kind* of Energy It Is.”

4. ACTIVITY: Do each of the following with your teacher and explain how the energy changes from one kind to another.

Turn on a light.

Rub your hands together fast.

Slowly move a pencil from the floor to your desk.

Let the pencil drop back down to the floor.

Teacher pass.

5. READ: Chapter 4, section “Changing to *Stored Energy*” to the end of the chapter.

6. ACTIVITY: Draw two pictures that show stored energy.

7. ACTIVITY: Write a story about how stored energy can be changed to a different kind of energy to do work.

E. TINY PARTS OF THINGS

1. READ: *Light Bulbs, Switches and Batteries*, Chapter 5 Atoms.

2. ACTIVITY: Look on your desk for the smallest speck you can see. Even that speck is made of many, many atoms!

3. READ: Chapter 6 Electrons.

4. ACTIVITY:

Look at and touch some copper, some silver and another kind of metal.

Look at and touch some glass, some wood and some plastic.

5. ACTIVITY: Have some objects be atoms and other objects be electrons.
 - Show that an atom has electrons.
 - Show that an electron can get away from its atom.
 - Show that in a conductor some electrons are free and can move easily between the atoms.
 - Show that in an insulator all the electrons are stuck to atoms and can't get away.
 - Show a material that is a “not-very-good conductor”—some electrons can get away and move, but it's not so easy and the atoms tend to catch them and hold on. (You could also call it a “not-very-good insulator.”)

Teacher pass.

6. ACTIVITY: With another student, walk around the room and point out two objects that are insulators and two objects that are conductors.
7. ACTIVITY: Look at a piece of wire used to carry electrical energy. Notice the insulator on the outside and the conductor on the inside.

F. LIGHT BULBS, SWITCHES AND BATTERIES

1. READ: *Light Bulbs, Switches and Batteries*, Chapter 7
Light Bulbs.
2. ACTIVITY: Look at a clear light bulb and point out the glass, the wires and the filament.
3. ACTIVITY: Get a lamp with a light bulb in it. Turn it on and off a few times while looking at it.

4. ACTIVITY:

- Use objects to demonstrate how when a light bulb is shining it is because electrons in the filament bump into atoms and give them energy.
- Show that when the atoms get a lot of energy this way the filament gets hot and glows.

Teacher pass.

5. READ: Chapter 8 Batteries.

6. ACTIVITY:

- Look at a battery. Find the “+” terminal and the “-” terminal.
- Look at a socket for a small light bulb and find where wires can be attached to connect it to the battery.

7. READ: Chapter 9 Circuits.

8. ACTIVITY:

- Use objects to demonstrate a circuit with a bulb in it. Show how a *lot* of electrons are pushed slowly through a circuit, from the battery into the wires, through the wires, socket and light bulb, and from the wire into the battery.
- Now show a short circuit and why a short circuit is bad.

9. ACTIVITY: Do Activity “Make a Circuit.”

10. READ: Chapter 10 Switches.

11. ACTIVITY:

- Look at a knife switch, and open and close it.
- Notice where wires can be attached to the switch.

12. ACTIVITY: Find three different sorts of switches that operate lights or radios or other things. Turn each of them on and off. _____

13. ACTIVITY: Use objects to demonstrate what the electrons do when the switch is open (light off) and when it is closed (light on). _____

14. ACTIVITY: Do Activity “Use a Switch.” _____

G. A LAW OF ELECTRONS

1. READ: *Light Bulbs, Switches and Batteries*, Chapter 11 Voltage. _____

2. ACTIVITY:

Put your hand against another student’s hand. Push against his or her hand. Does it move?

Pretend that you are the battery, your hand is voltage and the other student’s hand is an electron. Show higher voltage and lower voltage.

Explain to the other student what voltage is. _____

3. ACTIVITY: Do Activity “Use Different Batteries.” Show step 3 and step 5 to your teacher. **Teacher pass.** _____

4. ACTIVITY: Explain in writing how changing voltage changes the brightness of the bulb. _____

5. READ: Chapter 12 Resistance. _____

6. ACTIVITY: Pretend you are an electron and your classroom is a wire.
- Walk from one end of your classroom to the other. Did you have to do any work?
 - Now let's add some resistance. Have a couple of students pretend to be atoms and stand in your way when you try to walk across the room. Did you have to do any work to get by them?
 - Explain to your teacher how resistance makes electrons do work.

Teacher pass.

7. ACTIVITY:

- Use objects to demonstrate to another student what resistance is (show electrons and atoms).
- Show high resistance and low resistance.

8. ACTIVITY:

- In writing explain why the wires you use to connect your circuit should have low resistance.
- Now explain why the filament in a light bulb has to have high resistance. What would happen if the filament did not have high resistance?

9. ACTIVITY: Draw a picture of two circuits. Show one circuit having more resistance than the other.

10. ACTIVITY: Do Activity "Try Different Resistances."

11. READ: Chapter 13 Current.

12. ACTIVITY: Use objects to demonstrate to another student what current in a wire is. Show lots of electrons, with each electron only moving a short distance.

13. ACTIVITY: Look back at Activity “Use Different Batteries.” Explain to your teacher what happened to the current in step 3 as batteries were added. If you like, you can repeat the activity. **Teacher pass.** _____
14. READ: Chapter 14 An Important Law About Electrons to heading “Voltage, Current and Resistance.” _____
15. ACTIVITY: Write down three different natural laws you can think of. _____
16. READ: Chapter 14, section “Voltage, Current and Resistance.” _____
17. ACTIVITY: Use clay to demonstrate an example of Ohm’s law. Be sure to show changes in voltage and resistance and how these affect the current. **Teacher pass.** _____

H. FINAL ACTIVITIES

1. ACTIVITY: Do Activity “Change the Resistance.” **Teacher pass.** _____
2. ACTIVITY: Do Activity “Change the Voltage.” **Teacher pass.** _____
3. ACTIVITY: Do Activity “Run a Motor.” **Teacher pass.** _____

I have completed the steps of this course. I understand what I studied and can use it.

Student _____ Date _____

The student has completed the steps of this course and knows and can apply what was studied.

Teacher _____ Date _____

The student has passed the exam for this course.

Examiner _____ Date _____

FOR THE TEACHER

ADDITIONAL RESOURCES

Exam and answers

Materials list