Name: _____ Group: _____ Date: _____

Tech labs

See note to teachers or lab technicians at the end of this lab.

TECH 15 **ANSWER KEY**

Circuit control

PROGRAMS: ST, EST, AST
LAB TYPE: Observation
CONCEPT: Control
STUDENT BOOK: Chapter 14, page 469
TOOLBOX: Pages 77 and 79

GOAL

Observe several types of switches in electrical circuits.

OBSERVATION CRITERIA

1. What purpose do control components serve in electrical circuits?

They are used to open and close electrical circuits.

2. What is the difference between an open circuit and a closed circuit?

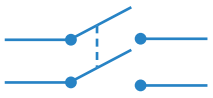
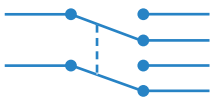
Current cannot flow through an open circuit, but it can flow through a closed circuit, in a continuous loop.

3. Complete the table of switch types below with the following information:

a) the number of contacts opened or closed at a time

b) the number of paths that electrons may take

c) the symbol for the switch

Type of switch	Number of contacts opened or closed at a time	Number of possible paths for electrons	Symbol
Single-pole, single-throw	*1*	*1*	
Single-pole, double-throw	*1*	*2*	
Double-pole, single-throw	*2*	*1*	
Double-pole, double-throw	*2*	*2*	

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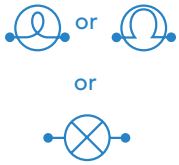
4. Draw the symbol for each of the circuit components below.

Electric cell ("battery")	Source of direct current (DC)	Electrical wire	Light bulb
			

MATERIALS

- 4 workstations, each with a different electrical circuit containing light bulbs

PROCEDURE

For each workstation:

1. Make sure the DC power supply is working if the electrical circuit is powered by such a source.
2. Observe the number of possible switch positions that allow the bulb or bulbs to light up. Record your observations.
3. For each of these positions, observe the number of contacts that open or close simultaneously. To do this, count the number of light bulbs that light up or go out at the same time. Record your observations.
4. Study the electrical circuit. Draw the circuit diagram.
5. Repeat steps 1 to 4 at each workstation.
6. Put away the materials.

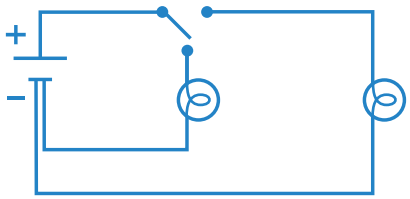
OBSERVATIONS

Workstation 1

1. How many switch positions allow one or more bulbs to light up? *2*

2. How many bulbs light up or go out at the same time? *1*

3. Draw the circuit diagram in the space below.



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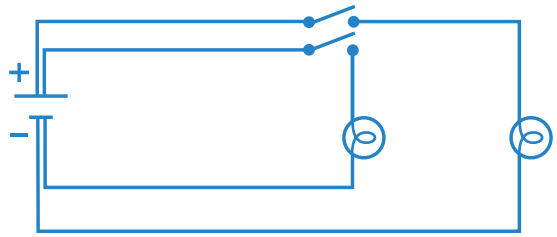
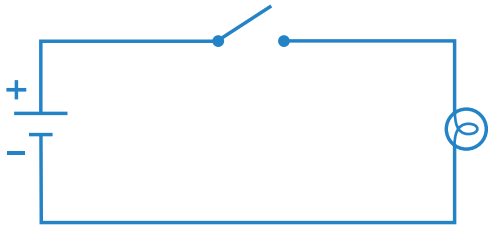
Workstation 2

1. How many switch positions allow one or more bulbs to light up? *1*
2. How many bulbs light up or go out at the same time? *2*
3. Draw the circuit diagram in the space below.



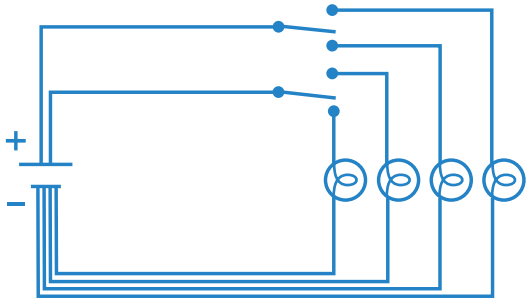
Workstation 3

1. How many switch positions allow one or more bulbs to light up? *1*
2. How many bulbs light up or go out at the same time? *1*
3. Draw the circuit diagram in the space below.



Workstation 4

1. How many switch positions allow one or more bulbs to light up? *2*
2. How many bulbs light up or go out at the same time? *2*
3. Draw the circuit diagram in the space below.



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REFLECTING ON YOUR OBSERVATIONS

1. According to your observations, what type of switch was installed in the circuit at:

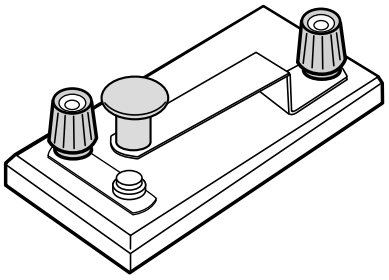
a) Workstation 1? *A single-pole, double-throw switch*

b) Workstation 2? *A double-pole, single-throw switch*

c) Workstation 3? *A single-pole, single-throw switch*

d) Workstation 4? *A double-pole, double-throw switch*

2. Look at the illustration below. What type of switch is it?



It is a single-pole, single-throw switch.

3. Have your observations helped you understand the various types of switches? Explain your answer.

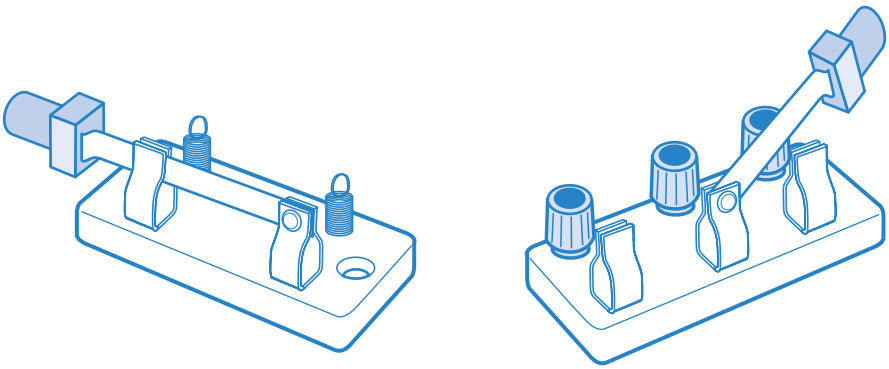
Answers will vary.

4. How could you improve the protocol for this lab?

Answers will vary.

NOTE TO TEACHERS OR LAB TECHNICIANS

– The switches used in this lab resemble those shown below. You can obtain switches like these at specialty suppliers of electronic or physics lab equipment.



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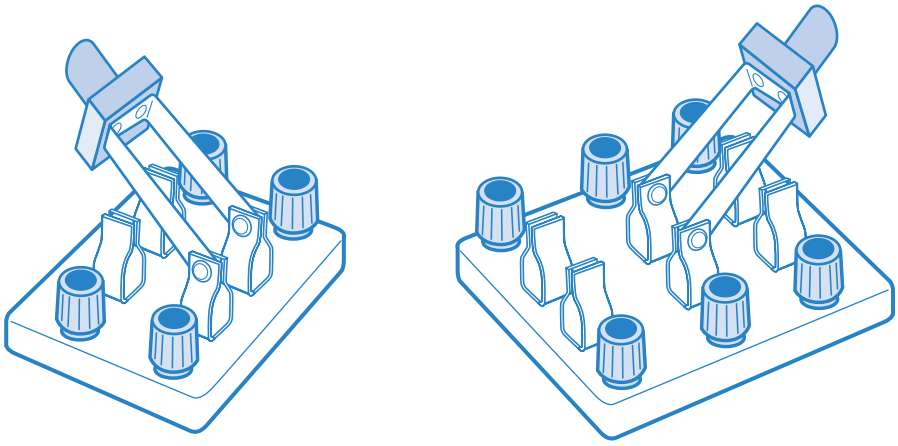

– For this lab, you can have students work in teams of two. For a class of 32 students, you will thus need four workstations of each type. Student teams will take turns observing four different workstations.

Materials for Workstation 1, with a single-pole, double-throw switch
- 9-V battery or other source of direct current
- 2 6-V light bulbs, each mounted on a plastic base
- single-pole, double-throw knife switch
- 5 electrical wires with alligator clips

Materials for Workstation 2, with a double-pole, single-throw switch
- 9-V battery or other source of direct current
- 2 6-V light bulbs, each mounted on a plastic base
- double-pole, single-throw knife switch
- 6 electrical wires with alligator clips

Materials for Workstation 3, with a single-pole, single-throw switch
- 9-V battery or other source of direct current
- 6-V light bulb mounted on a plastic base
- single-pole, single-throw knife switch
- 3 electrical wires with alligator clips

Materials for Workstation 4, with a double-pole, double-throw switch
- 9-V battery or other source of direct current
- 4 6-V light bulbs, each mounted on a plastic base
- double-pole, double-throw knife switch
- 10 electrical wires with alligator clips

– See pages 2–3 of the answer key for the circuit diagrams for each workstation.