Name: _____ Group: _____ Date: _____

Tech labs

TECH 13

Electrical functions

PROGRAMS:	ST, EST, AST
LAB TYPE:	Observation
CONCEPT:	Electrical functions • power supply, conduction, insulation and protection • typical controls, transformation of energy
STUDENT BOOK:	Chapter 14, page 462
TOOLBOX:	Pages 77 and 79

GOAL

Observe the various components of a flashlight to determine their electrical functions.

OBSERVATION CRITERIA

1. In electrical engineering, what is meant by an *electrical function*?

_____

_____

_____

2. There are various types of electrical functions. Complete the table below by defining the main types of electrical functions and by giving at least one example of a component for each type.

Electrical function	Definition	Example
Power supply		
Conduction		

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(continued)

Electrical function	Definition	Example

3. Some electrical circuits contain components called *resistors*.

a) What role do resistors play in a circuit?

_____

_____

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b) Electrical resistance is indicated by a colour code. In the table below, write the corresponding values for each colour and indicate which bands represent the different values.

Colour	Values		
	Digit Bands _____ and _____	**Multiplier** Band _____	**Tolerance** Band _____
Black			
Brown			
Red			
Orange			
Yellow			
Green			
Blue			
Violet			
Grey			
White			
Gold			
Silver			

4. Draw the symbols for the following circuit components:

a) battery (multicell)	**b)** source of alternating current	**c)** single-pole switch
d) electrical wire	**e)** light-emitting diode (LED)	**f)** resistor or electrical appliance

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5. In the table below, write the following information for each type of switch:

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

b) the number of possible paths for the electrons

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

MATERIALS

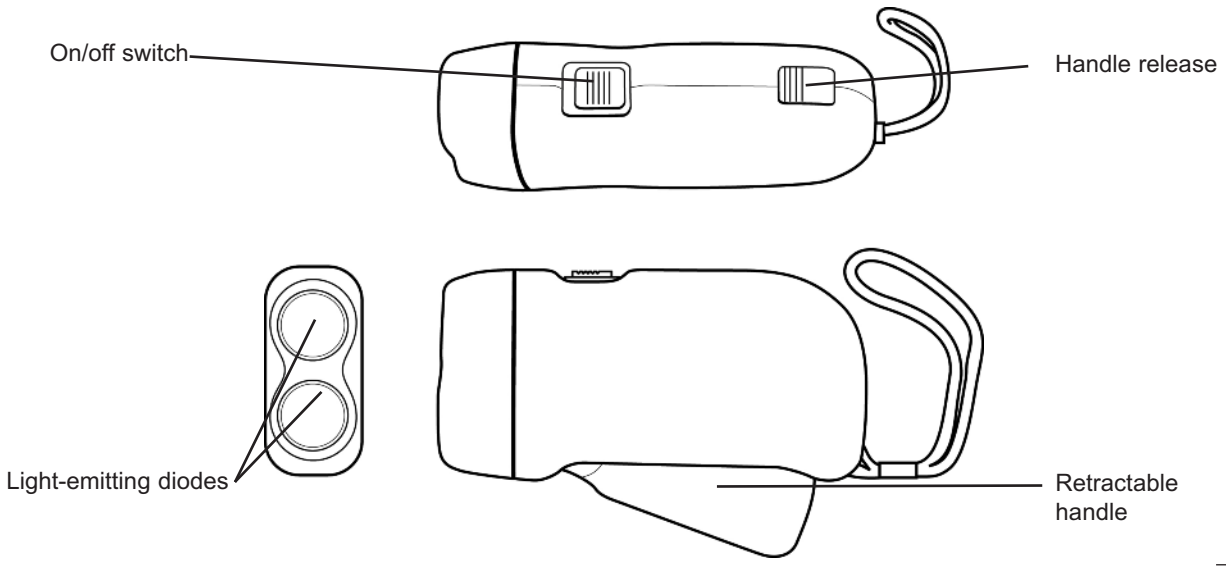
- rechargeable flashlight, intact (flashlight 1)
- rechargeable flashlight, disassembled (flashlight 2)
- rechargeable flashlight with part of its housing removed to show the inner parts assembly (flashlight 3)
- screwdriver

Note: The flashlight illustrated in this lab is a hand-press LED flashlight.

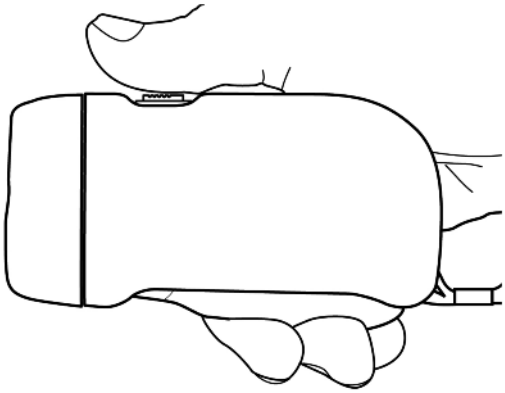
PROCEDURE

Part A: Observing the operation of the light-emitting diodes

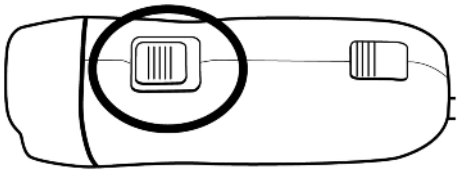
1. Find the following parts on the flashlight: on/off switch, light-emitting diodes (LEDs), handle release and retractable handle (for charging the flashlight).

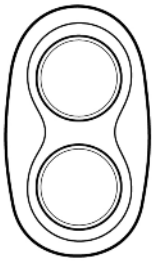


2. Slide the on/off switch toward the back of the flashlight (away from the LEDs).
3. Press the handle release to unlock the handle if necessary.
4. Charge the flashlight by squeezing the handle several times, letting it return to its original position each time. Observe and record the reaction of the LEDs.



5. Slide the on/off switch toward the front of the flashlight. Observe and record the reaction of the LEDs.





6. Squeeze the handle again. Observe and record any change in the luminous intensity of the LEDs.
7. Slide the on/off switch back toward the back of the flashlight and lock the handle.

Part B: Observing the electrical circuit

1. Observe flashlight 2 and its parts. Find where each part fits into the flashlight by studying flashlight 3 (in which only part of the housing has been removed).
2. Find the magnet, in its compartment, among the disassembled parts. Remember that a moving magnet can induce alternating electric current.

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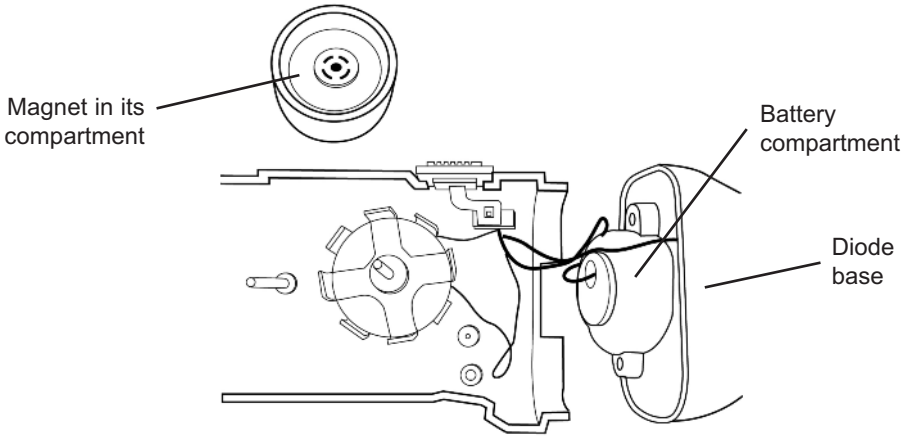
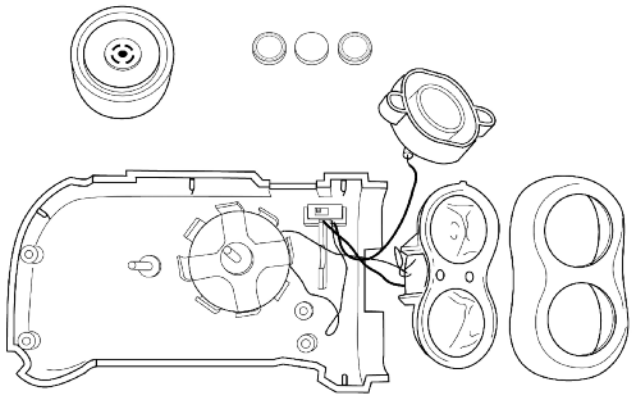
3. Find the battery compartment in flashlight 2.

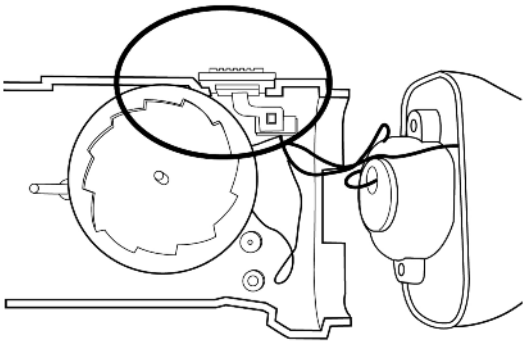


4. Unscrew the battery compartment and carefully detach it from the diode base.
5. Study the electrical circuit of the flashlight and choose the diagram on page 8 that best illustrates this circuit.

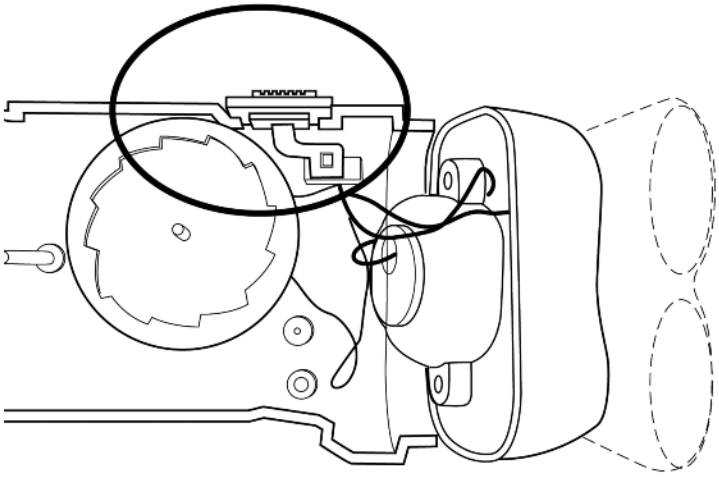


EST AST **Part C: Observing the LEDs when the current direction is reversed**

1. Look inside the battery compartment and observe the direction in which the batteries have been inserted.
2. Carefully remove the batteries and reinsert them in the opposite direction.
3. Screw the battery compartment onto the diode base.
4. Slide the on/off switch forward gently, toward the diode base.
5. Observe whether the LEDs light up.
   Record your observations.



6. Slide the on/off switch back to its original position.
7. Unscrew the battery compartment from the diode base.
8. Replace the batteries in their original position.
9. Screw the battery compartment back onto the diode base.
10. Gently slide the on/off switch forward again.
11. Observe whether the LEDs light up. Record your observations.



12. Slide the on/off switch back to its original position.

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Part D: Observing the colour bands on the resistor

1. Find the resistor in the flashlight circuit.
2. Observe the colour of each band. Record your observations.
3. Put away the materials.

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OBSERVATIONS

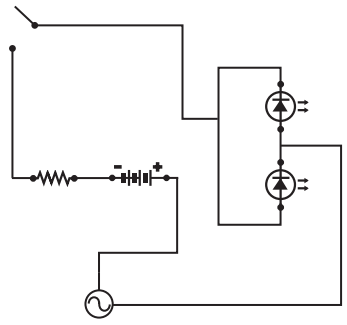
Part A: Observing the operation of the light-emitting diodes

On/off switch position	LED reaction
Toward the back of the flashlight	
Toward the front of the flashlight, without squeezing the handle	
Toward the front of the flashlight, while squeezing the handle	

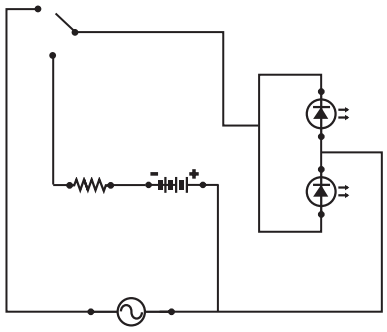
Part B: Observing the electrical circuit

Check the box next to the diagram representing the electrical circuit in the flashlight.

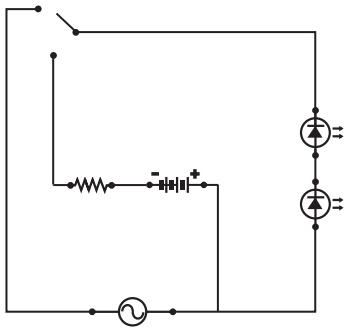
A ☐



B ☐



C ☐



EST

Part C: Observing the LEDs when the current direction is reversed

AST

Battery direction	LED reaction
Reversed position	
Original position	

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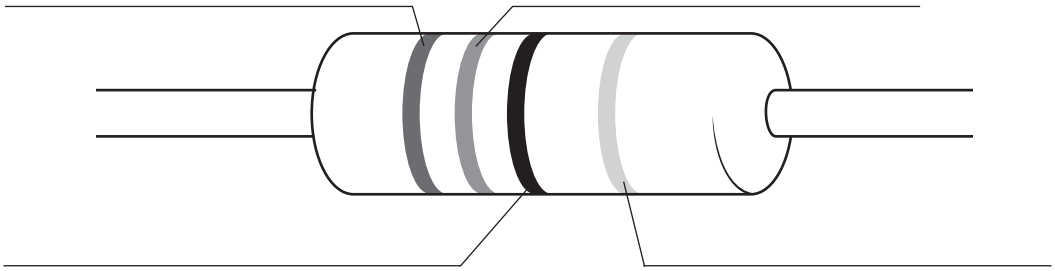
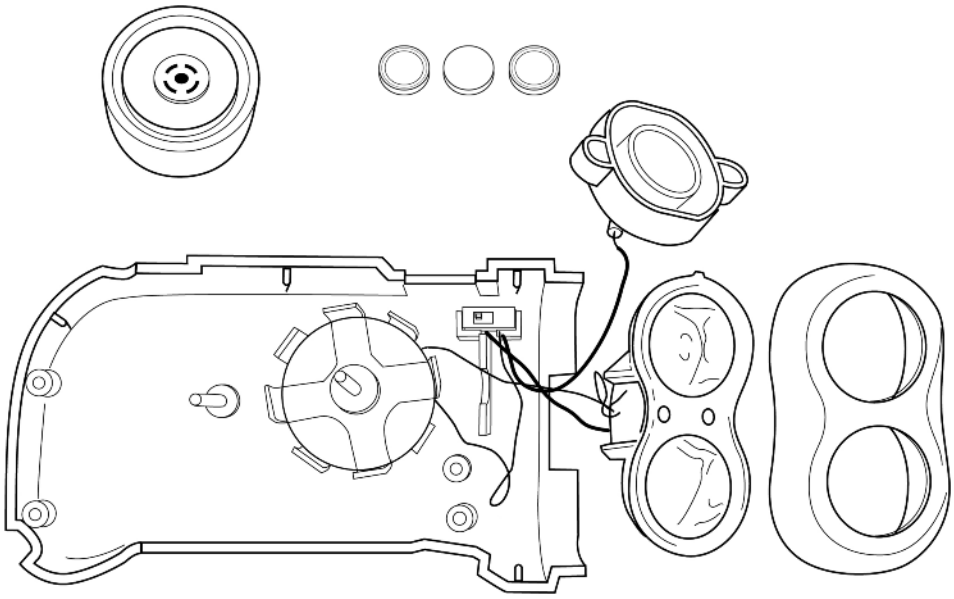
EST AST

Part D: Observing the colour bands on the resistor



REFLECTING ON YOUR OBSERVATIONS

1. Observe the components of the flashlight illustrated opposite. In the table below, write the name and the electrical function of each component indicated.



Component	Name	Electrical function
1		
2		
3		
4		
5		
6		

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2. According to your observations, does the flashlight have more than one power supply? If so, name these power sources.

_____

_____

_____

_____

EST AST **3.** What is the resistance value of the flashlight? Show your calculations based on the band colours.

Band 1: _____

Band 2: _____

Band 3: _____

Band 4: _____

The resistance value is therefore _____

EST AST **4.** According to your observations in Part A:

a) Is it possible to turn on the flashlight by sliding the on/off switch to either of the two possible positions?

_____

_____

_____

b) How many different paths can electric current take to make the flashlight work?

_____

c) Does the on/off switch allow electric current to flow along only one path or along more than one path at a time? Explain your answer.

_____

_____

_____

_____

_____

_____

_____

d) Based on your answers to the three preceding questions, what type of switch controls the flashlight circuit?

_____

_____

_____

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EST AST **5.** Given that incandescent bulbs light up regardless of the current direction and that LEDs light up only when current flows in a specific direction, explain why the flashlight components that emit the light must be diodes rather than bulbs. Base your answer on the observations you made in Part C.

EST AST **6.** How could you make the design and operation of this flashlight more environmentally friendly?