Model #: EB89

STEAM

ELECTRONIC BLOCKS

LESSON PLANS

Hamilton Buhl

WARNING: Always check your wiring before turning on a circuit. Never leave a circuit unattended while the batteries are installed. Never connect additional batteries or any other power sources to your circuits. Discard any cracked or broken parts.

ADULT SUPERVISION: Because student's abilities vary so much, teachers should exercise discretion as to which experiments are suitable and safe (the instructions should enable supervising adults to establish the experiment's suitability for the student). Make sure students read and follow all of the relevant instructions and safety procedures, and keep them at hand for reference.

This product is intended for use by teachers and students who have attained sufficient maturity to read and follow directions and warnings.

Do not modify any of the parts, as doing so may disable important safety features in them and could put a student at risk of injury and may void the warranty.

BATTERIES:

- Use only 1.5V "AA" batteries (not included).
- Insert batteries with correct polarity.
- Non-rechargeable batteries should not be recharged, and rechargeable batteries should only be charged under adult supervision (Never recharge batteries while they are in the product).
- Do not mix old and new batteries.
- Do not connect batteries or battery holder in parallel.
- Do not mix alkaline, standard (carbon-zinc), or rechargeable (nickel-cadmium) batteries.
- Do not leave batteries inside the battery compartment if unused for a long period of time.
- Do not short circuit the battery terminals.
- Never throw batteries in a fire.
- Batteries are harmful if swallowed, so keep away from small children.

WARNING:

MOVING PARTS: Do not touch the motor or fan during operation. Do not lean over the motor during operation. Do not launch the fan at people, animals, or objects. Eye protection is recommended.

SHOCK HAZARD: Never connect the components with electrical outlets.

CHOKING HAZARD: Small parts. Not intended for use by children under 3 years old. Recommended for use by children over 8 years old.

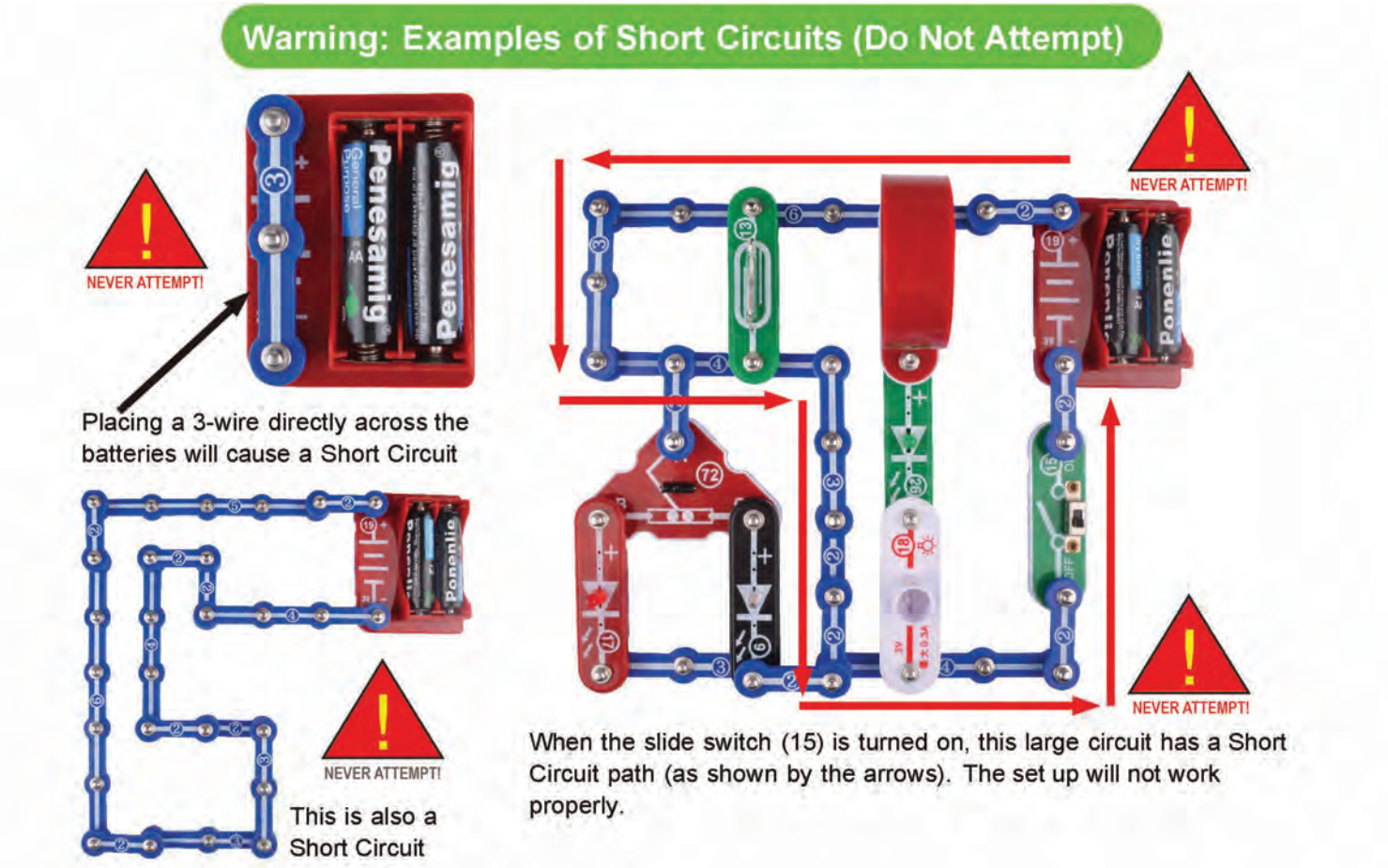


Table of Contents

Parts List. 2-3
Introduction to Components 4-6

Lesson 1: Basic Electrical Circuit

1. Lamp 7
2. Magnet-Controlled Glow Fan 7
3. Glow Flying Saucer 8
4. Color Fan. 8
5. LED 9
6. One Direction for LED 9
7. Red and Green LEDs in Parallel 9
8. Red and Green LEDs in Series 9
9. Lamp and LEDs in Series 10
10. Lamp and LEDs in Parallel 10
11. Lamp and Motor in Series 10
12. Loads Controlled Separately 11
13. Magnet-Controlled Alternating Light 11
14. Magnet-Controlled Variable Speed Fan 11
15. “AND” Gate 12
16. “OR” Gate 12
17. “NOT” Gate 12
18. Color Light 13
19. Blinking LED 13
20. The Motor Sound. 14
21. Spinning the Motor in Both Directions 14
22. Vibration Switch. 15
23. Light-Controlled LED 15
24. Water-Controlled LED 15
25. Infrared Detector of LED 16
26. Infrared Detector of Speaker 16
27. Tilt Sensor 16
28. Tilt Sensor 2 16

Lesson 2: Music Doorbell Circuits

1. Musical Doorbell 17
2. Vibration Musical Doorbell. 17
3. Magnet-Controlled Musical Doorbell 17
4. Voice-Controlled Musical Doorbell 17
5. Light-Controlled Musical Doorbell 18
6. Motor-Controlled Musical Doorbell 18
7. Water-Controlled Musical Doorbell 18
8. Magnet-Controlled Musical Doorbell 2 18
9. Sound-Controlled Motor Doorbell 19
10. Flashing Lamp. 19
11. Flashing LED. 19
12. Light and Sounds Musical Doorbell. 20
13. Red Light Musical Doorbell 20
14. Light-Controlled Sounds 21
15. Hand-Controlled Intermittent Musical Doorbell 21
16. Magnet-Controlled Intermittent Musical Doorbell 21
17. Infrared-Controlled LED 22
18. Tilt Music 22

Lesson 3: Alarm Circuit

1. Police Siren Sounds 23
2. Magnet-Controlled Machine Gun Sounds . . 23
3. Hand-Controlled Fire Engine Sounds 23
4. Ambulance Sounds 23
5. Alarm Lights and Sounds 23
6. Light-Controlled Fire Engine Sounds 24
7. Magnet-Controlled Police Siren Sounds . . . 24
8. Tilt Alarm 1 25
9. Tilt Alarm 2. 25

Lesson 4: Sound Effects

1. Sound Effects 26
2. Vibration Effects 26
3. Magnet-Controlled Effects. 26
4. Light-Controlled Sound and Light Effects . . 26
5. Touch-Controlled Sound and Light Effects . 26
6. Tilt Sensor 27
7. Infrared-Controlled Sound Effects. 27

Lesson 5: Maze Challenges

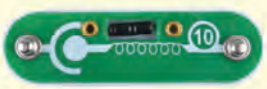
1. Maze Challenge 28
2. Maze Challenge – Color LED 29
3. Maze Challenge – Light Motor 29
4. Maze Challenge – Music. 30
5. Maze Challenge – Music 2 30
6. Maze Challenge – Police Siren 31
7. Maze Challenge – Sound Effects 31

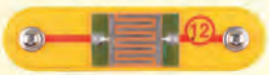
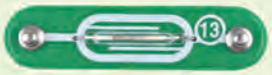
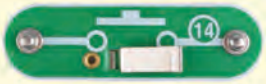
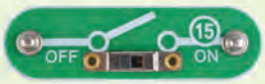
Lesson 6: FM Radio

1. FM Radio. 32
2. Light and Sound FM Radio 32

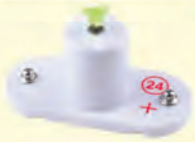
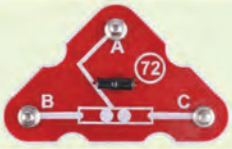
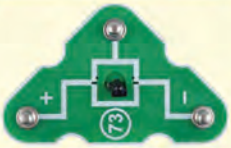
Think! Answers 33

Parts List

ID	Name	Image	Qty
1	1-Wire		5
2	2-Wire		8
3	3-Wire		4
4	4-Wire		2
5	5-Wire		1
6	6-Wire		1
8	FM Module		1
9	Color LED		1
10	Vibration Switch		1
11	Whistle Chip		1

ID	Name	Image	Qty
12	Touch Plate		1
13	Reed Switch		1
14	Press Switch		1
15	Slide Switch		1
16	Photoresistor		1
17	Red LED		1
18	3V Lamp		1
19	Battery Holder -uses 2 1.5V "AA" (not included)		2
20	Speaker		1
21	Music Integrated Circuit		1

Parts List

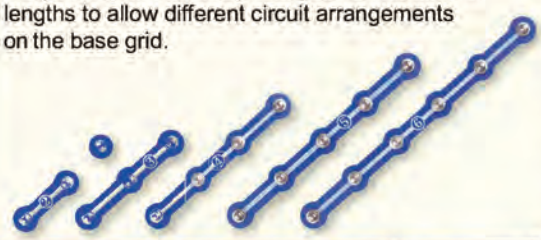
ID	Name	Image	Qty
22	Alarm Integrated Circuit		1
23	Sound Effects Integrated Circuit		1
24	Motor		1
26	Green LED		1
71	Light Motor		1
72	Tilt Switch		1
73	Infrared Receiver		1
78	Maze Wand		1
	Metal Wire		1
	Green Jumper Wire		1

ID	Name	Image	Qty
	Red Jumper Wire		1
	Magnet		1
	Glow Fan Blade		2
	Base Grid		1
	Fiber Optic Tree		1
	Light Post		1
	Mounting Base		1
	Large Metal Ring		1
	Small Metal Ring		1

Introduction to Components

Wires (ID #1-6)

The blue wires are used to connect components. They transport electricity. They come in different lengths to allow different circuit arrangements on the base grid.



Red & Green Jumper Wires

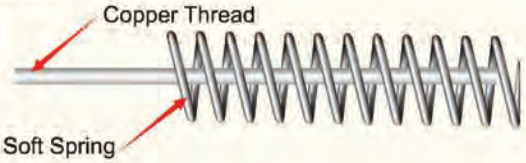
The red and green jumper wires make flexible connections. They also are used to make connections off the base grid. Wires transport electricity just like pipes are used to transport water.

FM Module (ID #8)

Contains an integrated FM radio circuit that connects power and speaker, which allows play of FM radio (only certain radio stations with a strong signal can be detected with the FM module).

Vibration Switch (ID #10)

One side of the vibration switch connects to a spring; the other side connects to a wire through the spring. The spring bounces to connect or disconnect the circuit.

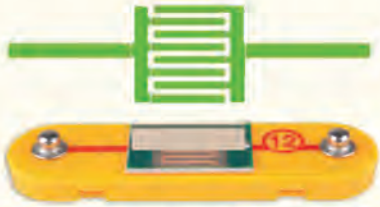


Whistle Chip (ID #11)

The whistle chip contains two thin plates. When an electrical signal is applied across them, they will stretch slightly in an effort to separate (like two magnets opposing each other). When the signal is removed, they come back together. If the electrical signal applied across them is changing quickly, then the plates will vibrate. These vibrations create variations in air pressure that your ears hear, just like sound from a speaker.

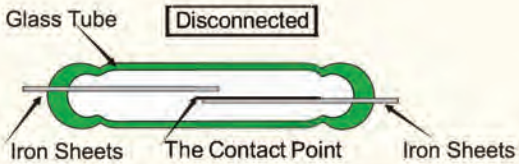
Touch Plate (ID #12)

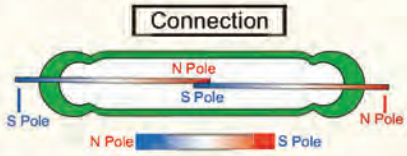
On touch plate ID #12, when two circuit lines are not connected but are near each other, and when a conductive object is used, the circuits will flow.



Reed Switch (ID #13)

The principle of the reed switch is when two separated iron sheets in a hermetic glass tube gets connected by magnetic force that will generate the circuit flow. Once the magnetic force is removed, it will return to its original state.





Introduction to Components

Press Switch (ID #14)

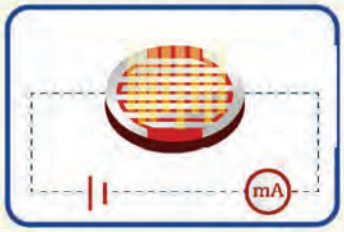
When copper press switch is pressed, the circuit is connected. If not pressed, the circuit is not connected.

Slide Switch (ID #15)

The slide switch connects (ON) or disconnects (OFF) the wires in a circuit. When ON it has no effect on circuit performance.

Photoresistor (ID #16)

The Photoresistor is a light-sensitive resistor, its value changes from total darkness to about 1000Ω when a bright light shines on it.

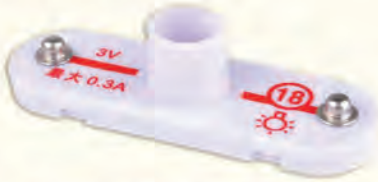


Three LEDs: (ID #9, #17, #26)

The white (ID #9), red (ID #17), and green (ID #26) LEDs are all light emitting diodes, like special one-way light bulbs. In the "forward" direction (indicated by the arrow), electricity flows if the voltage exceeds a turn-on threshold, and the light will turn on.

Lamp (ID #18)

Lamp ID #18 contains a bulb that will light when an electric current passes through it. Voltage above the bulb rating can burn out the bulb.



Battery Holder (ID #19)

The batteries produce an electrical voltage using a chemical reaction. Think of this as electrical pressure pushing electricity through a circuit, just like a pump pushes water through pipes. These are low voltage components and are safe to use.

Speaker (ID #20)

The speaker converts electricity into sound by making mechanical vibrations. These vibrations create variations in air pressure, which travels across the room. You "hear" sounds when your ears feel these air pressure variations.

Introduction to Components

Integrated Circuits (ID #21, #22, #23)

Pre-recorded music clips are in an integrated circuit (IC) that you assemble. When connecting several external electronic devices, you can hear music or other sounds.

Motor (ID #24)

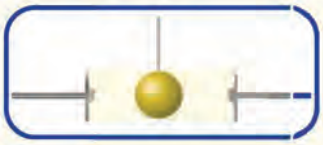
The motor converts electricity into mechanical motion. An electrical current will turn the shaft, the motor blades, and the fan blade (if it is on the motor). The motor can turn in either direction, clockwise or counterclockwise.

Light Motor (ID #71)

The light motor is a motor with an LED circuit mounted on its shaft. The motor converts electricity into mechanical motion and will spin the shaft. If the light motor electricity is transported through the motor shaft to power an LED circuit, the LEDs mounted on the blade will light while spinning.

Tilt Switch (ID #72)

The tilt switch has a ball that can roll to make connections between the center and one of the sides.



Infrared Receiver (ID #73)

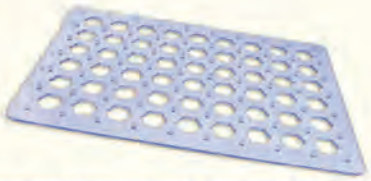
The Infrared module is a miniaturized infrared receiver circuit for remote control.

Glow Fan

Place the fan on top of the motor shaft and secure properly in place.

Base Grid

The base grid is a platform for mounting parts and wires. It functions like the printed circuit boards used in most electronic products.



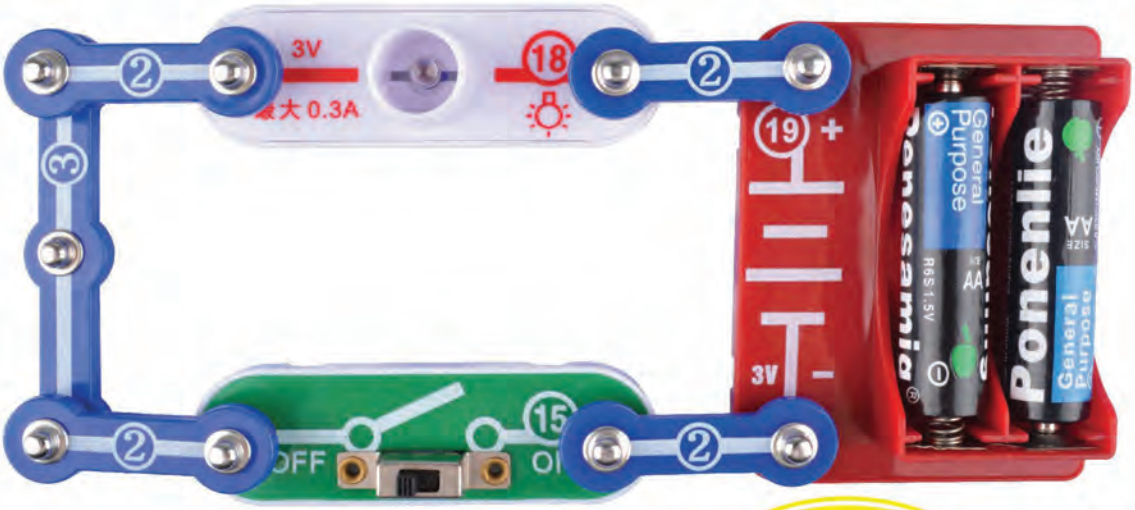
Metal Wire and Maze Wand

Use the Maze Wand to bend the metal wire into any shape you want.

Fiber Optic and Tree Light Post

The fiber optic and tree light post can be mounted on the LED modules (ID #9, #17, #26) to enhance their lighting effects (must be mounted using the mounting base).

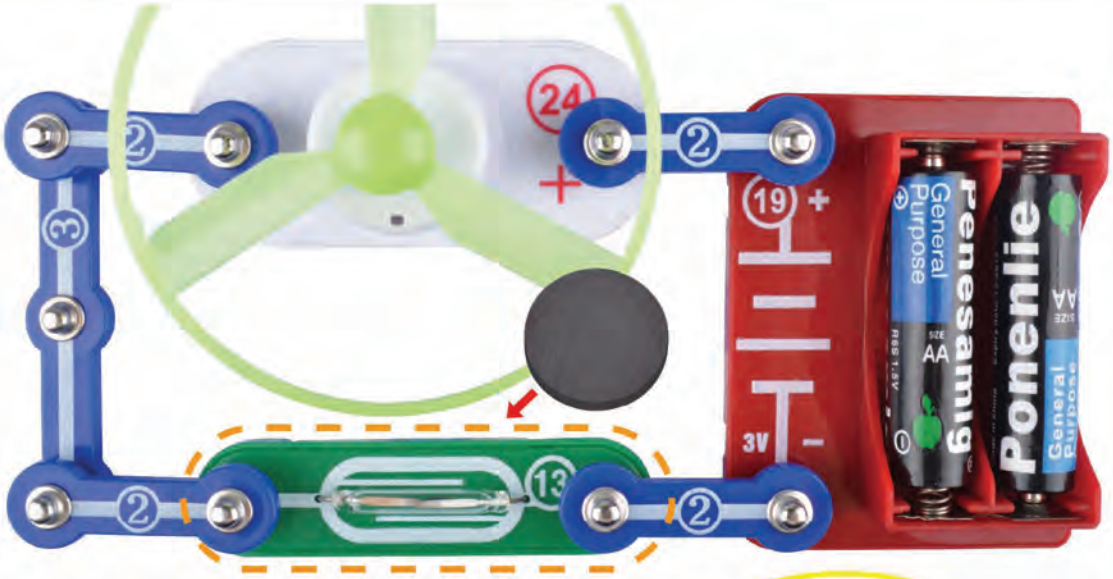
Lesson 1: Basic Electrical Circuit



TRY THIS!
Can you build the lamp after removing the 2 wires?

1.Lamp

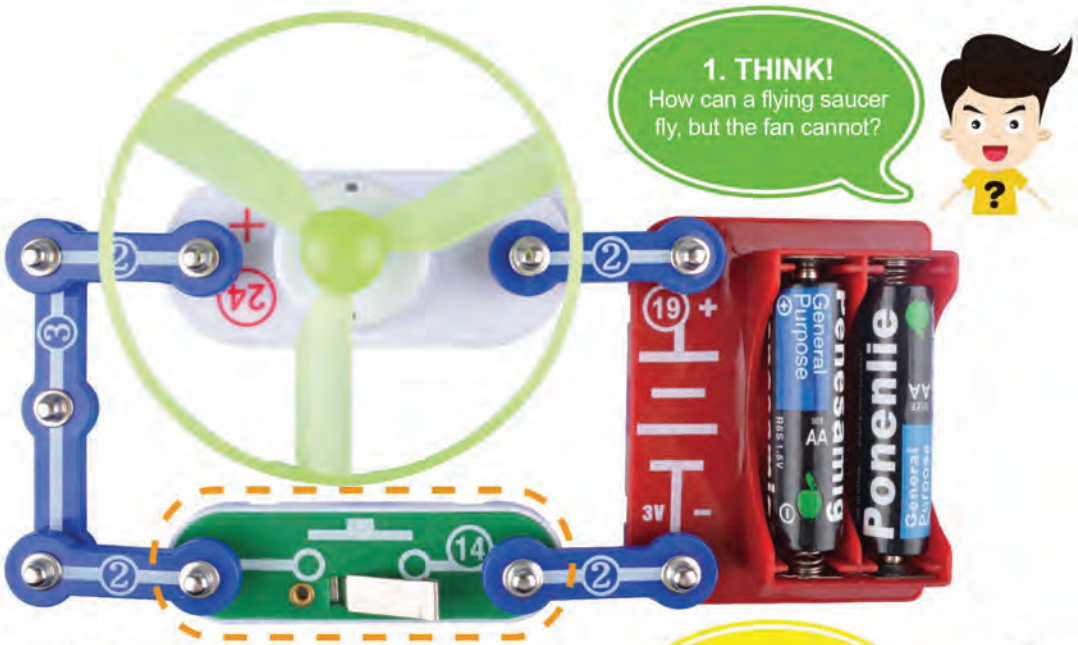
Turn on the slide switch (15), the lamp (18) lights up.



TRY THIS!
Replace reed switch 13 with press switch 14 or slide switch 15.

2. Magnet-Controlled Glow Fan

Place the magnet close to the reed switch (13). The motor (24) will spin. Remove the magnet and the motor (24) will stop spinning. The glow fan glows in the dark.



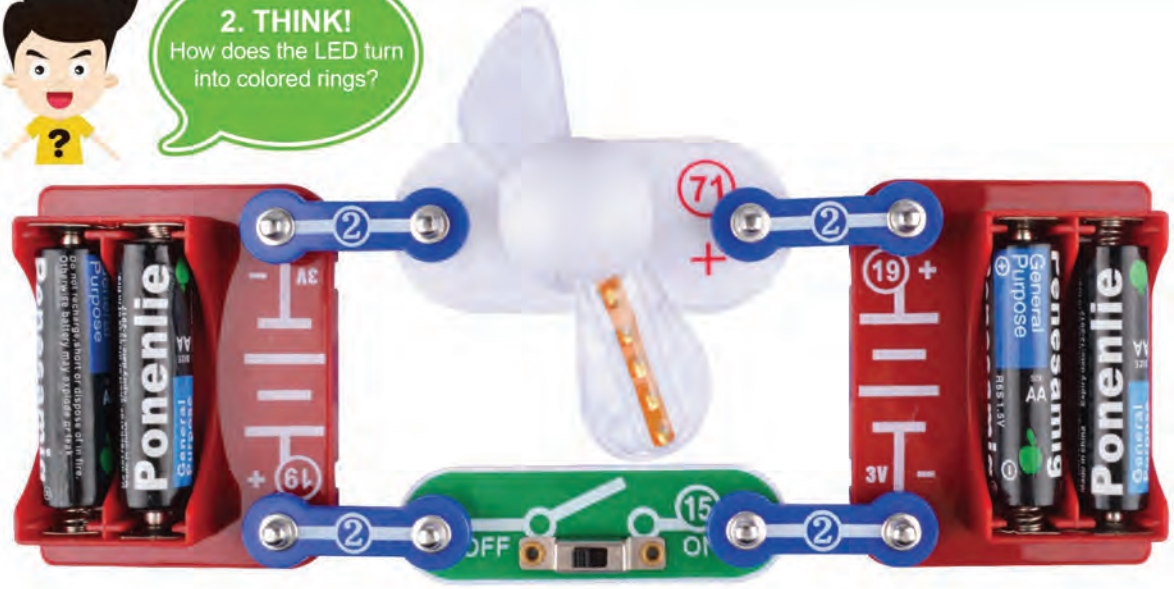
3. Glow Flying Saucer

Press the Press switch 14 until the motor 24 reaches full speed, then release the press switch 14, the fan blade will lift-off and float through the air like a flying saucer. The glow looks best in a dimly lit room.

TRY THIS!
Replace Press switch 14 with Reed switch 13.

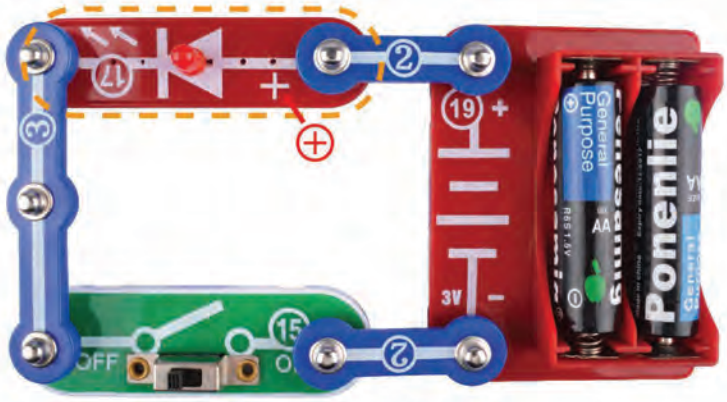
WARNING: Moving parts. Do not touch the motor or fan during operation. Do not lean over the motor. Fan will not lift-off until switch is released. Do not launch the fan at people, animals, or objects. Eye protection is recommended.

2. THINK!
How does the LED turn into colored rings?



4. Color Fan

Turn on the slide switch 15. The light motor 71 starts to spin and shows colorful lights. For best effects, dim the room lights.



5.LED

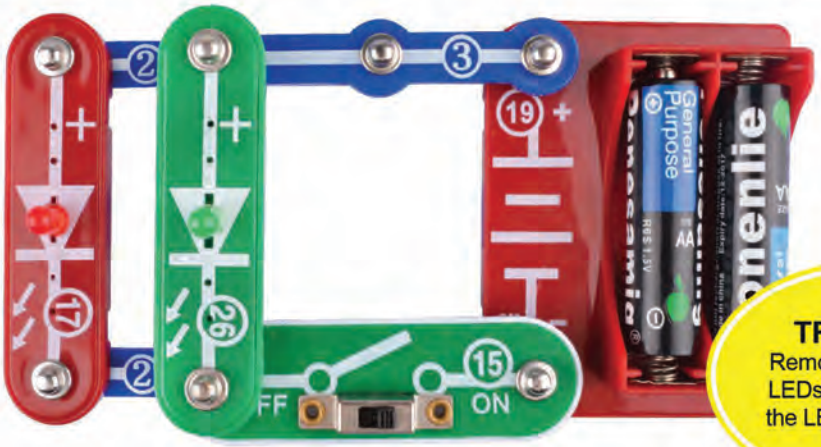
Turn on the slide switch 15, and the LED 17 lights up.

3. THINK!
Why won't the LEDs light up when you exchange the two polarities?

6. One Direction for LED

Reverse the polarity on the LED 17 so the positive (+) on the LED 17 is near to the 3-wire.Then, turn on the slide switch 15; the LED will not light.

TRY THIS!
Replace the Red LED #17 with the Green LED #26.



7.Red & Green LEDs in Parallel

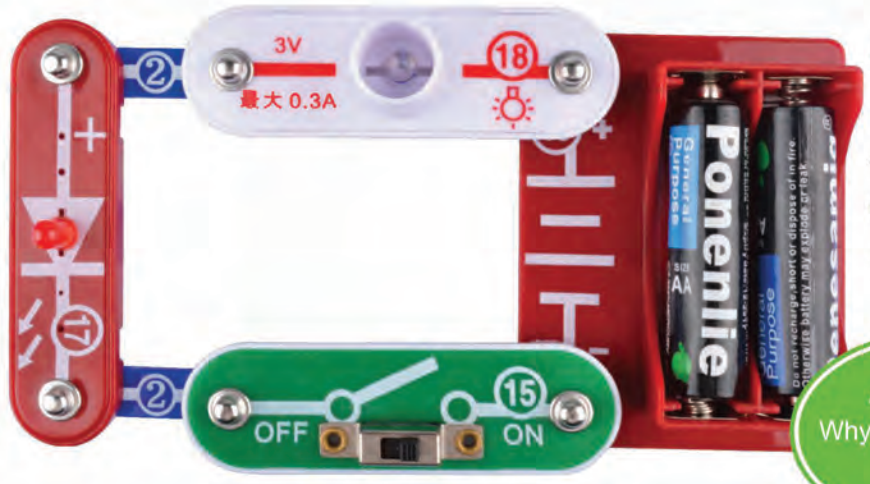
Turn on the slide switch 15 to light up both of the LEDs.

TRY THIS!
Remove one of the LEDs and compare the LED brightness.

8.Red & Green LED in Series

Turn on the slide switch 15 and both of the LEDs should light up.

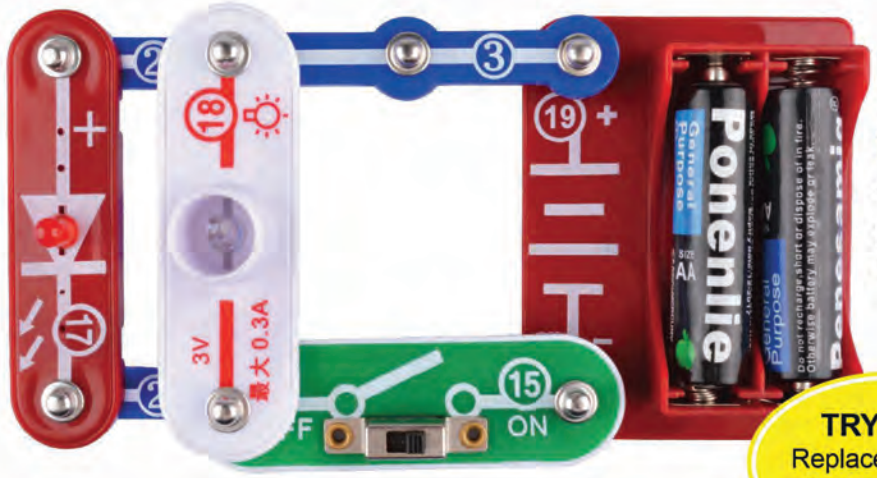
TRY THIS!
Replace one Battery Holder #19 with the 3-wire and compare the LED brightness.



9.Lamp & LED in Series

Turn on the slide switch 15.
Only the LED 17 lights up and the lamp 18 will not be bright.

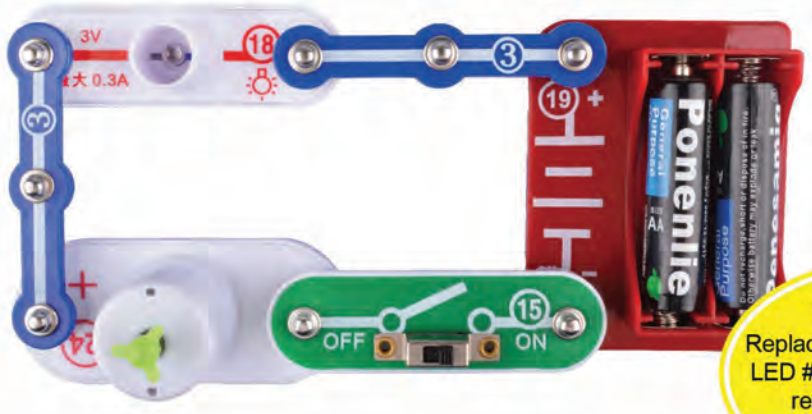
4. THINK!
Why won't lamp #18 light up?



10.Lamp & LED in Parallel

Turn on the slide switch 15.
Both the LED 17 and the lamp 18 will light up.

TRY THIS!
Replace LED #17 with the Motor #24



11.Lamp & Motor in Series

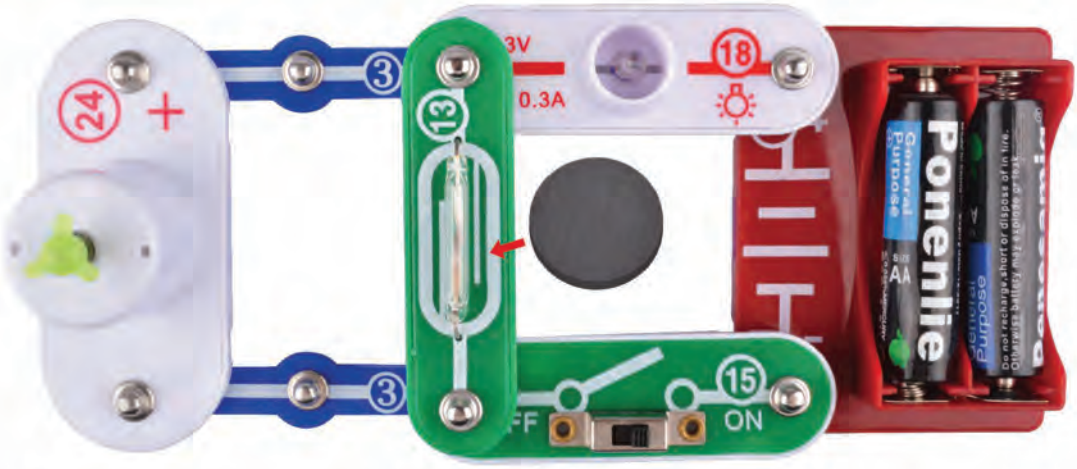
Turn on the slide switch 15.
The lamp 18 lights up and the motor 24 will spin (sometimes need to turn the shaft by hand).

TRY THIS!
Replace Lamp #18 with the LED #17 and compare the results – is there a difference?

5. THINK!
Are the appliances in your home connected in parallel circuits?

12. Loads Controlled Separately

In this circuit, the lamp (18) controlled by press switch (14),the motor (24) controlled by reed switch (13) and the green LED (26) controlled by slide switch (15) are all connected in parallel.



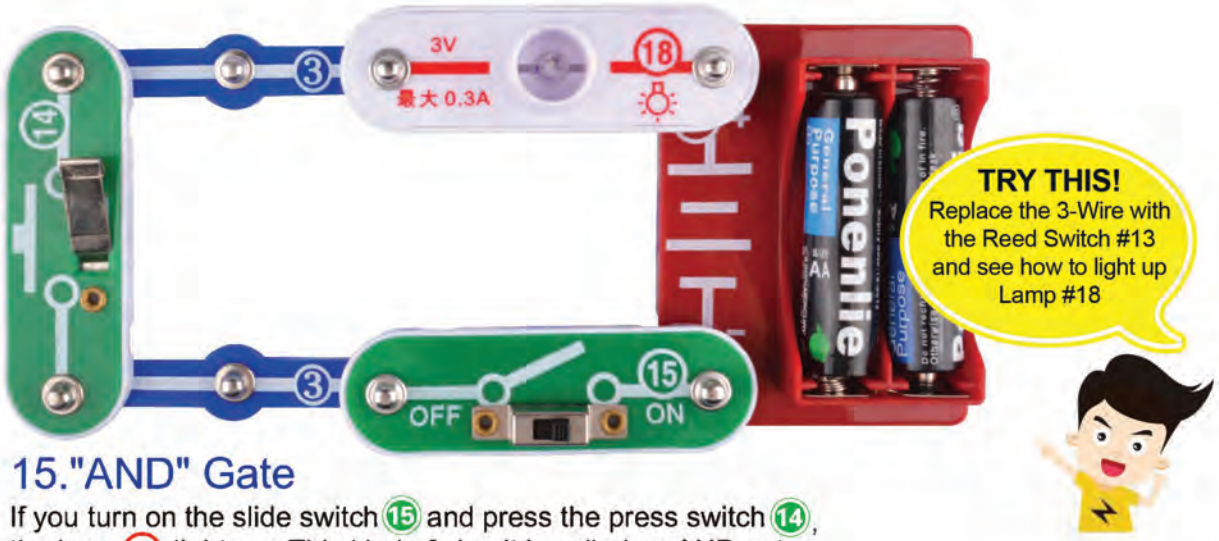
13.Magnet-Controlled Alternating Light

Turn on slide switch (15). The lamp (18) and motor (24) will turn on. Place the magnet near the reed switch (13), and the brightness of the lamp (18) will change.

14.Magnet-Controlled Variable Speed Fan

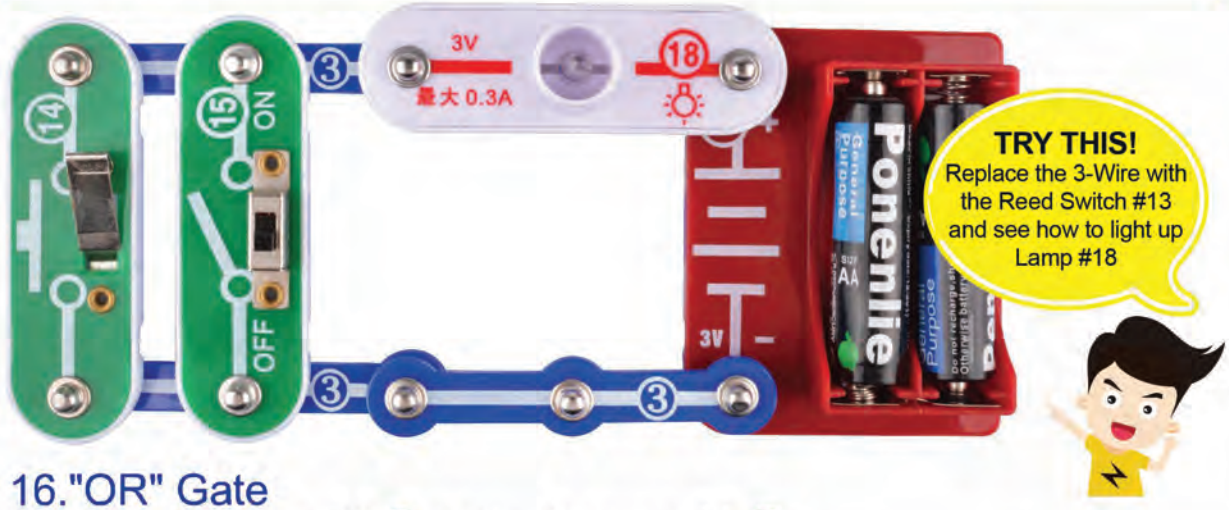
Swap the locations of the lamp (18) and the motor (24). Turn on the slide switch (15) and place the magnet near the reed switch (13). The speed of the fan will become variable.

6. THINK!
Why is the fan speed variable?



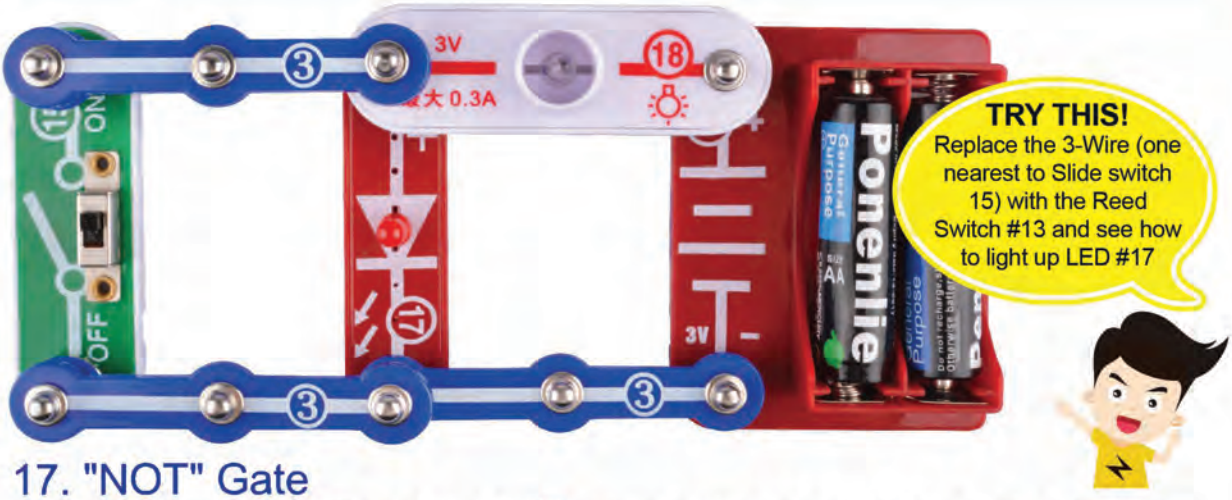
15."AND" Gate

If you turn on the slide switch (15) and press the press switch (14), the lamp (18) lights up.This kind of circuit is called an AND gate.



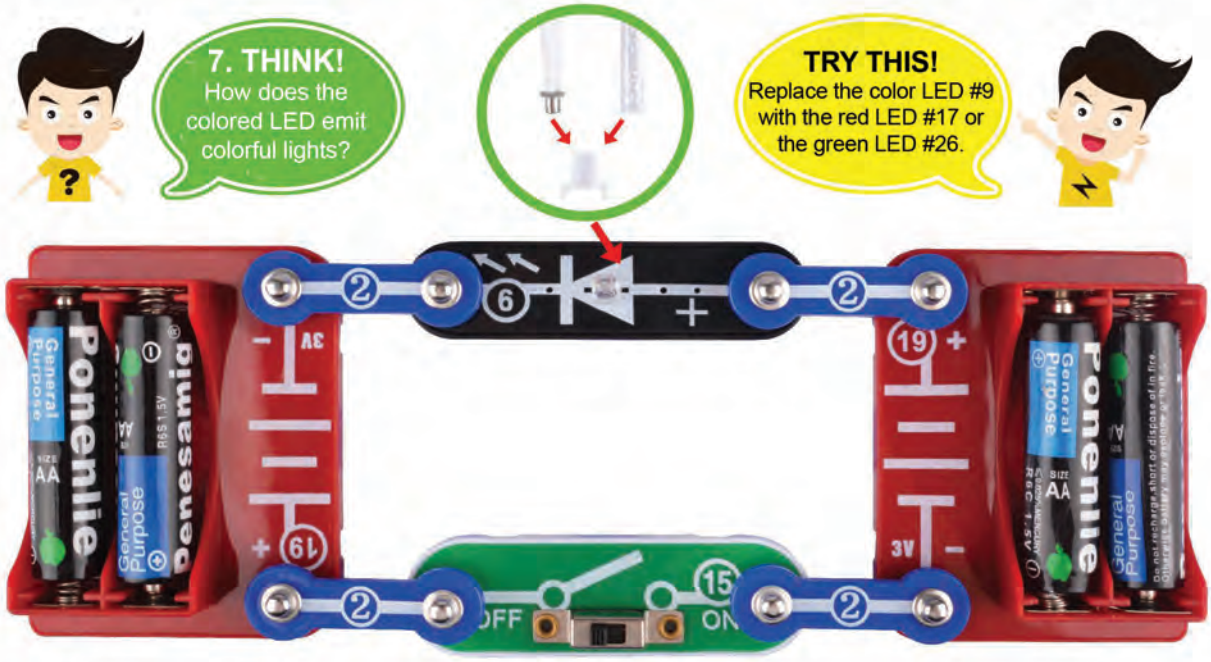
16."OR" Gate

If you turn on the slide switch (15) or press the press switch (14), the lamp (18) lights up. This kind of circuit is called an OR gate.



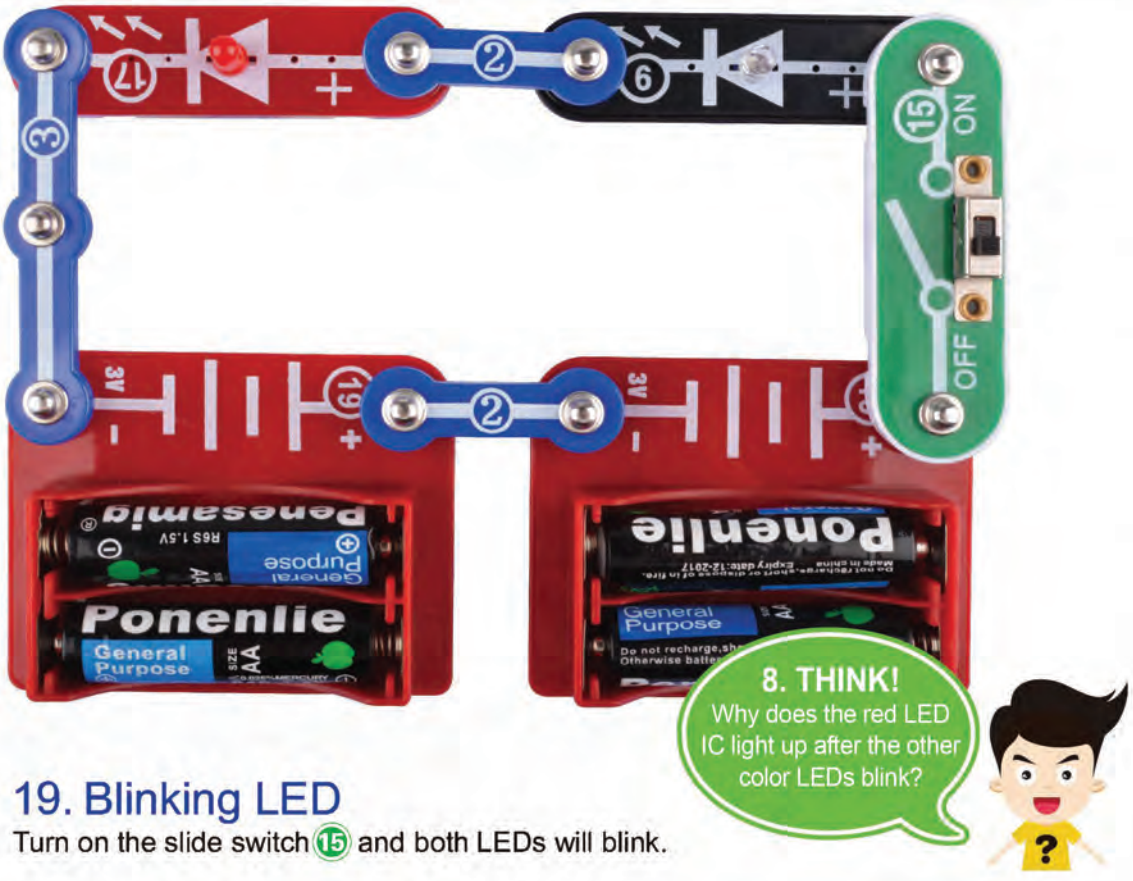
17. "NOT" Gate

Turn on the slide switch (15) and the LED (17) goes out. This kind of circuit is called a NOT gate.



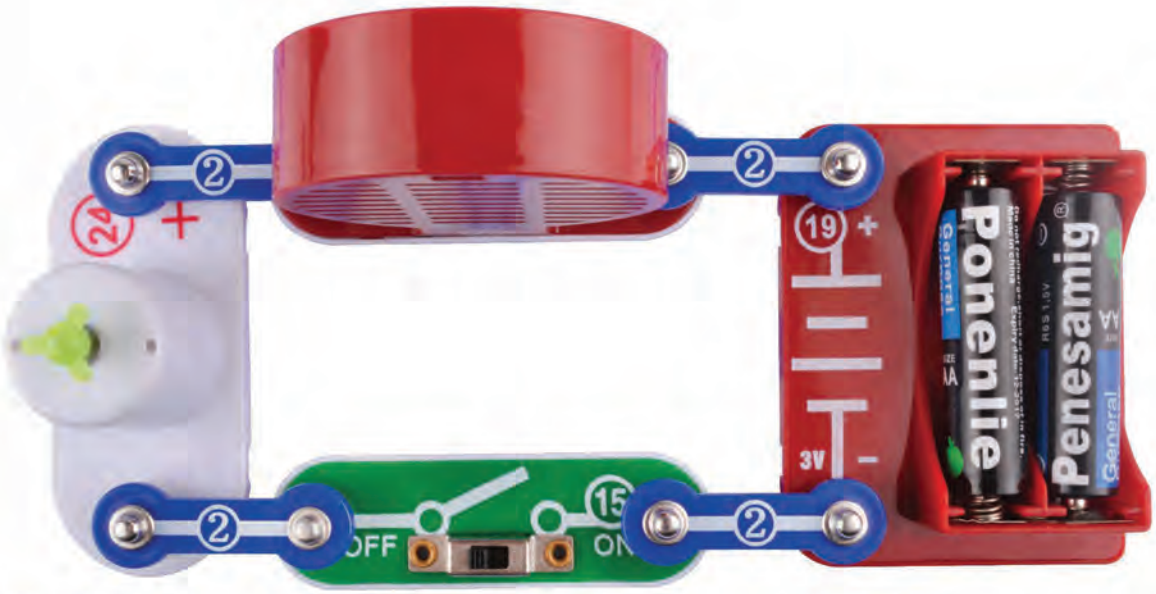
18.Color Light

Turn on the slide switch ⑮, and enjoy the light show from the color LEDs ⑨. For best effects, place the LED fiber optic tree or light post on the color LEDs ⑨, and dim the room lights.



19. Blinking LED

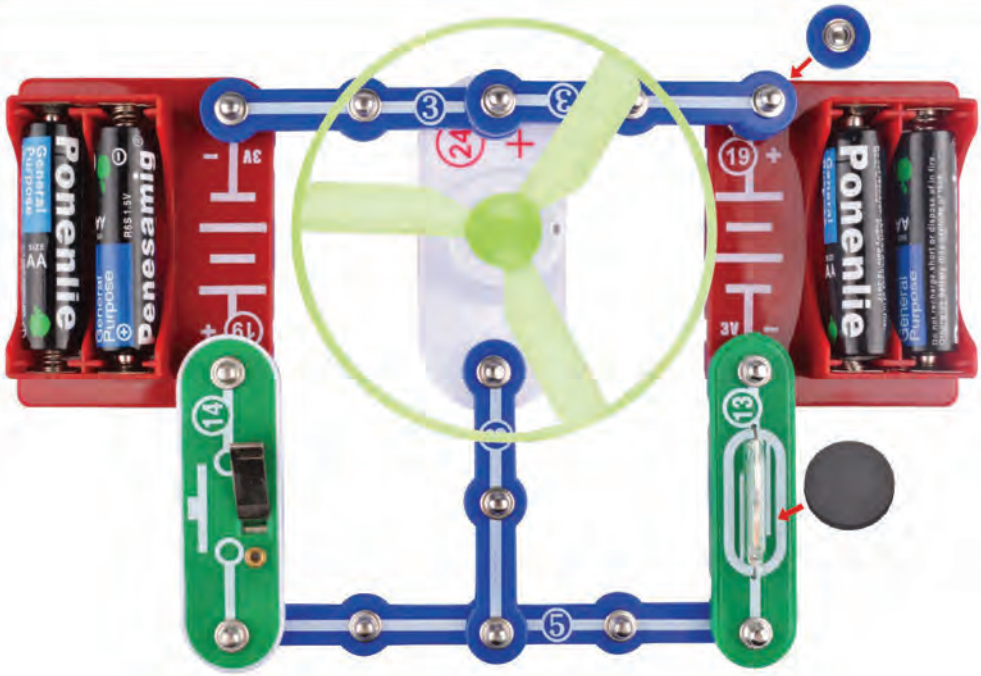
Turn on the slide switch ⑮ and both LEDs will blink.



20. The Motor Sound

Turn on the slide switch (15), the motor (24) spins. The speaker (20) will make a sound as the motor shaft spins around it, connecting or disconnecting several sets of electrical contacts. As these contacts are switched, an electrical disturbance is created, which the speaker converts into sound.

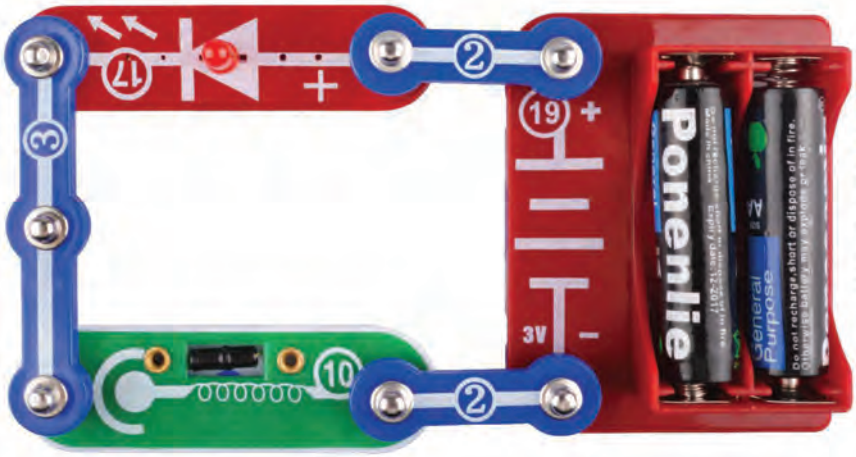
TRY THIS!
Replace Motor #24 with the LED or Lamp #18. Can you hear the sound?



21. Spinning the Motor in Both Directions

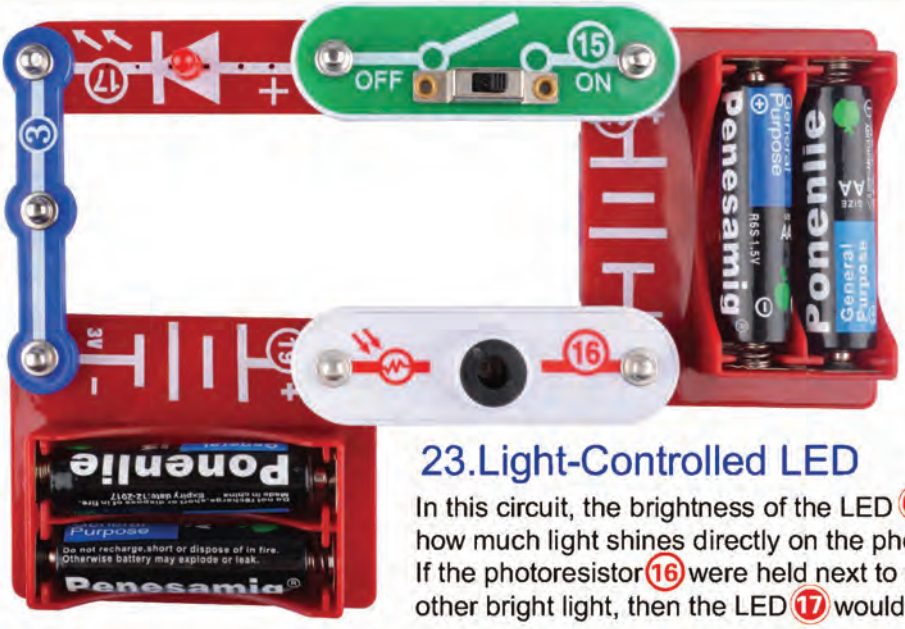
Build the circuit as shown. Press the press switch (14), and the motor (24) will spin counterclockwise. Release the press switch (14), place the magnet close to the reed switch (13), and the motor (24) will spin clockwise.

WARNING: Press switch 14 and reed switch 13 must not be turned on at the same time, or the battery will be damaged.



22.Vibration Switch

Tap on the vibration switch (10) or bang on the table to make the red LED (17) light.

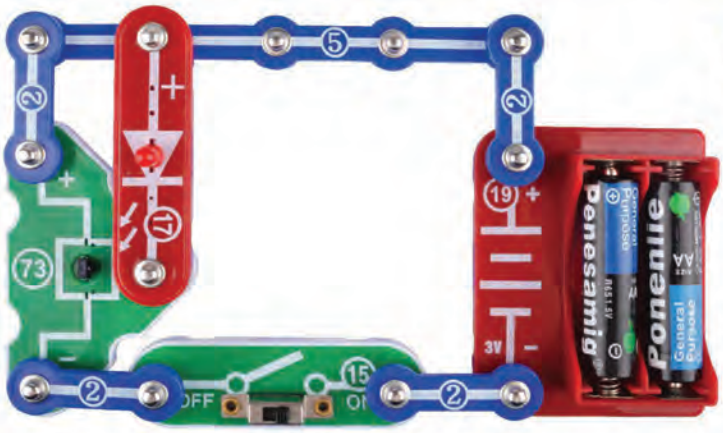


23.Light-Controlled LED

In this circuit, the brightness of the LED (17) depends on how much light shines directly on the photoresistor (16). If the photoresistor (16) were held next to a flashlight or other bright light, then the LED (17) would be very bright.

24.Water-Controlled LED

Wetting your fingers to touching the touch plate (12) or drops of water on the touch plate (12), the LED (9) light up.



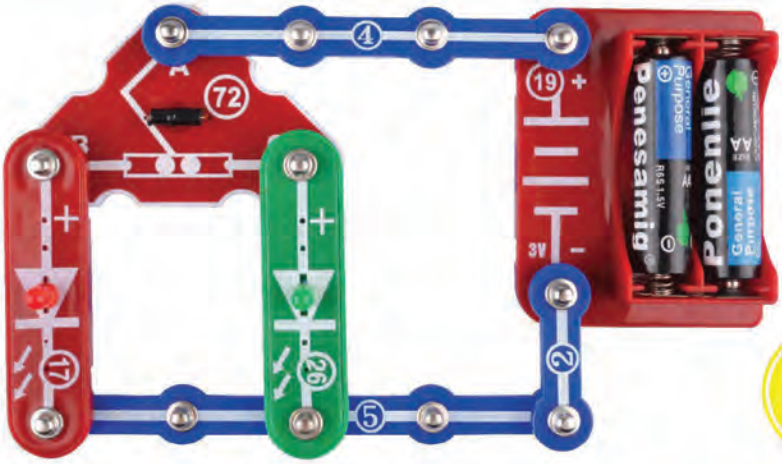
25.Infrared Detector of LED

You need an infrared remote control for this project, such as any TV/stereo/DVD remote control in your school. Turn on the switch (15). Point your remote control toward the infrared receiver (73) and press any button to activate the red LED (17). Sometimes this circuit may activate without a remote control, due to infrared in sunlight or some room lights. If this happens, try moving to a darker room.

9. THINK!
Can you use the IR detector function in sunlight?

26.Infrared Detector of Speaker

Replace the LED (17) with the speaker (20). These operate in the same manner, with the speaker (20) making a "beep". Sometimes this circuit may activate without a remote control, due to infrared in sunlight or some room lights. If this happens, try moving to a darker room.



27.Tilt Sensor 1

Build the circuit as shown,The red LED (17) or green LED (26) will light if the circuit is tilted or moved. Experiment to see which tilt angles activate which LED.
If the circuit does not shut off when left alone on a flat surface, then tilt it slightly so it turns off.

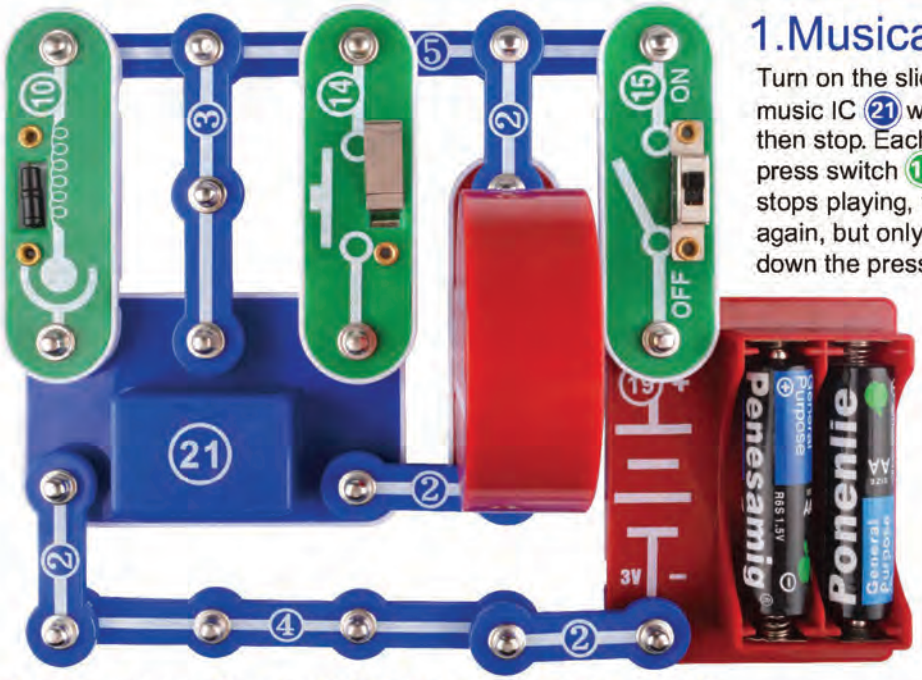
TRY THIS!
Replace the 4-wire with the color LED (9)

28.Tilt Sensor 2

Operates the same as Tilt Sensor 1.

10. THINK!
Can you list anything else that uses a tilt switch?

Lesson 2: Musical Doorbell Circuits

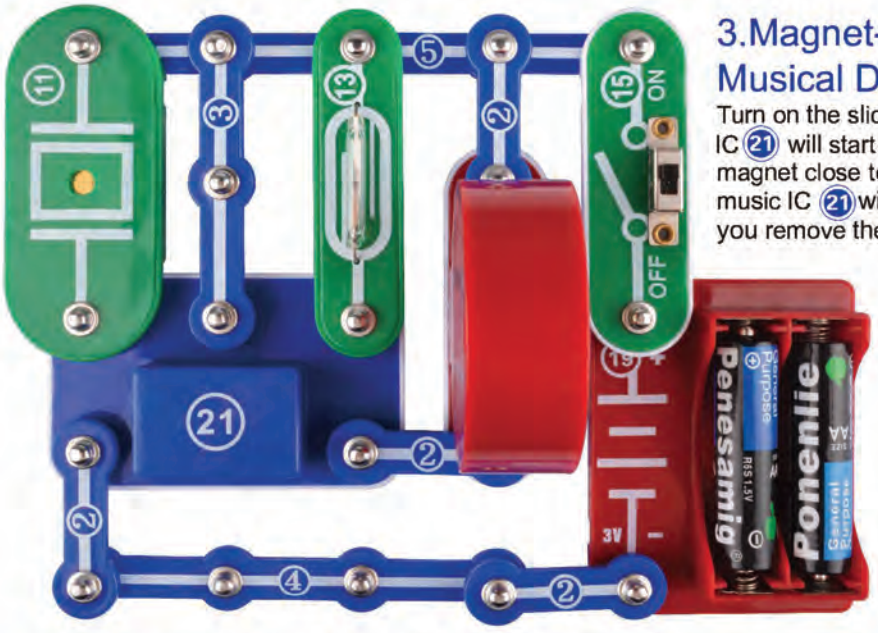


1.Musical Doorbell

Turn on the slide switch 15. The music IC 21 will start playing music, then stop. Each time you push the press switch 14 after the music stops playing, the music will play again, but only while you're holding down the press switch 14.

2.Vibration-Controlled Musical Doorbell

Turn on the slide switch 15. The music IC 21 will start playing music, then stop. Each time you tap on the vibration switch 10 or bang on the table, the music will play again and keep playing until it has reached the end of the music.

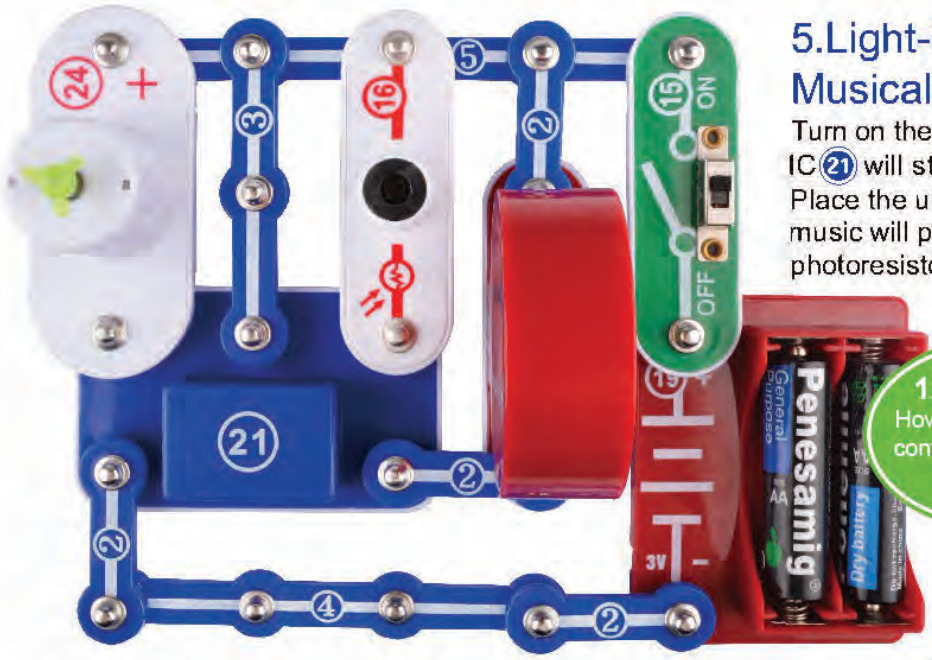


3.Magnet-Controlled Musical Doorbell

Turn on the slide switch 15. The music IC 21 will start playing, then stop. Place the magnet close to the reed switch 13 and the music IC 21 will start playing again, until you remove the magnet.

4.Sound-Controlled Musical Doorbell

Turn on the slide switch 15. The music IC 21 will start playing music, then stop.
Each time you clap your hands or speak loudly near the whistle chip, the music will play again.

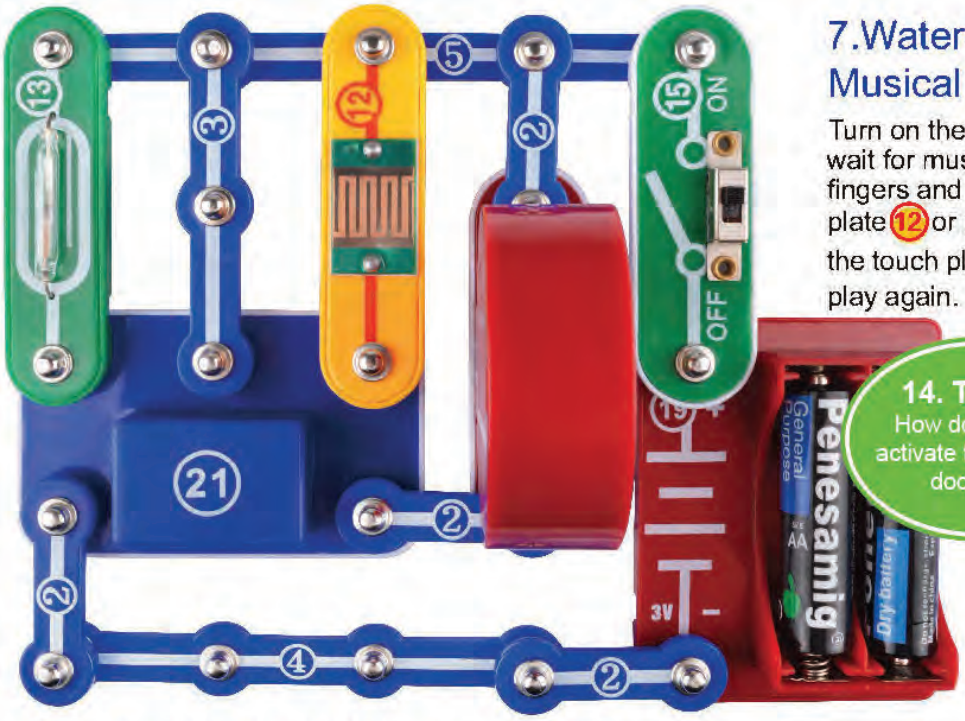


5.Light-Controlled Musical Doorbell

Turn on the slide switch (15). The music IC (21) will start playing music, then stop. Place the unit near a light and the music will play. Cover the photoresistor (16) and the music will stop.

6.Motor-Controlled Musical Doorbell

Turn on the slide switch (15), and the music IC (21) will start playing music, then stop. Spin the motor (24) and the music will play again.

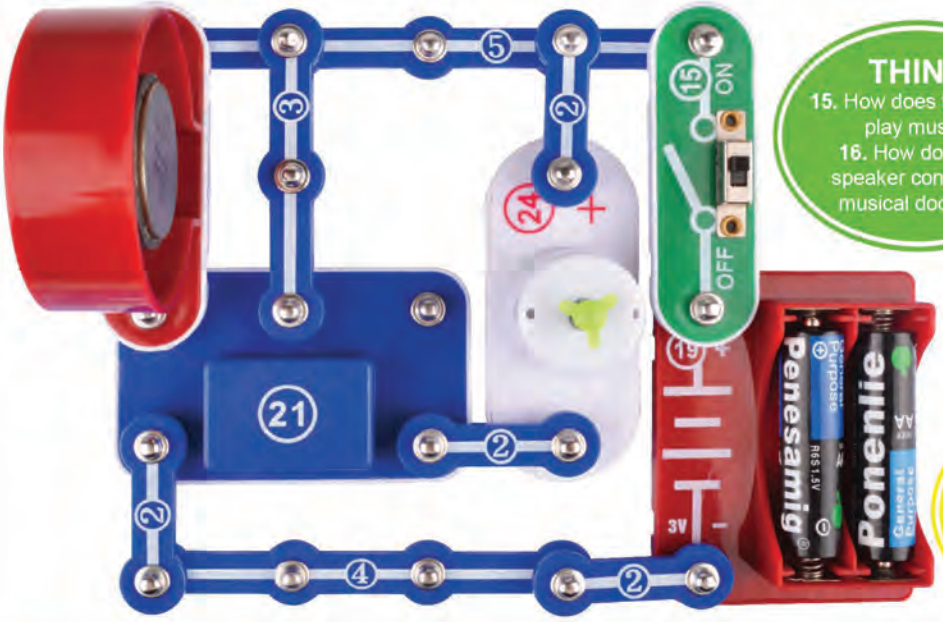


7.Water-Controlled Musical Doorbell

Turn on the slide switch (15) and wait for music to stop. Wet your fingers and touch the touch plate (12) or put drops of water on the touch plate (12), the music will play again.

8.Magnet-Controlled Musical Doorbell 2

Turn on the slide switch (15) and wait for the music to stop. Place the magnet close to the reed switch (13), and the music will play again. Remove the magnet and the music will play until it has reached the end.

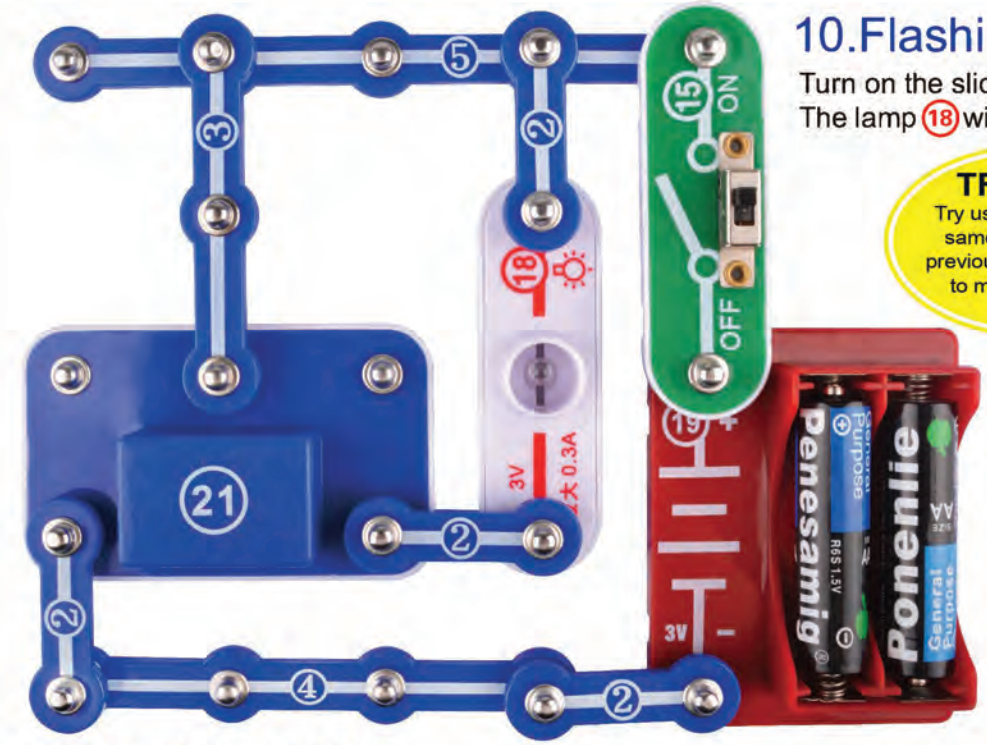


THINK!
15. How does the motor play music?
16. How does the speaker control the musical doorbell?

TRY THIS!
Try using some of the same variants as in previous circuit projects to make additional projects.

9.Voice-Controlled Motor Doorbell

Turn on the slide switch (15), and the motor will turn (24). Then, the music IC will play music, then stop. Each time clap your hands or speak loudly near the speaker (20) the music will play again.



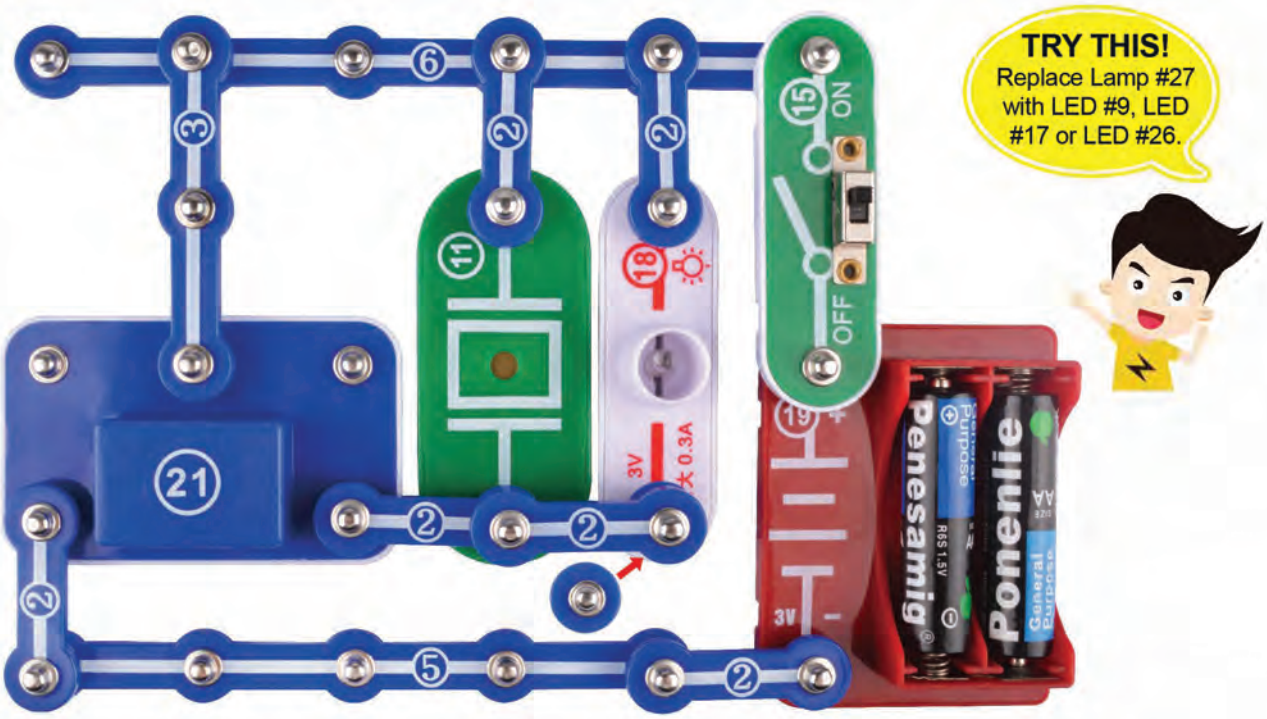
10.Flashing Lamp

Turn on the slide switch (15).
The lamp (18) will flash and stop.

TRY THIS!
Try using some of the same variants as in previous circuit projects to make additional projects.

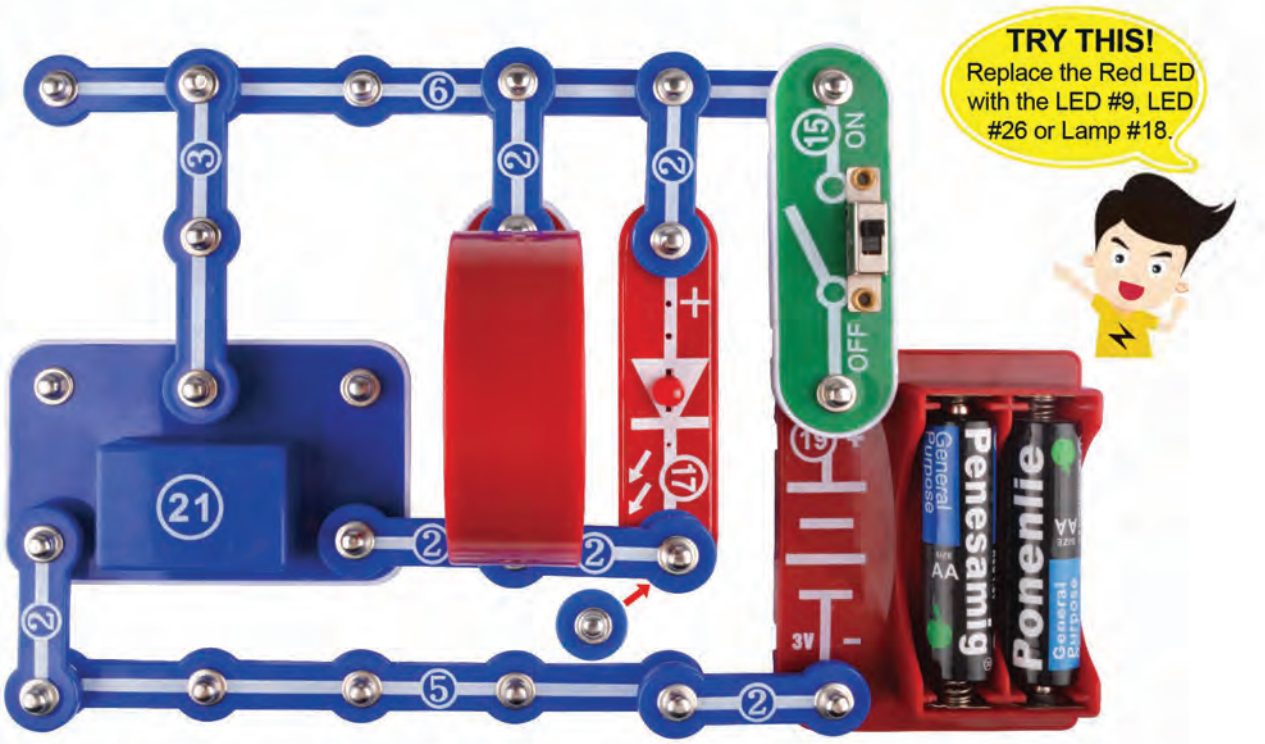
11.Flashing LED

Replace lamp (18) with red LED (17) or green LED (26). Turn on the slide switch (15) and the LED will flash.



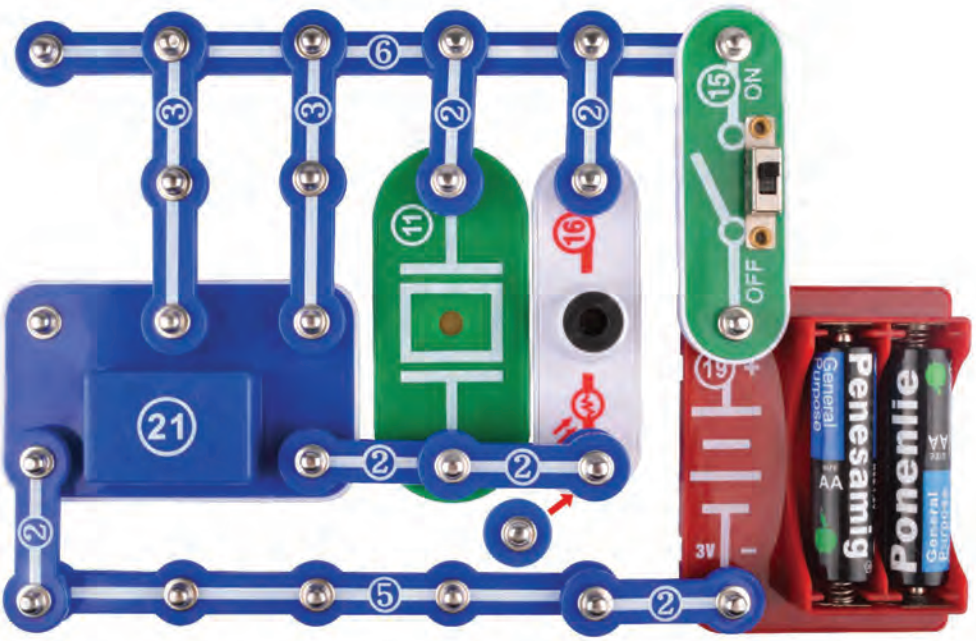
12. Light & Sounds Musical Doorbell

Turn on the slide switch (15); the Whistle Chip (11) will play music and the lamp (18) will flash.



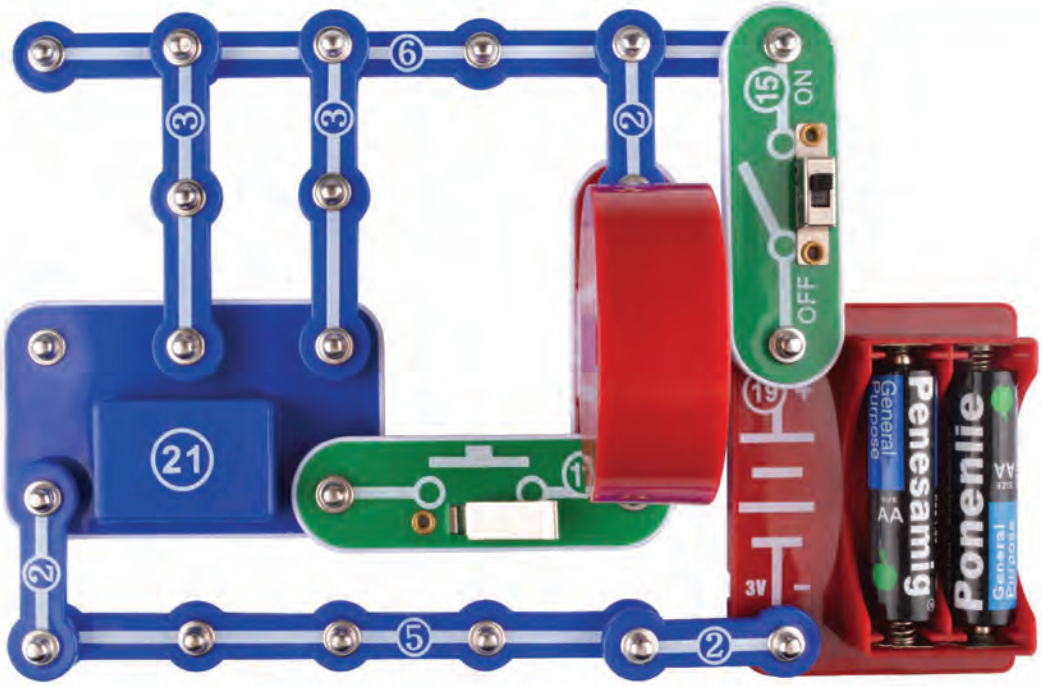
13. Red Light Musical Doorbell

Turn on the slide switch (15); the speaker (20) will play music and the LED (17) will flash.



14.Light-Controlled Sounds

Turn on the slide switch (15), and music will play. The loudness of the sound depends on how much light reaches the photoresistor (16). Try covering the photoresistor or placing it near a very bright light, and compare the sound differences.

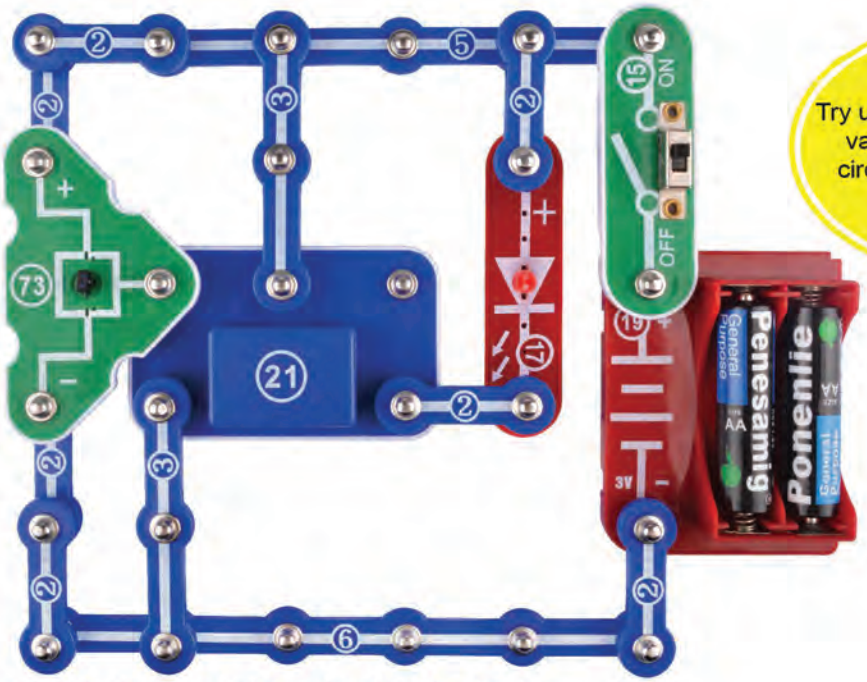


15. Hand-Controlled Intermittent Musical Doorbell

Turn on the slide switch (15), and push down the press switch (14) intermittently. Then, the speaker (20) will play the music at different rhythms.

16. Magnet-Controlled Intermittent Musical Doorbell

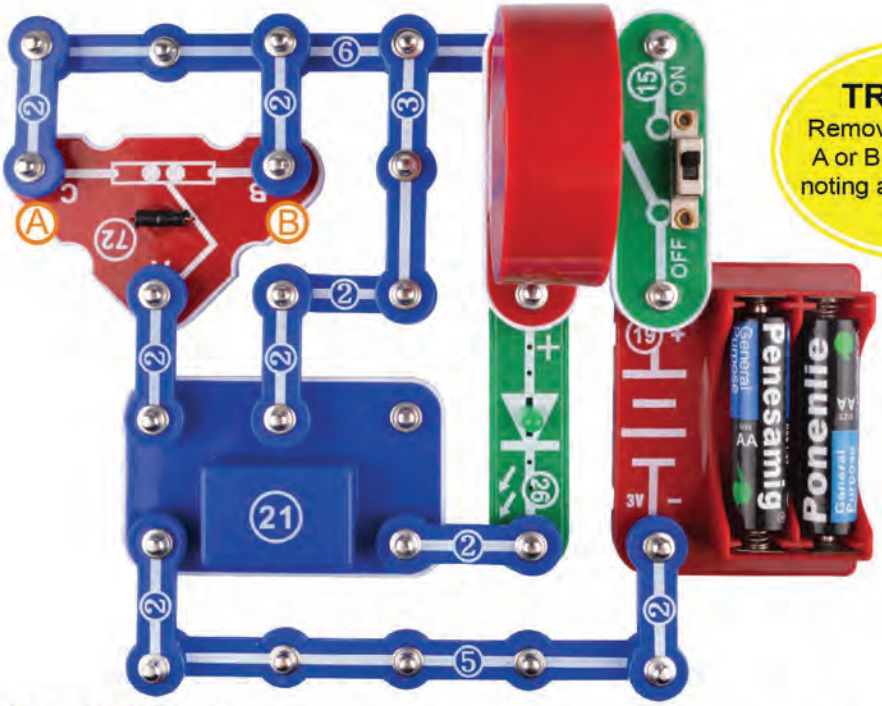
Replace the press switch (14) with the reed switch (13), and operate the same way as in #15.



TRY THIS!
Try using some of the same variants as in previous circuit projects. Replace LED #17 with other parts.

17. Infrared-Controlled LED

You need an infrared remote control for this project, such as any TV/stereo/DVD remote control in your school.Turn on the switch (15). Point your remote control toward the infrared receiver (73) and press any button. The red LED will flash and then turn off. Sometimes this circuit may activate without a remote control, due to infrared in sunlight or some room lights. If this happens, try moving to a darker room.

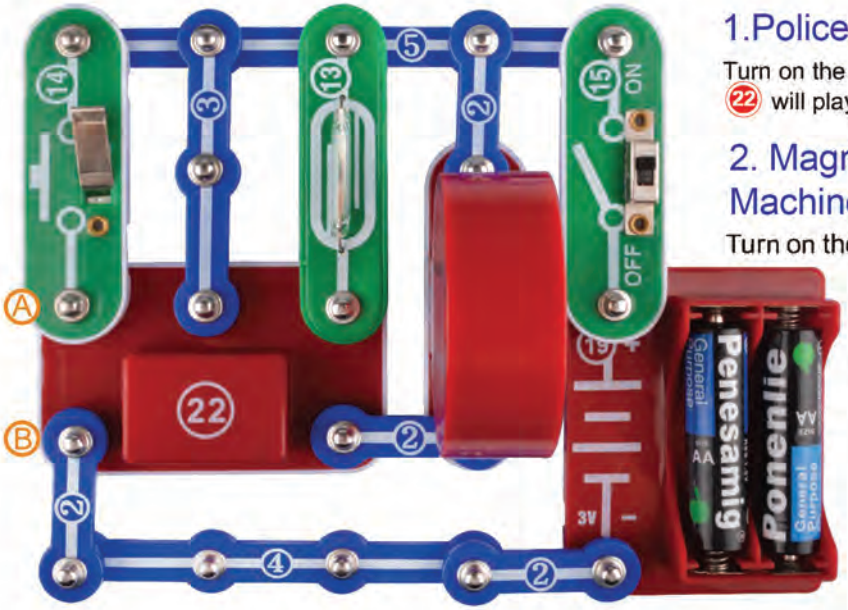


TRY THIS!
Remove the 2-wire in A or B and compare, noting any differences.

18.Tilt Music

Turn on the slide switch (15). The speaker (20) and the green LED (26) will turn on, then stop. If the circuit is tilted or moved, the speaker (20) and the green LED (26) will turn on again. If the circuit does not shut off when left alone on a flat surface, then tilt it slightly until it turns off.

Lesson 3: Alarm Circuit



1.Police Siren Sounds

Turn on the slide switch 15, the alarm IC 22 will play a police siren sound.

2. Magnet-Controlled Machine Gun Sounds

Turn on the slide switch 15, when the magnet is close to the reed switch 13, the alarm IC 22 will play a laser gun sound.

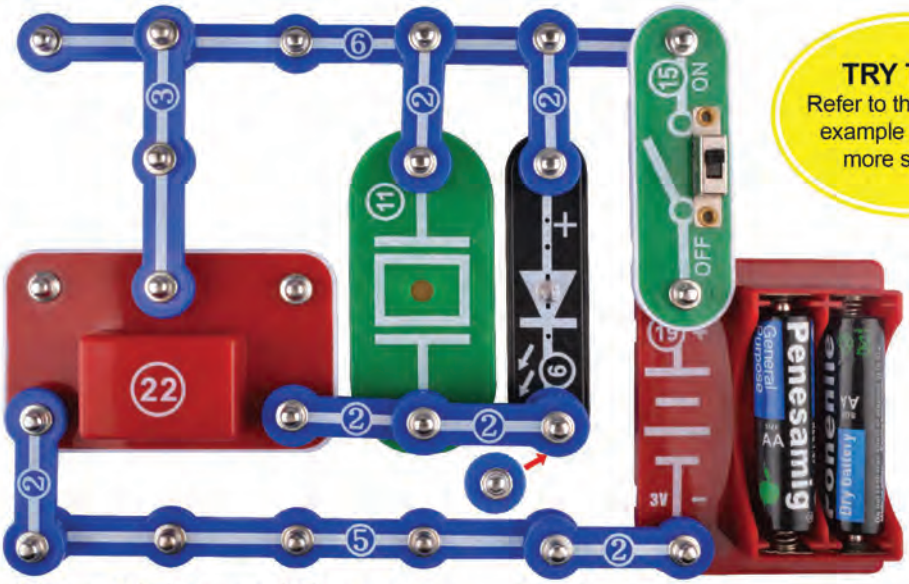
3. Hand-Controlled Fire Engine Sounds

Turn on the slide switch 15. Push the press switch 14, the alarm IC 22 will play a fire engine sound.

4. Ambulance Sounds

Turn on the slide switch 15, connecting points A and B. Alarm IC 22 will play an ambulance sound.

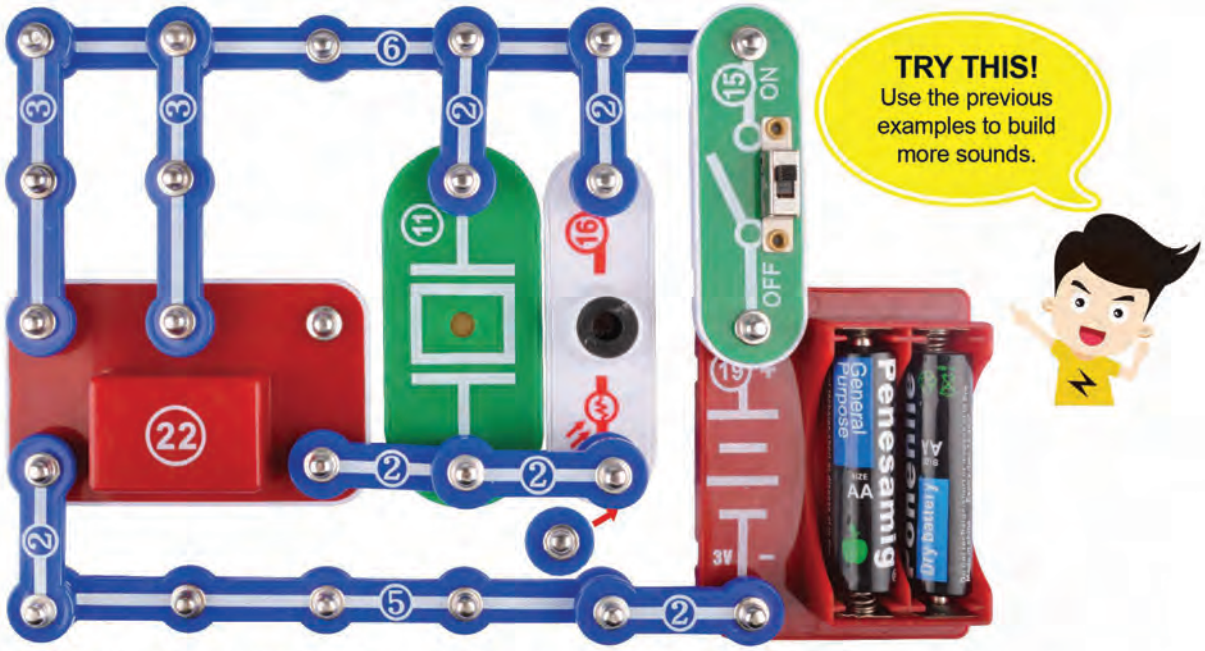
TRY THIS!
Replace Speaker #20 with #9, #17, #18, #24, #26 or #71.



TRY THIS!
Refer to the previous example and build more sounds.

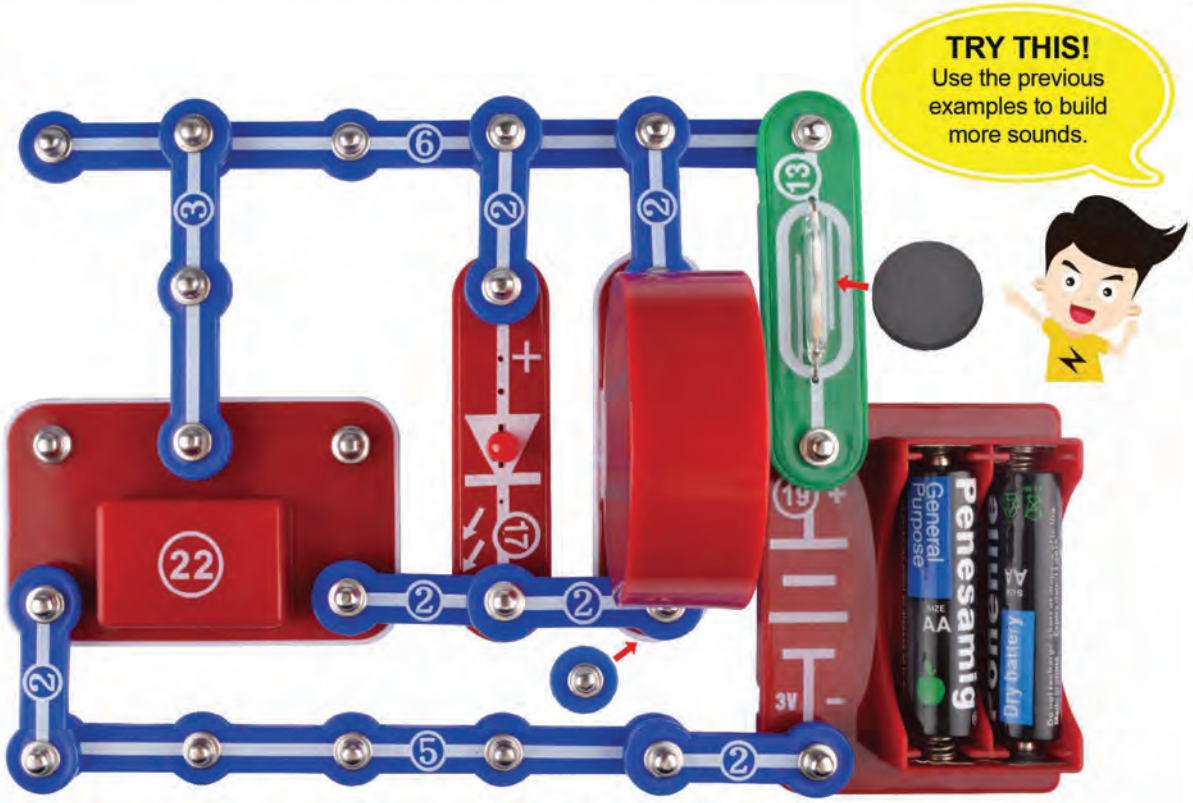
5. Alarm Lights and Sounds

Turn on the slide switch 15 and the whistle chip 11 will play a police siren sound and the color LED 9 will flash.



6. Light-Controlled Fire Engine Sounds

Turn on the slide switch (15), a fire engine is heard. The loudness of the sound depends on how much light reaches the photoresistor (16). Try partially shielding it or placing it near a very bright light, and compare the sound difference.



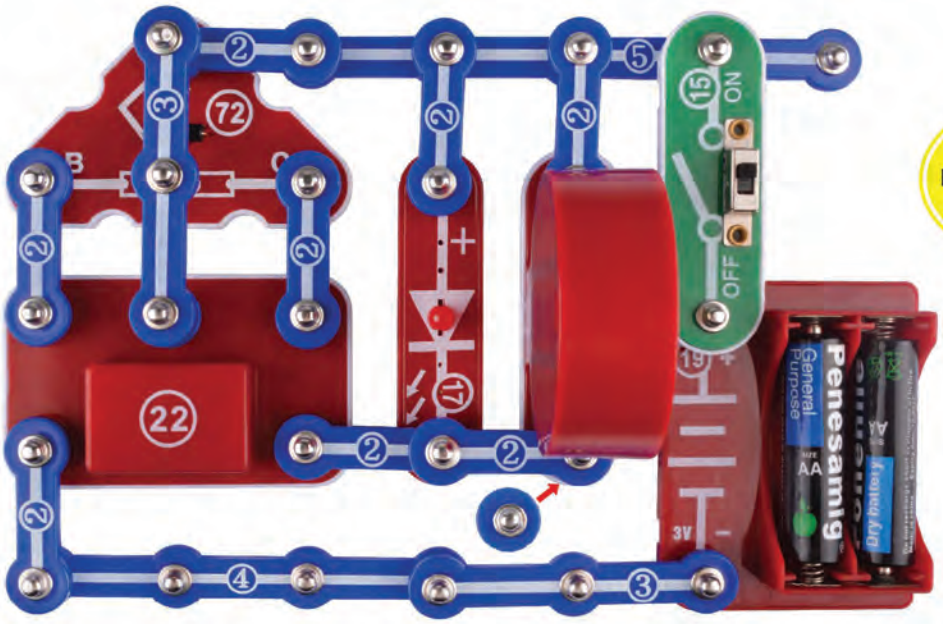
7. Magnet-Controlled Police Siren

Place the magnet close to the reed switch (13). The LED (17) and speaker (20) will turn on.

8.Tilt Alarm 1

Turn on the slide switch (15). If the circuit is tilted or moved, the speaker (20) will play an alarm.

TRY THIS!
Remove the 2-wire in A or B and compare to find differrences.

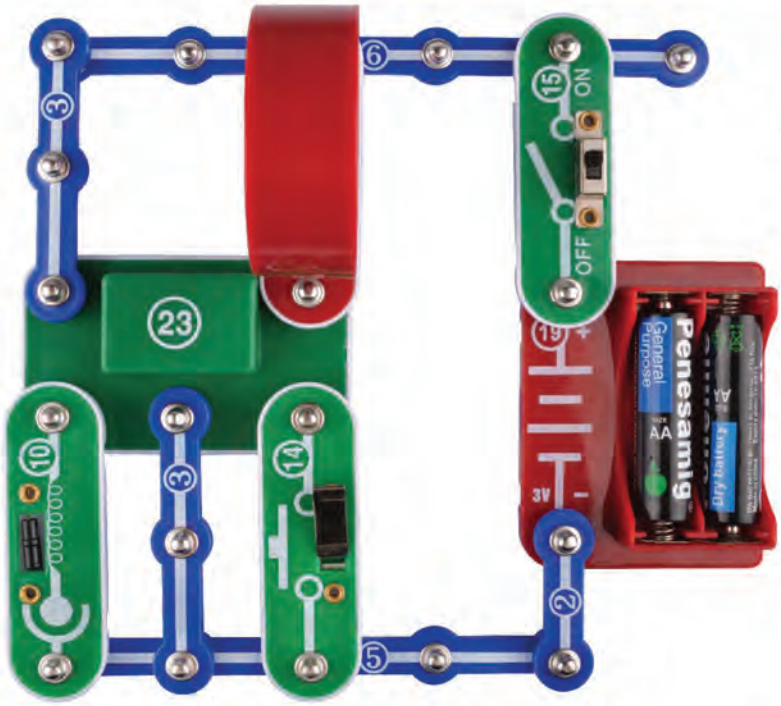


TRY THIS!
Build the sound of an ambulance

9.Tilt Alarm 2

Turn on the slide switch (15). If the circuit is tilted or moved, the speaker (20) and LED (17) will turn on. Experiment to see which angles activate which sound.

Lesson 4: Sound Effects



1.Sound Effects

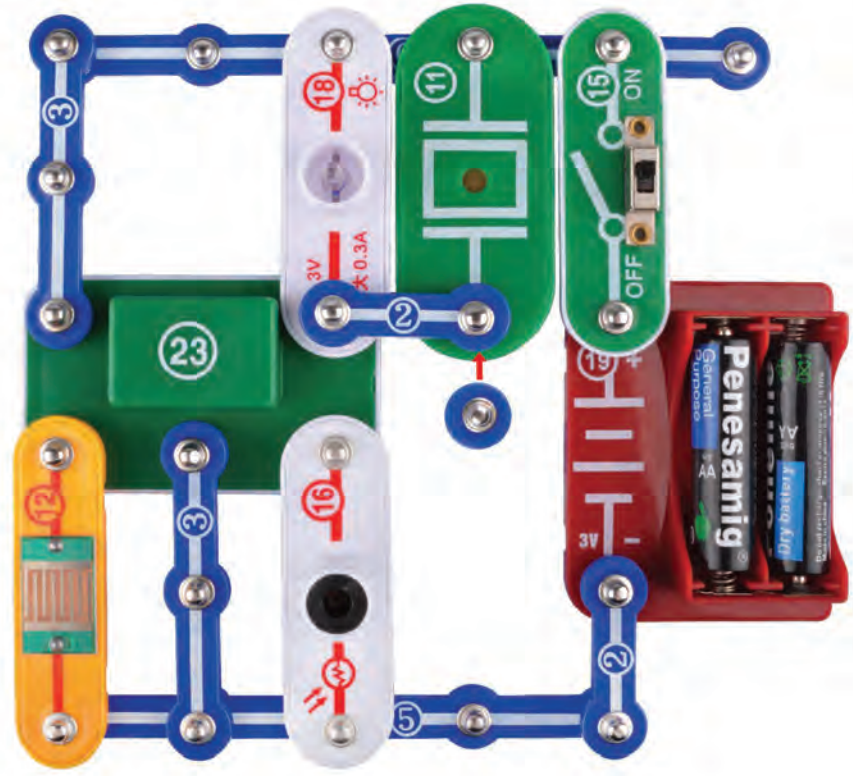
Turn on the slide switch (15), push the press switch (14), and the sound effects IC (23) will play an exciting range of sounds.

2.Vibration Effects

Turn on the slide switch (15). Each time you tap on the vibration switch (10) or bang on the table you will hear exciting sounds.

3.Magnet-Controlled Sound Effects

Replace the press switch (14) with the reed switch (13),turn on the slide switch (15), you can control the sound effects with a magnet.

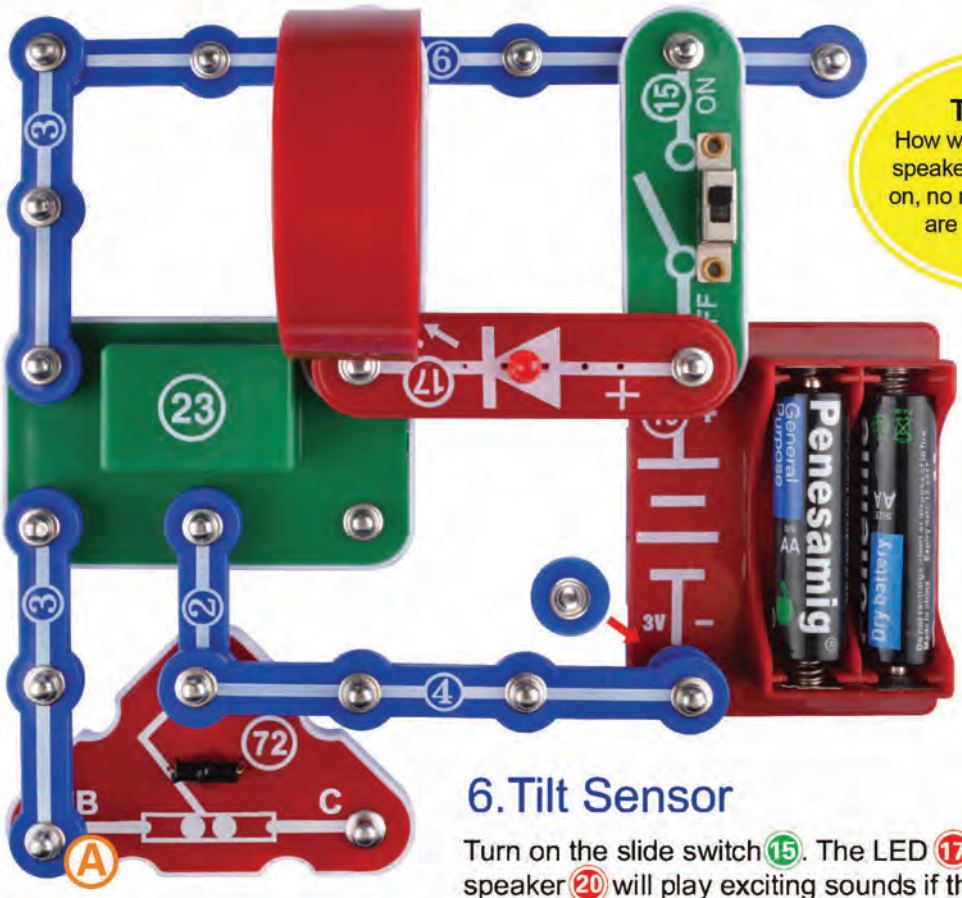


4. Light-Controlled Sound and Light Effects

Turn on the slide switch (15), wave your hand to block off light shining on the photoresistor to control the sounds.

5. Touch-Controlled Sound and Light Effects

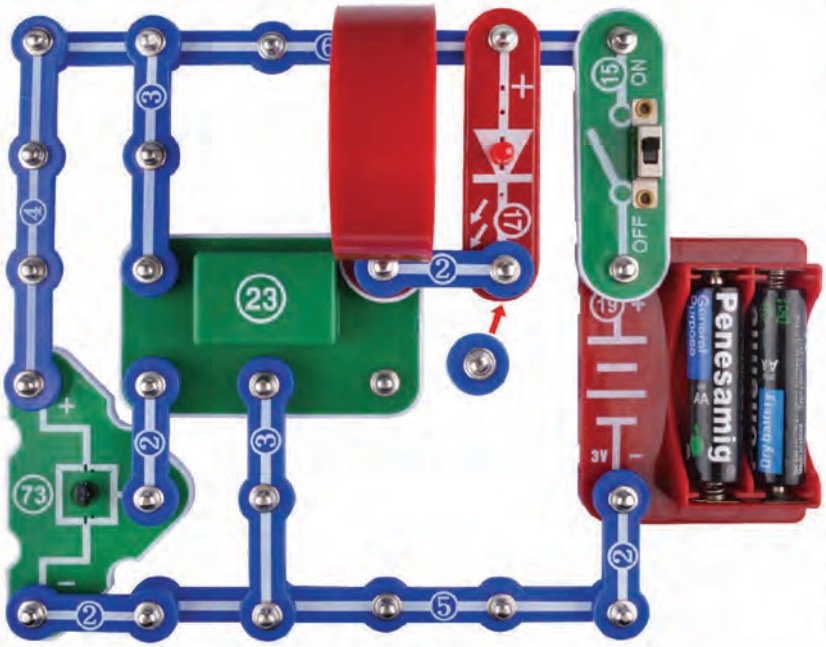
Turn on the slide switch (15). Use your fingers to touch the touch plate (12) to hear exciting sounds.



TRY THIS!
How would you make the speaker and the LED turn on, no matter if the circuits are tilted or angled.

6. Tilt Sensor

Turn on the slide switch 15. The LED 17 will light and speaker 20 will play exciting sounds if the circuit is tilted or moved to point A.



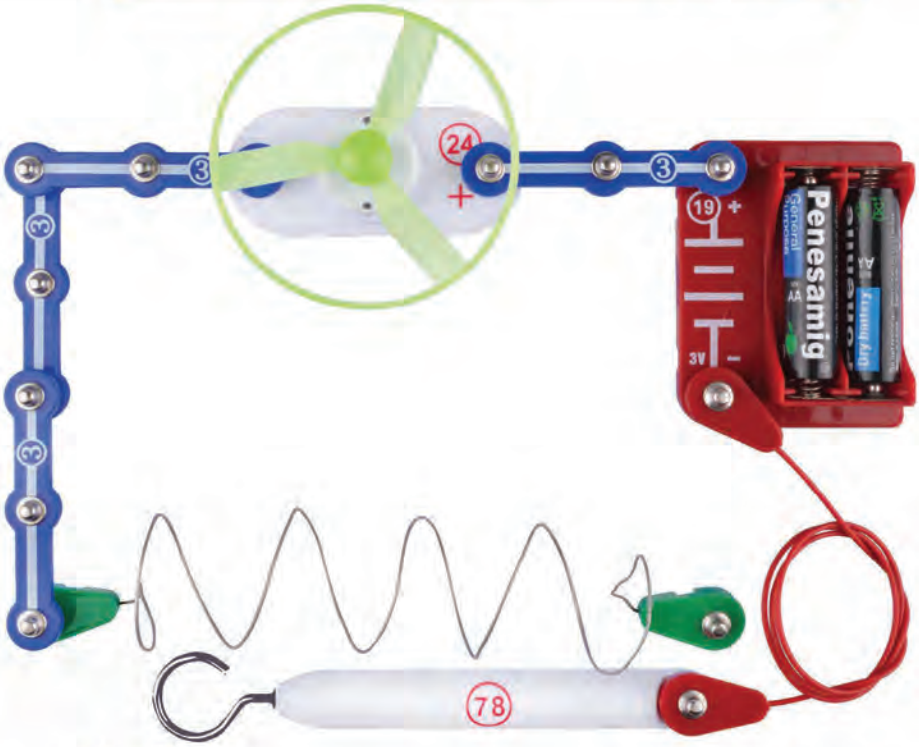
7. Infrared-Controlled Sound Effects

You will need an infrared remote control for this project, such as any TV/stereo/DVD remote.

Turn on slide switch 15. Point your remote control toward the infrared receiver 73 and press any button. The red LED 17 and the speaker 20 will turn on.

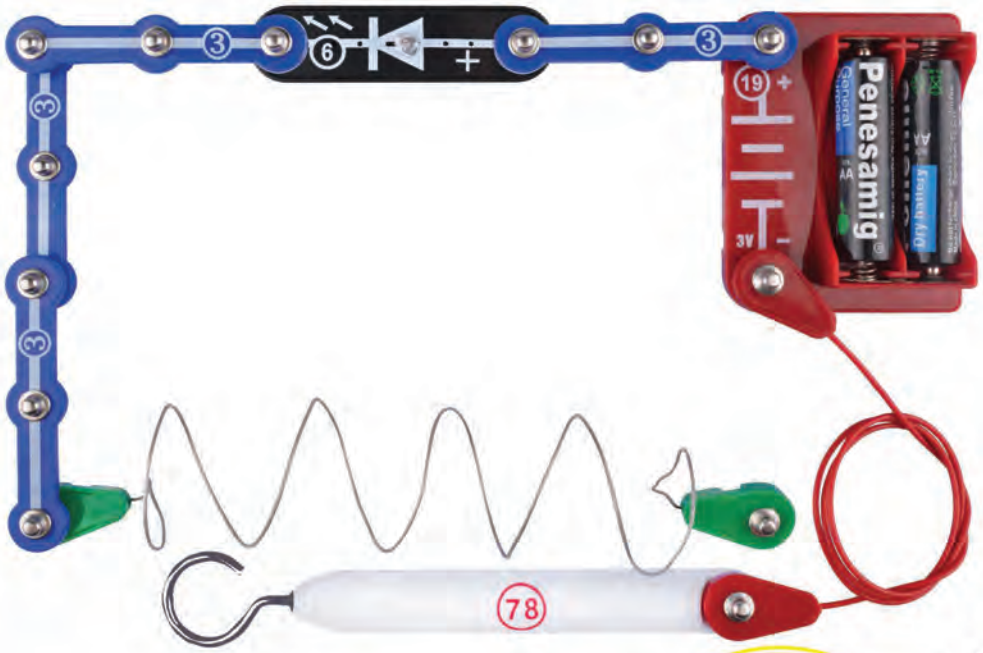
Sometimes this circuit may activate without a remote control, due to infrared from sunlight or some room lights. If this happens, try moving to a darker room.

Lesson 5: Maze Challenges



1.Maze Challenge

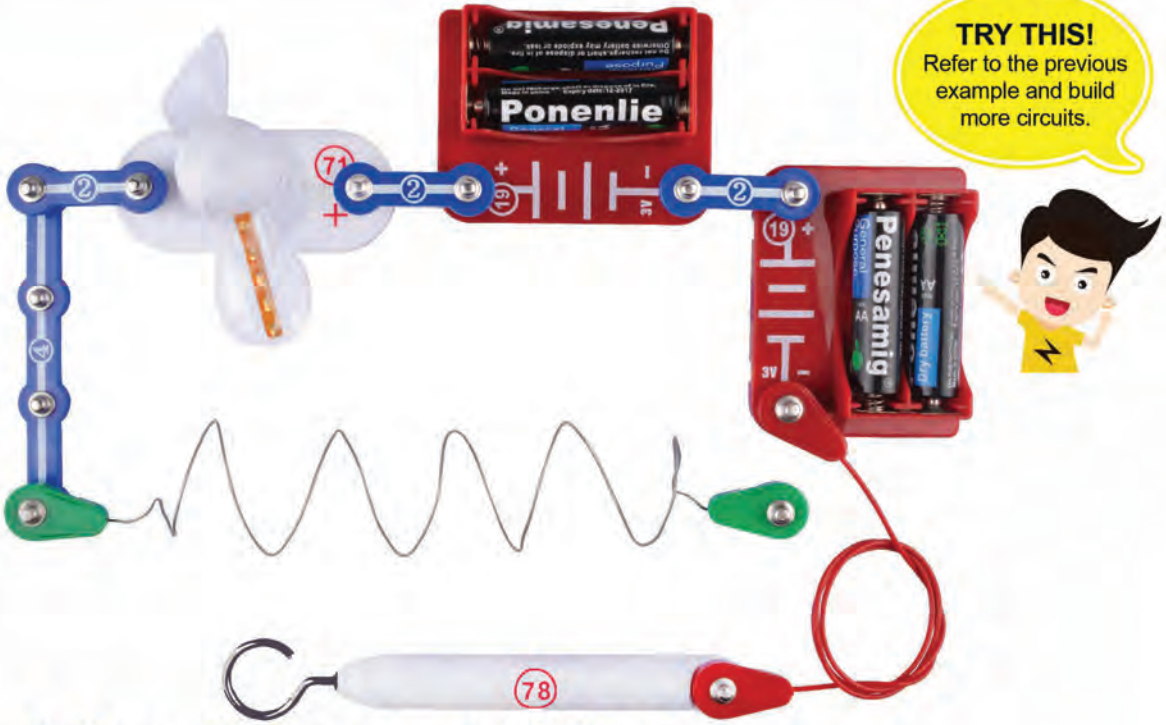
Put the hook of the wand around the metal wire via the open area of the ring. Keep your hand steady and carefully move the ring of the wand through the metal wire. If the ring touches the metal wire, the motor (24) will spin – and you lose. Call on your classmates to challenge!



2.Maze Challenge – Color LED

If the ring touches the metal wire, the color LED ⑨ will flash.

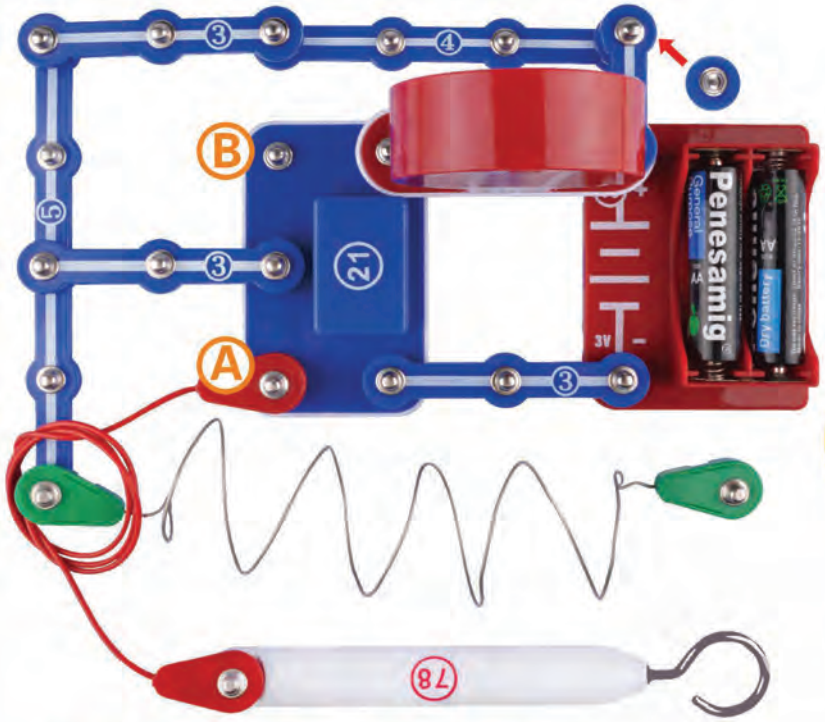
TRY THIS!
Replace LED #9 with LED #17, LED #26, or Lamp #28.



TRY THIS!
Refer to the previous example and build more circuits.

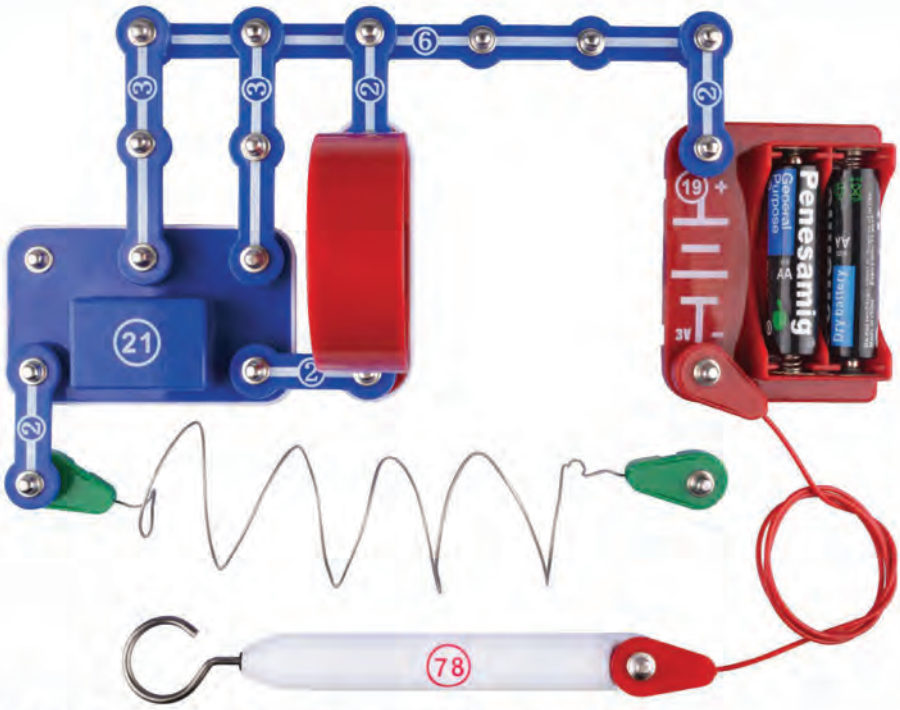
3.Maze Challenge – Light Motor

If the ring touches the metal wire, the light motor (71) will spin and light up.



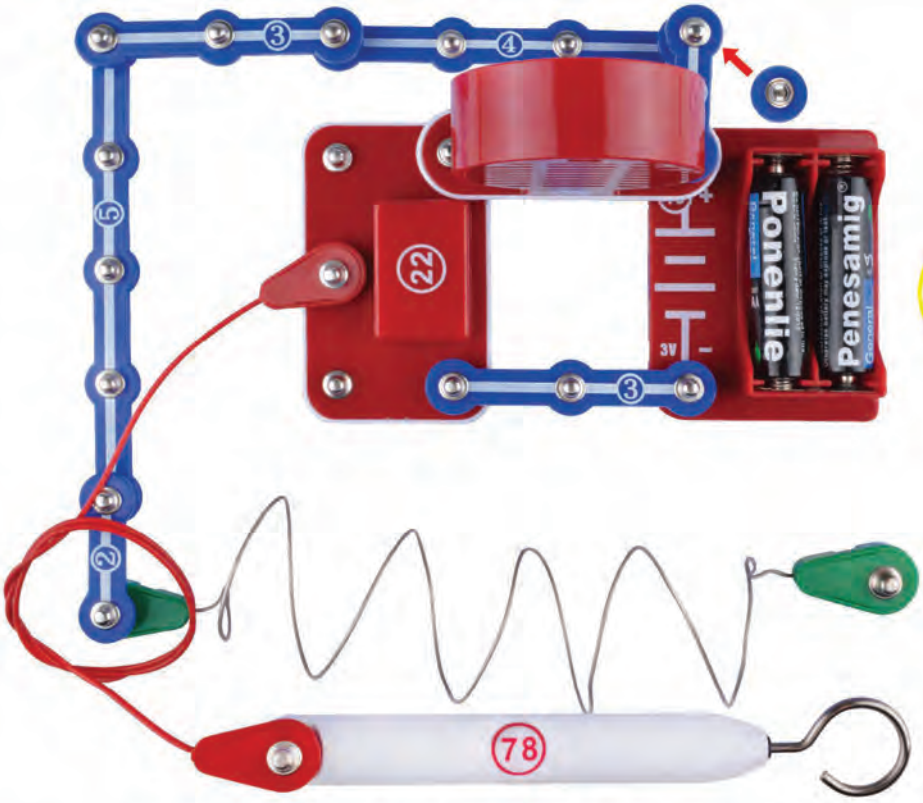
4.Maze Challenge – Music

If the ring touches the metal wire, the music will play for awhile, then stop.



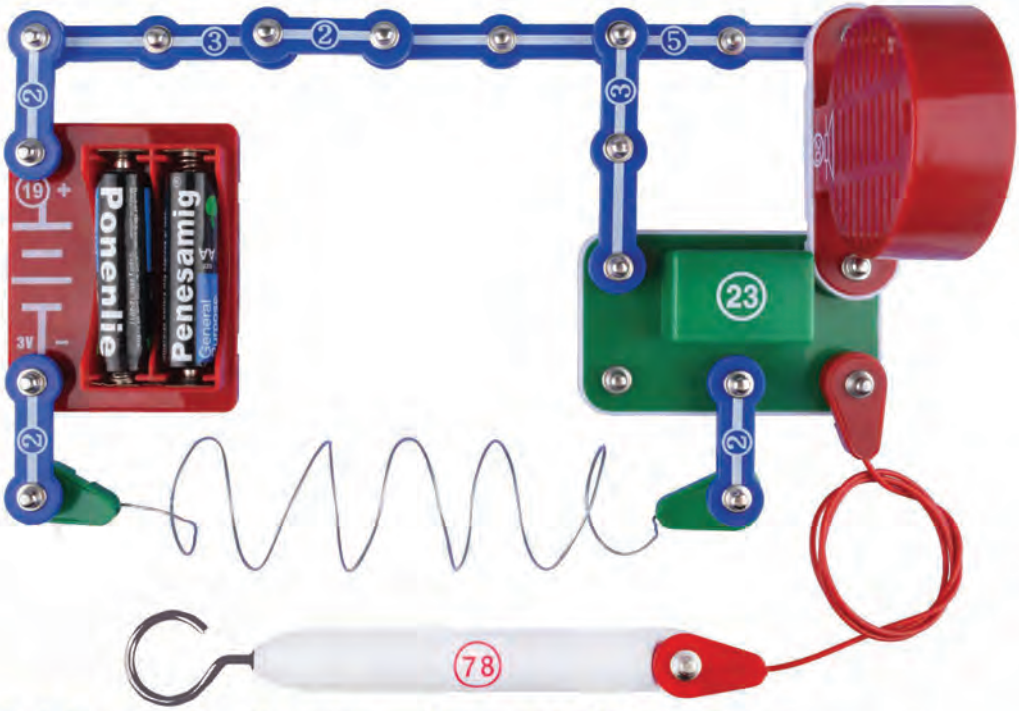
5.Maze Challenge – Music 2

If the ring touches the metal wire, the speaker (20) will play a sound.



6. Maze Challenge – Police Siren

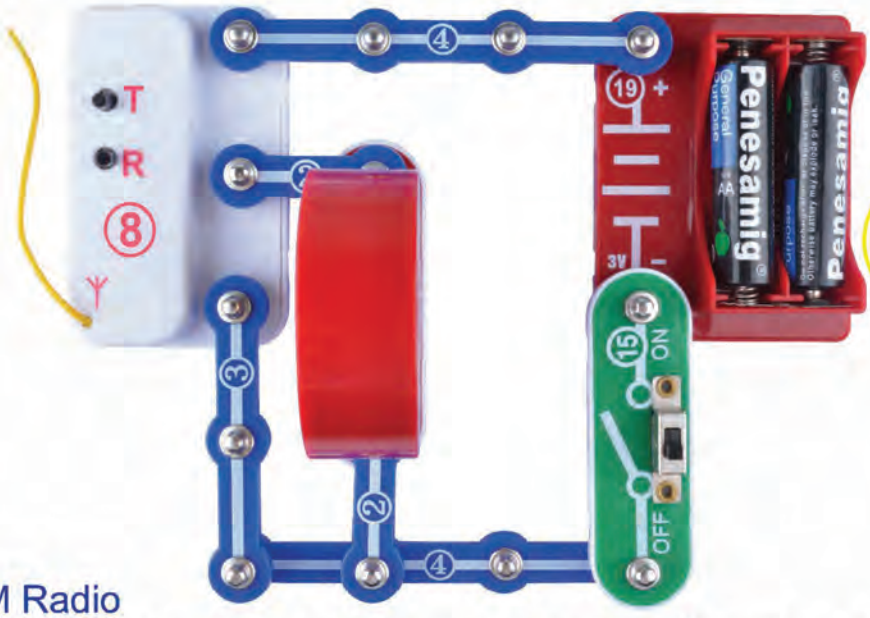
If the ring touches the metal wire, the police siren will sound.



7. Maze Challenge – Sound Effects

If the ring touches the metal wire, you will hear an exciting range of sounds.

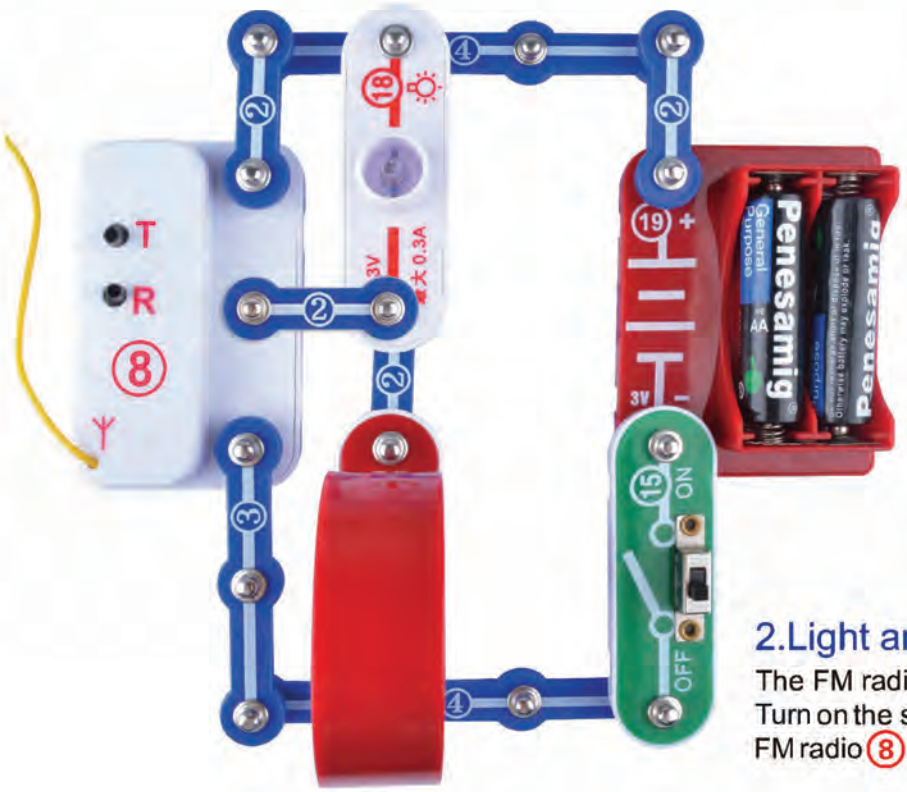
Lesson 6: FM Radio



TRY THIS!
Replace the speaker #20 with the whistle chip #11 or the motor #24.

1.FM Radio

"R" button resets the frequency to 88MHz. This is the beginning of the FM range. Press the "T" button, and the module scans for the next available radio station. Turn on the slide switch (15) and press the "R" button. Now press the "T" button and the FM module scans for an available radio station. When a station is found, it locks on to it and you hear it on the speaker. Press the "T" button again for the next radio station. The module will scan up to 108MHz, the end of the FM band, and stop. You must then press the reset "R" button to start at 88MHz again.



TRY THIS!
Replace Lamp #18 with any of the LEDs.

2.Light and Sound FM Radio

The FM radio operates as before. Turn on the slide switch (15). The FM radio (8) and lamp (18) will turn on.

“Think!” Answers

1. How can a flying saucer fly, but a fan cannot?

The blades of a fan are at an angle in design. When the blades are turning clockwise, the air in the obverse side of the fan will be pushed and moved upward, forming a current of wind. This is the principle of a fan. When the blades are turning counterclockwise, the air in the inverse side of the blades will be pushed and moved downward. The air forces propulsion onto the blades, and the blades will fly up.

2. How does the LED turn into colored rings?

When the object is moving slowly, our eyes can easily identify each image. However, when the object is moving rapidly, our eyes will see it as a continuous image.

3. Why won’t the LEDs light up when you exchange the 2 polarities?

The LED is like a check valve that only allows current to flow from positive pole to negative pole, not otherwise.

4. Why won’t lamp #18 light up?

When connected in a series, all components will have equal electric current through them. the lamp is off because it requires a higher current through the circuit to turn on than the LED’s do.

5. Are the appliances in your home connected in parallel circuits?

Yes, home appliances are connected in parallel.

6. Why is the fan speed variable?

When you turn on the reed switch #13, the lamp is interrupted and the fan motor speed increases.

7. How does the colored LED emit colorful lights?

Colorful light is equipped with flashing integrated circuits and LEDs in three colors. The flashing IC can control the time and speed of the LED lights, allowing different color effects.

8. Why does the red LED IC light up after the other color LEDs blink?

Since the blinking LED is first in the current flow, the red LED will only light up after going through the complete sequence of the blinking LED IC.

9. Can you use the IR detector function in sunlight?

Sunlight contains infrared (IR), so if you are using this function in the sun, it will not be effective.

10. Can you list anything else that uses a tilt switch?

Tilt switches are commonly used in rotating digital photo frames, smartphone gravity sensors, some appliances, security equipment, intelligent systems, and others.

11. How does the whistle chip control the doorbell?

The Whistle chip contains two thin plates. When an electrical signal is applied across them, they stretch slightly in an effort to separate (like two magnets opposing each other). When the signal is removed, they come back together. If the electrical signal applied across them is changing quickly, then the plates will vibrate. These vibrations create variations in air pressure that your ears feel, just like sound from a speaker.

12. How does the light control the musical doorbell?

The photoresistor contains material that changes its resistance when it is exposed to light. As it gets more light, the resistance of the photoresistor decreases. When the strength of the light changes, the current of the circuits will change and the doorbell circuits are triggered.

13. How does spinning the motor control the musical doorbell?

The motor is also a DC generator, and when you turn it, the motor generates a voltage that triggers the musical doorbell circuits.

14. How does water activate the musical doorbell?

Although water is not a good conductor, nevertheless, it can pass current. The circuit only needs a small current to pass through; therefore, even drops of water can control the musical doorbell.

15. How does the motor play music?

The motor uses magnets and a coil of wire. When the rotor of the motor is connected to music current, it receives a magnetic force and produces vibration, emitting a musical sound.

16. How does the speaker control the musical doorbell?

There is coil on the paper cone of the speaker. When the coil is in a magnetic field, the paper cone vibrates from the pressure of a voice, the coil will cut through the magnetic line to produce a weak current, and it will trigger the music doorbell to ring.

ELECTRONIC BLOCKS

Hamilton Buhl®

80 Little Falls Road • Fairfield, NJ 07004

www.HamiltonBuhl.com

EB89M