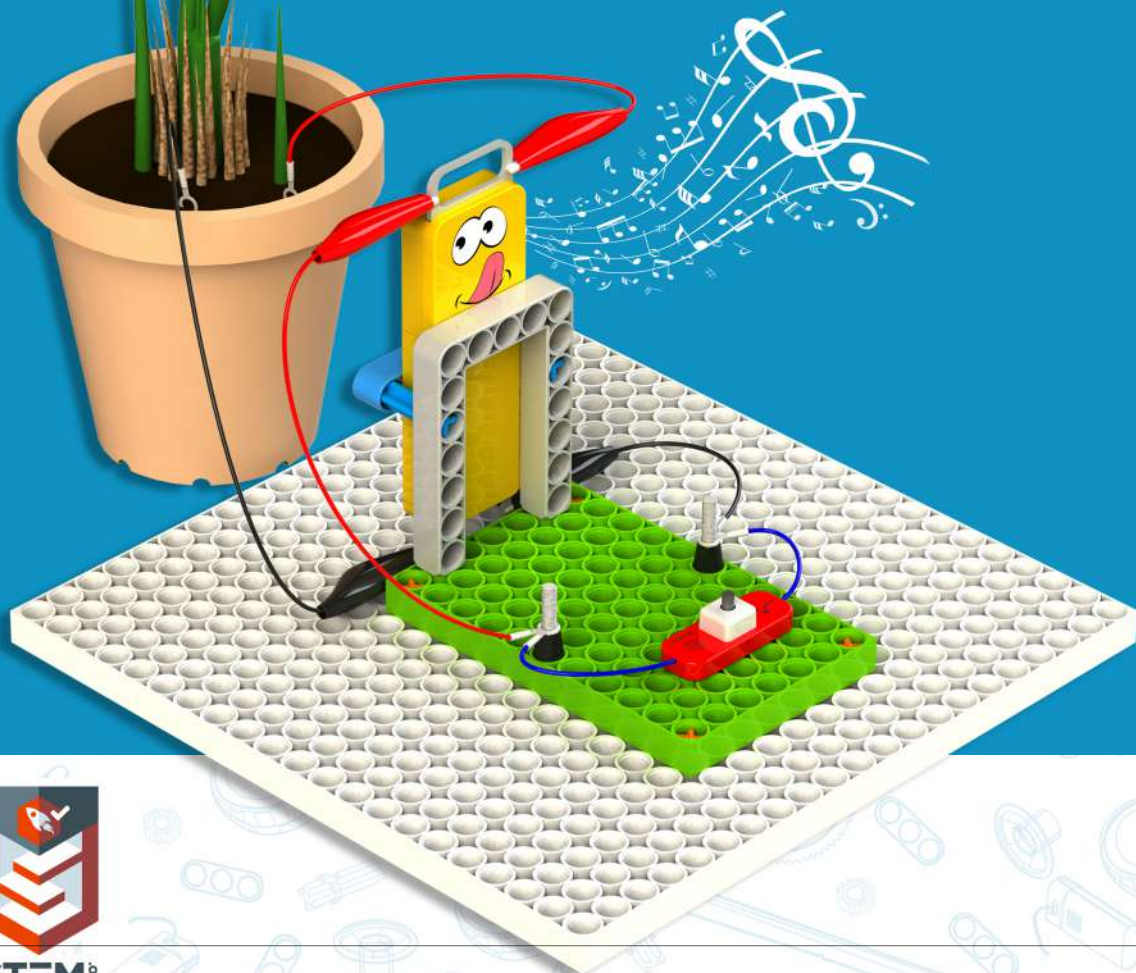


**Blix**<sup>TM</sup>

# JUNIOR ELECTRONICS



**STEM**<sup>500</sup>  
ACCREDITED  
EDUCATIONAL EXPERIENCE

## Things to keep in mind while playing with Queaky

Playing with a musical STEM (Science, Technology, Engineering, and Mathematics) toy can be a fun and educational experience. Whether it's a build-your-own-musical instrument set, these toys offer hands-on experience in both the science of sound and the joy of music. Here are some things to keep in mind:

- Do not ever connect with an external power supply.
- Don't ever fully immerse Queaky in water.
- Make sure you turn off the switch once Queaky is not in use.
- Use Queaky as a conducting material not as the power supply.

# Introduction

Everyone, at some point, has come across or learned about electricity in one way or another. There might have been experiences such as:



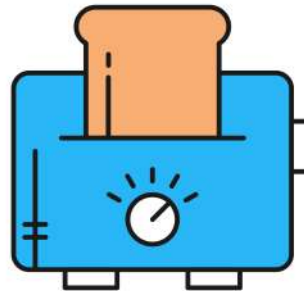
Turning ON Lights



Using a Refrigerator



Watching Television



Using a Toaster

Each of the above involves the use of electrical appliances that are wired together in a complete loop known as a Circuit. And they all are kind of nonliving circuits.

What if we use humans as conductors, using their hands, noses, skin, and essentially every other part of their bodies to conduct electricity? We're going to have some really enjoyable experiments with various conductors and insulators in the upcoming chapters.



## Chapter 1: My First Queaky Circuit

Have you ever played a pass-the-parcel game? Think of an electric circuit like a circle of friends playing pass-the-parcel.



The battery is like the music starter, giving the energy to start the game. The wires are like the children's hands, passing the energy (or the parcel). The light bulb is like the child who opens the parcel, using the energy to light up with joy. If someone breaks the circle, the parcel stops - just like when a circuit is broken, the electricity stops flowing, and the light goes off.

### Now Who / What is Queaky?

Queaky is something magical yet technical. It has a fancy colourful body with two metallic ears. The moment both ears senses that the circuit is closed meaning there is a loop for the current to flow, it gives out a shout. The tone is based on how much resistance is present in the circuit.

Examine the table below to see the analogy between both circuit types:



(a) Hungry



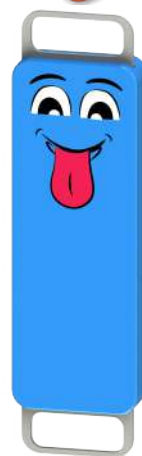
(b) Flirty



(c) Happy



(d) Sleepy



(e) Goofy

S.No.	Electric Circuit	Queaky Circuit
1	Battery	Queaky
2	Terminals	Ears
3	Wires	Human Touch / Body
4	LED / Buzzer / Motors	Inbuilt Buzzer

Let's do an experiment to justify the above table:

### Experiment 1:

Make your first Queaky Circuit

Materials Required:

1. Queaky Instrument
2. A human

### Build Your Queaky Circuit:

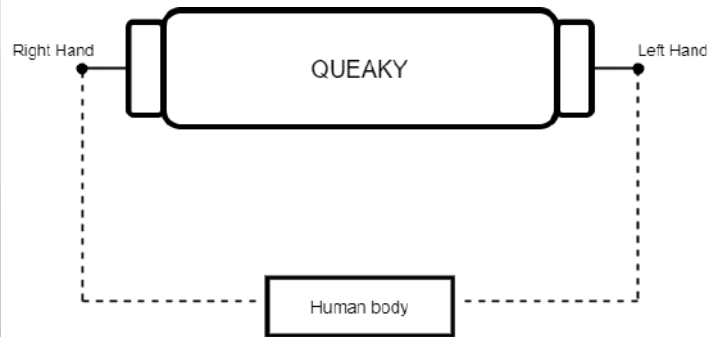
1. Turn on the Queaky.



- 2. Hold an ear of Queaky with one hand.
- 3. And the other ear with another hand.



(a) Photo



(b) Circuit Diagram

Write your Observation:

.....

.....

### Experiment 2:

To make your Queaky shout using 2 human beings using their hands

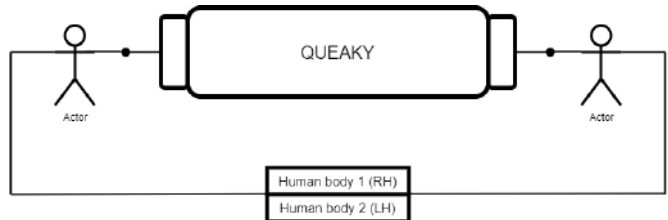
**Materials Required:**

- 1. Queaky Instrument
- 2. Two humans.

**Build Your Queaky Circuit:**



(a) Photo



(b) Circuit Diagram

### Experiment 3:

To make your Queaky shout using two arms and a nose.

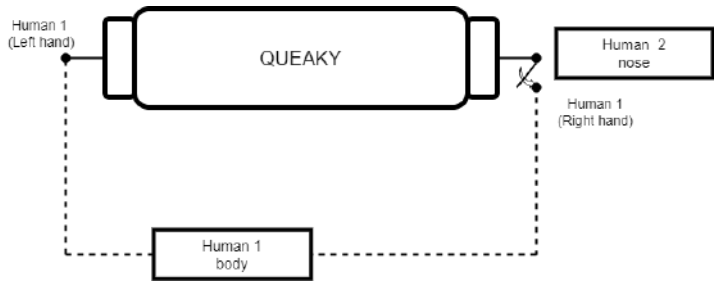
**Materials Required:**

- 1. Queaky Instrument
- 2. Two humans.

# Build Your Queaky Circuit:



(a) Photo



(b) Circuit Diagram

## Conclusion :

Whenever both ears sense that the circuit is closed meaning there is a loop for the current to flow, it gives out a shout.

## Activity

Write the sentence given below using the Electric circuit / Queaky circuit analogy as presented in the table before

'If you disconnect the wire from even one terminal of the battery, the circuit will not be complete and this is called "Open Circuit". If you connect it again, the circuit is completed and is called "Closed Circuit".' (Try doing this in E1)

.....

.....

.....

Whoo-Hoo!! Time for the next concept.



## Chapter 2: Sparks and Barriers: Mastering Conductivity

We now know that our Queaky shouts with a variety of connections, but they only respond when connections are made with specific types of living and nonliving things. Based on its response we can categorize those things into conductors and insulators.

### Let's understand conductors and insulators in detail

An electric circuit cannot be completed if a conductor is not connected between the different components and the two terminals of a battery.

"Conductors" are materials that allow electricity to pass easily whereas "Insulators" are materials that do not allow electricity to pass easily.

So conductors are like nice, new, big, smooth pipes that allow water to flow easily but insulators are like choked pipes that won't let water flow!



Conductors are like smooth pipes



Insulators are like choked pipes

In general, remember that metals like iron, copper, and gold are conductors whereas non-metals like wood, rubber, and plastic are insulators.

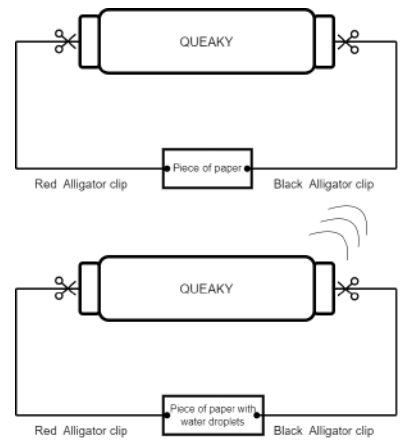
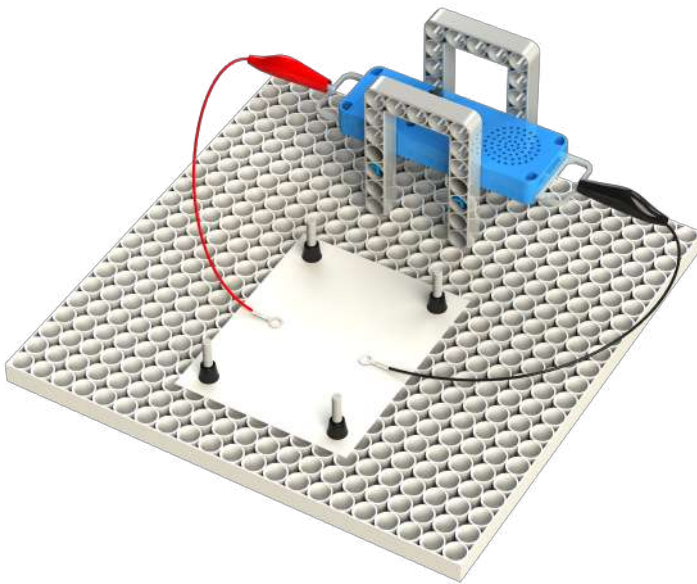
### Experiment 1:

Make a Queaky Circuit with paper.

### Materials Required:

1. Queaky Experiment
2. Two Alligator Clips
3. Two PU5\*7
4. P21\*21
5. 4 Connecting Towers
6. Paper
7. 4 CT3
8. SH60
9. Coin

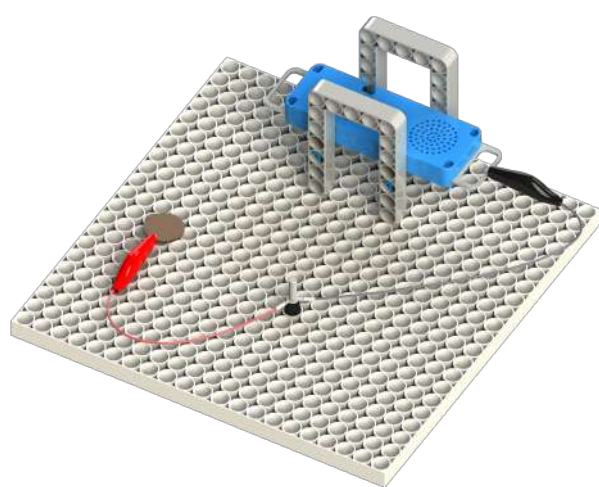
### Build Your Queaky Circuit:



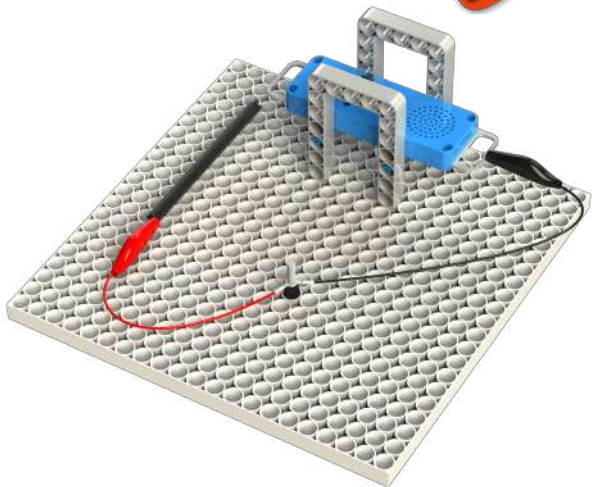
Wet the paper to make it conductive

### Experiment 2:

### Build Your Queaky Circuit:

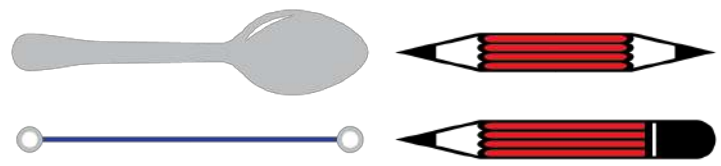


Using Coin



Using SH60

Also, try connecting these objects between the clips



### Activity 1

Based on the above experiments, categorise the following in conductors and insulators

S.No.	Materials	Conductor or Insulator
1	Paper	
2	SH(60)	
3	Coin	
4	Wet String	

## Activity 2

Categorise the following items into conductors and insulators with the help of Queaky.





## Chapter 3: Queaky being Quaky

When a conductor is in a closed loop, the fantastic Queaky shouts. However, the sound it produces varies depending on the type of conductor used. The cause for this shift is resistance.

Let's understand resistances in detail:

When you are trying to walk through water in a swimming pool, it's harder than walking on the ground, right? The water pushes against you. That's resistance.

### 2) Water resistance



When walking or swimming through the sea or swimming pool, you feel that water is pushing you back.

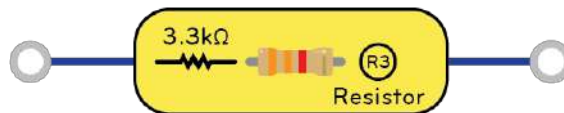
Our bodies have something like that as well.

Remember our previous circuits. In one, a person held Queaky with both hands and in the other, one individual held one ear while a different person held the other ear. In each scenario, Queaky sounded differently.

That's because the total body mass in contact changed and they are like, "Wait a minute!" to that shout. That's called body resistance!"



**NOTE:** In various electric applications, resistances are like a superhero, controlling electricity so that things just work out right. It prevents the blowing off of LED and other components due to excess electricity.



## Experiment 1:

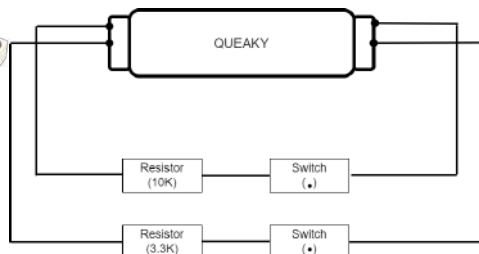
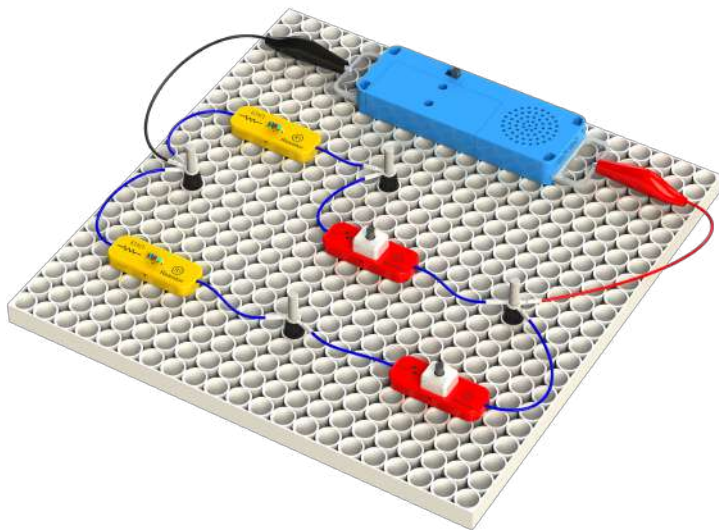
Make two circuits with two types of resistances and note down the modulation in their tone.

### Materials Required:

1. 10k Resistance
2. 3.3k Resistance
3. Queaky
4. 2 Switches
5. 4 Connecting Tower
6. Two Alligator Clips

### Build Your Queaky Circuit:

Press each switch and write your observations below-



S.No.	Circuit	Sound Level (High or Low)
1	Circuit with 10K ohm	
2	Circuit with 3.3K ohm	

## Activity

Grab a spoon and a pencil with two pointed ends, and create their circuits. Refer to the table above, and by listening to the sound, determine which material has higher or lower resistance.

S.No.	Material	Resistance (High or Low)
1	Spoon	
2	Sharp-edged Pencil	

## Chapter 4: The Biggest Conductor Ever - Earth

The Earth is often referred to as the largest conductor, providing a vast pathway for electric currents to flow and stabilize. This natural conductivity makes it a safe place to send extra electricity from our machines and gadgets to ensure electrical safety. And that extra electricity is known as "Static Electricity"



Let's understand this in detail. Imagine you've just gone down a slide at the playground on a sunny day. When you get to the bottom, you might feel a little "shock" when you touch someone or something. It's like tiny little sparks jumping from one place to another. BOOM!! That's static electricity.

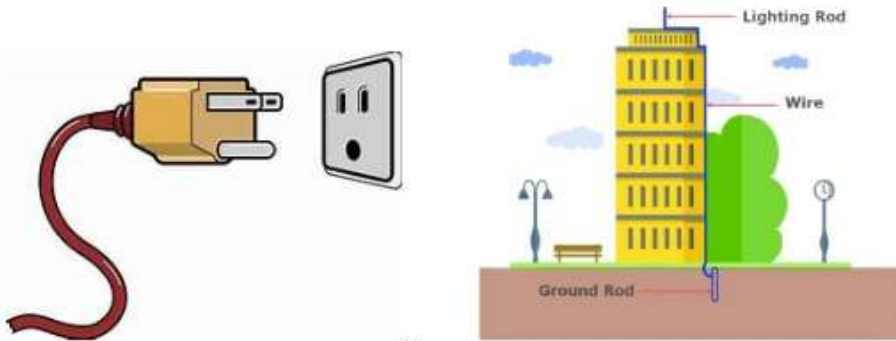


Now, think of static electricity as an extra amount of water in a cup, and you want to pour some water out safely. If you pour it onto the ground, the water goes away and everything is okay. But if you pour it on your friends, they might get wet and upset. In the same way, "Earthing" is like running the static electricity (or those little sparks) safely into the ground so no one gets a "shock".



## Curiosity Corner:

Why do most electric plugs come with 3 pins instead of 2?



Plugs have three pins to make them safer:

Two pins for power and one extra pin to connect to the Earth, which can take away any unwanted electricity and reduce the risk of shocks.

Time to understand the concept of Earthing using Queaky.

## Experiment 1:

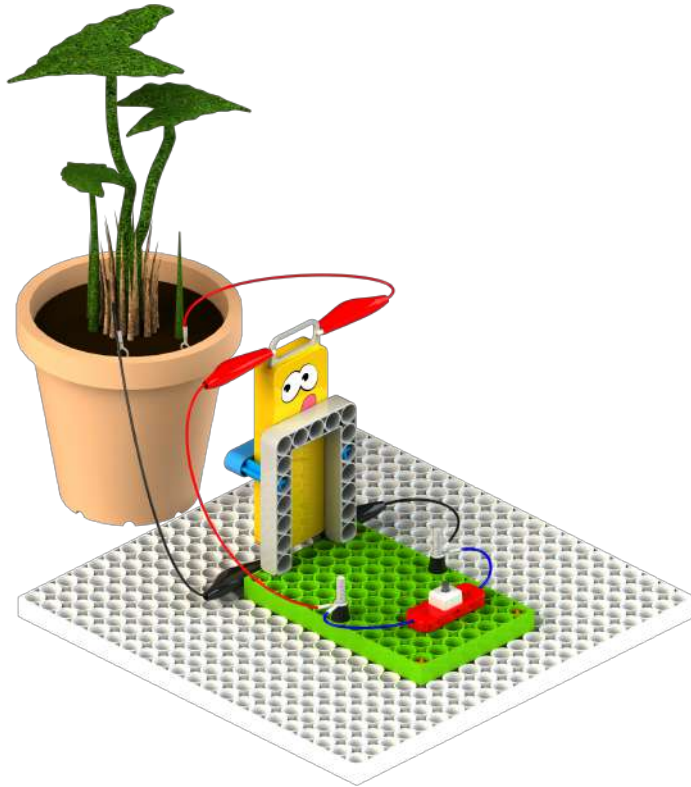
Make a Queaky circuit where the electricity is going to the earth when the switch is not pressed.

## Materials Required:

1. 1 P21x21
2. 1 P7x11
3. Queaky
4. 1 Switch
5. 2 Connecting Tower
6. 4 Alligator Clips
7. 1 P5
8. 2 CT3

## Build Your Queaky Circuit:

1. Make two circuits:



- First Circuit: Connect Queaky with a switch using alligator clips.
- Second Circuit: Put the alligator clip's plugs, connected to the Queaky, into the ground.

2. Now press the switch.

Write your Observation:

.....

.....

.....

The Earth, being a good conductor of electricity and its gigantic size paves a path for the safe discharge of the electric charge.

Yayyyyyyy! Time to try some more amazing experiments.

## Chapter 5: Queaky-Dough Duo

Hello creators, We all have played with Play-Doh or some modelling dough or clay or eatable dough at some point in our lives. It's fun, it comes in all sorts of colors, and you can give it any shape as per your imagination.

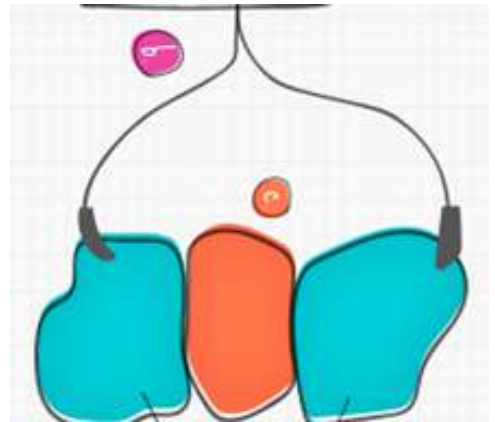
What if those dough starts to conduct electricity or we make them fit enough to conduct electricity through Queaky?

### Experiment 1:

Make your dough conducting.

#### Materials Required:

1. 1 cup of water
2.  $\frac{1}{4}$  cup of salt
3. 1 Tbsp vegetable oil
4. Cooking spoon



#### Procedure:

1. Mix salt water, and vegetable oil in your pot. Add dough to the pot.
2. Put the pot on your stove over medium heat and stir it continuously.
3. Your dough mixture will eventually start to boil and get chunky. Keep stirring until the dough, vegetable oil, and salt water are mixed thoroughly.
4. Turn off the stove. When it's cool, knead the dough.

### Experiment 2:

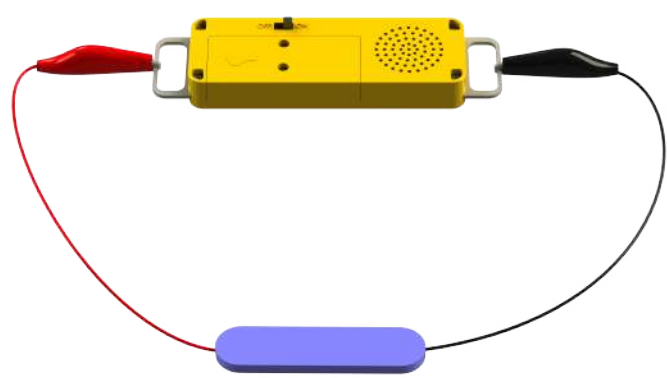
Test if the dough became an electric dough or not.

#### Materials Required:

1. Queaky
2. Alligator Clips
3. 2 Connecting Tower
4. Dough

Procedure:

Connect the circuit as shown below.



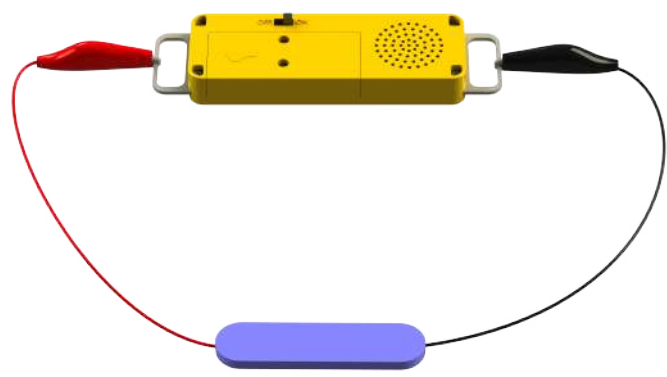
Write your Observation:

.....

.....

### Activity 1

Try the following circuit and see if Queaky shouts or not.





Provide the possible reason in support of your observation:

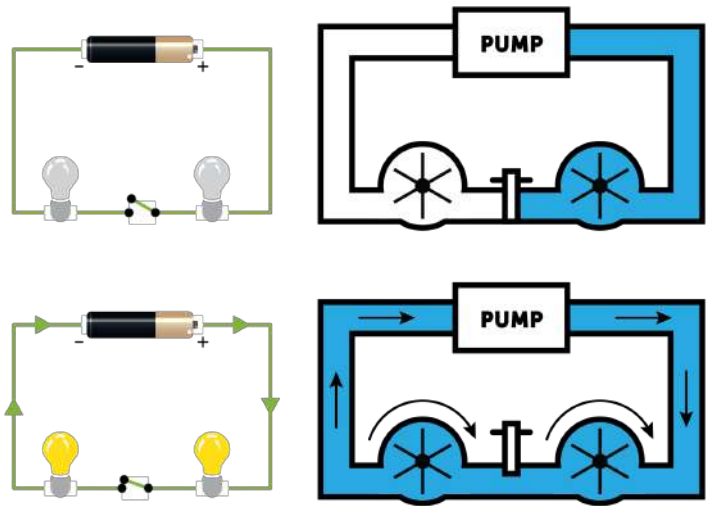
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**Series Connections:**

In electronics, there are two major types of connections - 'Series and Parallel'.

Series connection means that we are connecting components one after the other in a line, such that electricity has only one path to flow. If any one component is removed or the circuit "opens" at any point, no current will pass through the circuit!

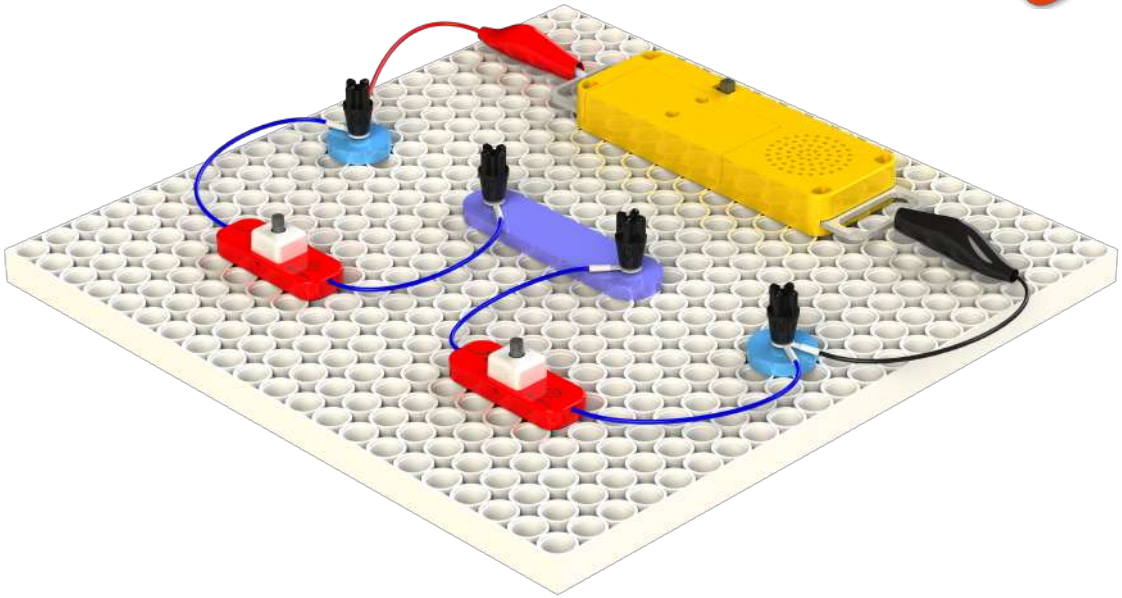


**Experiment 3:**

Connect the circuit as per the diagram 'Series connection' on the next page:

Here, three pieces of dough are connected in series using two switches. Based on the observation, fill in the following table.

S.No.	Which Switch is pressed	Queaky Shouts (Yes or No)
1	Switch - 1	
2	Switch - 2	
3	Both the switches are pressed	



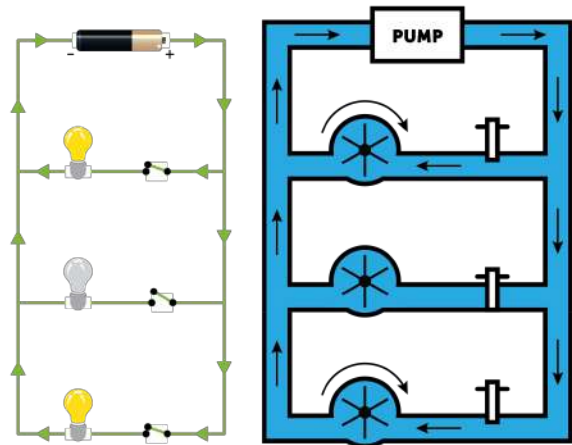
Series connection

The disadvantage of series connections is that if one of the components is off or damaged, then no other component will work as electricity has no other path to flow through them

### Parallel Connections:

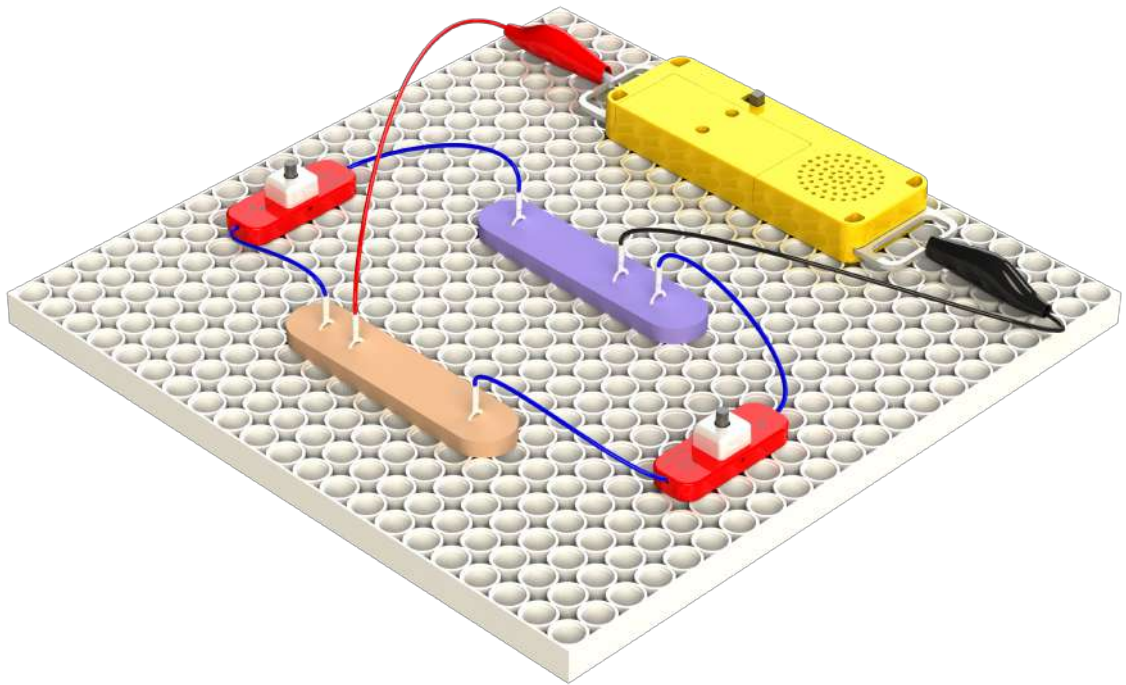
In a parallel connection, we connect components side by side, such that electricity has multiple parallel paths to flow and flow through each path independently. Electricity is split between all these paths and if components in one path are damaged or off, other paths are not affected!

Our homes use parallel circuits, so when you turn off the lights, the fan doesn't get turned off!



## Experiment 4:

Connect the circuit as per the following:



Parallel connection

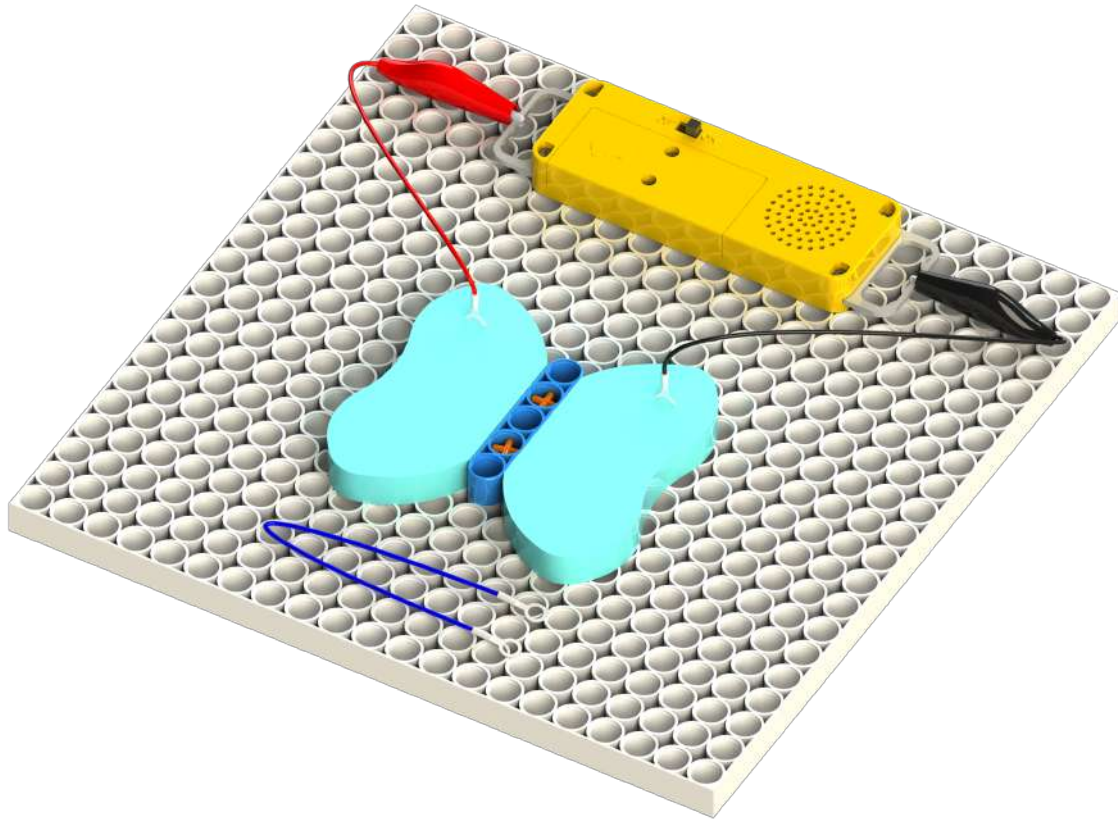
Here, two pieces of dough are connected in parallel using two switches. Based on the observation, fill in the following table.

S.No.	Which Switch is pressed	Queaky Shouts (Yes or No)
1	Switch - 1	
2	Switch - 2	
3	Both the switches are pressed	



## Activity 2

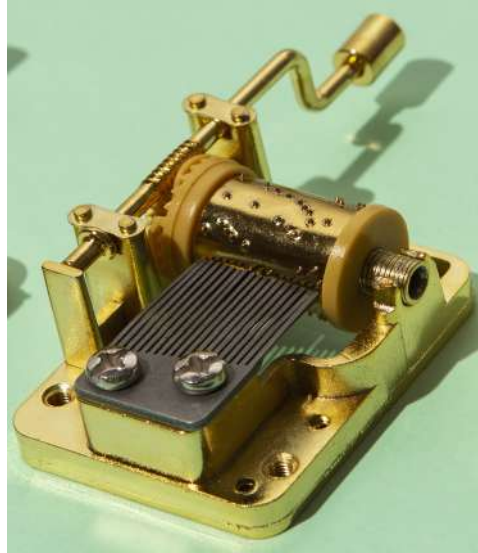
Complete the circuit to make Queaky shout.





## Chapter 6: Tone Explorer Box

Hello Creators, Imagine a box where you can create your very own symphony of sounds, where every touch and press brings forth a melody that's uniquely yours.



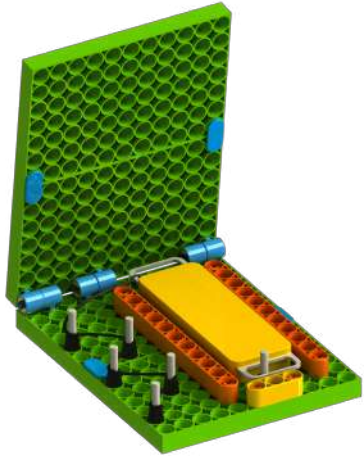
### Experiment 1:

Let's create a Tone Explorer box using Queaky.

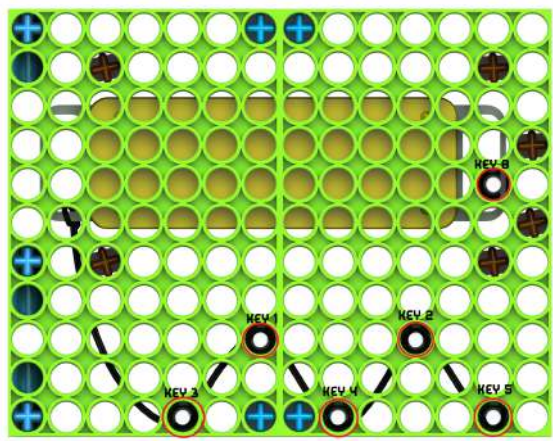
#### Materials Required:

1. 4 P7X11
2. 4 CT(1X2)
3. 6 CH2
4. 3 CL2
5. 6 Connecting Towers
6. Thread
7. Queaky
8. 2 P11
9. P3
10. CT2

Construction:



Open



Closed

In the above model, there are 6 keys in total.

**NOTE: Wet the strings kept inside.**

Now, Key 0 is a unique key. Hold the key 0 with one of your hands permanently every time you need to make a sound. Play with different keys with your other hand.

### Activity 1

What made the above possible?

.....

### Activity 2

Why was it always necessary to hold the key 0, every time a tone is generated?

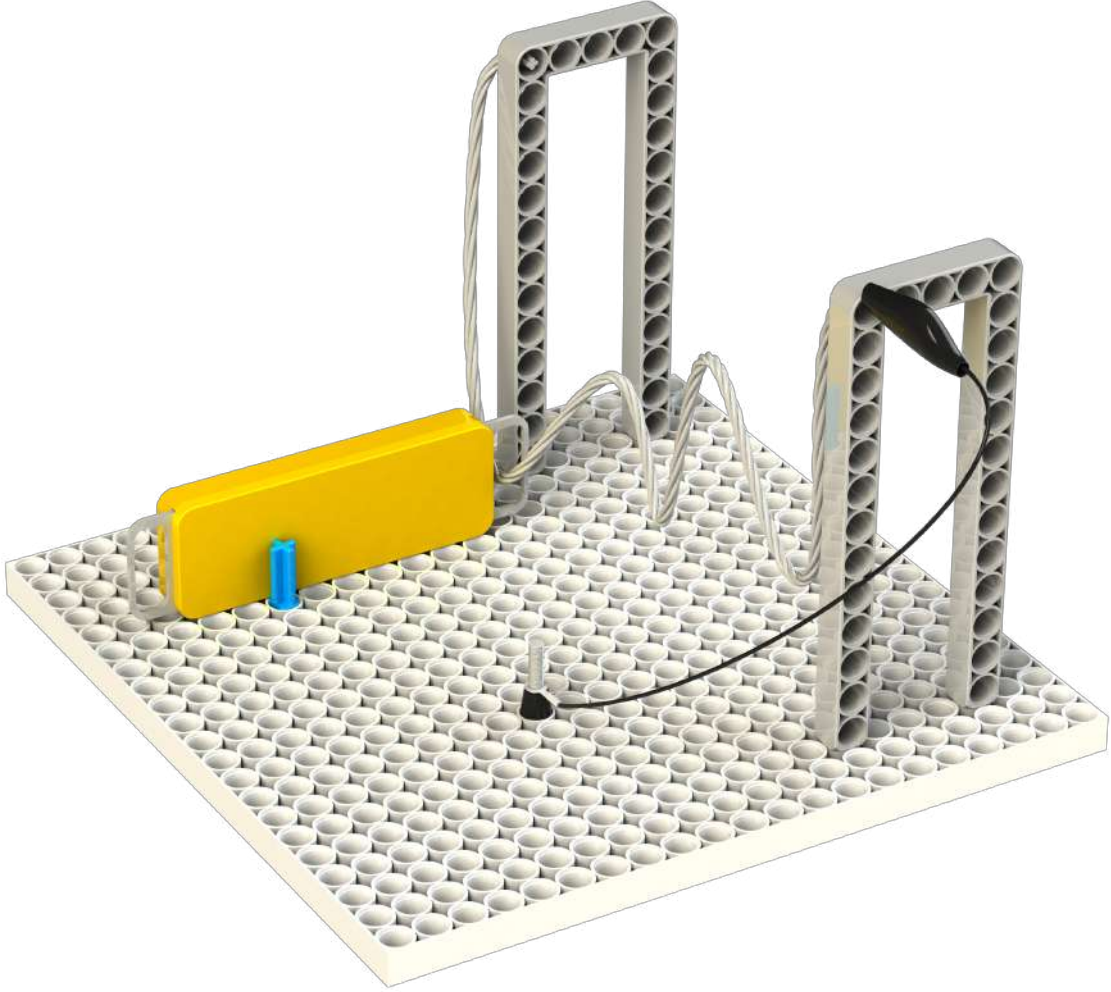
.....

.....

## Chapter 7: Buzz wire game - Queaky

Hello Innovators, Today we have an exciting game to introduce called "the Buzz wire loop game". This game is not only super fun but also a great way to learn about patience, concentration, coordination and mostly learning electric circuit's concepts

Construction:



## Objective:

The students have to navigate the Queaky through a twisted wire loop from start to end without touching the slides. If you do that without making a buzz, you win the game.

## Materials Required:

1. PU5X13
2. P21X21
3. Black Alligator Clip
4. 2 CT3
5. 1 Connecting Tower
6. Queaky
7. Metal Wire

**Note:** The circuit shown above is yet incomplete which means if Queaky touches the wire it will not make a buzzing sound.

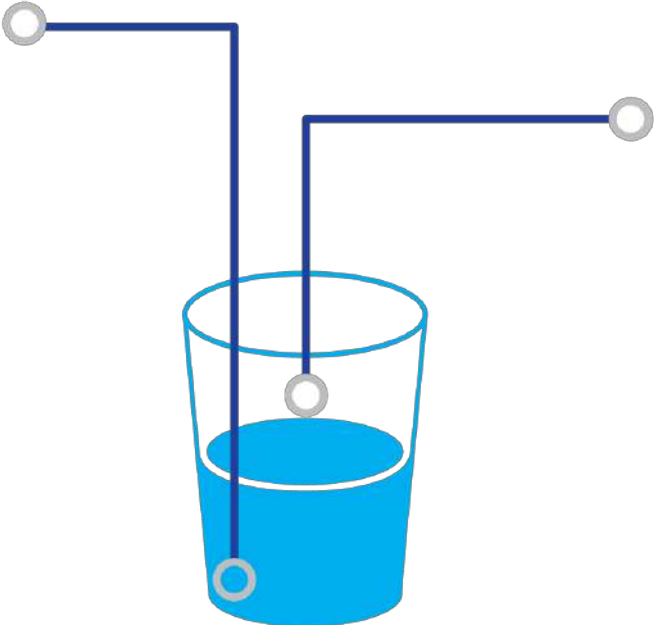
Hold the free ear in your left hand and the connecting tower with your right hand to complete the circuit so that Queaky can buzz once contacted by the wire while passing through it.

Time to play the game and enjoy it.

## Chapter 8: Challenge: WATER LEVEL INDICATOR

Have you ever filled up a glass with water and noticed how the water rises? A Water Level Indicator can tell us when something needs more water or has too much of it. Imagine if your plants could say, "I'm thirsty!" or your fishbowl shouted, "Too full!" That's what this indicator can help with.

Challenge: Make a super cool "Water Level Indicator" using Queaky.







For suggestions or feedback, please contact on

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