

# ACTIVITY TITLE: Circuits of Hypatia

Activity code: ncACINV03



	DURATION	90 min
	AGE RANGE	13-14 YEARS
	TOPICS	ASTRONOMY CIRCUITS SCIENCE



## Description of the project

In this activity, students will design and build a basic paper circuit using components such as batteries, LEDs, conductive tape, and switches. Through this hands-on experience, they will understand the structure of simple electrical circuits and their real-world applications.

Simultaneously, students will explore the life and legacy of Hypatia of Alexandria, a pioneering female figure in astronomy, mathematics, and philosophy. This activity aims to inspire curiosity and promote the visibility of women in STEAM fields by integrating science with historical narrative and creative expression.



## Objectives: What will I learn?

- Identify and assemble basic components of an electrical circuit.
- Learn about Hypatia and reflect on her contributions to science.
- Develop critical thinking and problem-solving skills.
- Enhance creativity through design and storytelling.
- Promote gender equity in STEAM fields.



## Materials: What do I need?

The materials needed to develop the activity will be listed. They will have to be divided into:

1. Provided by the teacher/institution:
  - Scissors
  - 3V battery
  - Conductive tape (copper) and aluminum foil
  - 10mm LED
  - Clear tape & double-sided tape
  - Paperclip
2. Downloadable resources:
  - [Printable circuit postcard](#)



## Previous preparation

List of actions to complete before starting the activity, such as:

- Print Hypatia circuit postcards.
- Review the historical background of Hypatia.
- Prepare all materials for circuit construction.



## RESEARCH



Have a look at these resources

### Hypatia of Alexandria:

Hypatia of Alexandria is the first female mathematician of whom we have reasonably detailed knowledge. She wrote about geometry, algebra, and astronomy, and improved or designed astronomical instruments.. In addition, she was a charismatic teacher who left a lasting impact on her students, some of whom also became prominent scientists of the time.



As an astronomer, Hypatia advocated for an approach based on empirical observation and reason, rather than mythological and superstitious beliefs. This made her one of the most rationalist figures of her time.



Hypatia is credited with improving the astrolabe, a device that:

- Determine the local time based on the position of celestial bodies (especially the Sun or some well-known stars).
- Calculate the altitude of celestial bodies above the horizon.
- Solve problems of spherical trigonometry.
- Assist in navigation and orientation.

Her work was not limited to astronomy but also integrated philosophy, mathematics, and astronomy, demonstrating how these disciplines can collaborate to understand the cosmos. Her influence was crucial for the development of science and logical thinking.

Hypatia stood out not only as an astronomer but also as one of the first documented female scientists in history, breaking barriers in a field dominated by men and leaving a lasting impact on the history of science. The figure of Hypatia invites us to reflect on how women have been made invisible in science throughout history.

We recommend watching this video regarding the history and functionality of the astrolabe:

<https://www.youtube.com/watch?v=0MxzfqadkBO>



### Reflective Questions:

- Why is Hypatia an important role model?
- How did her contributions shape scientific thinking?
- Compare the astrolabe with a modern clock. What do you think? Can we use the same clock in every location without adjusting it? Can this be similar to changing the disc of location in an astrolabe?

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## CREATE



### Some things you need before beginning

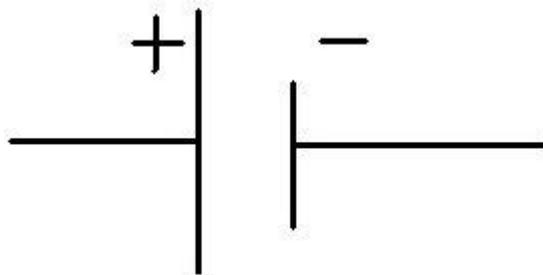
In an electrical circuit, the main components are typically classified into generators, conductors, and receptors. These categories help to understand the role of each part within the circuit and how they interact to make the system work properly. Here's an explanation of each:

#### 1. Generator

A generator is any component or device in a circuit that provides electrical energy. The energy supplied by the generator is converted into electric current that flows through the circuit.

##### Function:

- Supply the electromotive force or voltage needed to move electrons through the circuit.
- It is the source of electrical energy in the circuit.



Battery symbol in an electrical schematic.

#### 2. Conductor

A conductor is any material that allows electric current to flow from one point to another within the circuit. Conductors provide the path for electrons to move from the generator to the receptor.

##### Function:

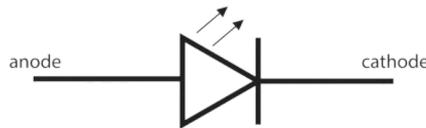
- Facilitate the flow of current between the generator and the receptor.
- Typically, conductors have low electrical resistance so current can flow efficiently.

### 3. Receptor

A receptor is any device that uses the electrical energy supplied by the generator to perform a useful function. Receptors convert electrical energy into another form of energy, such as light, heat, motion, etc.

#### Function:

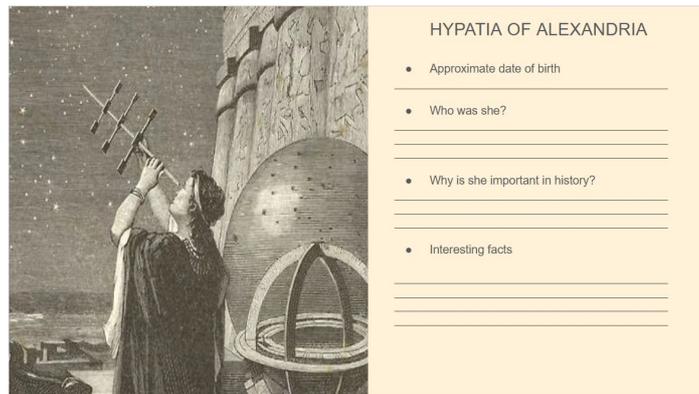
- Convert electrical energy into another form of energy: light, sound, heat, motion, etc.
- They are the final part of the circuit, where useful work is done.



Led symbol in an electrical schematic.

**Now, follow these steps**

**Step 1:** Distribute a postcard of Hypatia of Alexandria to each student.



**Step 2:** The students will answer the questions on the postcard, filling in the blanks with all the information they have learned about this historical figure:

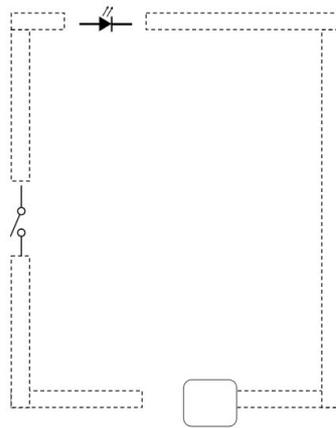
**HYPATIA OF ALEXANDRIA**

- Approximate date of birth  
\_\_\_\_\_
- Who was she?  
\_\_\_\_\_  
\_\_\_\_\_
- Why is she important in history?  
\_\_\_\_\_  
\_\_\_\_\_
- Interesting facts  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Step 3:** Preparing the materials for the circuit:



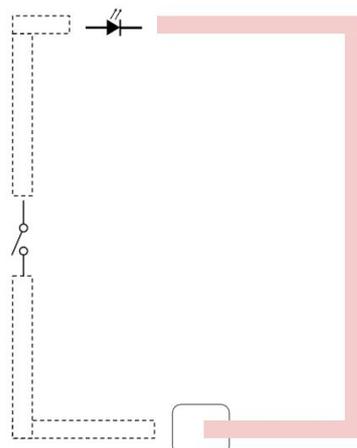
**Step 4:** Stick a piece of double-sided tape over the battery symbol.



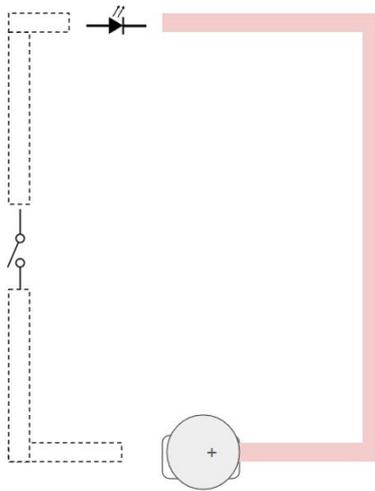
**Step 5:** Place the negative side of the conductive tape.

It's important to be careful when removing the backing paper from the conductive tape. The tape should be applied gradually as the paper is peeled off. Otherwise, the tape may curl up on itself and become unusable.

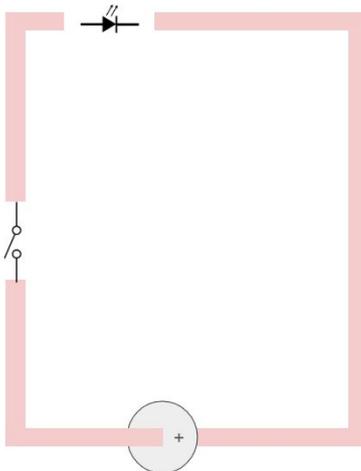
It's essential to remind students that if the tape breaks, the damaged piece must be replaced with a new one.



**Step 6:** Place the battery in its spot. Keep in mind that the negative side of the battery must be on top of the conductive tape.

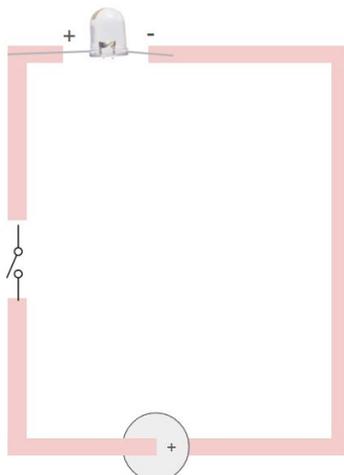


**Step 7:** Stick the positive side of the conductive tape.

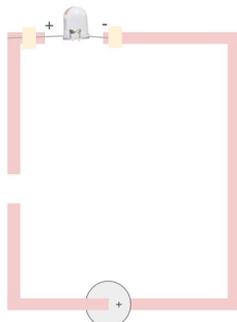


**Step 8:** Place the LED.

The LED has two legs: the longer one is the positive side, and the shorter one is the negative side.



**Step 9:** Secure it with clear tape, making sure the legs rest on the conductive tape.



**Step 10:** Place a paperclip in the space where the switch goes.

To do this, tape down only one end of the paperclip so that it touches the conductive tape. The other end should remain free. This way, when you press the clip, the free end will close the circuit and the LED will turn on.



**Step 11:** Measuring light.

Now you will use external **digital tools** to measure parameters such as light intensity to see how our model is working.

One possibility regarding this is using the App [ARDUINO Science Journal](#) that has a **light intensity sensor** integrated. You may use it to see and test how your circuit is doing, and if there is a possibility to make it more efficient in terms of irradiated light. Could it be improved by putting another battery in parallel? Maybe changing the type of led? In this [link](#) you may see specifically how to use the light sensor in this app.



**Step 12:** Ideas for extension:

After your first measurement, try replacing conductive tape with graphite or aluminum foil. What changes? Why? Compare copper tape vs aluminum foil and justify which one is be the best choice based on conductivity and usability. Finally, write a short paragraph explaining which version worked better and why — using scientific principles (conductivity, resistance, material properties).

**Step 13:** Creative lights

Do you enjoy astronomy? Let's draw an **asterism**! (In case you're not familiar with the term, an asterism refers to the recognizable patterns or shapes formed by stars within the larger regions of the sky known as constellations. Although we often call these shapes "constellations," the more precise term for these patterns is "asterisms.")

Now that you understand how to build circuits, you will work in pairs or small groups to create a new version of the circuit, connecting science + art + history + culture + inclusion:



- Firstly, each team will choose a traditional or cultural representation of stars, navigation, or symbols.
  - Examples:
    - Islamic star patterns / mosaics
    - Māori star navigation
    - Indigenous constellations
    - Greek or Roman mythology constellations
    - African star knowledge
    - Chinese star maps
- Once chosen the representation, in groups, research this tradition briefly (internet, articles, can be used to find information and data). Afterwards, reflect on:
  - What values or knowledge does this tradition convey?
  - How can we represent this in a paper circuit with LED stars?
- Later, in your team:
  - Sketch a new circuit design based on your cultural source. Once you have drawn the main asterism, a good next step is to highlight its main stars, or at least the brightest one. In order to do this, you will have to design the circuit and put the leds in the place of the stars.
  - Build the circuit collaboratively.
  - Decorate the circuit creatively to reflect the cultural source.
  - Write a small explanation to present your work: What is the origin of this star pattern? Why did you choose it? What did you learn about this culture? How did your team ensure inclusion and collaboration during the project?



## COMMUNICATE

Firstly, teams will present their cultural star circuits to other teams; each team will give feedback to at least one other group:

- What did you like about their design and story?
- What did you learn about the culture they represented?
- One suggestion for improvement.

Once feedback is given, it's time to share thoughts about:

- Why does the LED turn on in circuits? Describe what happens in the circuits and the function of each component.
- Where do you find electronic circuits in your daily life?
- Have you found this activity useful for understanding the components of a circuit?
- How did this project help you explore cultural exchange through art?
- How did your team work to ensure everyone contributed?
- How do traditional knowledge and modern STEAM connect in this project?



It is time to share!

In this section different social media will be presented in order to upload their activity result.

#circuitsofhypatia

- LinkedIn: <https://www.linkedin.com/company/steambrace-project/posts/?feedView=all>
- Instagram: [https://www.instagram.com/steambrace\\_eu/](https://www.instagram.com/steambrace_eu/)
- X: [https://www.instagram.com/steambrace\\_eu/](https://www.instagram.com/steambrace_eu/)



## KEEP ON LEARNING



### How can I make a similar project by myself?

Provide students with questions that engage them to further explore the topic beyond the activity done. For example,

#### Reflection Questions:

- Which historical figure would you like to represent in your own paper circuit?
- What would you do if the circuit doesn't work as expected?
- How would you explain your project to someone who has never done something similar?
- If you had to do the project again, what would you improve or change?
- How would you make sure your circuit works correctly and stays connected?
- What challenges did you face while creating your circuit?



### Which are other connected projects?

- Can you recreate this circuit using only recycled items? How does it reduce waste? Adapt this activity to recycled materials
- After initial build, students may test and redesign the circuit for efficiency or aesthetics.
- Do you know any other women whose discoveries have been important to the history of humanity? You can create a postcard inspired by that figure and create your own circuit.
- Besides Hypatia, research a contemporary scientist and make a visual comparison between the two.
- Use a tool like Canva or StoryJumper to tell the story of Hypatia in a visual format
- Redesign packaging for a different target audience (e.g., children, seniors).
- Develop a branding concept around their design.
- Explore biodegradable materials for sustainable solutions.



## LINKS FOR FURTHER INFORMATION

- How to make an astrolabius:  
<https://agrupacionastronomicamagalanes.wordpress.com/2014/09/21/construir-un-planisferio-celeste-recortable/>
- A funny video to learn more about Hypatia of Alexandria:  
[https://www.youtube.com/watch?v=SselOJQd2\\_4&t=207s](https://www.youtube.com/watch?v=SselOJQd2_4&t=207s)

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