Series and Parallel Circuits

Rashid Ayyub[1]

[1]Journal of Conceptual and Applied STEM Education

May 18, 2021

Suggested Time: 50 minutes

Grade levels: VI, VII , VIII

Overview:

This lesson demonstrates simple circuits and the differences between parallel and serial circuit design and functions. The Series and Parallel Circuits activity encourages students to test two different circuit designs through the use of low voltage light bulbs. Students work in teams to predict the difference between the two circuit designs, and then build examples of the two different circuits using wires, bulbs, and batteries. After testing several predictions about each circuit type, the students will compare results and discuss findings.

Note:

This lesson plan is designed for classroom use only, with supervision by a teacher familiar with electrical and electronic concepts.

Vocabulary :

Series

Parallel

Open circuit

Close circuit

LED

Resistance

Objectives:

- Students will Learn that different circuit designs result in different electrical behaviors.
- Students will Learn about current flow and the operational differences between series and parallel circuits.
- students will use of different electrical and electronics components like,bulb, resister, power supple and use of multi meter.
- Students will be able to measure voltage and current.
- Students will Learn to predict outcomes and draw conclusions.
- Students will Learn about teamwork and working in groups.

Required Project Materials:

- Student Resource Sheets and Worksheet
- Wires
- Supply/Power Source (Cell or Battery) 3V and 9V
- LED (3 volt LED)
- Battery Holder
- Crocodile clip
- Wire cutter
- Wire Stripper
- Breadboard
- Jumper Wires
- Switch

Multimedia Resources:

- None

Optional Multimedia Resources:

- None

The Lesson:

Series circuit connection gives us the opportunity to connect more than two loads to a common switch. Street lights are a very good example of this.

Parallel circuit connection makes it possible for us to connect loads to their individual switch. Home wiring is the best example of this where each electrical appliances like bulb, fan, refrigerator and etc are have individual switch.

Procedure/Instructions:

- Review the definitions of series and parallel circuits with the class.
- Use Student Reference Sheets for background information. These may also be distributed as homework reading .
- Divide students into small groups of 3-4 students and distribute Student Work sheet and two set-ups to each group.
- Ask the groups to examine the schematic of a series circuit on the Student Worksheet and draw their own plan for a parallel circuit in the space provided.
- Have each student group make a series and parallel circuit using batteries, wires,and bulbs.
- Once the circuits are complete, ask student groups to make predictions as to how the circuits will function if a LED is removed.
- Also discuss whether the LED might burn brighter in one set up than another.
- Students should record their predictions on the Student Worksheet.
- Have each student group test their predictions using their circuits, and compare their results to their predictions.
- Bring the student groups together to discuss their findings.

Steps for Series Circuit:

Connect three LED on breadboard in series.

each of LED is 3 Volt so in series circuit the total voltage will be 9 volt.

Connect Negative terminal of 1st LED to the positive terminal of 2nd LED and negative terminal of 2nd LED to the positive terminal of 3rd LED.

Connect 9 volt battery to the Circuit.

Connect Positive Terminal of the Battery to the positive terminal of 1st LED and negative terminal of battery to the negative of 3rd LED.

Now you will see all three LEDs will glow. if any of the LED is burnt the circuit will be open and no LED will glow.

Steps for Parallel Circuit:

Connect three LED on breadboard in parallel.

each of LED is 3 Volt so in parallel circuit the total voltage will be remain same that is 3 volt.

Connect positive terminals of all three LEDs together and negative terminals all together.

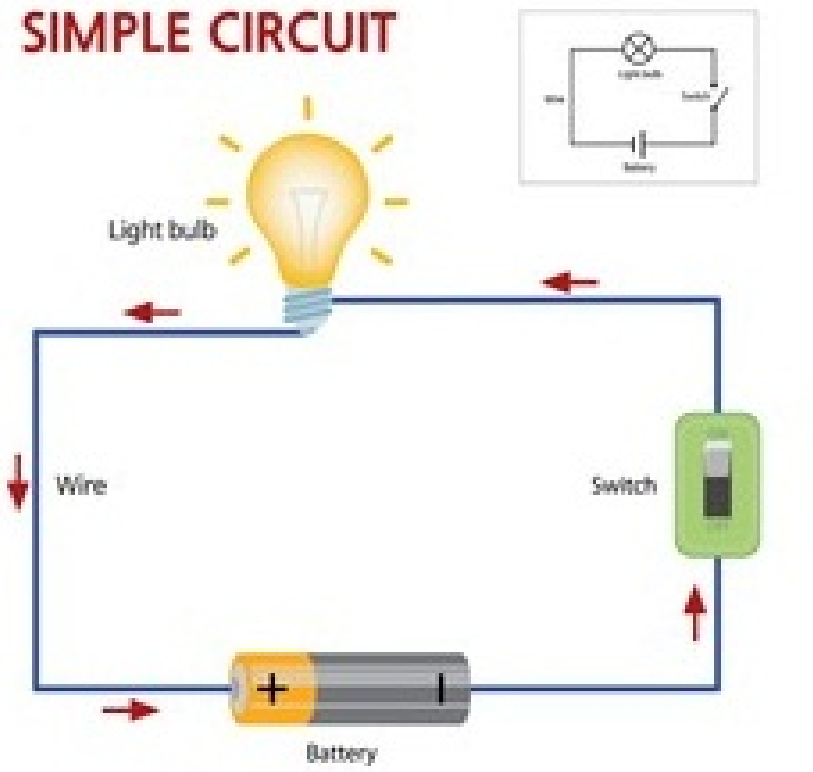
Connect 3 volt battery to the Circuit.

Connect Positive Terminal of the Battery to the positive terminal of LEDs and negative terminal of battery to the negative of LEDs.

Now you will see all three LEDs will glow. if any of the LED is burnt the circuit still remain close and other two LEDs will glow.

Student Resource:

Simple Circuit A simple circuit consists of three minimum elements that are required to complete a functioning electric circuit: a source of electricity (battery), a path or conductor on which electricity flows (wire) and an electrical resistor (lamp) which is any device that requires electricity to operate. The illustration below shows a simple circuit containing, one battery, two wires, a switch, and a bulb. The flow of electricity is from the high potential(+) terminal of the battery through the bulb (lighting it up), and back to the negative (-)terminal, in a continual flow when the switch is in the on position so current can flow.



Series Circuits In a series circuit, electricity has only one path on which to travel. In the example to the right, two bulbs are powered by a battery in a series circuit design.Electricity flows from the battery to each bulb, one at a time, in the order they are wired to the circuit. In this case, because the electricity can only flow in one path,if one of the bulbs blew out, the other bulb would not be able to light up because the flow of electric current would have been interrupted. In the same way, if one bulb was unscrewed, the current flow to both bulbs would be interrupted.

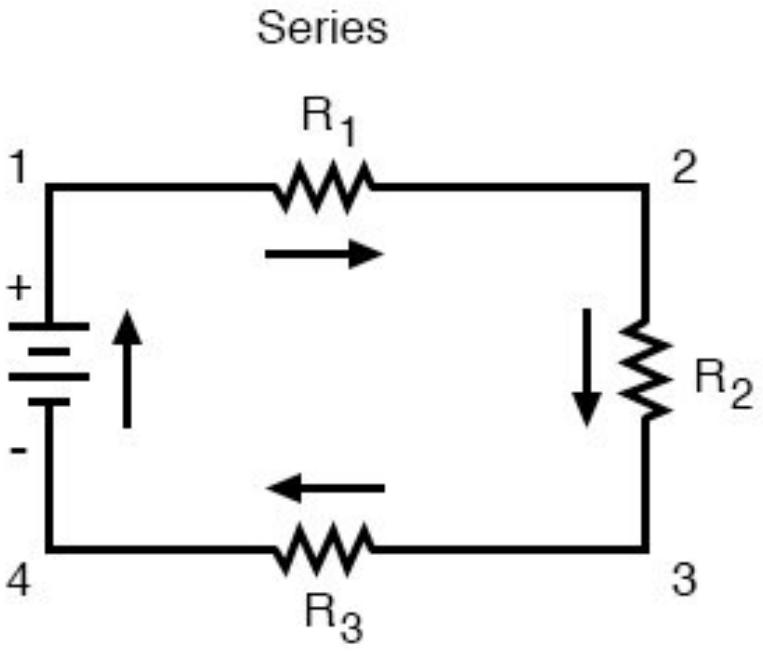
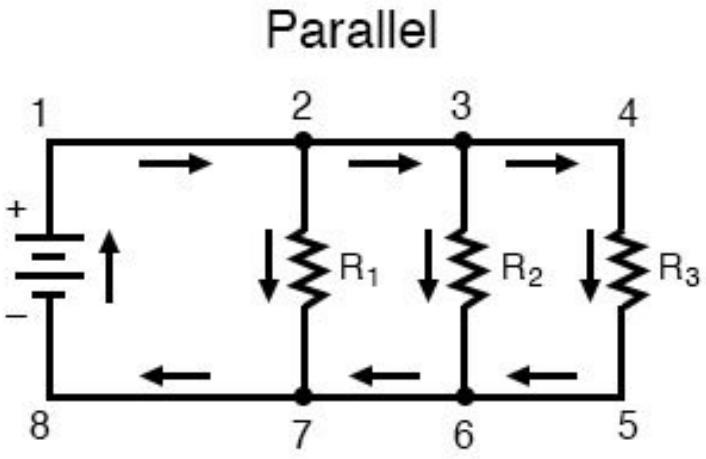


Figure 1:

Parallel Circuits In a parallel circuit, electricity has more than one path on which to travel. In the example to the right, two bulbs are powered by a battery in a parallel circuit design. In this case, because the electricity can flow in more than one path, if one of the bulbs blew out, the other bulb would still be able to light up because the flow of electricity to the broken bulb would not stop the flow of electricity to the good bulb. In the same way, if one bulb were unscrewed, it would not prevent the other bulb from lighting up.



Resistance: The flow of electricity depends on how much resistance is in the circuit. In our examples,the

bulbs provide resistance. In a series circuit, the resistance in the circuit equals the total resistance of all the bulbs.

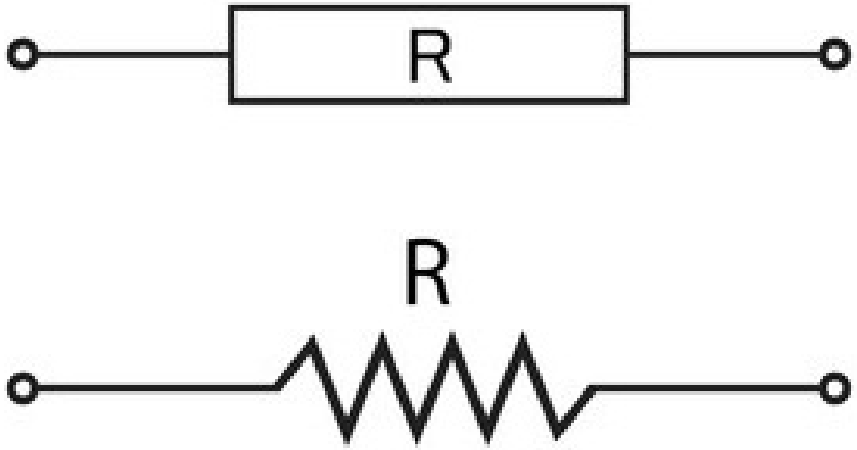
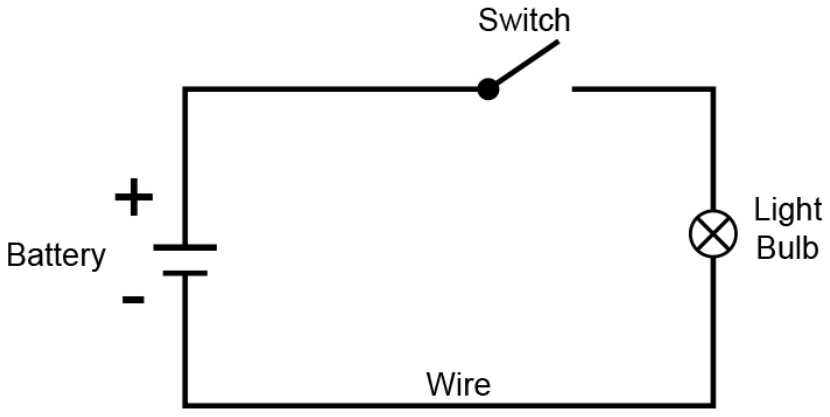


Figure 2:

Simple Circuit: A simple circuit consists of three minimum elements that are required to complete a functioning electric circuit: a source of electricity (battery), a path or conductor on which electricity flows (wire) and an electrical resistor (lamp) which is any device that requires electricity to operate.**(Switch is optional)**



Assessment:

1. Do you think House lights are an example of parallel or series bulbs in a circuit?Explain why?
2. Do you think the bulbs in the parallel circuit or the series circuit will burn brighter?Explain why?
3. If you remove a bulb in your parallel circuit, will the other bulb(s) still light? Explain why?

4. If you remove a bulb in your series circuit, will the other bulb(s) still light? Explain why?

Project Visuals:

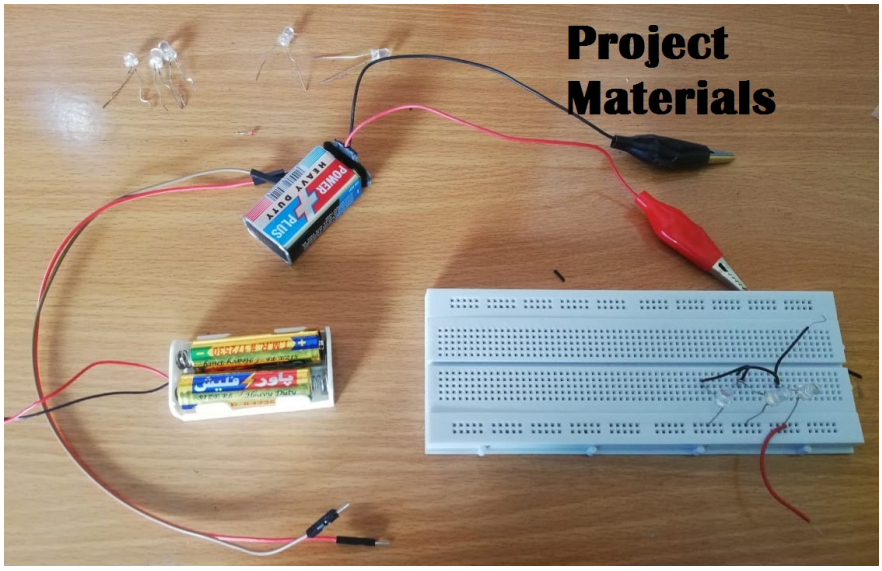


Figure 3: This is a caption

Figure 4: This is a caption

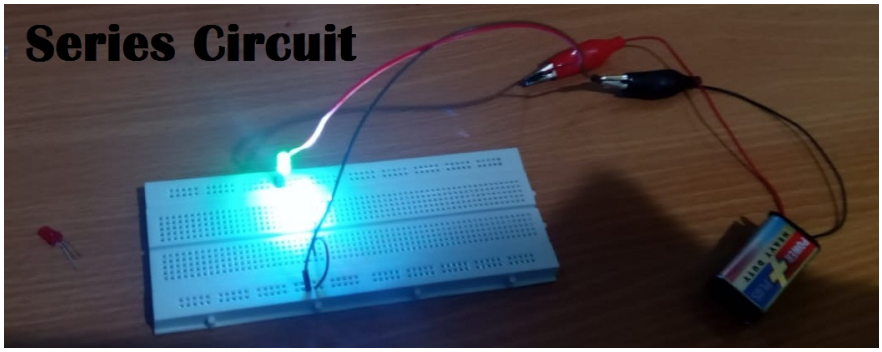


Figure 5: This is a caption

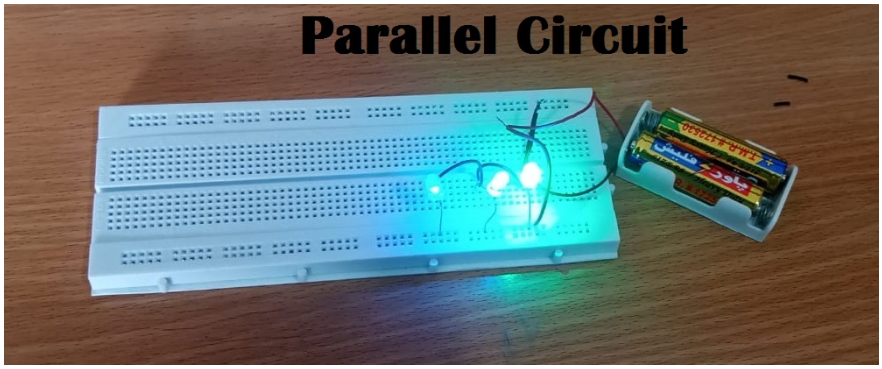


Figure 6: This is a caption

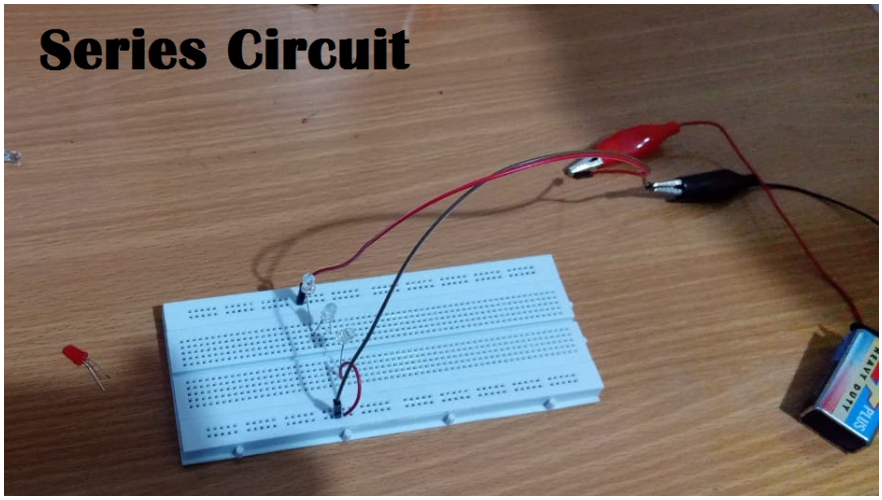


Figure 7: This is a caption