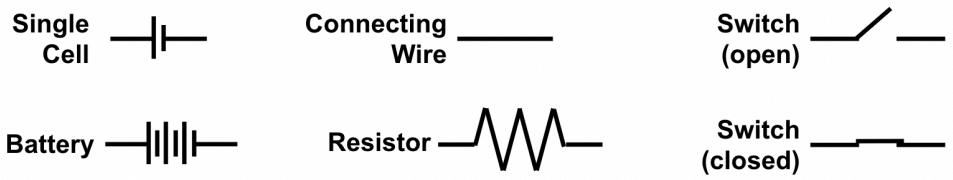
Comparing Series and Parallel Circuits
Lesson Notes

Learning Outcomes

- How can conventional circuit symbols be used to represent circuits?
- How do series and parallel arrangement of resistors compare and contrast?

Schematic Diagrams

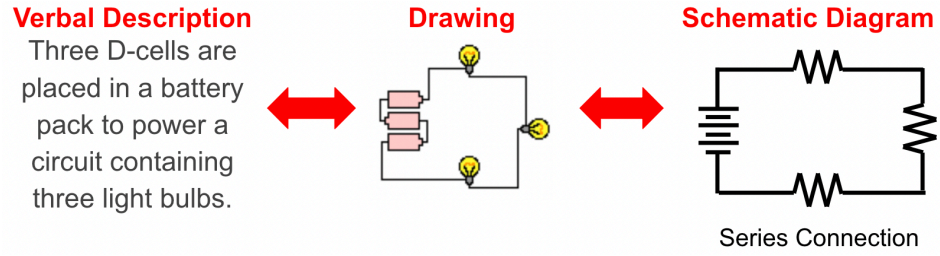
Schematic Diagrams describe circuits be showing the arrangement of their parts using conventional **circuit symbols**.



Schematic Representations

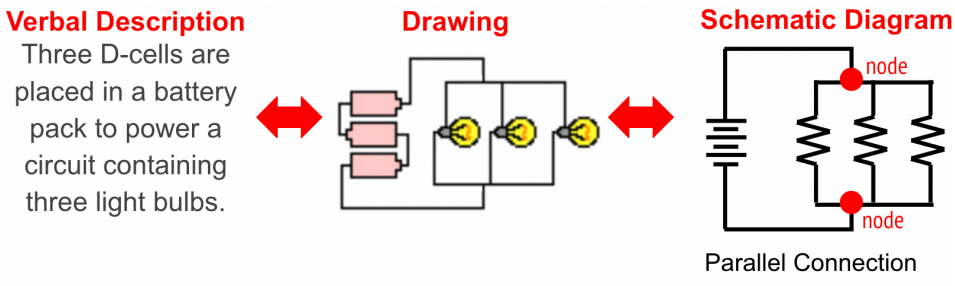
Example 1

The representations presume the light bulbs are connected in such a manner that charge passes through each light bulb in consecutive fashion.



Example 2

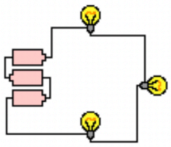
Parallel connections include a point on the circuit where the wires branch off of each other. This point is a **node**. Charge does not pass through every bulb. At the node, a charge is diverted to one of the branches before returning to the - terminal of the battery.



Two Types of Connections

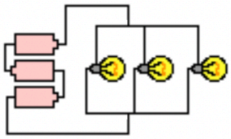
There are two basic ways of arranging two or more bulbs in a circuit. The manner in which bulbs are arranged affects the overall resistance and current, the voltage drops across each bulb, and the current in each bulb.

Series Connection of 3 Bulbs



A single pathway for charge flow.
Charge passes through each bulb.
Bulbs arranged back-to-back in consecutive fashion.

Parallel Connection of 3 Bulbs

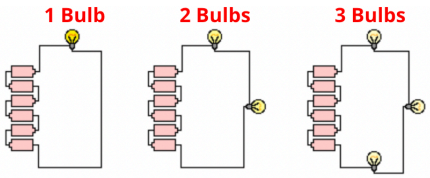


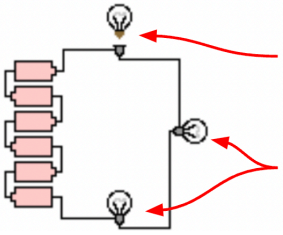
Multiple pathways for charge flow.
Charge passes through only one bulb.
Bulbs arranged in separate branches that separate at the node.

Series Circuit Observations

As the number of bulbs increases:

- Bulb brightness decreases.
- Overall current decreases.
- Overall resistance increases.





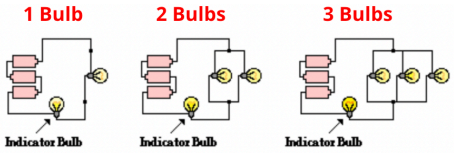
When a bulb is unscrewed from its socket …

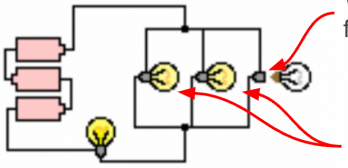
… the other bulbs no longer remain lit.

Parallel Circuit Observations

As the number of bulbs increases:

- The indicator bulb becomes brighter.
- Overall current increases.
- Overall resistance decreases.





When a bulb is unscrewed from its socket …

… the other two bulbs still remain lit.

Tollway Analogy

- On a tollway system, the toll booths are the locations of greatest resistance. Flow rate along the tollway is reduced by the presence of a toll booth.
- Adding more toll booths in series would only make matters worse, increasing the total resistance and making the flow rate even less.
- Adding more resistors in parallel such that cars had a choice of lanes would decrease the total resistance and increase the car flow rate.