SCI10F **Circuits Role Play**

Purpose:

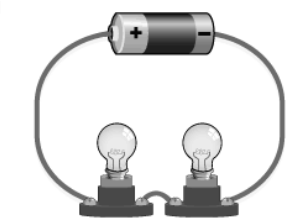
To give students a better understanding of the relationships between current, voltage and resistance in series and parallel circuits.

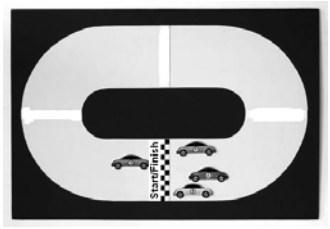
Introductory Information:

The relationships between current, voltage and resistance are exhibited differently in series and parallel circuits.

Series Circuits

Recall that a series circuit is like a race track – the cars only can travel one way, and only have one path to follow. Any electrons flowing in the following circuit only have one path to follow, just like the race track.

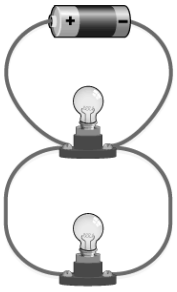


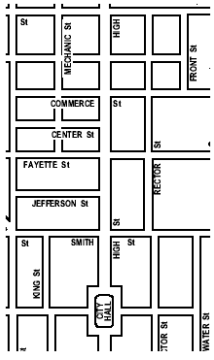


All of the electrons that flow in this type of circuit must flow through each light giving up some energy (volts) as they pass. If we imagine the light bulbs (loads) to be like a bottle neck for electrons, we can see that they are slowed down at these points. This slowing of electrons is called resistance. The more loads, the more resistance.

Parallel Circuits:

If you were to think of a parallel circuit in terms of cars it would be more like a map of city streets instead of a race track. In the city, cars have many ways to travel to the same place, unlike on the race track.





The electrons that flow in this type of circuit can flow through either light, which means they have more energy (volts) to give as they pass, hence a brighter bulb (we divided the resistance between the paths). In a city, if we add more streets, more traffic can flow. So in a circuit, each time we add a pathway, more electrons can flow, creating more current.

Procedure:

Part A: Series Circuits

1. Each student will be given 10 “Volts” in the form of energy tickets.
2. All students will walk around the perimeter of the room creating a loop, like in a series circuit.
3. When you encounter a “load”, you must stop and give the required amount of energy tickets before you can pass (similar to a toll booth on a bridge).
4. Before you leave the “load”, you must wait the indicated amount of “wait time”.
5. Continue along the pathway until you return to the start, then answer the questions that follow.

Series Circuit Questions:

1. How many energy tickets did you have left?

2. What was the “wait time” at each load representing?

3. How did the “wait time” affect how long it took to get around the room?

4. Did all of the “wait time” slow you down equally?

5. Remember that current is how many electrons are flowing at any point. Once everyone was spread around the room, compare the current of “electrons” at different places around the room.

6. How do you think the amount of energy that the “loads” now have compares to the total amount of energy you had at the start?

Procedure:

Part B: Parallel Circuits

1. Again, each student will be given 10 “Volts” in the form of energy tickets.
2. All students will walk from the “battery” through the room and back, however, this time you can travel through the indicated rows, instead of all the way around the room.
3. Again, when you encounter a “load”, you must stop and give the required amount of energy tickets before you can pass (similar to a toll booth on a bridge).
4. Before you leave the “load”, you must wait the indicated amount of “wait time”.
5. Continue along the pathway until you return to the start, then answer the questions that follow.

Parallel Circuit Questions:

1. How many energy tickets did you have left?

2. How did the energy the “loads” received in this circuit compare to that of the loads in the other circuit?

3. How did the “wait time” affect how long it took to get around the room?

4. Compare your “wait time” in the two different circuits.

5. Remember that current is how many electrons are flowing at any point. Once everyone was spread around the room, compare the current of “electrons” at different paths through the “circuit”.

6. How do you think the amount of energy that each of the “loads” now have compares to the total amount of energy you had at the start?

Final Questions:

Use the observations you made in this activity to answer the following questions:

Series Circuits:

1. How does the total energy that all the loads receive compare to the energy of the power source?

2. How did the resistance of each load compare to the total resistance of the circuit?

3. How would the current at any two points in the circuit compare?

4. What would happen to a series circuit if the path was broken?

Parallel Circuits:

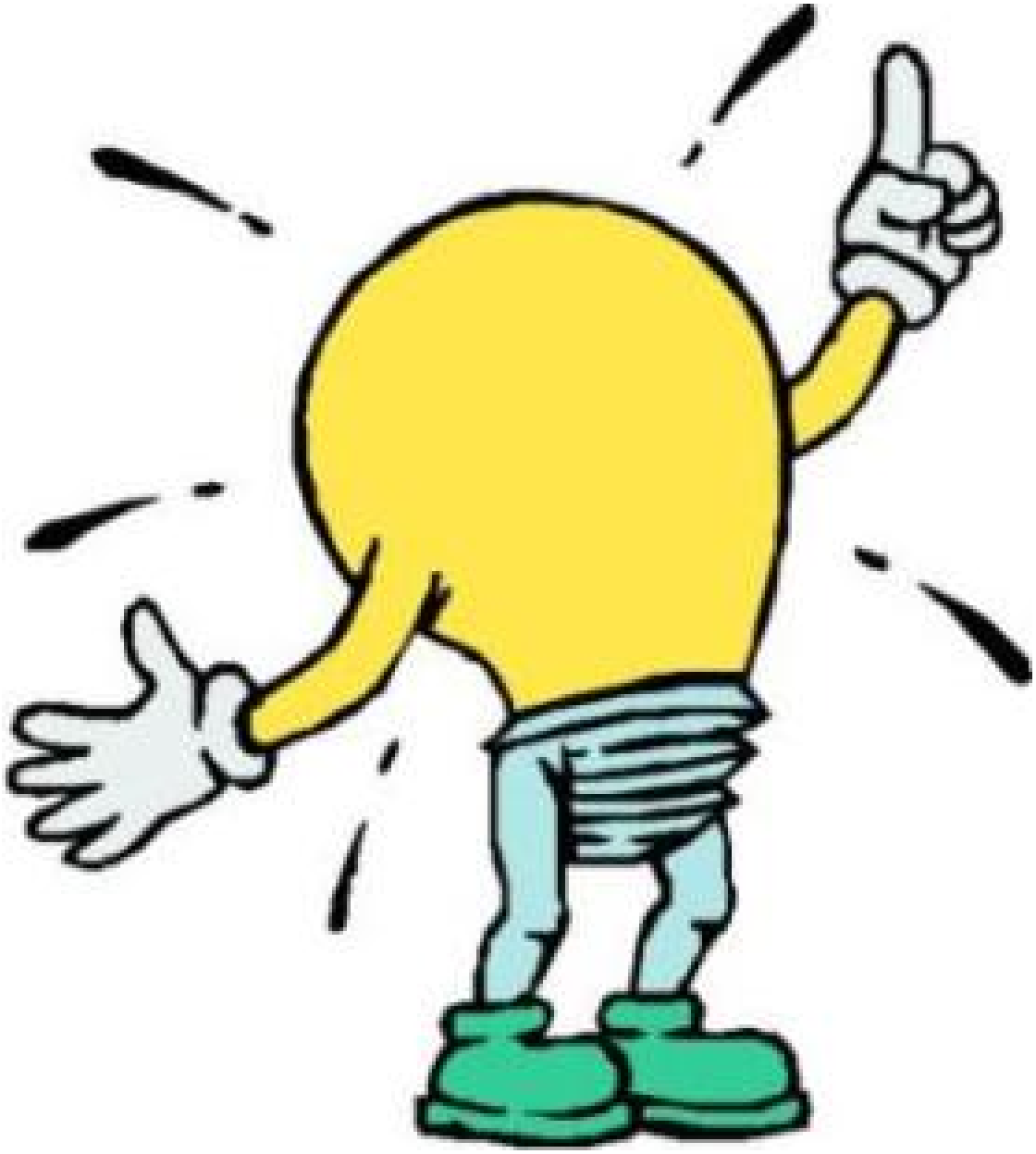
1. How does the energy that each of the loads receive compare to the energy of the power source?

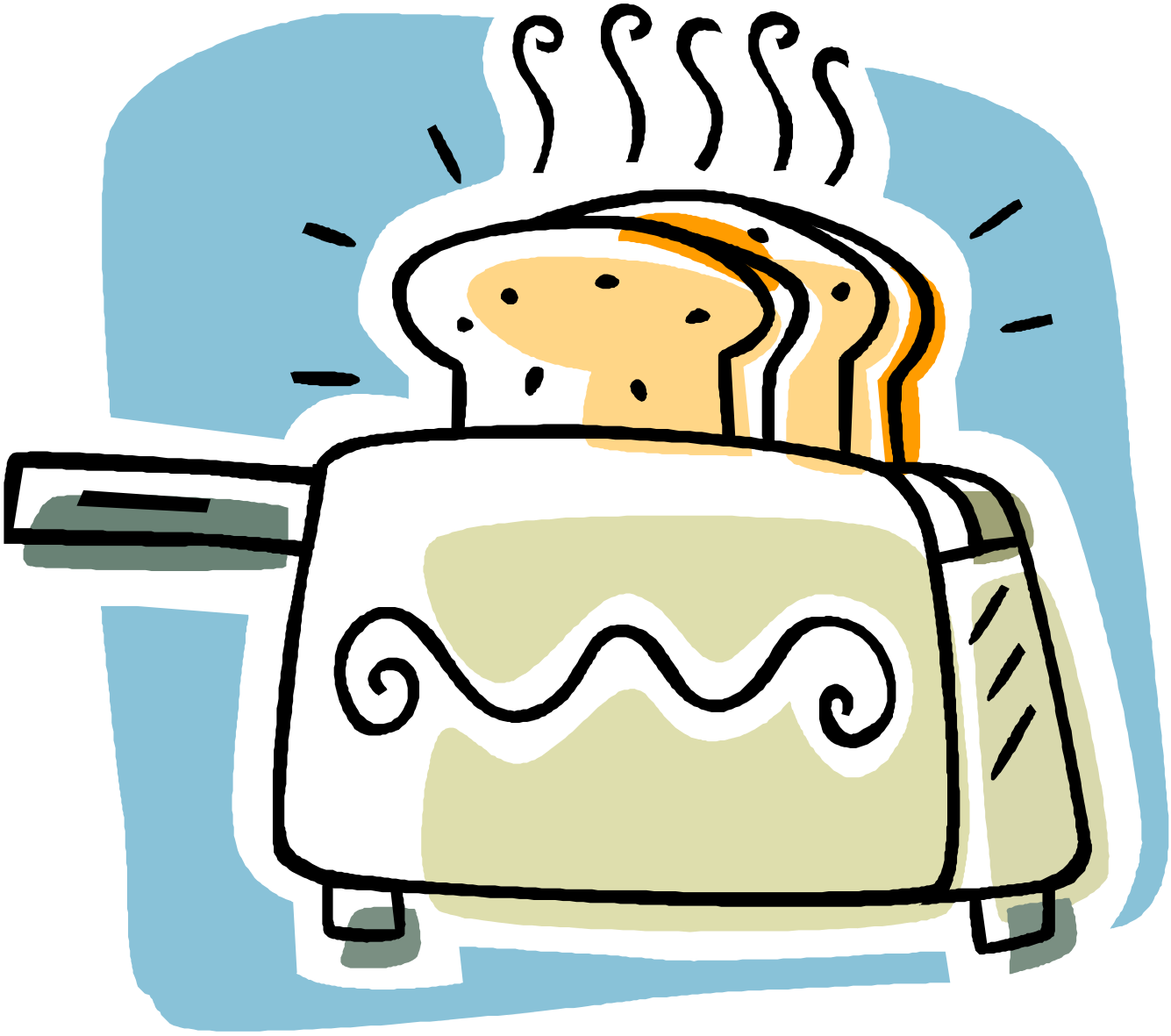
2. How would the current at any two points in the circuit compare?

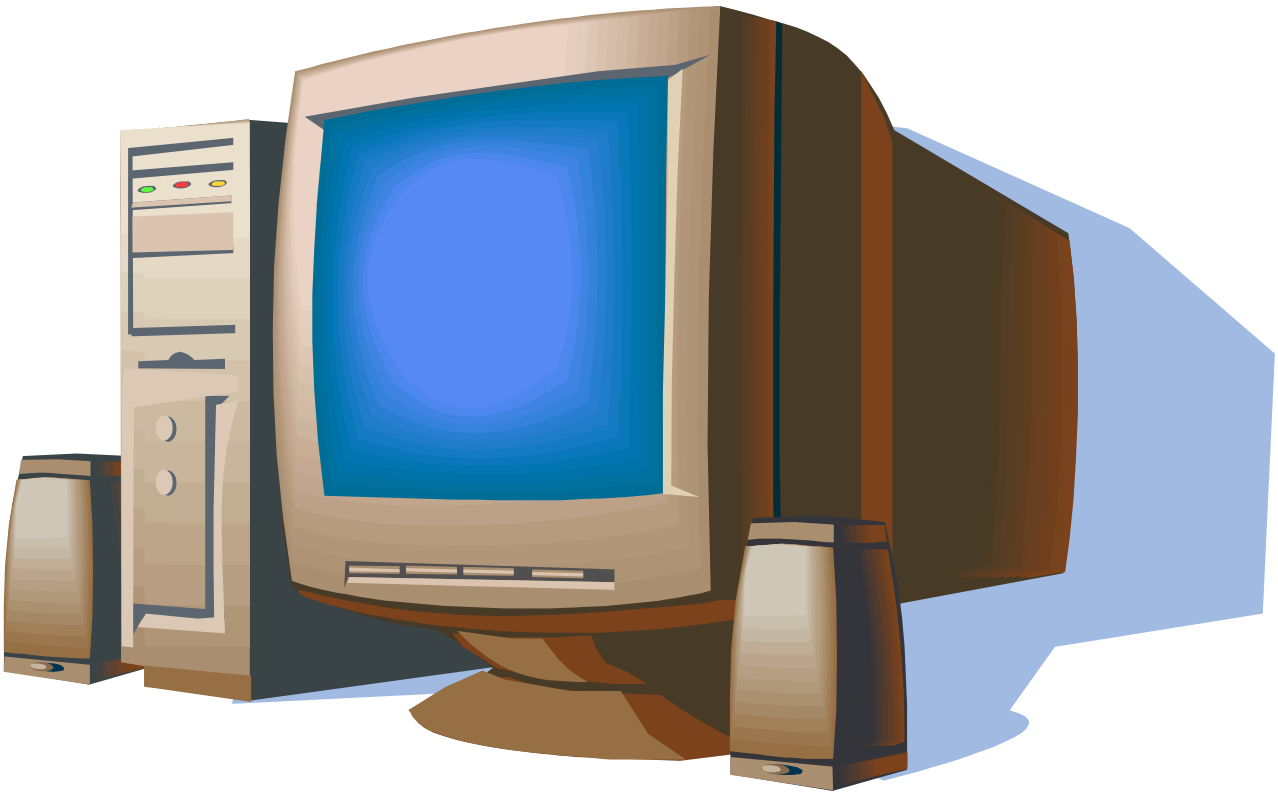
3. Remembering that current is how many electrons are flowing, how could the current change if you add more pathways to the circuit?

4. How does the current in each pathway compare to the total current in leaving the source?

5. What would happen to a parallel circuit if the path was broken?







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