Student Example: Predictions on Parallel and Series Circuits
Analyzing a Series Circuit

Notice how this student uses a traveling or substance notion of electrical flow. The underlying causal model is at best Cyclic Sequential and reveals that the student does not attend to the whole circuit at once as a system. Rather s/he reasons that the electricity will reach certain components before it reaches others.

Look at the picture labeled Circuit #1. It has one battery and two bulbs. Notice how the wires are attached. What do you predict will happen if you hook up a circuit just like this one?

Circuit #1

Write a paragraph telling what you think will happen. Be sure to answer the following questions: 1) Will it work? 2) Will both bulbs light up? If not, will any bulbs light up? If one of the bulbs lights, tell which one. 3) If both bulbs do light, will there be any differences in how bright they are (compared to each other or compared to when there is only one light bulb in a circuit)? <u>Most importantly</u>, using what you know about how circuits work, tell <u>why</u> it does what it does. Draw arrows or a diagram if it helps you to explain.

> If I were to hook up a circuit like this both bulbs would light up. One would light up a little more than the other. Probably A a little more than B. This is because the wires are different lenghts. The electricity will travel faster through one of the wires. Both lightbulbs would light.
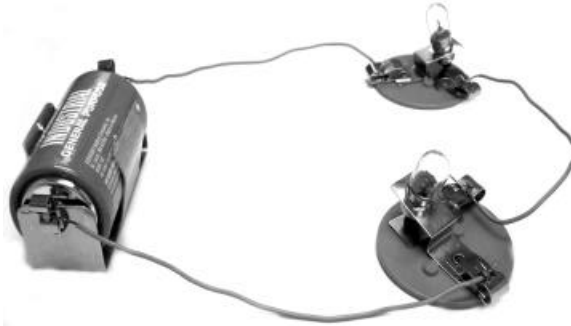
Be SURE to turn your paper over and do the second part on the back!

Student Example: Predictions on Parallel and Series Circuits
Analyzing a Series Circuit

This student reasons from a Cyclic Simultaneous Model and attends to the series circuit as a system.

Look at the picture labeled Circuit #1. It has one battery and two bulbs. Notice how the wires are attached. What do you predict will happen if you hook up a circuit just like this one?

Circuit #1

Write a paragraph telling what you think will happen. Be sure to answer the following questions: 1) Will it work? 2) Will both bulbs light up? If not, will any bulbs light up? If one of the bulbs lights, tell which one. 3) If both bulbs do light, will there be any differences in how bright they are (compared to each other or compared to when there is only one light bulb in a circuit)? <u>Most importantly</u>, using what you know about how circuits work, tell <u>why</u> it does what it does. Draw arrows or a diagram if it helps you to explain.

I think that Circuit #1 probably will work. Depending on the voltage of the battery (and how old it is) the lightbulbs may be extremely dim or extremely bright however I think that the brightness between the two bulbs will be the same. If there was only one lightbulb in the circuit it would be brighter alone than two together because the voltage is shared so they are dimmer. This works because it's like a bicycle chain as the electrons move through the circuit so it's equal at all places.

Be SURE to turn your paper over and do the second part on the back!

Student Example: Predictions on Parallel and Series Circuits
Analyzing a Series Circuit

This student uses a Cyclic Sequential Model and does not see current as conserved across the series circuit.

Look at the picture labeled Circuit #1. It has one battery and two bulbs. Notice how the wires are attached. What do you predict will happen if you hook up a circuit just like this one?
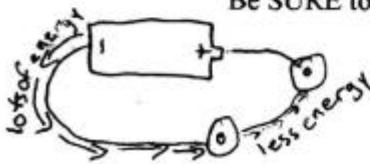
Circuit #1

Write a paragraph telling what you think will happen. Be sure to answer the following questions: 1) Will it work? 2) Will both bulbs light up? If not, will any bulbs light up? If one of the bulbs lights, tell which one. 3) If both bulbs do light, will there be any differences in how bright they are (compared to each other or compared to when there is only one light bulb in a circuit)? <u>Most importantly</u>, using what you know about how circuits work, tell <u>why</u> it does what it does. Draw arrows or a diagram if it helps you to explain.

      I think that this circuit is set up in such a way that it will work. The way that this is set up, I believe that both lights will light up, but the way I see it, light bulb A will be brighter. The reason I see it this way is because electrons are going through bulb A and not as much through bulb B. Bulb A is using up some of the electricity before it gets to bulb B.

Be SURE to turn your paper over and do the second part on the back!
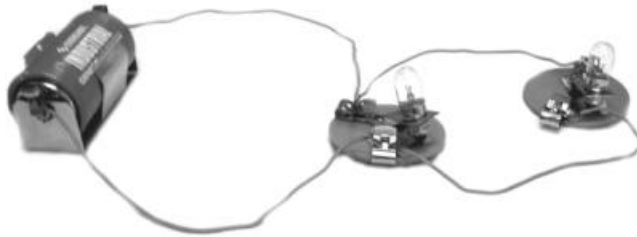
This student appears to hold aspects of a Cyclic Simultaneous Model in that s/he realizes that there are electrons throughout the circuit. However, s/he retains aspects of a Cyclic Sequential Model and expects that the bulbs closer to the negative contact of the battery will be brighter.

Look at the picture labeled Circuit #2. It also has one battery and two bulbs. Notice how the wires are attached. What do you predict will happen if you hook up a circuit just like this one?

Circuit #2

Write a paragraph telling what you think will happen. Be sure to answer the following questions: 1) Will it work? 2) Will both bulbs light up? If not, will any bulbs light up? If one of the bulbs lights, tell which one. 3) If both bulbs do light, will there be any differences in how bright they are (compared to each other or compared to when there is only one light bulb in a circuit)? Most importantly, using what you know about how circuits work, tell **why** it does what it does. Draw arrows or a diagram if it helps you to explain.

Yes, I believe this will work. Circuit D will light up more bright than circuit C, Because circuit C is connected to the negative side. The power from the light bulb will be more evenly distributed in this diagram. The power current comes from the negative side. Every part in the wire is filled w/electrons but the current is being pushed from the negative side. Therefore the negative side will be lighter.
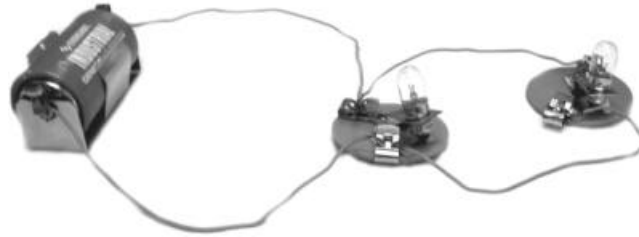
Read over BOTH of your answers and make sure that they are clear and well-explained.

Student Example: Predictions on Parallel and Series Circuits
Analyzing a Parallel Circuit

This student reasons from a Cyclic Simultaneous Model and reasons about the circuit as a system. This leads the student to realize that both bulbs will light.

Look at the picture labeled Circuit #2. It also has one battery and two bulbs. Notice how the wires are attached. What do you predict will happen if you hook up a circuit just like this one?

Circuit #2

Write a paragraph telling what you think will happen. Be sure to answer the following questions: 1) Will it work? 2) Will both bulbs light up? If not, will any bulbs light up? If one of the bulbs lights, tell which one. 3) If both bulbs do light, will there be any differences in how bright they are (compared to each other or compared to when there is only one light bulb in a circuit)? <u>Most importantly</u>, using what you know about how circuits work, tell <u>why</u> it does what it does. Draw arrows or a diagram if it helps you to explain.

> Yes, this circuit will work, and both bulbs will light with the same brightness. As I predicted in the first one, the two bulbs may not be the same brightness as if there was only one bulb. This circit will work because when one electron moves they ALL move which causes electricity both bulbs are connected to the positive and negative side of the battery. When an electron moves and comes out on the A side, the B side will move too so the bulb will light up

Read over BOTH of your answers and make sure that they are clear and well-explained.