Phet Simulator: Part 1 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Circuit Basics & Building! Date: \_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_

**Part A: Signal Circuit**

Go to the following: <https://phet.colorado.edu/en/simulation/legacy/signal-circuit> and click **Play**!

1. Observe the circuit that appears in the simulator screen. Click “**Show Inside Switch**” and notice whether the circuit is open or closed.
2. Notice the switch control on the bottom right. Draw the control all the way to the ***left*** to close the switch.
3. Describe what happens to the **electrons** in the circuit as soon as the switch is closed:

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1. Does the light turn on **instantly**? (Practice opening and closing the switch several times until you are sure). Explain why this happens. (Note that the time is drastically slowed down for the purposes of this simulator).

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1. Sketch a diagram of the closed circuit below. On your diagram: a) **label all parts of the diagram** including battery (fuel cell) and direction it is facing (+ and -), b) **show the direction** the electrons are flowing (click “**Show Signal Arrow**” if you are not sure, c) Determine whether this is a **series** or **parallel circuit**.
2. If not done already, select” **Show Signal Arrow**” and “**Paint Electron**”. Which moves ***faster*** through the circuit? Explain why you think this is:

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1. Open the switch by dragging the control to the ***right***. Does the light turn off instantly? Explain why this occurs.

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1. What would happen if the battery (fuel cell) was turned to face the other way? Explain why this occurs.

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**Part B: Circuit Construction Kit (DC Only), Virtual Lab**

Go to: <https://phet.colorado.edu/en/simulation/legacy/circuit-construction-kit-dc-virtual-lab> and click **Play**!

**Practice & Exploration:** In this virtual lab, you will practice **building series and parallel circuits**, determining **which types of materials** can complete a closed circuit, and **observing which factors affect how electrons move** to create electrical current!

1. Notice the materials you have available to you: wires, resistors, batteries (fuel cells), light bulbs and switches.
2. Practice selecting and attaching the available materials in the simulator window. Please read the following tips:

\*Notice that you can un-attach materials by right clicking on where they are joined and selecting “**Split**

 **Junction**”.

\*You can also remove an unwanted part by right clicking on the part and selecting “**Remove**”.

\*The lights bulbs, though small, have **TWO** points that must attach for the circuit to be closed.

1. When you feel you are comfortable using the features of the simulator, click “**Reset All**” on the bottom right.

**Series vs. Parallel Circuit Building**: Please follow the directions exactly as they are given so you can compare circuit arrangements clearly!

1. Create a simple **SERIES** circuit using the following materials: **TWO** light bulbs, **ONE** battery (fuel cell) and **THREE**

 wires. (Stretch the wires to help you observe the arrangement more clearly. Your series circuit should be

 ***somewhat triangle-shaped***.)

13) Sketch a diagram of the **SERIES** circuit below. On your diagram: a) **label all parts of the diagram** including battery

 (fuel cell) and direction it is facing (+ and -), b) **show the direction** the electrons are flowing.

1. Add and remove materials to your **SERIES** circuit to observe how they affect the flow of electricity! **Check the corresponding boxes** for what happens when you add or remove each item.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SERIES CITCUIT** | **Light becomes brighter** | **Light becomes dimmer** | **Only one light bulb goes out, the other stays on** | **Both light bulbs go out** | **No change in brightness** |
| **Add a fuel cell** |  |  |  |  |  |
| **Add a light bulb** |  |  |  |  |  |
| **Add wire** |  |  |  |  |  |
| **Add a resistor** |  |  |  |  |  |
| **Disconnect only one wire** |  |  |  |  |  |

1. Click “**Reset All**” on the bottom right.
2. Create a simple **PARALLEL** circuit using the following materials: **TWO** light bulbs, **ONE** battery (fuel cell) and **EIGHT**

 wires. (Your parallel circuit ***should resemble a figure-eight*** with the battery in the middle and the light bulbs on

 the TOP and BOTTOM of the figure eight).

17) Sketch a diagram of the **PARALLEL** circuit below. On your diagram: a) **label all parts of the diagram** including

battery (fuel cell) and direction it is facing (+ and -), b) **show the direction** the electrons are flowing.

1. Add and remove materials to your PARALLEL circuit to observe how they affect the flow of electricity! **Check the corresponding boxes** for what happens when you add or remove each item.

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| --- | --- | --- | --- | --- | --- |
| **PARALLEL CIRCUIT** | **Light becomes brighter** | **Light becomes dimmer** | **Only one light bulb goes out, the other stays on** | **Both light** **bulbs go out** | **No change in brightness** |
| **Add a fuel cell** |  |  |  |  |  |
| **Add a light bulb** |  |  |  |  |  |
| **Add wire** |  |  |  |  |  |
| **Add a resistor** |  |  |  |  |  |
| **Disconnect only one wire** |  |  |  |  |  |

**Grab bag**:Use the different materials in the Grab Bag at the top left corner to see if they can be used to conduct electricity and complete the circuit!

1. Click “**Reset all**” and build a **SERIES** circuit of your choice (use as many fuel cells, wires, and light bulbs as you’d like!)
2. Then, add each of the grab bag materials to your circuit to see if the flow of electricity continues flowing or stops!

|  |  |
| --- | --- |
| **Materials** | **Did the light bulb(s) stay illuminated? (Yes or No)** |
| **Dollar Bill** |  |
| **Paper Clip** |  |
| **Penny** |  |
| **Eraser** |  |
| **Pencil Lead** |  |
| **Hand** |  |
| **Dog** |  |