Electricity and Circuits Phet Name: _____

1. Find a way to make a **single light bulb** light up with as FEW parts hooked up as possible. When electricity flows through wires and makes something work, like a light bulb, it is called a circuit.
    a. Sketch and label your circuit below:

2. What seems to be making the light bulb turn on in your circuit? (what do you think electricity is based on the simulator?) _____

    _____

3. *Click on advanced* on the right side of the screen.
    a. **Increase** the wire resistivity. How does this impact the amount of light the bulb is emitting? (does it increase or decrease?) _____
    b. **Increase** the battery resistance. How does this impact the amount of light the bulb is emitting? (does it increase or decrease?) _____
4. Use the cutting tool to make a **gap** in your circuit. Go to the column *on the left* and scroll down. Starting with the light bulb, play with the putting the different objects in your circuit. Find out which objects allow electricity to flow or not and fill in the data table: (there should be a total of 13).

Objects that allow electricity to flow (conductors)	Objects that do NOT allow electricity to flow (insulators)

5. What do the conductors have in common? _____

    _____

6. What do the insulators have in common?_____

    _____

*For the next few activities (#'s 5-10), you need to **light up more than 1 bulb** at the same time, using just *one battery.*

7. **First circuit**: find a way to hook up your bulbs in a way that if you break the connection at one bulb, *ALL bulbs go out*.
    a. Sketch and label your new circuit:

8. Why did the rest of the bulbs go out if you break the connection at one bulb? _____
    _____
    _____

9. This circuit is called a **series circuit** because the bulbs are hooked up in one long "series" or line. Name somewhere you have seen a string of lights that are also a series circuit.
    _____

Second circuit: find a way to hook up your bulbs in a way that if you break the connection at one bulb, ONLY that bulb goes out.

10. Sketch and label this circuit:

11. Why do the rest of the bulbs stay lit if you break the connection at one bulb? _____
    _____
    _____

12. This circuit is called a **parallel circuit,** which has 2 or more single loops connected to the same battery. When 1 bulb goes out in these circuits, the rest of the lights stay on. Name somewhere you have seen many bulbs hooked up to one power source, where one bulb can go out without affecting the others.
    _____
    _____

13. You design toys for a toy company. Your boss wants you to hook up the lights in the toy car you are working on in the cheapest way possible, without consideration of the quality of the toy. (*think of series circuits and parallel circuits)
    a. Which circuit should you use if you want to save money by using fewer parts? ____

       _____

    b. Why would this circuit be cheaper? _____

       _____

14. You are an electrician working on a house. What type of circuit should you use for the house so that the owners don't call to complain about their wiring? _____

    _____

    a. Why use this circuit? _____

       _____

Experiment with the simulator, see what you can make it do.

15. What did you do to make light bulbs glow brighter? _____

    _____

    _____

16. What did you do to make light bulbs glow **dimmer**? _____

    _____

    _____

*go to the next page

17. Create **three separate circuits**, each containing one battery and one resistor connected by wires. Change the resistance of two of the resistors to 5 Ω and 20 Ω.
18. When you change the values of the resistors, the color pattern on the resistors will also change. Complete the statements below:

Compared to the 10 Ω resistor circuit, the 5 Ω resistor circuit...	
Compared to the 10 Ω resistor circuit, the 20 Ω resistor circuit...	

19. For each circuit, you will be changing the voltage of the battery and measuring the resulting current in the circuit. You will be using the **Ammeter** tool to measure the current in each circuit.
*There are two different types of ammeters available in the simulation. Use the ammeter with the ***crosshairs***. Move the crosshairs to any point on each circuit to determine the current in the circuit. Record this information in the table below.

Battery Voltage (V)	Current in 5 Ω circuit (A)	Current in 10 Ω circuit (A)	Current in 20 Ω circuit (A)
9			
20			
40			

20. Based on the data you collected, as you *increase* the resistance (**Ω)**, the current (increases *or* decreases) _____.
21. Based on the data you collected, as you *increase* the battery voltage, the current (increases *or* decreases) _____.