Controlling the Flow

A. Fill in the Blanks

Complete the sentences with the correct word from the word bank. | Word Bank: resistance | voltage | switch | parallel | valve | conductor |

1. A material that allows electricity to pass through it easily is called a _____.

2. In a _____ circuit, there are multiple paths for the current to flow.

3. The opposition to the flow of electrical current is known as _____.

4. A faucet is a type of _____ used to start or stop the flow of water.

5. The electrical "pressure" or "push" that causes current to flow is called _____.

B. Match the Following;

Match the items in Column A with the correct description in Column B.

Column A	Column B
1. ____ Battery	A. A device that uses resistance to produce light and heat.
2. ____ Resistor	B. A safety device that automatically opens a circuit if the current is too high.
3. ____ Switch	C. Provides the voltage or electrical energy source for a circuit.
4. _____ Light Bulb	D. Intentionally restricts or reduces the flow of electrical current.
5. ____ Circuit Breaker	E. Opens or closes a path to control the flow of current.

1. _____ 2. _____ 3. _____ 4. _____ 5. _____

C. Practice Problems

Apply your knowledge to these scenarios.

1. Draw a simple series circuit containing one battery, two light bulbs, and a switch.

2. Draw a simple parallel circuit containing one battery, two light bulbs, and a switch that turns the whole circuit on or off.

3. In the series circuit you drew for question 1, what happens to the second light bulb if the first one burns out? Why?
4. In the parallel circuit you drew for question 2, what happens to the second light bulb if the first one burns out? Why?
5. What is the function of a resistor in a circuit?
6. Explain how a dam on a river is a method of controlling fluid flow.
7. How is a water pump in a plumbing system analogous (similar) to a battery in an electrical circuit?
8. If you squeeze a garden hose, the water comes out faster. How does this relate to the concept of resistance and flow?
9. Name two materials that are good electrical conductors (allow electricity to flow easily). _____ and ___.
10. Name two materials that are good electrical insulators (do not allow electricity to flow easily). ____ and _____.

D. Warm-up Questions

Answer the following basic questions to get your brain warmed up!

1. What is the main job of a switch in an electrical circuit?
2. What is the common name for a valve that controls the flow of water in a sink?
3. The flow of electrons in a circuit is called electrical _____.
4. What component in a circuit provides the "push" or energy to the electrons?
5. Besides liquids like water, what other state of matter is considered a fluid?

E. Challenge Questions

Think critically to solve these more difficult problems.

1. Why are the electrical outlets in your house wired in a parallel circuit and not a series circuit? Give two reasons.
2. A dimmer switch for a light allows you to make the light brighter or dimmer. This is a type of variable resistor. Explain how a variable resistor controls the brightness of the light bulb.
3. Ohm's Law states that Voltage = Current × Resistance (V=IR). If you have a circuit with a constant voltage (e.g., a 9V battery), what must happen to the current if you increase the resistance?
4. Design and describe (or draw) a circuit that has one battery and two light bulbs, each with its own separate switch, so you can turn each light on and off independently.

5. Imagine a city's water supply system. What are two different ways the city could control or change the water pressure in the pipes leading to homes?

F. Word Problems & Application

Apply your knowledge to real-world situations.

1. **Holiday Lights:** An old string of holiday lights is wired in series. One bulb burns out, and the entire string of lights goes dark. A new string of lights is wired in parallel. If one bulb on the new string burns out, what happens to the rest of the lights?
2. **The Toaster:** A toaster works by passing electricity through special wires that have high resistance. What does this high resistance cause the wires to do, and how does this toast your bread?
3. **The Garden Hose:** You are watering your garden with a hose that has a nozzle on the end. How is turning the nozzle to change the spray from a wide mist to a strong jet an example of controlling fluid flow?
4. **The Flashlight:** Your flashlight is getting dim. You know the bulb is still good. What is likely happening to the batteries, and how does this affect the flow of current?
5. **The Circuit Breaker:** In your home's electrical panel, a circuit breaker is a special kind of switch. What is its job, and why is it important for safety?

G. True or False

1. A closed switch allows electricity to flow through a circuit. _____
2. In a series circuit, the electric current has only one path to follow. _____
3. Rubber and plastic are used to cover electrical wires because they are good conductors. _____
4. Increasing the diameter (width) of a pipe will increase the resistance to water flow. _____
5. Adding more batteries in a series circuit decreases the total voltage. _____