

Nova's Laboratory: Investigating Electrical Circuits

Learning objective: To identify, construct, and troubleshoot simple series circuits, understanding the function of components and the effect of voltage on brightness.

Welcome to Nova's Laboratory! As a junior scientist, your task is to design, test, and document a series circuit. Use this experiment record to track your findings. Ensure your circuit is complete before testing, and remember to handle all electrical components with care. If your bulb does not illuminate, use your analytical skills to diagnose the fault.

Word bank: conductor · insulator · cell · component · circuit · filament · brightness · voltage · resistance · terminal

1. Circuit Blueprint: Describe the components you have chosen for your circuit and explain the function of the cell (battery) in this system. (2 marks)

2. Predicting Outcomes: What do you anticipate will happen to the brightness of the bulb if you add a second cell to your circuit? Justify your prediction using scientific reasoning. (3 marks)

3. Troubleshooting: If your bulb fails to light up, identify three potential reasons for this failure. Explain how you would test each hypothesis. (3 marks)

4. Comparative Analysis: Compare the effect of using a metal paperclip versus a plastic ruler within your circuit. Explain why one allows the bulb to light while the other does not. (3 marks)

5. Evaluating Variables: Explain why it is important to keep the wire length consistent when testing how different bulbs affect the brightness of your circuit. (2 marks)

6. Critical Thinking: What might happen to the circuit if the bulb's filament were to break? Explain the impact this has on the flow of electricity. (2 marks)

Extension challenge: Design a 'Scientific Challenge': Create a diagram of a circuit that includes two switches. Explain how this design could be used to control two separate lights independently. Justify why this arrangement is more practical for household lighting than a simple single-loop series circuit.