Nova’s Night-Time Electricity Investigation

Learning objective: To identify, construct, and troubleshoot simple series electrical circuits, and to understand the function of components such as cells, bulbs, and switches.

Use your knowledge of electrical circuits to answer the questions below. Think carefully about how components must be connected to create a complete loop for electricity to flow.

Nova the owl is preparing her observatory for a night of stargazing. She needs to ensure her reading lamp and signal lights are working perfectly. Remember: a circuit must be a complete loop for the electrons to flow, and components must be connected to both terminals of the power source.

Word bank: cell · conductor · insulator · switch · filament · circuit · terminal · voltage

1. Nova has a bulb that will not light up even though her cell is new. Explain why the bulb might remain dark, referring to the path of the electricity. (2 marks)

2. Compare and contrast a switch and a piece of plastic string in an electrical circuit. Why is one used as a control component while the other is not? (3 marks)

3. If Nova adds a second bulb to her simple series circuit, what do you observe happening to the brightness of both bulbs? Justify your answer using scientific reasoning. (3 marks)

4. What might happen to the flow of electricity if Nova accidentally used a wooden stick instead of a copper wire to connect her circuit? Explain your reasoning. (2 marks)

5. Nova wants to create a circuit with one cell, two bulbs, and one switch. Draw a clear diagram using standard scientific symbols to represent this circuit. (4 marks)

Draw: Draw a scientific circuit diagram for Nova's observatory, including one cell, one switch, and two bulbs connected in a series circuit. Ensure you use the correct symbols for each component.

Extension challenge: Design a 'Fail-Safe' alarm system for Nova's owl nest. If a predator approaches, a hidden switch is triggered to light up a warning bulb. Write a paragraph explaining how you would arrange your components to ensure the light stays off until the switch is closed. Why is it important that the wires are insulated?