

Circuitry and Control: Designing with Kit the Fox

Learning objective: To understand the components of a simple series circuit and how to incorporate a switch to control an electronic product.

Read each question carefully. Use your knowledge of electrical components to design and explain your electronic solutions. Refer to the word bank if you are unsure of the correct terminology.

Word bank: Cell · Conductor · Insulator · Component · Terminal · Circuit · Switch · Filament

1. Kit the Fox is designing a light-up sign for his computing lab. Identify the three essential components he needs to complete a basic series circuit and explain the specific function of each. (3 marks)

2. Explain why it is necessary to use copper wire as a conductor in a circuit, rather than plastic or rubber. What would happen to the flow of electricity if the entire wire were made of rubber? (3 marks)

3. Compare and contrast a 'closed' circuit and an 'open' circuit. How does a switch physically change the state of the circuit to turn an electronic device on or off? (4 marks)

4. If Kit adds a second bulb to his series circuit, the original bulb becomes dimmer. Justify why this happens using the concept of energy distribution within the circuit. (2 marks)

5. What might happen if you replaced the metal switch in a circuit with a piece of dry wood? Would the device function? Explain your reasoning. (2 marks)

6. Design a simple alarm system for a treasure chest. Describe which components you would choose and where you would position the switch to ensure the alarm only sounds when the lid is lifted. (3 marks)

Draw: Draw a clear, labelled circuit diagram showing a cell, a switch, and a bulb connected in a loop. Use standard scientific symbols for the components.



Extension challenge: Imagine you are an engineer designing a toy that requires two different motors to run at the same time. Would you connect these in a series circuit or a parallel circuit? Justify your choice by explaining how the performance of the motors might differ in each setup.