

Year 4 Design Technology: Fundamentals of Electronics

Learning objective: To assess understanding of electrical circuits, components, and the application of switches in design.

Read each question carefully. Use the word bank to help you with your terminology. Ensure your diagrams are neat and clearly labelled.

Max the monkey is helping his friends build a new alarm system for their woodland clubhouse. To make the system work, they need to create a complete loop that allows electricity to flow. Max needs to ensure that the alarm sounds only when a door is opened, triggering a mechanism that connects the circuit.

Word bank: circuit · conductive · insulator · switch · component · battery · bulb · buzzer · terminal

1. Define the term 'circuit' and explain the difference between a complete circuit and an incomplete circuit. (2 marks)

2. Max has a pile of materials. Identify two materials that are conductive and one material that acts as an insulator. (3 marks)

3. What is the specific function of a switch within an electronic circuit? Why is it vital for Max's alarm design? (3 marks)

4. If Max replaces the bulb in his circuit with a buzzer, what energy transformation is taking place? Explain your reasoning. (4 marks)

5. Compare and contrast the function of a battery in a circuit to the function of a wire. Justify why both are necessary. (4 marks)

6. Explain why a circuit might stop working if one of the wires becomes disconnected or frayed. What might happen if the battery runs low on energy? (4 marks)

7. Design Task: You are building a light-up sign that costs £5.50 in total. If you have £10.00, calculate the change you would receive. Then, describe a design feature you would add to make the sign more energy-efficient. (5 marks)

Draw: Draw a circuit diagram for Max. Include a battery, a buzzer, and a switch. Ensure your symbols are clear and the wires connect all components in a single, unbroken loop.



Extension challenge: Total: /25. Extension: Imagine you are designing a complex security system for a treasure chest. How would you incorporate multiple switches to ensure the alarm only triggers if two specific conditions are met simultaneously? Explain your logic using the concept of a series circuit.