

Kit's Circuit Design Challenge

Learning objective: To understand how to design and construct a functional electrical circuit with a switch, bulb, and buzzer to solve a practical problem.

Kit the fox is designing an alarm system for his woodland den to keep his collection of shiny pebbles safe. You must act as the lead engineer. Using your knowledge of electrical components, identify the correct symbols for a circuit, describe how the components interact to form a loop, and justify why your circuit is the most efficient design.

Word bank: conductor · insulator · cell · closed circuit · switch · buzzer · filament · component

1. A circuit must be a complete loop to function. Explain why the light bulb will not illuminate if the switch is left in the 'open' position. (2 marks)

2. Kit wants to add a buzzer to his alarm. Compare and contrast the function of a bulb (outputting light) and a buzzer (outputting sound) within a circuit. (2 marks)

3. If Kit uses a piece of plastic string to connect his battery to the bulb, what might happen? Justify your answer using scientific terminology. (2 marks)

4. What might happen to the brightness of the bulb if you were to add a second cell to the circuit in series? Explain your reasoning. (2 marks)

5. Design a simple series circuit diagram for Kit's alarm. Which component acts as the 'gatekeeper' of the electricity flow? (2 marks)

6. If the total cost of a bulb is £0.45 and a buzzer is £1.20, calculate the total cost of five alarm systems. Show your working clearly. (2 marks)

Draw: Draw a clear circuit diagram showing a battery (cell), a switch, and a bulb connected by wires. Use standard symbols: a circle with an 'X' for the bulb, two horizontal lines for the cell, and a gap for the switch.



Extension challenge: Design a 'secret' entry system for the den. Write a paragraph explaining how you could use a pressure-sensitive switch to trigger the buzzer when an intruder steps on a specific tile. Why is it important to ensure all wires are covered in an insulating material?