Materials and Their Remarkable Properties

Learning objective: To identify, describe, and compare the properties of everyday materials and explain why specific materials are chosen for particular purposes based on their physical characteristics.

Read each question carefully and use your knowledge of material science to provide detailed answers. Remember to explain your reasoning using scientific vocabulary.

Nova the barn owl is preparing for a night of stargazing and needs to ensure her equipment is up to the task. Meanwhile, Max the monkey is busy testing various objects to see how they react to water, heat, and electricity. Use your scientific knowledge to help them with their investigations.

Word bank: thermal insulator · electrical conductor · permeable · transparent · opaque · flexible · durable · soluble · reversible change

1. Max is designing a new teapot. He needs a material for the handle that will not burn his hands when the pot is full of boiling water. Which property must this material have, and why? (2 marks)

2. Nova wants to build a small shelter to keep her star charts dry during a rain shower. Should she choose a material that is permeable or impermeable? Explain your choice. (2 marks)

3. If you place a spoonful of sugar into a cup of warm water, it disappears. Is this a reversible or irreversible change? Explain what has happened to the sugar. (2 marks)

4. Explain why electrical wires are usually made of metal (like copper) covered in a layer of plastic. Use the terms 'electrical conductor' and 'insulator' in your answer. (3 marks)

5. Compare a glass window and a wooden door. Use the terms 'transparent' and 'opaque' to describe how light interacts with these two materials. (2 marks)

Draw: Draw a diagram of a 'Super-Backpack' for Finn the dolphin to use on land. Label three different parts of the backpack and explain the properties of the materials used for each part (e.g., waterproof, lightweight, or strong).

Extension challenge: Imagine you are an engineer tasked with creating a new type of lunchbox. Research and write a short paragraph explaining which material you would choose for the outer shell to keep food fresh and why its specific properties make it the best choice.