Max and Bea’s Mystery Mixtures

Learning objective: To identify and classify materials as solutions or mixtures and determine the most effective methods for separation based on their physical properties.

Max the monkey and Bea the honeybee are tidying up their laboratory. They have several containers of mixed substances. Your task is to act as the lead scientist: first, classify each mixture as either a 'solution' or a 'suspension/mixture'. Then, justify which separation technique (sieving, filtering, or evaporation) you would use to separate the components and explain why.

Word bank: solute · solvent · solution · suspension · filtrate · residue · evaporation · dissolved · insoluble

1. Max has a beaker filled with water and sand. Is this a solution or a mixture? Justify your answer using the term 'insoluble'. (2 marks)

2. Bea has a glass of water with salt stirred into it until it disappears. Explain why you cannot use a filter paper to remove the salt from this water. (2 marks)

3. Compare and contrast the process of sieving with the process of filtering. When would you choose one over the other? (3 marks)

4. Max accidentally drops iron filings into a bowl of dry flour. What physical property could you use to separate these two solids? Explain your choice. (2 marks)

5. If you had a mixture of sugar and water, how could you recover the solid sugar from the liquid? Describe the scientific process. (2 marks)

6. What might happen if you tried to separate a mixture of oil and water using filter paper? Justify your prediction. (2 marks)

Draw: Draw a scientific diagram of a filter funnel setup. Label the 'filter paper', 'residue', 'filtrate', and 'beaker'.

Extension challenge: Design a new experiment to separate three materials mixed together: gravel, salt, and water. Write a step-by-step method using the vocabulary from the word bank to explain how you would isolate each of the three components.