













## Worksheet

Use your schoolbook to answer the following questions related to the experiment.

- There are many chemical reactions occurring around us. For example, sodium bicarbonate is used to produce carbon dioxide which makes a dough rise. In this experiment, you used sodium bicarbonate in a slightly different reaction, but one that also produces carbon dioxide.
  -  Using a balanced chemical equation, express the dehydration process of turning sodium bicarbonate into sodium carbonate in the oven.
  -  Assuming the exact mass of sodium bicarbonate before heating was 5.00 g, what is the expected mass of sodium carbonate after the process?
  -  Why do we need sodium carbonate in coffee water, and not sodium bicarbonate?
- A very useful scientific skill is to link the theory with a visual representation of the experiment.
  -  Draw and label a separating funnel containing coffee water and an organic solvent.
  -  What was the organic solvent used, and why does it form as the upper layer?
  -  Draw and label your gravity filtration setup as well as the crystallisation process.
  -  Draw the chemical structure of caffeine and explain why it is a heterocycle.
- Solubility is one of the key properties of a substance that plays a vital part in shaping its chemistry and reactivity. At room temperature, the solubility of salt in water is 357 mg/mL, that of ethyl acetate in water is 83 mg/mL, and the solubility of water in ethyl acetate is 3%.
  -  How much salt is needed to make a saturated solution when using 50 mL of water?
  -  At the end of the caffeine extraction step (Stage 2e), how much water was in the organic extract if its volume was 150 mL?
  -  To extract as much caffeine from the coffee water as possible, what could we do to minimise the solubility of the organic solvent (and caffeine) in water?
- Imagine you are a head coach of a group of professional athletes and you ordered a pack of pure caffeine powder to offer it to the athletes as a dietary supplement.
  -  You have got access to a chemical laboratory – how would you test the purity of the caffeine powder?
  -  Your youngest athlete is 17 years old. What is the maximum recommended daily intake of caffeine in milligrams if her weight is 60 kg?