

# Solubility

## Learning objectives

- 1 Interpret solubility curves.
- 2 Describe the difference between a concentrated and a dilute solution.
- 3 Describe the factors that can affect the solubility of a substance.

## Introduction

Solubility is a very important property. Substances need to dissolve in order to carry out many chemical reactions, including those in the body.

For example, when someone takes a paracetamol tablet to treat their headache, the active ingredient, paracetamol, needs to be soluble so that it can be absorbed into the bloodstream and carried to the pain receptors. But the filler material (which bulks out the tablet to make it big enough for people to handle easily) is insoluble, so it passes through the digestive system without being absorbed.

## Instructions

1. Stick the structure strip into the margin of your exercise book/paper.
2. Follow the prompts in the structure strip, and use your knowledge, to write a summary of solubility:
  - Reflect on what you already know about solubility.
  - Where have you seen the keywords before?
  - If you'd like more support, what other sources could you use to find the information, e.g. a textbook, online?
3. Complete the extended answer question to apply your knowledge of solubility to a new context.

## Keywords

Use these key words in your responses:

• solubility • dissolve • soluble • insoluble • solute • precipitate

| Solubility<br>structure strip                                                                                                                     | Solubility<br>structure strip                                                                                                                     | Solubility<br>structure strip                                                                                                                     | Solubility<br>structure strip                                                                                                                     | Solubility<br>structure strip                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Define solubility.                                                                                                                                | Define solubility.                                                                                                                                | Define solubility.                                                                                                                                | Define solubility.                                                                                                                                | Define solubility.                                                                                                                                |
| Describe how to work out the mass of solute dissolved in 50, 25, and 10 grams of solvent, if you know the solubility at a particular temperature. | Describe how to work out the mass of solute dissolved in 50, 25, and 10 grams of solvent, if you know the solubility at a particular temperature. | Describe how to work out the mass of solute dissolved in 50, 25, and 10 grams of solvent, if you know the solubility at a particular temperature. | Describe how to work out the mass of solute dissolved in 50, 25, and 10 grams of solvent, if you know the solubility at a particular temperature. | Describe how to work out the mass of solute dissolved in 50, 25, and 10 grams of solvent, if you know the solubility at a particular temperature. |
| Explain how a concentrated solution is different from a dilute solution. Use diagrams in your explanation.                                        | Explain how a concentrated solution is different from a dilute solution. Use diagrams in your explanation.                                        | Explain how a concentrated solution is different from a dilute solution. Use diagrams in your explanation.                                        | Explain how a concentrated solution is different from a dilute solution. Use diagrams in your explanation.                                        | Explain how a concentrated solution is different from a dilute solution. Use diagrams in your explanation.                                        |
| Explain how a simple experiment can show whether a solid substance is soluble or insoluble in water. Use appropriate keywords.                    | Explain how a simple experiment can show whether a solid substance is soluble or insoluble in water. Use appropriate keywords.                    | Explain how a simple experiment can show whether a solid substance is soluble or insoluble in water. Use appropriate keywords.                    | Explain how a simple experiment can show whether a solid substance is soluble or insoluble in water. Use appropriate keywords.                    | Explain how a simple experiment can show whether a solid substance is soluble or insoluble in water. Use appropriate keywords.                    |
| Think about dissolving sugar lumps and sugar crystals in water. What factors can affect the sugar's solubility?                                   | Think about dissolving sugar lumps and sugar crystals in water. What factors can affect the sugar's solubility?                                   | Think about dissolving sugar lumps and sugar crystals in water. What factors can affect the sugar's solubility?                                   | Think about dissolving sugar lumps and sugar crystals in water. What factors can affect the sugar's solubility?                                   | Think about dissolving sugar lumps and sugar crystals in water. What factors can affect the sugar's solubility?                                   |

### Extended answer question

The graph below shows the solubility curves for three salts: sodium chloride ( $\text{NaCl}$ ), potassium nitrate ( $\text{KNO}_3$ ) and potassium chlorate ( $\text{KClO}_3$ ).

Describe the key trends shown in the solubility curve graph. Include up to six points, and think about the questions below to help to structure your answer:

- What is the general trend of solubility with increasing temperature?
- Which salt has the widest solubility range? Specify the temperature range.
- Which salt has the narrowest solubility range? Specify the temperature range.
- Which salt has a solubility range that is between the narrowest and the widest? Specify the temperature range.
- Do any of the salts have the same solubility at any temperatures?
- Do any of the salts have different solubilities at all temperatures?

