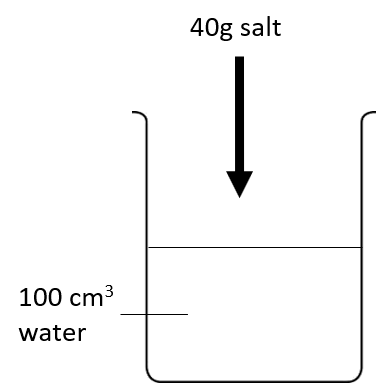
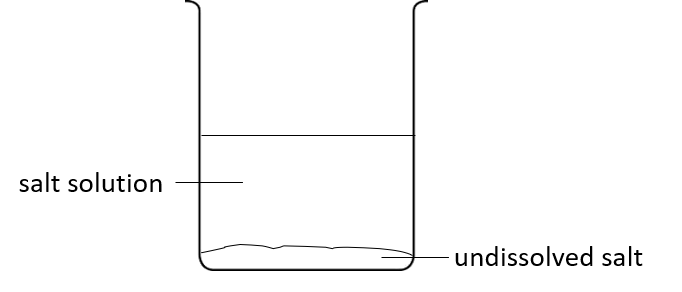
**Undissolved salt**

40g of salt is added to 100 cm3 of water.



Some of the salt does not dissolve. It can be seen at the bottom of the beaker.



1. The maximum mass of salt that can dissolve in 100cm3 of water (the solubility of salt) at room temperature is 36g.
   1. Work out the mass of undissolved salt at the bottom of the beaker. Show you working.
   2. 100 cm3 more water is added. How much salt can dissolve in 200cm3 of water?
   3. All the salt now dissolves. Explain why.

*Chemistry > Big idea CSU: Substance > Topic CSU2: Solubility > Key concept CSU2.1: Comparing solubility*

|  |
| --- |
| **Response activity** |
| **Undissolved salt** |

**Overview**

|  |  |
| --- | --- |
| Learning objective: | Solubility is a property of a substance that varies with temperature. |
| Observable learning outcome: | Recognise that increasing the volume of solvent does not increase the solubility of a substance. |
| Activity type: | Response, application and practice - problem |
| Key words: | solution, undissolved, solubility |

This activity can help develop students’ understanding by addressing the misunderstandings revealed by the following diagnostic question:

* Adding water

**What does the research say?**

A research project (Adadan and Savasci, 2012) developed diagnostic questions to investigate 16 to 17 year old’s understanding of solution chemistry.

One question asked students to select the answer options that increase the solubility of sucrose in 500ml of water.

30.8% of the students (sample size 756) believed that increasing the temperature and increasing the volume of water would increase solubility of the sucrose. About 28% of these students equated dissolving more sucrose with an increase in solubility. They did not recognise that the amount of sucrose that is able to be dissolved in the water increases proportionally with the volume of water. This does not change the solubility of sucrose at a particular temperature.

**Ways to use this activity**

This activity gives students the opportunity to practise applying their understanding and to clarify their thinking through discussion. To support this, students should answer the question in pairs or small groups.

Listening to individual groups as they work often highlights any difficulties they might have. These can often be overcome, through a whole class clarification or redirection part way through the activity.

This activity is deliberately quantitative in nature and aims to illustrate how different masses of salt dissolve in different volumes of water. Emphasise to students that the solubility of salt remains the same.

To support in answering the question, the solubility of salt is described in words as “The maximum mass of salt that can dissolve in 100cm3.” Solubility is commonly expressed as grams of solute per 100g of water and this is used in subsequent questions and activities.

*Differentiation*

It may help some students to work through the basic maths idea first with some more straightforward numbers. For example, students could be asked. “If 10g of a substance dissolves in 100cm3 of water, how many grams can dissolve in 200cm3, 500cm3 or 1000cm3?”

**Expected answers**

1a Only 36g of salt can dissolve in 100cm3 of water, so 40-36 = 4g of salt must remain undissolved.

b If 36g of water dissolves in 100cm3 then 2x36 = 72g of salt can dissolve in 200cm3 of water.

C This means that all the 40g of salt added can now dissolve.

**Acknowledgments**

Developed by Helen Harden (UYSEG).

Images: Helen Harden and Alistair Moore (UYSEG)

**References**

Adadan, E. and Savasci, F. (2012). An analysis of 16 to 17 year old students' understanding of solution chemistry concepts using a two-tier diagnostic instrument. *International Journal of Science Education,* 34(4)**,** 513 to 544.