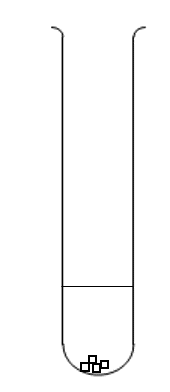
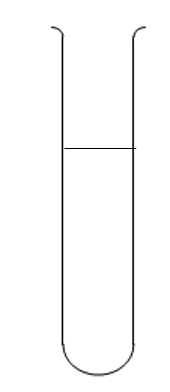
**Adding water**

Some salt is added to 2cm3 of water.

A small amount of salt does not dissolve. More water is added. All the salt dissolves.

What has happened to the solubility of the salt?

Put a tick (✓) in the box next to the best answer.

|  |  |  |
| --- | --- | --- |
| **A** | The solubility of the salt has **increased**. |  |
|  |  |  |
| **B** | The solubility of the salt has **stayed the same**. |  |
|  |  |  |
| **C** | The solubility of the salt has **decreased**. |  |
|  |  |  |

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

|  |
| --- |
| **Diagnostic question** |
| **Adding water** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | 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. |
| Question type: | Diagnostic, simple multiple choice |
| Key words: | dissolve, solubility |

**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 question**

Students should complete the question individually. This could be a pencil and paper exercise, or you could use an electronic ‘voting system’ or mini white boards and the PowerPoint presentation.

If there is a range of answers, you may choose to respond through structured class discussion. Ask one student to explain why they gave the answer they did; ask another student to explain why they agree with them; ask another to explain why they disagree, and so on. This sort of discussion gives students the opportunity to explore their thinking and for you to really understand their learning needs.

*Differentiation*

You may choose to demonstrate and talk through the experiment to ensure that all students understand the description in the question.

**Expected answers**

B

**How to respond - what next?**

A student who chooses A may have confused an increase in the amount of salt that dissolves with an increase in solubility.

Students are unlikely to choose option C, but it is included for completeness.

If students have misunderstandings about solubility you may need to reinforce that solubility refers to the mass of a solute that dissolves in a given volume of liquid. You may also wish to ensure that students are confident in understanding that solubility is a property of a substance (at a given temperature) so the solubility of a substance cannot change when more water is added. The following BEST ‘response activity’ could be used in follow-up to this diagnostic question:

* Undissolved salt

**Acknowledgments**

Developed by Helen Harden (UYSEG), from an idea by Emine Adadan (Department of Secondary Science and Mathematics Education, Bogazici University, Istanbul) and Funda Savasci (Department of Science Education, Istanbul University).

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.