**Purple crystal**

A crystal of a purple substance is placed in the centre of a petri dish containing water.

The purple substance is soluble.

The water is not stirred. The experiment is left and not touched.

What would you expect to observe the next day?

Tick a box to show how confident you are that each statement is right or wrong.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | I am **sure** this is right | I think this is right. | I think this is wrong. | I am **sure** this is wrong. |
| **A** No change |  |  |  |  |
| **B** There would be a small circle of purple around the crystal. |  |  |  |  |
| **C** All the water would turn purple. |  |  |  |  |

*Chemistry > Big idea CPS: Particles and structure> Topic CPS1: Substances and mixtures > Key concept CPS1.2: Particles in solutions*

|  |
| --- |
| **Diagnostic question** |
| **Purple crystal** |

|  |  |
| --- | --- |
| Learning focus: | Understand how a particle model of matter can be used to describe and explain solutions. |
| Observable learning outcome: | Explain why stirring is not necessary for dissolving. |
| Item type: | confidence grid |
| Key words: | dissolve, particle, diffusion |

**What does the research say?**

Johnstone (1991) explains the difficulties that many students face in understanding science as the degree of ‘multilevel’ thought required. In chemistry students are frequently required to think about very different types of thing all at once.

Johnstone presented this in the form of a triangle:



*(after Johnstone, 1991, p78)*

In addition to a static particle representation, students need to appreciate the intrinsic movement of particles in liquid which exists without the need for stirring.

**Ways to use this question**

Students should complete the confidence grid 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*

It may be helpful to some students to be shown the set-up of the experiment.

**Expected answers**

The expected answer is that all the water turns purple as the crystal dissolves.

**How to respond - what next?**

Some students may think that the actual physical stirring of the water is necessary to ensure that particles are moving, and that dissolving can happen.

If students have misunderstandings about the intrinsic movement of particles and the diffusion process you may wish to demonstrate the experiment (using potassium manganate (VII)- wear eye protection and carry out a risk assessment).

The following BEST ‘response activity’ could be used in follow-up to this diagnostic question:

* Blue crystals

This uses a microscale chemistry technique to observe diffusion as a crystal of copper sulfate dissolves in a drop of water.

**Acknowledgments**

Developed by Helen Harden (UYSEG), from an idea by Philip Johnson and Bob Worley (CLEAPSS).

Images: Helen Harden

**References**

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