**Blue crystals**

This experiment is carried out on a microscale. You will be predicting and observing what happens when a few crystals of copper sulfate are added to a small puddle of water.

**Safety**

Wear eye protection.

Only use wooden toothpick to transfer crystals. Avoid copper sulfate touching your skin.

**Apparatus and materials**

* white sheet of paper
* plastic folder
* dropping pipette
* wooden tooth pick
* fine copper sulfate crystals

**Procedure**

Insert the white sheet of paper into a plastic folder.

Use a pipette to add a puddle of water on the plastic about 1cm in diameter.

Dip one end of a wooden tooth pick into the water.

Then dip it into some fine copper sulfate crystals so the solid sticks.

Carefully dip back into the puddle to leave a few blue copper sulfate crystals.

**Predict**

What do you predict that you would observe?

**Explain**

Explain the thinking behind your prediction.

**Observe**

Describe what happens.

**Explain**

Now that you have seen what happens, can you explain your observations? (If your prediction and explanation earlier were right, just say so. There is no need to write it again.)

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

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| **Response activity** |
| **Blue crystals** |

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| 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. |
| Activity type: | predict-explain-observe-explain |
| Key words: | dissolve, particle, diffusion |

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

* Purple crystal

**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 activity**

Students may carry out the experiment individually (or in pairs). This will enable them to observe in detail what happens. If this is different to their predictions, use discussion to draw out their current understanding of particle movement and if necessary, link back to work on the particle model which describes particles as constantly moving. This means that stirring is not necessary for the crystals to dissolve and the colour to spread. Stirring would speed the process up.

**Equipment**

For each student/pair/group:

* ‘Coloured crystals’ student worksheet
* wooden toothpick
* copper sulfate crystals
* plastic pipette
* white paper inside a plastic sleeve

**Technician notes**

Students will require fine crystals of hydrated copper sulfate as the experiment is carried out in microscale in a small puddle of water of 1cm diameter.

Plastic sheets may simply be wiped and then reused.

**Health and safety**

Practical work should be carried out in accordance with local health and safety requirements, guidance from manufacturers and suppliers, and guidance available from CLEAPSS.

*Copper (II) sulfate (VI)-5-water (hydrated copper sulfate)*

Harmful if swallowed. Causes skin irritation. Causes serious eye damage.

Very toxic to aquatic life with long lasting effects.

Eye protection should be worn. A wooden toothpick is suggested to pick up crystals which avoids contact with the skin.

**Expected answers**

Students should predict that the copper sulfate crystals will dissolve producing a clear blue solution. A full explanation as to why the crystals dissolve should include the concept of the intrinsic movement of the water particles which can then ‘knock into’ the particles of the copper sulfate causing them to break off.

**Acknowledgments**

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

Images: Helen Harden

**References**

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