**Solution?**

1. Water is added to three tests tubes.

A different substance is placed in each test tube.

Look at the results below.

  

copper copper carbonate copper sulfate

Which substance (or substances) is now in solution?

A copper carbonate and copper sulfate

B copper sulfate only

C none

*Chemistry > Big idea CCR: Chemical reactions > Topic CCR2: Understanding reactions > Key concept CCR2.1: Reactions in solution*

|  |
| --- |
| **Diagnostic question** |
| **Solution?** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | When two solutions react, a product may be insoluble, resulting in the formation of a precipitate. |
| Observable learning outcome: | Use observations to determine whether a substance is in solution. |
| Question type: | simple multiple choice |
| Key words: | soluble, insoluble, solution |

|  |  |
| --- | --- |
| **P** | **PRIOR UNDERSTANDING**  This diagnostic question probes understanding of ideas that are usually taught at age 5-11, to aid transition from earlier stages of learning. |

**What does the research say?**

Johnson (2012) describes the difficulty some students have with understanding observations of suspensions of fine powders. The powder appears to disperse through the water and some students consider this to be dissolving. This indicates that students are not using ‘clearness’ as a defining characteristic of a solution. Suspensions can be explained using the idea of particles (see key concept CPS1.2: Particles in solutions).

A precipitate forms when a product of a reaction between two solutions is insoluble. It is therefore important that students are able to interpret the appearance of a suspension.

It is important that student understand that a suspension

**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.

*Differentiation*

It may help some students if the experiment in the question is demonstrated.

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

**Expected answers**

B

**How to respond - what next?**

A student selecting option A may not be using clearness as the means to identify a solution.

Selection of option C may indicate that a student does not understand that being ‘in solution’ means that a substance is dissolved. It may be worth finding out whether they would choose the same answer if the question was ‘Which substance or substances are soluble?”.

If students have misunderstandings about how to use observations to identify whether a substance is in solution they may need consolidate ideas from key concept CSU1.2: Solutions.

The following BEST ‘response activities’ (from CSU1.2) could be used in follow-up to this diagnostic question:

* Dissolving discussion

**Acknowledgments**

Developed by Helen Harden (UYSEG).

Images: Peter Fairhurst and Helen Harden

**References**

Johnson, P. (2012). Introducing particle theory. In Taber, K. (ed.) *ASE Science Practice: Teaching Secondary Chemistry.* New edition ed. London, UK: Hodder Education.