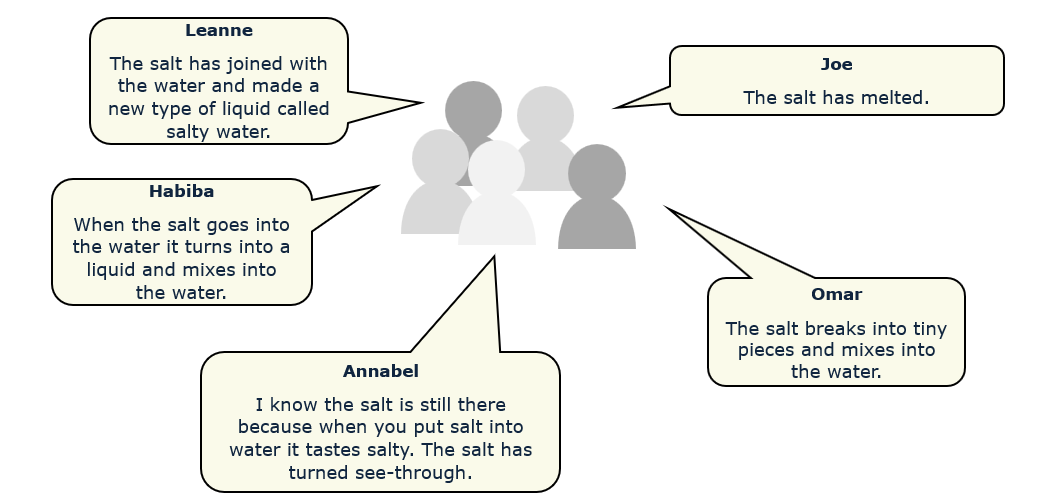
**Where is the salt?**

Some salt was added to a beaker of water. After stirring the salt could no longer be seen.

Some students were asked “Where is the salt?”

Which student do you agree with, and why?



|  |
| --- |
| **Leanne**  The salt has joined with the water and made a new type of liquid called salty water. |
| **Habiba**  When the salt goes into the water it turns into a liquid and mixes into the water. |
| **Annabel**  I know the salt is still there because when you put salt into water it tastes salty. The salt has turned see-through. |
| **Joe**  The salt has melted. |
| **Omar**  The salt breaks into tiny pieces and mixes into the water. |

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

|  |
| --- |
| **Diagnostic question** |
| **Where is the salt?** |

|  |  |
| --- | --- |
| Learning focus: | Understand how a particle model of matter can be used to describe and explain solutions. |
| Observable learning outcome: | Explain the observed disappearance of a solute in terms of breaking into parts that are too small to see. |
| Question type: | talking heads |
| Key words: | solution, dissolve, mixture |

**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)*

This item may be used to find out whether students are thinking only about the macroscopic (observable) level or whether they are starting to consider the sub-microscopic in terms of providing an explanation.

**Ways to use this question**

This task is intended for discussion in pairs or small groups. It could be projected or alternatively the statements are provided ready to print and cut out.

Listening in to the conversations of each group will often give you insights into how your students are thinking. Each member of a group should be able to report back to the class.

Feedback from each group can be used, with careful teacher questioning, to bring out a clear description or explanation of the science.

*Differentiation*

The quality of the discussions can be improved with a careful selection of groups; or by allocating specific roles to students in each group. For example, you may choose to select a student with strong prior knowledge as the scribe. They may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

It may support some students if they are able to dissolve some salt and observe what happens for themselves.

**Expected answers**

Omar provides the best explanation.

**How to respond - what next?**

The explanations of the other students illustrate a range of misconceptions:

Leanne does not recognise that the salt is still present and instead infers that a new liquid has been formed.

Habiba does recognise that mixing has occurred but explains it in terms of salt changing into a liquid. She is inferring macroscopic properties to the explain observations of the salt disappearing. It must now be like the water.

Joe is misapplying the scientific word ‘melting’ to the situation. He is focusing on similarities in his observations at the macroscopic level rather than understanding that melting is a change of state and is explained by different changes at the sub-microscopic level.

Annabel correctly uses macroscopic observation as evidence that the salt is still present but is unable to explain these observations without relating what has happened to the salt with her macroscopic observations of water.

If students have misunderstandings about how to use the particle model to explain observations of dissolving these will need to inform planning of teaching of this key concept.

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Images: None

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