**Explaining bubbles observed during boiling**

Sequence the statements below to create an explanation of how bubbles form when water boils in a kettle.

Start with the first statement.

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| Water in the kettle is in the liquid state. |
| The water particles are able to move further apart. |
| The water particles are very close together. |
| A group of water particles form a pocket of water in the gas state. |
| This creates a bubble within the water that is still in the liquid state. |
| When the kettle is switched on, the temperature of the water increases. |

*Chemistry > Big idea CPS: Particles and structure > Topic CPS1: Substances and mixtures > Key concept CPS1.1: Particle model for the solid liquid and gas states*

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| --- |
| **Response activity** |
| **Explaining bubbles during boiling** |

|  |  |
| --- | --- |
| Learning focus: | Understand a basic particle model of matter that can explain the properties of substances in the gas state. |
| Observable learning outcome: | Use the basic particle model to explain observations of boiling. |
| Activity type: | sequencing explanation |
| Key words: | liquid, gas, state, particle, boiling |

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

* Bubbles during boiling

**What does the research say?**

Research by Johnson and Papageorgiou (2010) included a question about the bubbles in boiling water.

In order to understand the formation of bubbles during boiling students need to understand that a sample of water can change into a body of gas and that this gas is still the substance water. They should then recognise that a bubble formed during boiling consists of water particles that are further apart inside the bubble than in the surrounding liquid.

Some students in the study recognised that the bubbles were made of a ‘gas’ but were unclear as to the identity of that gas. They struggled with idea that the ‘gas’ could actually be water.

**Ways to use this activity**

Students should complete the sequencing activity in pairs or small groups, and the focus should be on the discussions. The statements are also provided as cut-out cards for students to physically organise. Alternatively, students could number the statements.

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 explain why the statements were put in the chosen order.

*Differentiation*

It may help some students to carry out this activity as part of a demonstration of water boiling. This could be used to support students in linking macroscopic observations with a sub-microscopic explanation in terms of the particle model.

**Expected answers**

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| --- |
| Water in the kettle is in the liquid state. |
| The water particles are very close together. |
| When the kettle is switched on, the temperature of the water increases. |
| The water particles are able to move further apart. |
| A group of water particles form a pocket of water in the gas state. |
| This creates a bubble within the water that is still in the liquid state. |

**Acknowledgments**

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**References**

Johnson, P. and Papageorgiou, G. (2010). Rethinking the Introduction of Particle Theory: A Substance-based framework. *Journal of Research in Science Teaching.* 42(2) 130-150