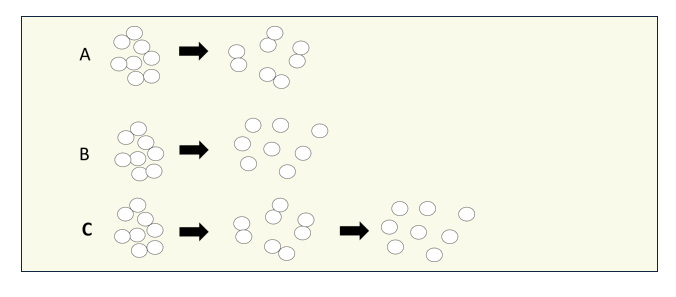
**Changing to the gas state**

1. An element in the liquid state is made up of separate molecules. Each molecule is made of two atoms.

Which diagram best shows what happens when the substance is heated and it changes into the gas state?



*Chemistry > Big idea CPS: Particles and structure > Topic CPS2: Elements and compounds > Key concept CPS2.1: Atoms and molecules*

|  |
| --- |
| **Response activity** |
| **Changing to the gas state** |

**Overview**

|  |  |
| --- | --- |
| Learning objective: | The properties of elements and compounds arise from the structural arrangement of their constituent atoms. |
| Observable learning outcome: | Explain differences in melting points between elements in terms of their structure (separate molecules or a single giant structure). |
| Activity type: | clarifying thinking/simple multiple choice |
| Key words: | substance, molecule, atom, gas state |

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

* Element differences

**What does the research say?**

This learning outcome is inspired by the fourth unit developed for a study (Johnson, 2000) into the development of students’ understanding of the concept of substance. In this study elements and compounds were explained in terms of atoms and molecules with both ‘molecular’ and ‘giant’ structures being given as possibilities. This is earlier than these ideas are typically introduced in chemistry courses however the idea is useful in explaining, in general terms, the low and high melting points of different substances.

At this stage, whilst considering changes of state, the emphasis should be on the substance remaining the same. Later, when studying chemical change, students should be more able to recognise that changes in the combination of atoms must result in different properties, and hence new substances. (Johnson, 2002)

**Ways to use this activity**

This activity gives students the opportunity to clarify their thinking through discussion. To support this, students should answer the question in pairs or small groups.

*Differentiation*

If some students are working with a teaching assistant, then a list of prompt questions for the teaching assistant could help to make this activity more purposeful.

**Expected answers**

A

**Acknowledgments**

Developed by Helen Harden (UYSEG.

Images: Helen Harden

**References**

Johnson, P. (2000). Children's understanding of substances, part 1: recognizing chemical change. *International Journal of Science Education,* 22(7)**,** 719-737.

Johnson, P. (2002). Children's understanding of substances, part 2: Explaining chemical change. *International Journal of Science Education,* 24(10)**,** 1037-1054.