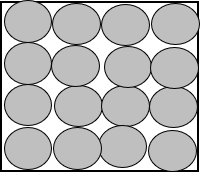
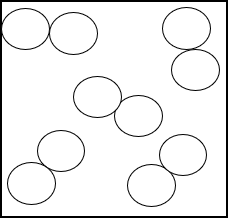
**Explaining melting points**

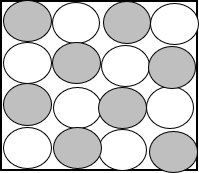
Magnesium has a melting point of 650°C.

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Oxygen has a melting point of -218°C.



Magnesium oxide has a melting point of 2852°



1. Complete the sentences below to explain why magnesium, oxygen and magnesium oxide have different melting points. Use the diagrams and information above to help.

You should use only the words **high/low**, **strongly/weakly** or **atoms/molecules** to fill in the gaps.

Magnesium has a \_\_\_\_\_\_\_ melting point because the magnesium \_\_\_\_\_\_ are \_\_\_\_\_\_\_\_\_\_\_ held together.

Oxygen has a \_\_\_\_\_\_\_ melting point because the oxygen\_\_\_\_\_\_\_\_ are \_\_\_\_\_\_\_\_\_\_\_\_ held together.

Magnesium has a very \_\_\_\_\_\_\_ melting point because the magnesium and oxygen \_\_\_\_\_\_\_ are very \_\_\_\_\_\_\_\_ held together.

*Chemistry > Big idea CPS: Particles and structure > Topic CPS3: Chemical change > Key concept CPS3.1: Rearrangement of atoms*

|  |
| --- |
| **Response activity** |
| **Explaining melting points** |

**Overview**

|  |  |
| --- | --- |
| Learning objective: | During a chemical reaction, atoms are rearranged and a new substance (or substances) is formed with different properties. |
| Observable learning outcome: | Explain observations of reactions in which elements combine in terms of a change in arrangement of atoms resulting in new properties. |
| Activity type: | clarifying |
| Key words: | melting point, atom, molecule |

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

* Explaining melting point

**What does the research say?**

Research by Johnson and Papageorgiou (2009) recommends that the particle model is used to explain why substances melt at different temperatures. Variations in melting point arise from differences between the forces of attraction between particles. The state of a substance results from how these forces of attraction compare with the energy of the movement of the particles (which depends upon the temperature). When a substance melts the particles have sufficient energy to overcome these forces and move, whilst still staying close together.

It should be noted that use of the term ‘attraction’ is inconsistent with later understanding of a chemical bond as a balance between attraction and repulsion. For this reason, Johnson suggests that alternative terminology, such as ‘ability to hold’ may be preferable.

**Ways to use this activity**

Please note that in this question the term ‘atom’ has been used for simplicity although magnesium oxide is actually formed from ions.

This ‘cloze’ exercise could be completed by pairs of students, facilitating discussion and justification of the choice of words.

*Differentiation*

Some students may need structured guidance in linking this understanding to the concept of atom rearrangement during chemical reactions. This may then help students to explain why the melting point of the product of a reaction depends upon the structural arrangement of atoms and does not relate to the melting points of the reactants.

**Expected answers**

Magnesium has a **high** melting point because the magnesium **atoms** are **strongly** held together.

Oxygen has a **low** melting point because the oxygen **molecules** are **weakly** held together.

Magnesium has a very **high** melting point because the magnesium and oxygen **atoms** are very **strongly** held together.

**Acknowledgments**

Developed by Helen Harden (UYSEG).

Images: Helen Harden

**References**

Johnson, P. and Papageorgiou, G. (2009). Rethinking the introduction of particle theory: A subtance-based approach. *Journal of Research into Science Teaching,* 47(2)**,** 130-150.