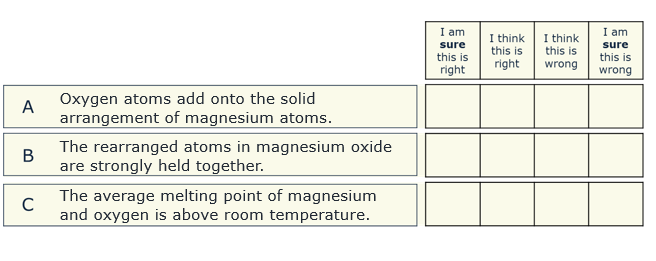
**Explaining oxidation**

Magnesium reacts with oxygen to form the compound magnesium oxide.

1. Why is magnesium oxide in the solid state?

*Read these statements.*

*For each statement, tick (*✓*)* ***one*** *column to show* *what you think about it.*



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

|  |
| --- |
| **Diagnostic question** |
| **Explaining oxidation** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | During a chemical reaction, atoms are rearranged and a new substance (or substances) are 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. |
| Question type: | confidence grid |
| Key words: | atom, compound, reaction, state |

**What does the research say?**

Research (Talanquer, 2007) explored the extent to which students used an additive framework to predict the properties of a product , rather than recognising that properties emerge from the arrangement of atoms.

The research asked students to predict a sensory property of a compound based on information about the sensory properties of the reactants. The majority of student responses predicted that the product would have sensory properties based on a combination of the properties of the two reactants. This suggested that students were using an additive framework. In addition, the study found that the students who selected additive options frequently considered compounds to be a mixture of substances that maintained some of the properties of the original reactants.

This has implications for students in terms of their ability to explain observations of chemical reactions. If they are expecting a product to have the combined properties of the reactants, they may find it challenging to account for observations that are different to this.

**Ways to use this question**

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

Students should complete the confidence grid 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.

If there is a range of answers, you may choose to respond through structured class discussion. Ask one student to explain why they gave the answer they did; ask another student to explain why they agree with them; ask another to explain why they disagree, and so on. This sort of discussion gives students the opportunity to explore their thinking and for you to really understand their learning needs.

**Expected answers**

B is the only answer that is right.

**How to respond - what next?**

A student who thinks that option A or C are right, may still hold an additive view of compounds. In answer A the oxygen atoms are described as simply adding onto the existing solid structure. They then take on the predominant property of that structure (high melting point). Option C suggests that when the elements combine, their properties are averaged.

If students have misunderstandings about the relationship between the arrangement of atoms in a compound and properties, they may need to revisit work on compounds (see key concept CPS2.1: atoms and molecules).

The following BEST ‘response activities’ could be used in follow-up to this diagnostic question:

* Explaining melting points

**Acknowledgments**

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Images: None

**References**

Talanquer, V. (2007). Students' predictions about the sensory properties of chemical compounds: Additive versus emergent frameworks. *Science Education,* 92(1)**,** 96-114.