**Burning iron wool**

1. The mas of iron wool at the start of an experiment is 4g.

The iron wool is then heated so that it burns.

Predict what will happen to the mass. Explain your answer.

A Increase

B Stay the same

C Decrease

*Chemistry > Big idea CCR: Chemical reactions > Topic CCR2: Understanding reactions> Key concept CCR2.2: Combustion*

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| **Diagnostic question** |
| **Burning iron wool** |

**Overview**

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| Learning focus: | During combustion new products are formed from the combination of oxygen with the fuel, resulting in an increase in measured mass. |
| Observable learning outcome: | Predict an increase in mass following the burning of a metal. |
| Question type: | simple multiple choice |
| Key words: | mass |

**What does the research say?**

Research carried out in New Zealand (Driver, Guesne and Tiberghien, 1985) found that about a quarter of twelve year olds predicted an increase in mass of iron wool when it burned. However, only a few gave the scientifically correct reason that oxygen combines with the iron. Some suggested that the increase would be due to physical changes such as the addition of soot from the flame.

About another quarter of students predicted the mass would stay the same. Some used the reasoning that the iron wool would still be there, but that it had changed form.

The most popular response was that the iron wool would get lighter. The reasons given often related to a gas or smoke being given off or something being ‘burnt away’.

**Ways to use this question**

Students should complete the question 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**

A

**How to respond - what next?**

A student selecting answer B could be using the idea of conservation of mass without recognising that the oxygen comes from the air and is therefore not included in the initial mass measurement. Alternatively, they may hold a more fundamental misunderstanding about the nature of chemical change in which an observed property change is explained simply as a substance changing rather than the formation of a new substance.

A student who selects C may perceive burning as a substance being ‘burnt away’ and hence predicts a decrease in mass. Alternatively, their prior experience of burning may support the idea that burning produces smoke which also suggests a potential decrease in mass.

If students have misconceptions about burning involving combination with oxygen and an increase in measured mass, they may need further explanation before being given the opportunity to apply this understanding to another situation.

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

* Iron wool balance

**Acknowledgments**

Developed by Helen Harden (UYSEG), from an idea from Children’s Ideas in Science (Driver et al., 1985)

Images: None

**References**

Driver, R., Guesne, E. and Tiberghien, A. (1985). *Children's Ideas in Science,* Milton Keynes, UK: Open University Press.