**Burning carbon**

1. A piece of pure carbon is burnt. This produces carbon dioxide.

The chemical equation for the reaction is:

C(s) + O2(g) → CO2(g)

How does the mass of C(s) compare with CO2(g)?

A The mass of C(s) is equal to the mass of CO2(g).

B The mass of C(s) is greater than the mass of CO2(g).

C The mass of C(s) is less than the mass of CO2(g).

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

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| **Response activity** |
| **Burning carbon** |

**Overview**

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| Learning objective: | 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 that products of combustion will have a greater mass than the original fuel due to combination with oxygen |
| Activity type: | application and practice |
| Key words: | chemical equation |

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

* Exhaust gases

**What does the research say?**

Research (Kind, 2014) into pre-service teachers’ understanding found that 41% answered a question about the mass of exhaust gases compared to the starting mass of petrol correctly. About 26% applied conservation of mass to the question and thought that the mass of the of the exhaust gases would equal that of the petrol. These individuals had omitted to consider the oxygen with which the petrol reacted.

Some gave the explanation that the petrol was ‘used up’. The exhaust gases were then considered to have less mass. Others thought that the mass of the exhaust gases would be less because mass had changed into energy to move the car.

This activity simplifies the original question to consider the burning of pure carbon.

**Ways to use this activity**

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

Listening to individual groups as they work often highlights any difficulties they might have. These can often be overcome, through a whole class clarification or redirection part way through the activity.

*Differentiation*

It may help some students to model the rearrangement of atoms during the reaction using either a diagram or a physical aid such as counters.

**Expected answers**

C

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Developed by Helen Harden (UYSEG) inspired by an idea by Vanessa Kind (University of Durham).

Images: None

**References**

Kind, V. (2014). A degree is not enough: A qualitative study of aspects of pre-service science teachers' chemistry content knowledge. *International Journal of Science Education,* 36(8)**,** 1313-1345.