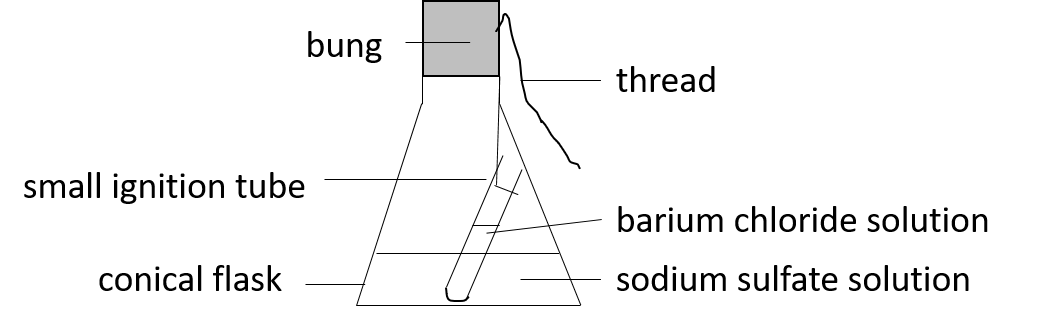
**Predicting mass**

Some students investigated how mass changes during a chemical reaction.

They used a balance to find the mass before the reaction.



The small tube was lowered. This allowed the sodium sulfate solution and barium chloride solution to react.

The students measured the mass again.

1. How do you predict the mass changed?

A The mass increased.

B The mass stayed the same.

C The mass decreased.

*Chemistry > Big idea CCR: Chemical reactions > Topic CCR2:Understanding reactions> Key concept CCR2.1: Reactions in solution*

|  |
| --- |
| **Response activity** |
| **Predicting mass** |

**Overview**

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| --- | --- |
| Learning objective: | When two solutions react, a product may be insoluble, resulting in the formation of a precipitate. |
| Observable learning outcome: | Predict the conservation of mass during a displacement or precipitation reaction. |
| Activity type: | application and practice |
| Key words: | solution, mass |

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

* Mass change?

**What does the research say?**

Research (Andersson, 1990) suggests that student answers to a research question asking students to predict the mass after a chemical reaction is influenced by their conceptions of chemical change.

For example, if a student observes that a substance ‘disappears’ they may consider that the mass will decrease. If the appearance of a product is explained as it having been present all along but having moved so that it becomes visible, then students might correctly predict conservation of mass (although for incorrect reasons).

Answers to the question were also affected by student understanding of mass and weight. Some student claimed that smoke did not weigh anything. Other students thought that a gas had no mass which suggests that they may not recognise a gas as a substance.

**Ways to use this activity**

This activity gives students the opportunity to practise applying their understanding to a different type of reaction (precipitation). It can be used to help students to clarify their thinking through discussion. To support this, students should, if possible, watch a demonstration or video of the reaction. Alternatively, the question could be carried out using the diagram provided.

It may help students to be provided with the chemical equation for the reaction. The state symbols may be used to explain the appearance of a precipitate and the equation as a whole used as a prompt that during a reaction, atoms are rearranged.

BaCl2 (aq) + Na2SO4 (aq) →BaSO4 (s) + 2NaCl (aq)

Students should be asked to predict the final mass after having observed the reaction.

*Differentiation*

Providing suitable recording sheets could help some students organise their understanding of what is being weighed at each stage.

**Equipment**

For the demonstration:

* conical flask and bung
* ignition tube
* cotton thread
* digital balance
* barium chloride solution (Harmful – ingestion)
* sodium sulfate solution

**Technician notes**

Consult Hazcards from <http://www.cleapss.org.uk/> for details of preparation of solutions and suitable concentrations.

Strict hygiene standards should be enforced rigorously. Ingestion is unlikely if eating and drinking is banned in laboratories and prep rooms.

**Health and safety**

Eye protection should be worn and hands should be washed thoroughly afterwards.

Practical work should be carried out in accordance with local health and safety requirements, guidance from manufacturers and suppliers, and guidance available from CLEAPSS.

**Expected answers**

The mass is unchanged.

**Acknowledgments**

Developed by Helen Harden (UYSEG).

Images: Helen Harden

**References**

Andersson, B. (1990). Pupils' conceptions of matter and its transformations (age 12-16). *Studies in Science Education,* 18**,** 53-85.