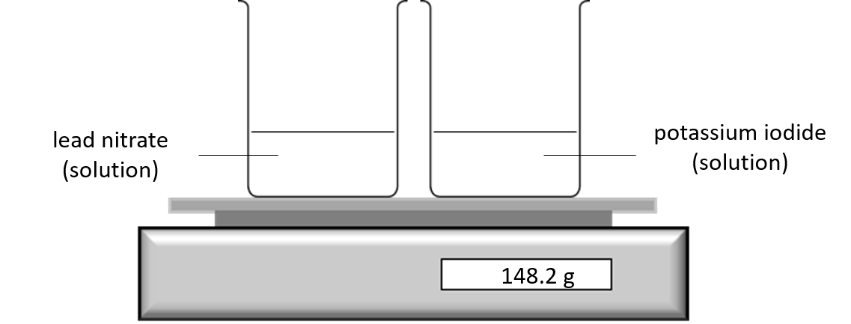
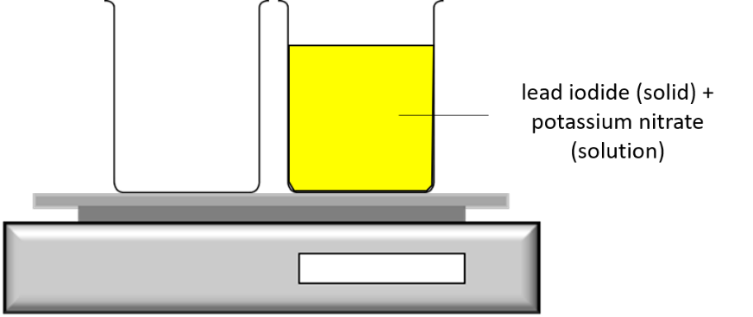
**Product mass**

1. The reactants are placed on a balance. The total mass is 148.2g.

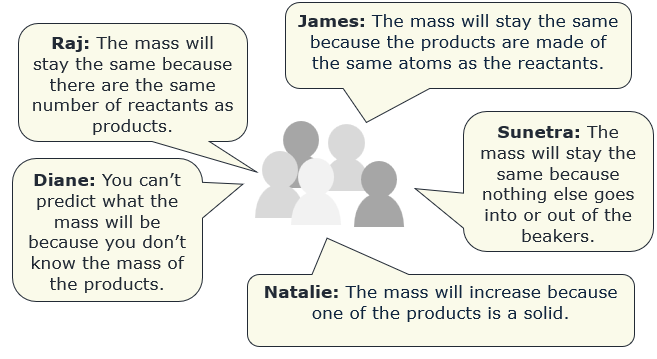


The reactants are mixed. A yellow precipitate forms.



Some students predict how the mass of the reaction will change.

Who do you agree with, and why?



|  |
| --- |
| **Raj**  The mass will stay the same because there are the same number of reactants as products. |
| **Diane**  You can’t predict what the mass will be because you don’t know the mass of the products. |
| **Natalie**  The mass will increase because one of the products is a solid. |
| **Sunetra**  The mass will stay the same because nothing else goes into or out of the beakers. |
| **James**  The mass will stay the same because the products are made of the same atoms as the reactants. |

*Chemistry > Big idea CPS: Particles and structure > Topic CPS4: Understanding reactions > Key concept CPS4.2: Conservation of mass*

|  |
| --- |
| **Response activity** |
| **Product mass** |

**Overview**

|  |  |
| --- | --- |
| Learning objective: | During a chemical reaction no atoms are created or destroyed. Mass is conserved. |
| Observable learning outcome: | Predict and explain conservation of mass during a chemical reaction. |
| Activity type: | simple multiple choice |
| Key words: | reactant, product, chemical reaction, mass |

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

* What mass?

**What does the research say?**

A question used during research by Barker and Millar (1999) asked students to predict whether the mass of two solutions mixed together to form a precipitate would change. Student explanations for their answers revealed a number of misunderstandings.

Some students predicted that the mass would increase because a solid “weighs more” than a liquid. Other predicted the mass would decrease because a gas is produced. It appeared that the evolution of a gas was something they associated with a chemical reaction.

Students who correctly predicted no change in mass did not always do so for the correct scientific reason. Some made this prediction on the basis that no reaction had taken place.

**Ways to use this activity**

Students should complete this activity in pairs or small groups, and the focus should be on the discussions. The statements are also provided as cut-out cards for students to physically organise.

If there is disagreement when you take feedback, a good way to progress might be 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.

*Differentiation*

The quality of the discussions may be improved with a careful selection of groups; or by allocating specific roles to students in each group. For example, you may choose to select a student with strong prior knowledge as a scribe. They may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

**Expected answers**

Sunetra correctly predicts that the mass will stay the same, using a macroscopic explanation.

James also makes the correct prediction but uses an understanding of the rearrangement of atoms.

Raj makes the correct prediction but for a scientifically incorrect reason.

**Acknowledgments**

Developed by Helen Harden (UYSEG), from an idea by Vanessa Barker and Robin Millar (1999)

Images: Helen Harden and Alistair Moore

**References**

Barker, V. and Millar, R. (1999). Students' reasoning about chemical reactions: what changes occur during a context-based post-16 chemistry course? *International Journal of Science Education,* 21(6)**,** 645-665.