Australian Curriculum: Year 9 Science Understanding Chemical Sciences

Chemical reactions, including combustion and the reactions of acids, are important in both non-living and living systems and involve energy transfer

1

Before transformation: Sample Year 9 task

Aim

To demonstrate that mass is conserved in a chemical reaction.

Procedure

1. Measure **5g of sodium bicarbonate** and put it into a balloon.
2. Measure **20mL of acetic acid** and carefully pour it into a flask.
3. Secure the balloon over the mouth of the flask, being careful not to spill any sodium bicarbonate into the acetic acid.
4. Use an electronic balance to weigh the total mass of the balloon, flask, sodium bicarbonate and acetic acid. Record.
5. Lift the balloon so that the bicarbonate soda pours into the bottle. Carefully swirl to mix, do not splash up into the balloon. Observe the reaction.
6. After five minutes once again use an electronic balance to weigh the total mass of the balloon, flask, sodium bicarbonate and acetic acid. Record.

Results

2. Record your observations and masses in a table like the one below.

Total mass before reaction (g)	Total mass after reaction (g)	Difference in mass(g)

Discussion

1. List evidence that chemical reactions took place when the substances were added together.
2. Compare the total masses before and after the reaction.
3. State the law of conservation of mass.
4. Assess whether or not your results support this law.

Science as a Human Endeavour

French scientist Antoine Lavoisier was known for his painstaking attention to detail. For example, whenever he made a chemical reaction, he weighed all the substances carefully before and after the reaction. He established that, in a chemical reaction, although substances may change their chemical nature, their total mass remains the same. This is called ***the law of conservation of mass****.*

What's possible?

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AFTER transformation: Getting the students doing the thinking

Science as a Human Endeavour

A French scientist, Antoine Lavoisier was known for his painstaking attention to detail. Whenever he made a chemical reaction he weighed all the substances carefully before and after the reaction. This process meant that he was able to establish one of the laws of chemistry.

1. What do you think the law of chemistry that he established might have been?

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6. After five minutes once again use an electronic balance to weigh the total mass of the balloon, flask, sodium bicarbonate and acetic acid. Record.
7. Pop the balloon, and measure the mass of the set up for a third time.

Discussion

2. What do you think happened: (a) after step 5? (b) after step 6? (c) after step 7? Why do you think that?
3. Why do you think a balloon was used?
4. What do you think the investigation is designed to find out?

Design an investigation

Read information about Lavoisier and his discovery. In small groups, carry out, and record an investigation that tests Lavoisier's discovery, and meets his demand for detail. You may modify the above investigation or design one of your own, using the equipment provided.

a. Accurately record the steps you took, and tabulate your observations.
b. Evaluate your investigation. How well did it meet Lavoisier's demand for detail and accuracy?
c. How might you improve the investigation for fairness and accuracy?

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Annotations: How has the task been changed?

What did the teacher do?	Why?
Withheld information by omitting the aim of the experiment, and asked students what they thought the purpose of the investigation might be, before giving them the explanation.	So students could carefully analyse the information (i.e. the investigation procedure and background information about Lavoisier), and use this to logically formulate their own ideas about the law of chemistry that Lavoisier established.
Asked the students to make predictions about possible results	So students could apply prior knowledge when considering possible results.
Asked students how they might improve their inquiry process.	So students could reflect critically about aspects of the investigation which may have negatively affected the results.
Asked students to design their own way of demonstrating The Law of Conservation of Mass.	So students could apply their critical evaluation of the first investigation, and their understanding of its purpose, to design an improved investigation of their own.
Asked students to carry out and evaluate their own investigation	So students could decide how best to organise and carry out an investigation that best met specific criteria, and assess how well their aim was achieved.

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