Conservation of Mass

Task 1: Fill in the missing words.

products same boiling spread out reactants conservation of mass gas same

In any chemical reaction the total mass of the _____ is equal to the total mass of the _____. This is called the _____.

Another way to explain it would be to say that matter is not created or destroyed.

Therefore, the total mass of reactants and the total mass of products must be the _____.

Mass is also conserved in changes of state. When water boils, the molecules get further apart and _____ turning into a _____, but the total number of molecules stays the _____. Therefore, the total mass of water molecules stays the same after _____.

Task 2: Complete the following

1. 58g of ice is melted in a beaker sealed with plastic film. What mass of liquid water will be formed? _____ g

2. Carbon reacts with oxygen to make carbon dioxide.

a) If 3g of carbon and 8 g of oxygen are reacted together in a sealed flask, what mass of carbon dioxide will be made? _____ g

b) If 202g of carbon dioxide is made what must be the total mass of the oxygen and carbon at the start of the reaction? _____

Conservation of Mass

Method Part 1

1. Place the beaker on top of the balance.
2. Add ice cubes to the beaker
3. Cover with cling film. Record weight of cling, beaker and ice cubes.
4. Wait until all the ice has melted and record weight again.

Mass of ice, beaker and cling film (g)	Mass of water, beaker and cling film (g)

Questions

1. Is the change from ice to water a chemical reaction or a change in state?

_____

2. Describe the results that you obtained. Explain why you think this was.

_____

_____

Method Part 2

1. Place a drinks bottle (500ml) on top of the balance.
2. Measure 50 cm^3 of vinegar and pour it into the drinks bottle.
3. Record the combined weight of the vinegar and the bottle here:
4. Place the balloon and the elastic band onto the balance.
5. Carefully put a spatula of sodium bicarbonate into the balloon, pushing it as far towards the end as possible.
6. Record the combined weight of the elastic band, the balloon and the sodium bicarbonate here:
7. Add these two weights together and record them in your table.
8. Carefully stretch the balloon over the neck of the bottle, pinching to keep the sodium bicarbonate in place. Secure in place with elastic band.
9. Push the top of the balloon into drinks bottle.
10. Observe what happens. When the reaction has stopped, record the combined weight of bottle and balloon in your table.

Conservation of Mass

Combined mass of bottle, chemicals, balloon and elastic band before reaction (g)	Combined mass of bottle, chemicals, balloon and elastic band after reaction (g)

In the space below, draw 2 diagrams, one of the bottle and balloon before the chemical reaction and one of the bottle and balloon after.

Before

After

Questions

Describe the results that you obtained.

Do your results prove the conservation of mass?

This reaction involved a chemical reaction. How can you know that this was a chemical reaction?

What would have happened to the mass if the bottle was left open. Why would this have happened?

Challenge

In this experiment a balloon was used to collect the gas. How could we measure the volume of gas produced?

Conservation of Mass

Task 1: Fill in the missing words.

products same boiling spread out reactants conservation of mass gas same

In any chemical reaction the total mass of the reactants is equal to the total mass of the products. This is called the conservation of mass.

Another way to explain it would be to say that matter is not created or destroyed.

Therefore, the total mass of reactants and the total mass of products must be the same.

Mass is also conserved in changes of state. When water boils, the molecules get further apart and spread out turning into a gas, but the total number of molecules stays the same. Therefore, the total mass of water molecules stays the same after boiling.

Task 2: Complete the following

1. 58g of ice is melted in a beaker sealed with plastic film. What mass of liquid water will be formed? 58 g

2. Carbon reacts with oxygen to make carbon dioxide.

a) If 3g of carbon and 8 g of oxygen are reacted together in a sealed flask, what mass of carbon dioxide will be made? 11 g

b) If 202g of carbon dioxide is made what must be the total mass of the oxygen and carbon at the start of the reaction? 202

Conservation of Mass

Method Part 1

1. Place the beaker on top of the balance.
2. Add ice cubes to the beaker
3. Cover with cling film. Record weight of cling, beaker and ice cubes.
4. Wait until all the ice has melted and record weight again.

Mass of ice, beaker and cling film (g)	Mass of water, beaker and cling film (g)
Students' own answers – expect to be the same	

Questions

1. Is the change from ice to water a chemical reaction or a change in state?

Change in state

2. Describe the results that you obtained. Explain why you think this was.

Students own answers – expect to be the same. Same number of water particle in the ice as there is in the liquid water. Some students may comment errors they made e.g. not taring the balance, spilling water etc.

Method Part 2

1. Place a drinks bottle (500ml) on top of the balance.
2. Measure 50 cm^3 of vinegar and pour it into the drinks bottle.
3. Record the combined weight of the vinegar and the bottle here:
4. Place the balloon and the elastic band onto the balance.
5. Carefully put a spatula of sodium bicarbonate into the balloon, pushing it as far towards the end as possible.
6. Record the combined weight of the elastic band, the balloon and the sodium bicarbonate here:
7. Add these two weights together and record them in your table.
8. Carefully stretch the balloon over the neck of the bottle, pinching to keep the sodium bicarbonate in place. Secure in place with elastic band.
9. Push the top of the balloon into drinks bottle.
10. Observe what happens. When the reaction has stopped, record the combined weight of bottle and balloon in your table.

Conservation of Mass

Combined mass of bottle, chemicals, balloon and elastic band before reaction (g)	Combined mass of bottle, chemicals, balloon and elastic band after reaction (g)
Students' own answers – expect to be the same	

In the space below, draw 2 diagrams, one of the bottle and balloon before the chemical reaction and one of the bottle and balloon after.

Before

After

Students' own answers

Questions

Describe the results that you obtained.

Students' own answers – expect to be the same

Do your results prove the conservation of mass?

Students' own answers – expect to be the same, but may have had mishaps during the experiment e.g. balloon coming off bottle.

This reaction involved a chemical reaction. How can you know that this was a chemical reaction?

New substances made

What would have happened to the mass if the bottle was left open. Why would this have happened?

Mass would go down as the gas would escape from the bottle – no longer a closed system.

Challenge

In this experiment a balloon was used to collect the gas. How could we measure the volume of gas produced? Use a gas syringe or inverted measuring cylinder in water.