Conservation of mass: practical and equations

Name: Class: Date:

Page 1 is a practical that weighs the same reaction with the cap off and with the cap on. Page 2 is for drawing the atoms in three reactions and balancing equations. Page 3 is for writing explanations.

PRACTICAL Weigh the reaction with the cap off and with the cap on

You need. A balance that reads to 0.01 g, vinegar, bicarbonate of soda, a measuring cylinder, a plastic cup, a piece of paper, a plastic bottle made for fizzy drinks (1.25 L, with its cap), a small tube that fits through the neck of the bottle, a length of thread and eye protection. Never use a glass bottle, and never seal this reaction in glass.

1. Put on eye protection.
2. Cap off. Pour 50 mL of vinegar into the cup. Weigh out 2 g of bicarbonate of soda on the paper. Put the cup and the paper on the balance together and record the mass.
3. Tip the bicarbonate into the vinegar and put the empty paper back on the balance beside the cup. When the fizzing stops, record the mass again.
4. Cap on. Pour 50 mL of vinegar into the bottle. Put 2 g of bicarbonate in the small tube, tie the thread to it and lower it into the bottle so that it stays upright. Screw the cap on tightly over the thread. Record the mass.
5. Tilt the bottle until the tube tips over, then swirl it gently. When the fizzing stops, record the mass again.
6. Point the bottle away from everyone and loosen the cap slowly to let the gas out. Record the mass once more.

RECORD Results

Run	Mass before (g)	Mass after (g)	Change (g)
Cup, cap off			
Bottle, cap on			
Bottle, after the cap is loosened			

In which runs did the mass change?

Explain the results. Use the words gas, escaped and atoms.

MODEL Draw the atoms

Draw each atom as a circle with its symbol in it. Draw the reactants in the left box and the products in the right box, then count the atoms of each element in both boxes.

hydrogen + oxygen → water $\mathbf{2H_2 + O_2 \rightarrow 2H_2O}$

REACTANTS		PRODUCTS
	→	

magnesium + oxygen → magnesium oxide $\mathbf{2Mg + O_2 \rightarrow 2MgO}$

REACTANTS		PRODUCTS
	→	

methane + oxygen → carbon dioxide + water $\mathbf{CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O}$

REACTANTS		PRODUCTS
	→	

BALANCE Balance these equations

Write a number in each gap. Change only the numbers in front of the formulas, and use the smallest whole numbers that work. A gap can be left empty if the number is 1.

1. ____ H_2 + ____ O_2 → ____ H_2O
2. ____ Mg + ____ O_2 → ____ MgO
3. ____ N_2 + ____ H_2 → ____ NH_3
4. ____ CH_4 + ____ O_2 → ____ CO_2 + ____ H_2O
5. ____ H_2O_2 → ____ H_2O + ____ O_2
6. ____ Fe + ____ O_2 → ____ Fe_2O_3
7. ____ Fe_2O_3 + ____ CO → ____ Fe + ____ CO_2
8. ____ $CaCO_3$ → ____ CaO + ____ CO_2

CALCULATE Use the law of conservation of mass

0.48 g of magnesium burns and makes 0.80 g of magnesium oxide. Mass of oxygen that joined it: _____ g

16 g of methane burns in 64 g of oxygen and makes 44 g of carbon dioxide. Mass of water made: _____ g

EXPLAIN Explain it

Write each explanation in full sentences. Then tick the ideas your explanation has.

1. A candle on a balance gets lighter as it burns. Explain where the mass goes.

- [ ] Wax reacts with oxygen from the air.
- [ ] The products are gases.
- [ ] The gases leave, so they aren't weighed.
- [ ] No atoms are destroyed.

2. Magnesium oxide weighs more than the magnesium that burned to make it. Explain why this doesn't break the law of conservation of mass.

- [ ] Oxygen from the air is a reactant.
- [ ] The oxygen atoms join the magnesium.
- [ ] The product holds both kinds of atom.
- [ ] With the oxygen counted, the masses are equal.

3. Iron is made from iron oxide, Fe_2O_3. With carbon monoxide, CO, the waste is carbon dioxide. With hydrogen, H_2, the waste is water. Explain why the hydrogen reaction can't make carbon dioxide.

- [ ] A reaction only rearranges the atoms it starts with.
- [ ] The hydrogen reaction has no carbon atoms in its reactants.
- [ ] So no product can have carbon in it.

Say one of your explanations aloud to a partner. What did they add or correct?