LESSON
71
LAB

Some Things Never Change
Conservation of Mass

Name _____

Date _____ Period _____

Purpose

To explore changes in mass that may occur during chemical or physical changes.

Materials

- balance
- transparent plastic cups (6)
- water
- NaCl(s), 1 g
- 1.0 M Na$_2$CO$_3$(aq), 40 mL
- 1.0 M CaCl$_2$(aq), 20 mL
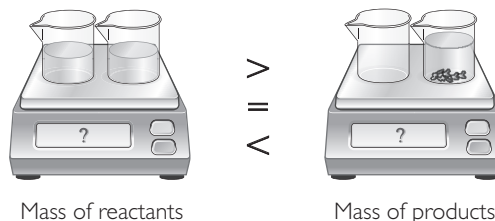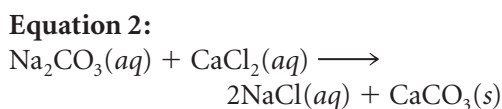- acetic acid, C$_2$H$_4$O$_2$, 20 mL
- graduated cylinder

Part 1: Predict the Mass

For each equation, predict whether the reactant or the products will have greater mass by circling >, =, or <. Write an explanation and try to convince your group.
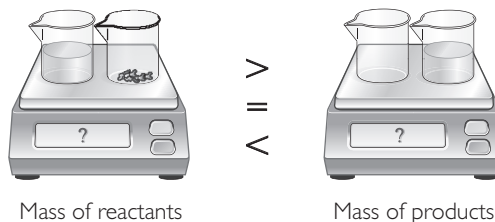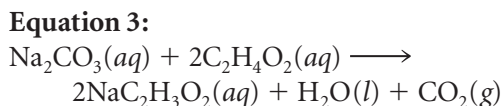
1. Water is added to solid sodium chloride to produce aqueous sodium chloride.

Equation 1: NaCl(s) $\longrightarrow$ NaCl(aq)

>
=
<

Mass of reactants   Mass of products
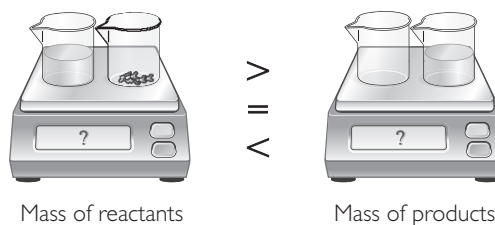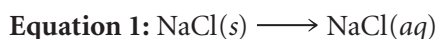
2. Aqueous sodium carbonate is added to aqueous calcium chloride to produce aqueous sodium chloride and solid calcium carbonate.

Equation 2:
Na$_2$CO$_3$(aq) + CaCl$_2$(aq) $\longrightarrow$
$\qquad$ 2NaCl(aq) + CaCO$_3$(s)


>
=
<

Mass of reactants   Mass of products

3. Aqueous sodium carbonate is added to aqueous acetic acid to produce aqueous sodium acetate, water, and carbon dioxide gas.

Equation 3:
Na$_2$CO$_3$(aq) + 2C$_2$H$_4$O$_2$(aq) $\longrightarrow$
$\qquad$ 2NaC$_2$H$_3$O$_2$(aq) + H$_2$O(l) + CO$_2$(g)

>
=
<

Mass of reactants   Mass of products

Part 2: Testing Your Predictions

Carry out each of the three changes described. Find the total mass before and after each change. Measure to the nearest tenth of a gram.

1. Put approximately 1 g of NaCl (s) in one cup. Put 20 mL of water in another cup.

Equation 1: $NaCl(s) \longrightarrow NaCl(aq)$
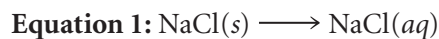
Reactants	Chemical name	Description	Total mass before mixing
$NaCl(s)$			
$H_2O(l)$			

2. Combine the reactants.

Products	Chemical name	Description	Total mass after mixing
$NaCl(aq)$			

3. Explain your observations. Do they match your predictions?

4. Why do you think water is not included as part of the chemical equation?

5. Put 20 mL of 1.0 M $Na_2CO_3(aq)$ in one cup. Put 20 mL of 1.0 M $CaCl_2$ in another cup.

Equation 2: $Na_2CO_3(aq) + CaCl_2(aq) \longrightarrow 2NaCl(aq) + CaCO_3(s)$
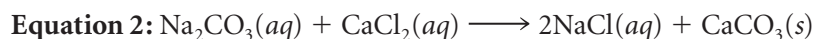
Reactants	Chemical name	Description	Total mass before mixing
$Na_2CO_3(aq)$			
$CaCl_2(aq)$			

6. Combine the reactants.

Products	Chemical name	Description	Total mass after mixing
$CaCO_3(s)$			
$NaCl(aq)$			

7. Explain your observations. Do they match your predictions?

8. Look at the chemical equation representing this change.
   a. What is the solid that formed?
   b. What is dissolved in the solution?
   c. Did the number of atoms change between reactants and products?

9. Put 20 mL of 1.0 M $Na_2CO_3(aq)$ in one cup. Put 20 mL of $C_2H_4O_2(aq)$ in the other cup.

Equation 3: $Na_2CO_3(aq) + 2C_2H_4O_2(aq) \longrightarrow 2NaC_2H_3O_2(aq) + H_2O(l) + CO_2(g)$
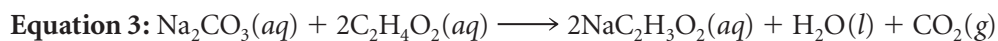
Reactant	Chemical name	Description	Total mass before mixing
$Na_2CO_3(aq)$			
$C_2H_4O_2(aq)$			

10. Combine the reactants.

Products	Chemical name	Description	Total mass after mixing
$NaC_2H_3O_2(aq)$			
$CO_2(g)$			

11. Explain your observations. Do they match your predictions?

12. Why do you think water is included as part of the chemical equation?

13. Making Sense Mass is conserved during physical and chemical changes. Explain what this means.