Name:	Class Period:
Lab Partner	Lab Partner

Conservation of Matter

Pre-lab Discussion

Matter cannot be created or destroyed by a chemical change. This very important principle is known as the Law of Conservation of Matter. It was discovered and first applied by the French scientist Antoine Laurent Lavoisier, who for this and other work became known as the father of modern chemistry. This law applies to ordinary chemical reactions. During a chemical change, the atoms of one or more substances simply undergo some rearrangements. The results of these rearrangements is the formation of new, different substances. All of the original atoms are still present though.

In this experiment, aqueous solutions of sodium carbonate (Na_2CO_3), calcium chloride ($CaCl_2$) and sulfuric acid (H_2SO_4) will be used to produce two separate and distinct chemical reactions. The fact that change occurs during each reaction will be readily observable. The reactions are:

$$Na_2CO_3(aq) + CaCl_2(aq) \rightarrow 2\ NaCl\ (aq) + Ca\ CO_3\ (s)$$
$$CaCO_3\ (s) + H_2SO_4\ (aq) \rightarrow CaSO_4\ (s) + H_2O\ (l) + CO_2\ (g)$$

The combined masses of these solutions and their containers will be measured before and after each reaction has occurred.

Purpose

The purpose of this experiment is to determine if mass is conserved in a particular set of chemical reactions.

Safety

Wear safety goggles at all times. Handle acids with care. If any is spilled rinse with copious amounts of water.

Materials

Laboratory Balance	2 test tubes
125 mL Erlenmeyer Flask	Graduated cylinder
Rubber Stopper	2 corks

Procedure

1) Measure 10.0 ml of $Na_2CO_3(aq)$ and pour it into a clean, dry 125 mL Erlenmeyer flask. Stopper the flask.
2) Measure 3.0 mL of $CaCl_2(aq)$ and pour into a clean, dry test tube. Stopper and label the test tube.
3) Repeat step 2 for H_2SO_4 (aq). CAUTION: Handle with care!!!

4) Measure and record the combined mass of these containers, stoppers and solutions.
5) Pour the $CaCl_2(aq)$ solution into the $NaCO_3(aq)$ solution. Swirl the flask to mix the solutions. Record observations.
6) Reweigh and record the combined mass of all containers, stoppers and solutions.
7) Carefully, pour the H_2SO_4 (aq) solution into the flask. With the stopper OFF, swirl the flask until all bubbling stops. Record observations.
8) After the flask has returned to room temperature re-measure and record the combined mass of these containers, stoppers and solutions.
9) Discard of all solutions, clean and dry glassware and materials.

Questions for Discussion

1.) What did you observe that indicated chemical reactions were taking place in step 5 and in step 7?
2.) What could have happened if you stoppered the flask after adding the H_2SO_4 (aq) solution in step 7?
3.) Compare the three masses you obtained during the lab. Account for any differences in your masses.
4.) How might the experiment be improved to bring its results more in line with the Law of Conservation of Matter?

Questions

1) Which process represents a chemical change?
A) melting of ice
B) corrosion of copper
C) evaporation of water
D) crystallization of sugar

2) Which substance can be decomposed by a chemical change?
A) Cr B) Cu C) Co D) CO

3) Which statement describes a chemical property of iron?
A) Iron can be flattened into sheets.
B) Iron combines with oxygen to form rust.
C) Iron can be drawn into a wire.
D) Iron conducts electricity and heat.

4) Which type of change must occur to form a compound?
A) chemical B) physical C) phase D) nuclear

5) Which substance can *not* be decomposed by ordinary chemical means?
A) ammonia B) methane C) mercury D) ethanol

6) One similarity between *all* mixtures and compounds is that *both*
A) combine in a definite ratio
B) are homogeneous
C) consist of two or more substances
D) are heterogeneous

7) Two substances, *A* and *Z*, are to be identified. Substance *A* can not be broken down by a chemical change. Substance *Z* can be broken down by a chemical change. What can be concluded about these substances?
A) Substance *A* is an element and substance *Z* is a compound.
B) Substance *A* is a compound and substance *Z* is an element.
C) Both substances are elements.
D) Both substances are compounds.

8) Which substance can be decomposed by a chemical change?
A) copper B) calcium C) ammonia D) potassium

9) Which substance can *not* be decomposed by a chemical change?
A) HF B) H_2O C) N_2O D) Ne

10) A sample of unknown composition was tested in a laboratory. The sample could *not* be decomposed by physical or chemical means. On the basis of these results, the laboratory reported that the sample