Student's Card 1 Proving the Law of the Conservation of Mass

Module 1

Objective: Burning Magnesium

Introduction

Oxidation reactions are ubiquitous chemical transformations that play a vital role in physiological processes in the human body and in the cycles of nature, as well as in manufacturing and production processes. Oxidation reactions that are accompanied by a release of heat are especially significant since such transformations can be used to acquire heat for heating and operate various mechanisms.

Reactions with oxygen often produce various oxides, which are chemically active substances. These oxides oftentimes participate in further instantaneous reactions with other substances present in the environment. It is also worth noting that during the oxidation processes, there are other reactive substances in the air apart from oxygen.

Necessary Lab Supplies

Reactants	Formula		Quantity (g) or Concentration (M)
Magnesium shavings	Mg		~0.3 g

List of lab equipment:

- tweezers;
- balances (readability of at least 2 decimal places);
- metal crucible;
- gas burner;
- fume hood;
- safety goggles;
- fireproof gloves;
- crucible tongs;
- heat-resistant surface (e.g. a ceramic tile);
- glass rod.

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Lab Procedure

- Weigh the crucible and record its mass in the data record table. Using tweezers, weigh ~0.3 g of magnesium shavings into the metal crucible. If the shavings are quite big, it is better to use slightly less than more.
- Transfer the metal crucible to the fume hood and turn on the fan. Put on protective gloves and goggles. Using crucible tongs, place the crucible on a heat-resistant surface.
- Light a gas burner and burn the magnesium shavings in the metal crucible. Continue burning until there are no signs of further combustion.
- After the burning has finished, leave the crucible in the fume hood to cool down for another 20 minutes.
- After 20 minutes, turn off the fan in the fume hood, remove the crucible with burnt magnesium from the heat-resistant surface and weigh it. After weighing, examine the contents of the crucible using a glass rod.

Additional Safety Notes

Magnesium is an active metal, so do not touch it with bare hands! Magnesium burns with a bright flame, so do not look directly at the flame during combustion! Since white smoke is emitted during combustion, it should be carried out in a fume hood with the fan turned on! Magnesium burns producing a very hot flame, so be careful and do not touch the crucible or anything else during this process.

Calculations

Recordings of masses during magnesium burning

Mass of the crucible, g	The total mass of the crucible and the magnesium, g	The total mass of the crucible and magnesium oxide after burning, g

Write the chemical equation of a reaction that theoretically took place during burning! Calculate how much magnesium oxide should have been theoretically produced during burning! Calculate the mass of the magnesium oxide that was actually obtained! Compare it with the theoretical mass and calculate the actual result!

The formula for calculating the actual result: $\eta = \frac{m_{actual}}{m_{theoretical}}$

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Quiz 

1. **Describe the contents of the crucible (purple liquid, red powdery substance, etc.). Using available literature and previous knowledge, identify the chemical formulas of the potential products! Write at least 3 chemical equations representing the transformations that could have occurred during the experiment!**

2. **What did you observe during the experiment? Assess whether, by conducting such an experiment, it is possible to prove the law of conservation of mass! Substantiate your answer! Write at least 2 suggestions on how this experiment could be improved to prove the law of conservation of mass more successfully!**

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3. **Did this experiment succeed in proving the law of the conservation of mass?**

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