CONSERVATION OF MASS

Answer all the questions below then check your answers

1. State the law of conservation of mass.

2. Fill in the gap to complete the sentence:

a.   When magnesium burns in air, it reacts with _____ to form magnesium oxide.

b. Describe what happens to the mass when magnesium burns in an open crucible, and explain why there might be a decrease in mass.

c.   A student burns 2.4 g of magnesium in air, forming 4.0 g of magnesium oxide. Show how this demonstrates the law of conservation of mass, and explain any discrepancies if the experiment was not carried out in a closed system.

3.   What happens to the total mass of the reactants and products in a closed system during a chemical reaction? (a system which can only exchange energy; such as heat with the surroundings is called a closed system, here matter is not exchanged with the surroundings.)

c. When copper reacts with oxygen, the product formed is _____.

4. When calcium carbonate ($CaCO_3$) is heated, it decomposes to form calcium oxide (CaO) and carbon dioxide gas (CO_2). If 100 g of calcium carbonate decomposes completely, what is the expected mass of calcium oxide if 44 g of carbon dioxide is released?

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a.   Explain why the mass of the reaction mixture decreases when calcium carbonate is heated.

Answers

1. State the law of conservation of mass.

Answer: The law of conservation of mass states that mass is neither created nor destroyed in a chemical reaction.

2.   Fill in the gap to complete the sentence:

a.   When magnesium burns in air, it reacts with _____ to form magnesium oxide.

Answer: oxygen

b.   Describe what happens to the mass when magnesium burns in an open crucible, and explain why there might be a decrease in mass.

Answer: When magnesium burns in an open crucible, it reacts with oxygen to form magnesium oxide. Some of the mass may appear to be lost if any magnesium oxide escapes as fine powder during the reaction. However, if all products are collected, the total mass would be equal to the mass of the reactants.

c.   A student burns 2.4 g of magnesium in air, forming 4.0 g of magnesium oxide. Show how this demonstrates the law of conservation of mass, and explain any discrepancies if the experiment was not carried out in a closed system (a system which can only exchange energy; such as heat with the surroundings is called a closed system, here matter is not exchanged with the surroundings.)

Answer:

Mass of magnesium = 2.4 g

Mass of magnesium oxide = 4.0 g

Mass of oxygen used = 4.0g – 2. g = 1.6g. This shows mass is conserved because the mass of reactants (2.4g + 1.6g) equals the mass of products (4.0 g). If the experiment wasn't in a closed system, some magnesium oxide could have escaped, appearing as a loss in mass.

3.   What happens to the total mass of the reactants and products in a closed system during a chemical reaction?

Answer: The total mass of the reactants equals the total mass of the products; mass is conserved.

c.   When copper reacts with oxygen, the product formed is _____.

Answer: copper(II) oxide

4.   When calcium carbonate ($CaCO_3$) is heated, it decomposes to form calcium oxide (CaO) and carbon dioxide gas (CO_2). If 100 g of calcium carbonate decomposes completely, what is the expected mass of calcium oxide if 44 g of carbon dioxide is released?

Answer: The mass of calcium oxide would be 56 g (since 100 g – 44 g = 56 g).

a.   Explain why the mass of the reaction mixture decreases when calcium carbonate is heated.

Answer. The mass decreases because carbon dioxide gas is released into the air, reducing the mass of the remaining solid, calcium oxide.

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