

The Next Generation Science Standards (NGSS)

Chapter 6, Lesson 3: Forming a Precipitate

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

DISCIPLINARY CORE IDEAS

PS1.A: Structure and Properties of Matter

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2), (MS-PS1-5)
- The total number of each type of atom is conserved and thus the mass does not change. (MS-PS1-5)

Students combine a baking soda solution with a calcium chloride solution and observe a gas produced and a white color in the solution. Students filter the solution and see a solid white precipitate. They look at the chemical equation for the reaction and realize that the gas is carbon dioxide, and that the solid is calcium carbonate or chalk. Students count the type and number of atoms in the reactants and products and see that they are the same.

SCIENCE AND ENGINEERING PRACTICES

Developing and Using Models

- Develop a model to describe unobservable mechanisms. (MS-PS3-2)

Planning and carrying out investigations

Engaging in argument from evidence

Students investigate the question: How do you know that a precipitate is formed in a chemical reaction? Students conduct a chemical reaction to investigate the production of a precipitate and how to separate it from the other products of the reaction. Students see observable evidence of carbon dioxide gas and calcium carbonate (chalk) as products of their reaction. Students look at a molecular model illustration of the chemical equation for the reaction along with an equation using the chemical formulas to get a better idea

of what the formulas actually represent. Students use and further develop this molecular model and apply it to evidence they have observed to explain their observations on the molecular level and to answer the question to investigate.

CROSSCUTTING CONCEPTS

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)

Scale, Proportion, and Quantity

- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1)

Energy and Matter

- Matter is conserved because atoms are conserved in physical and chemical processes. (MS-PS1-5)

Students use illustrations of molecules along with their formulas to explain how the interaction and rearrangement of atoms in the reaction between solutions of baking soda and calcium chloride results in the macroscopic observation of carbon dioxide gas, a calcium carbonate precipitate, and salt.