

The Next Generation Science Standards (NGSS)

CHAPTER 6, LESSON 10: CARBON DIOXIDE CAN MAKE A SOLUTION ACIDIC

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.

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 see that carbon dioxide from different sources results in a color change of a pH indicator in water. Students learn that carbon dioxide and water combine to form the weak acid, carbonic acid. Students look at the chemical equation for the reaction and see that the type and number of atoms in the reactants is the same as in the products.

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: Will carbon dioxide from different sources cause water to become acidic? Students conduct an investigation and see that carbon dioxide from exhaled breath, club soda, and from a vinegar-and-baking soda reaction all cause water to become acidic. Students look at a molecular model illustration of the chemical reaction and see that water and carbon dioxide molecules react to form carbonic acid. 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)

Students use molecular-level models to explain how the reaction between water and carbon dioxide molecules affect the macroscopic observable characteristic of an indicator changing color and water becoming more acidic. Students relate this process to an even larger scale when considering how this reaction affects ocean acidification.