

The Next Generation Science Standards (NGSS)

CHAPTER 5, LESSON 1: WATER IS A POLAR MOLECULE

MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.

DISCIPLINARY CORE IDEAS

PS1.A: Structure and Properties of Matter

- Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1)
- Each pure substance has characteristic physical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-3)
- The changes of state that occur with changes in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4)

Students put water and alcohol on brown paper towel and see that the liquids have different rates of evaporation. Students learn that the covalently bonded atoms in water and alcohol molecules make water a polar molecule and alcohol less polar which helps account for the difference in evaporation rate. Students see that the evaporation rate is a characteristic property that can be used to identify the liquids.

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: Does water evaporate faster or slower than alcohol? Students plan and conduct a simple evaporation test between water and alcohol on a brown paper towel. After observing that alcohol evaporates faster than water, students see a molecular model illustration of water and alcohol showing that water is more polar than alcohol. 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 of water and alcohol to explain how these sub-microscopic characteristics affect the macroscopic observable characteristic of different evaporation rates.