The Next Generation Science Standards (NGSS)

CHAPTER 3, LESSON 2: FINDING VOLUME – THE WATER DISPLACEMENT METHOD

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)

Students calculate the density of five different rods that all have the same mass but different volumes. Students use illustrations of the atoms and molecules that make up the different rod materials to further develop their understanding of how atoms and molecules determine a material's characteristic properties, including density, and can be used to identify it.

SCIENCE AND ENGINEERING PRACTICES

Developing and Using Models

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

Planning and carrying out investigations

Analyzing and interpreting data

Using mathematics and computational thinking

Engaging in Argument from Evidence

Students investigate the question: Can density be used to identify five rods made of different materials? Students measure and calculate the volume of the five rods using the water displacement method. They then use the mass and volume to calculate the density of each rod. Students use this information, and data given in a chart, to identify the substance each rod is made from (2 metal and 3 plastic). Students use a molecular model based on the size, mass, and arrangement of atoms of the different rod materials 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 different substances to explain how these sub-microscopic characteristics affect the macroscopic observable characteristic of density.