

The Next Generation Science Standards (NGSS)

CHAPTER 2, LESSON 3: CHANGING STATE - CONDENSATION

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

DISCIPLINARY CORE IDEAS

PS1.A: Structure and Properties of Matter

- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4)
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4)

Students discuss examples of condensation and then observe a sample of water vapor changing state to liquid water on the side of a cup. Students use their observations and what they have learned so far about the attractions, motion, and arrangement of molecules in a liquid and a gas and how they are affected when heated and cooled to begin to develop an understanding of the process of condensation.

SCIENCE AND ENGINEERING PRACTICES

Developing and Using Models

- Develop a model to predict and/or describe phenomena. (MS-PS1-1), (MS-PS1-4)

Asking Questions and Defining Problems

Planning and Carrying Out Investigations

Engaging in Argument from Evidence

Students investigate the question: What happens when water vapor condenses? Students help design an experiment to see if cooling water vapor affects the rate of condensation. Students see a molecular model animation of the process of condensation. 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.

CROSCUTTING 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)

Structure and Function

- Structures can be designed to serve particular functions by taking into account properties of different materials and how materials can be shaped and used. (MS-PS1-3)

Students see and apply the cause and effect relationship between cooling, decreasing the motion of molecules, and the molecules condensing to form a liquid. Students use a molecular-level explanation to explain the macroscopic effect of the water vapor changing to liquid water on the side of the cup. Students also see that a system can be designed to use the process of condensation to purify water.