

# The Next Generation Science Standards (NGSS)

## CHAPTER 2, LESSON 2: CHANGING STATE - EVAPORATION

**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 observe a drop of water on a paper towel placed on a warm surface and another placed on a room temperature surface. 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 to begin to develop an understanding of the process of evaporation.*

### SCIENCE AND ENGINEERING PRACTICES

#### *Developing and Using Models*

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

#### *Engaging in Argument from Evidence*

#### *Planning and Carrying Out Investigations*

#### *Asking Questions and Defining Problems*

*Students investigate the question: Does adding energy increase the rate of evaporation? Students help design an experiment to see if heating water affects the rate of evaporation. Students see a molecular model animation of the process of evaporation. 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)

*Students see and apply the cause and effect relationship between heating water, the motion of molecules, and the rate of evaporation. Students use molecular models to explain how heating on the molecular level affects the observed evaporation rate on the macroscopic level.*