

MAPPING GRADE 6 SCIENCE INSTRUCTION

Concept: Earth's Waters: Physical / Chemical Properties

<p>PWC Objective: 6.5(a)</p> <p>The student will investigate and understand <u>the unique properties and characteristics of water</u>. Key concepts include:</p> <ul style="list-style-type: none"> • water as the universal solvent (SOL 6.5a) • the properties of water in all three states (SOL 6.5b) • the action of water in physical and chemical weathering (SOL 6.5c) • the ability of large bodies of water to store heat and moderate climate (SOL 6.5d) 	
What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p><u>Essential Questions:</u></p> <ul style="list-style-type: none"> • Why is water the universal solvent? • What are the properties of water in all three states? • Describe the action of water in physical and chemical weathering. • How do large bodies of water store heat and moderate climate? <p><u>Critical Attributes:</u></p> <p>6.5a A large amount of substances will dissolve in water. For this reason, water is often called the universal solvent.</p> <p>6.5b Water is the only compound that commonly exists in all three states (solid, liquid, and gas) on Earth. The unique properties of water are a major factor in the ability of our planet to sustain life.</p> <p>6.5b Among water's unique properties is that one side of each water molecule is slightly negative and the other side is slightly positive. Individual water molecules, therefore, attract other water molecules like little magnets as the slightly positive portion of a water molecule is attracted to the slightly negative portion of an adjacent water molecule. In this way, water molecules "stick" together.</p>	<ul style="list-style-type: none"> • Comprehend and apply key terminology related to water and its properties and uses. • Design an investigation to demonstrate the ability of water to dissolve materials. • Relate the three states of water to the water cycle. • Infer how the unique properties of water are key to the life processes of organisms. • Model and explain the shape and composition of a water molecule. • Comprehend the adhesive and cohesive properties of water.

(continued on next page)

(continued from previous page)

What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p>6.5b Additional properties of water are its high surface tension and the large range of temperature (0 – 100 degrees Celsius) in which it can be found in the liquid state, as well as the fact that, unlike other substances, it expands when it freezes. Ice is less dense than water.</p>	<ul style="list-style-type: none">• Design an investigation to determine the effects of heat on the states of water.• Model and explain why ice is less dense than liquid water.• Compare the relative density of liquid and solid water.• Design an investigation to determine the relative density of liquid and solid water at various temperatures.
<p>6.5c Water (rain, ice, snow) has shaped our environment by physically and chemically weathering rock and soil and transporting sediments. Freezing water can break rock without any change in the minerals that form the rock (physical weathering). This usually produces small particles and sand. Water with dissolved gases and other chemicals causes the minerals in rocks to be changed, leading to the deterioration of the rock (chemical weathering).</p>	<ul style="list-style-type: none">• Design an investigation to model the action of freezing water on rock material.• Design an investigation to model the action of acidified water on building material such as concrete, limestone, or marble.• Chart, record, and describe evidence of chemical weathering in the local environment.
<p>6.5d Water is able to absorb heat energy without showing relatively large changes in temperature. Large bodies of water act to moderate the climate of surrounding areas by absorbing heat in summer and slowly releasing that heat in the winter. For this reason, the climate near large bodies of water is slightly milder than areas without large bodies of water.</p>	<ul style="list-style-type: none">• Analyze and explain the difference in average winter temperatures among areas in central and western Virginia and cities and counties along the Chesapeake Bay and Atlantic coast.

MAPPING GRADE 6 SCIENCE INSTRUCTION

Concept: Earth's Waters: Role in the Environment

PWC Objective: 6.5(b)

The student will investigate and understand the role of water in the natural and human-made environment. Key concepts include:

- the origin and occurrence of water on Earth **(SOL 6.5e)**
- the importance of water for agriculture, power generation, and public health **(SOL 6.5f)**
- the importance of protecting and maintaining water resources **(SOL 6.5g)**

What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p><u>Essential Questions:</u></p> <ul style="list-style-type: none"> • What is the origin and occurrence of water on Earth? • What is the importance of water for agriculture, power generation, and public health? • How can the water resources be protected and maintained? <p><u>Critical Attributes:</u></p> <p>6.5e Scientific evidence indicates that the Earth formed about four and one half billion years ago from the dust and debris orbiting the sun. Due to gravity, this debris became compacted and grew quite hot, creating hot gases including water vapor and carbon dioxide. Over millions of years, the Earth and its gases cooled and seas are believed to have formed when the Earth cooled enough for water vapor in the atmosphere to condense.</p> <p>6.5e Most of Earth's water is salt water in the oceans (97%). Available non-frozen, freshwater makes up less than 1%.</p> <p>6.5e Water occurs on our Earth in oceans, lakes, rivers, streams, and in rock layers underground called aquifers. A large amount of water is also found in the bodies of living things.</p> <p>6.5e The first human settlements were established by springs, rivers, and lakes. Reliable fresh water sources and irrigation systems allowed civilizations to grow and flourish. As cities grew, different strategies were employed to collect water (tunnels, aqueducts, wells, cisterns, pumps, and reservoirs).</p>	<ul style="list-style-type: none"> • Design an investigation to determine the presence of water in plant material (e.g., a fruit).

(continued on next page)

(continued from previous page)

What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p>6.5f Water is essential for agriculture. Crops watered by reliable irrigation systems are more productive, and harvests are more dependable.</p> <p>6.5f Water is an important resource used in power generation. Hydroelectric power plants make use of the kinetic energy of water as it flows through turbines. Water is also used in power plants as the water is heated and turned to steam. The steam is used to turn turbines that generate electricity.</p> <p>6.5g In the past, streams and rivers were often used to dispose of human waste, and open sewers were common. During the mid-1800s public health officials recognized the connection between disease outbreaks and contamination of public wells and drinking water. Advancements in water treatment and sanitary sewers have helped eliminate diseases associated with human waste.</p>	<ul style="list-style-type: none">• Explain the role of water in power generation. • Describe the importance of careful management of water resources.