Unit 1
What is the Water Cycle?

Activity A

Can you identify the properties and physical states of water?

Introduction

Water is a substance with which students may believe they are very familiar. This activity will guide students to clearly articulate the physical states of water, their physical properties, and important uses of water.

Students will first create a consensus about a definition of water. Then student teams will measure and observe the three states of water and its physical properties.

Scientific Learning Goals and Objectives for this Activity:

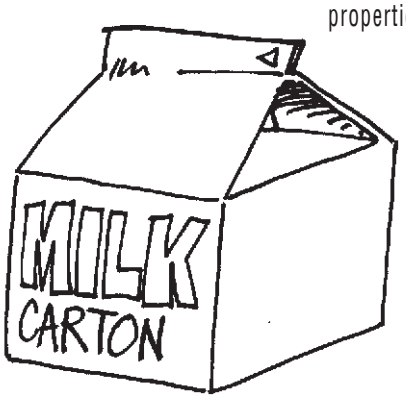
(Washington Grade Level Expectations (GLE's): 1.1.4 and 1.3.3.)

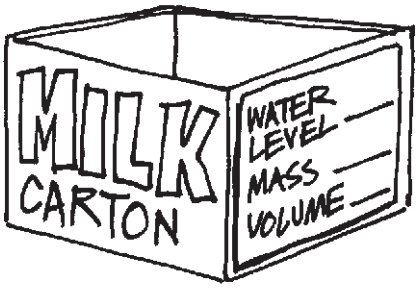
Goals

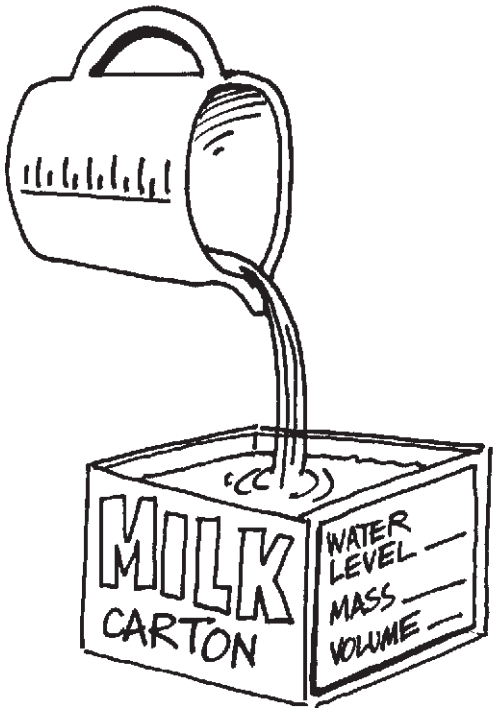
- Students will understand and apply scientific concepts and principles.
- Students will conduct scientific inquiry.
- Students will communicate scientific understanding.

Objectives

- Students will identify physical properties of water.
- Students will observe and identify water in solid, liquid, and gaseous states.
- Students will relate activities to real world uses and processes.







Teacher Preparation

Preparation Time:
15 minutes

Materials

Prepare for the Entire Class:

- Available freezer
- Water source (large bucket or sink)
- Masking or duct tape

Prepare for Each Team:

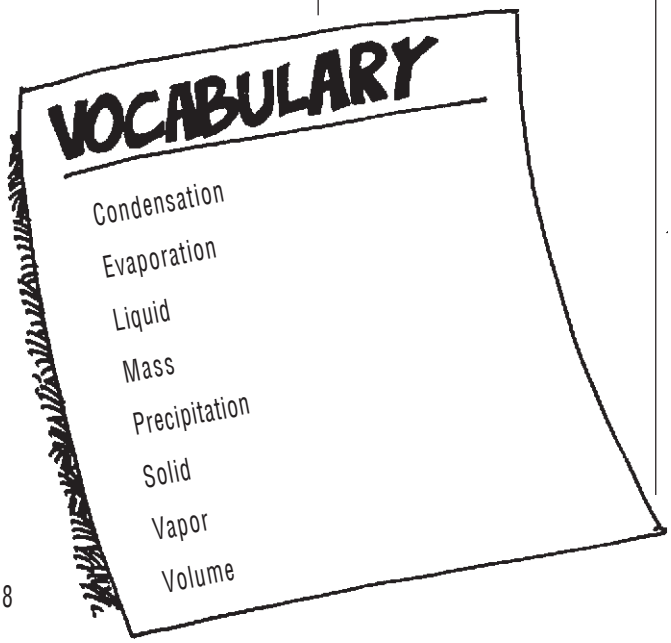
Day One:

- Water container (rinsed 1/2 pt. milk carton)
- Heavy duty quart freezer zip lock bag
- Scale or balance
- Liquid measuring device (100 ml graduated cylinder preferred)
- Permanent marker
- Sentence strip (approx. 4" x 24" strip of paper)

Prepare for Each Team:

Day Two:

- Frozen water in 1/2 pt. milk carton
- Predetermined fill line for all milk cartons
- Scale or balance
- Liquid measuring device (100 ml graduated cylinder preferred)
- Duct tape



Student Involvement

Prepare for Each Student:

- copy of journal pages

Activity Time:
Day One—
45 minutes
Day Two—
50 minutes

Activity Processes:

Day One:

1. Divide class up into teams of about 4 students. Each team creates a team name related to water. Using journal pages in this guide, each student begins a journal labeled with student's and team's name.

? Water origin and usage?

Create a class concept map on board by utilizing student responses. Using water as the central theme, connect water to related themes. See teacher notes for example. Encourage a variety of responses. Students enter up to 5 responses in their journal.

? What are the physical properties in each of the three states of water?

2. Pass out sentence strip to each team. Each team brainstorms for 2 minutes the physical properties of water and three states of water. They then write a definition of water on the sentence strip, including as many physical properties that are unique to water as possible. Some physical properties to include are color, taste, odor, and freezing and boiling points. The three states are ice (solid), liquid and vapor (gas).

Teacher may encourage friendly competition by asking each team to write their definition of water for an alien who is visiting earth and has never seen water. The definition must be definitive so that the alien could distinguish water from all other liquids found on earth. Teams present definitions to the class by taping sentence strips near the board. Students then develop a class definition of water.

3. Pass out materials to teams and explain activity. As an entire class, have students decide how much water to put in the milk carton. Then have class determine standards for measuring water, e.g. mass (100g) and volume (100ml). Have teams weigh empty container, fill with predetermined volume of water and then weigh filled container. Subtract mass of empty container from mass of filled container to determine mass of water. Also record volume, mass of filled and empty container and team name on side of container. Mark a line on side to show water level.

4. Collect team containers. Place in zip lock bag write team name on bag. Place in freezer for Day 2. Collect other materials.

Each student writes a definition of water in student journal.

Day Two:

1. Teacher passes out frozen milk cartons and scale or balance to teams.

? What are the physical properties of ice?

List on board or overhead team observations of physical properties of ice. Compare and contrast physical properties of ice and water.

Take containers out of zip lock bag and weigh. Subtract mass of empty container from mass of container with ice. Compare mass of ice with previous measurement of mass of water. If the mass has changed, discuss possible explanations such as spillage, error in measurement, evaporation, density change, etc.

2. Remove frozen water from container by tearing off paper. Place back in zip lock bag and securely seal with masking or duct tape.

? How does the melting process demonstrate the three states of water? Can it be slowed down or speeded up?

3. Utilizing only materials students have at their desks or on their person, each team takes two to three minutes to brainstorm 5 ways to slow down or speed up the process of ice melting. Students quickly record their team ideas in journal. Each team decides on one idea to try and tests this idea.

While teams are involved in this activity, encourage them to notice any condensation on the sides of bag.

Compare which teams slowed down or speeded up the melting process the most by teams presenting investigation and results to the class. When discussing results, make sure teams have identified the three states of water: liquid, solid, and vapor. Collect materials and have students describe results in their journals.

? Where have you seen real-world examples of attempts to control changes in the states of water?

Discuss student responses such as freezer, cloud seeding, clothes dryers, milk carton predetermined fill line, what percent expansion, observations - more/less and how much more?

Higher level activity:
1. Why does ice float?
2. Determine the percent increase in volume from liquid to solid.

Notes

Day One:

To reduce the amount of freezer space necessary, each team will freeze one container. If freezer space is a problem, you may want to do this activity on alternate days with your classes.

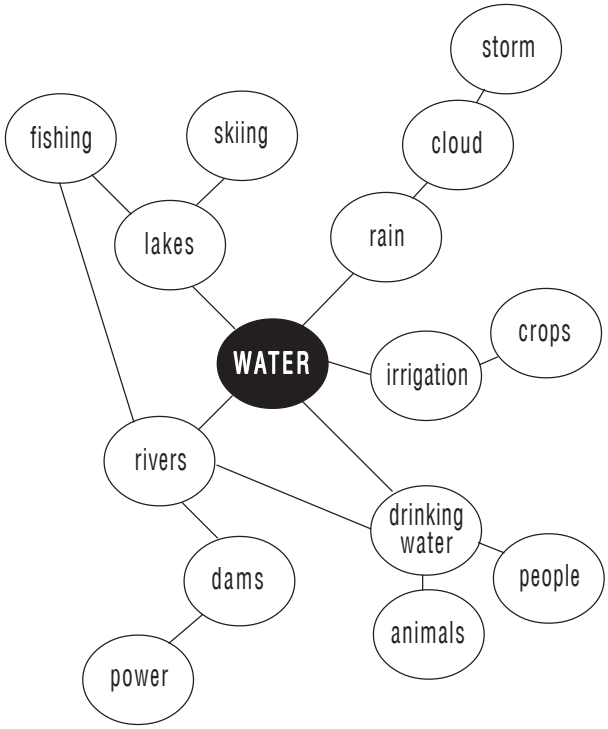
Day Two:

As the temperature of the water is reduced, molecular movement slows down. Conversely, as the temperatures rise, there is an increase in molecular movement.

Sometimes the milk cartons will split. This is because the water molecules "line up" when in solid form, taking up more space than the random orientation of molecules in a liquid. That is why water expands when frozen.

Bags may leak, so keep them away from electrical sources and books. Duct tape is used to help prevent leakage.

An additional discussion item can be to have students reflect on the availability of water on this planet. Specifically, the water from the first days of planet Earth is the same water we drink now!



Journal 1A
Can you identify the properties and states of water?

Name _____

Team Name _____

Date _____

DAY 1

Draw a concept map with five components to show how water is used.

Write a definition of water. Be sure to include physical properties such as color that make water distinctive from other liquids on earth.

Journal 1A Continued
Can you identify the properties and states of water?

DAY 2

List 5 ways to speed up or slow down the process of ice melting.

1. _____
2. _____
3. _____
4. _____
5. _____

Describe how the process and results of your team's attempt to slow or speed up ice melting. Include your observations of when you saw changes in the states of water: solid, liquid, and gas (vapor).

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_____

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