



**Grade Level:**  
11th Grade

**Subject:**  
Chemistry

**Exhibit:**  
#13 Demand  
Management  
*(How much of the water  
on earth is available  
fresh water?)*

**Approximate  
Time Frame:**  
2 hours *(more than one  
class period)*

**Materials:**

- paper
- pencil
- meter stick
- cardboard
- graduated cylinder

## Lesson Plan - The Freshest in the Neighborhood

### Science TEKS:

1. A Demonstrate safe practices during field and laboratory investigations.
1. B Make wise choices in the use and conservation of resources and the disposal or recycling of materials.
2. A Plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology.
2. B Collect data and make measurements with precision.
2. C Express and manipulate chemical quantities using scientific conventions and mathematical procedures such as dimensional analysis, scientific notation, and significant figures.
2. D Organize, analyze, evaluate, make inferences, and predict trends from data.
2. E Communicate valid conclusions.
3. A Analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information.
3. B Make responsible choices in selecting everyday products and services using scientific information.
3. C Evaluate the impact of research on scientific thought, society, and the environment.
3. D Describe connections between chemistry and future careers.

**Related TEKS:** Physics, Chemistry and Biology

### Vocabulary of Instruction:

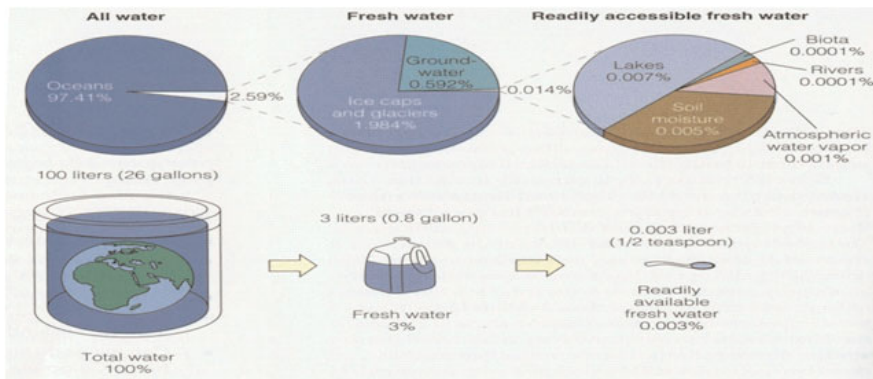
conversion factors  
human consumption

**Advanced Preparation:** Organize students' into groups

### Instructional Procedure (5 E)

**Engage:** The students will prioritize water use by importance at an individual level, agricultural level and industrial level. Incorporate alternatives to water use. Design and complete a variety of lab exercises to help understand sources of water, water scarcity, and water conservation.

**Explore:** Use a meter stick to measure out one cubic meter that will contain 1000 Liters. This amount will represent all of the water on Earth. Either construct your cube from cardboard or draw your cube to a 1: 10 scale.



Calculate the volume in cubic centimeters that 3% of the 1000 liter cube would be. This amount will represent all of the fresh water on Earth. Construct another cube using these dimensions or draw the cube using the same scale as in the cubic meter above.

Calculate in cubic centimeters the amount that 0.003% of the 1000 liter cube would be. Construct a cube as done above or draw a cube to the same scale used above.

Compare the three cubes to get a graphic representation of the available fresh water on use. Pour this amount into a graduated cylinder to help appreciate the small amount of fresh water we have available to us on Earth.

**Explain:** It is estimated that only 0.003% of all the water on Earth is readily available as fresh water for human consumption. To get an idea of how small an amount that is you can follow these laboratory procedures. Use the conversion factors of

$$1\text{ml} = 1\text{cm}^3$$

$$1000\text{cm}^3 = 1\text{Liter}$$

$$1.0 \times 10^6 \text{ cm}^3 = 1\text{meter}^3$$

**Elaborate/Extend:**

**Questions:**

- Describe the size difference of the available freshwater cube to the cubic meter scale model of all the water on Earth?
- Use this model to help explain the need to conserve the fresh water we do have.
- Come up with some ways to develop alternative sources of fresh water besides ones currently being used.

**Evaluate:** Closure of class will consist of student groups developing and presenting a statement about what they learned today and how it may change their ideas toward their water use and other water usage in the city.

