Demonstration: What is a 1 Molar Solution?

Summary
In this demonstration, students will determine the molarity of several different solutions demonstrated by the teacher.

Resource Type: Demonstration
Grade Level: High school

Objectives
By the end of this lesson, students should be able to
- determine the molarity of several different solutions.

Chemistry Topics
This lesson supports students’ understanding of
- Solutions
- Mole concept
- Molarity

Time
Teacher Preparation: 5 minutes
Lesson: 20 minutes

Materials
- One of each of the following:
  - 2000-mL beaker
  - 1000-mL beaker
  - 500-mL beaker
  - 250-mL beaker
  - 100-mL beaker
- 3 plastic cutouts of moles

Safety
There are no special safety considerations for this lab.

Teacher Notes
- Before the demonstration:
  - Gather beakers all supplies listed above.
  - You may also use stuffed moles or plastic moles instead of paper cutouts.
  - Have students finish the prelab questions and discuss the answers.
- For the demonstration:
  - Demonstrate the mole concept by placing one mole in the one liter beaker and add water to the 1L mark. Indicate that this is a 1 Molar solution.
  - Then move the mole into each of the other beakers filled with water and ask the students what the molarity of the new solution is.
I repeat for the 2 mole situation by asking first which size beaker would be needed in order to create a 1 molar solution using 2 moles of solute. Then complete the process for that row.

Repeat this process again for the 3 mole row. Begin again by asking what size beaker would be needed in order to create a 1 molar solution using 3 moles of solute.

Finally rip one mole in half and repeat the process by placing the half mole in each of the beakers.

Optional: Demonstrate making a 1 molar solution of salt using the correct technique in a volumetric flask.

FOR THE STUDENT

Prelab Questions
1. What is a mole?

2. What is the mass of a mole of oxygen atoms?

3. What is the mass of a mole of water molecules?

4. A 1 molar solution is one in which ____ mole of any substance is dissolved in enough water to make up a total of ____ liter of solution.

5. Molarity is defined as “a unit of concentration used in chemistry to indicate how strong or weak a solution is”. Its symbol is ______ and its units are ________________________________.

Results/Observations
As you watch the demonstration, fill in the molarity of each solution when either 1, 2, 3, or ½ moles is added to each beaker.

Molarity Table

<table>
<thead>
<tr>
<th># of</th>
<th>2000 mL beaker</th>
<th>1000 mL beaker</th>
<th>500 mL beaker</th>
<th>250 mL beaker</th>
<th>100 mL beaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>2</td>
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Analysis
1. Circle the correct answer within the ( ) for each statement below.
   The higher the molarity, the (more concentrated ... less concentrated) the solution.
   The lower the molarity, the (fewer ... greater) the number of particles the solution.
2. Describe two ways to make a 0.5 molar solution.