Moles and Molecules

Purpose

To compare the amounts of several substances using moles and number of molecules.

Materials

four 500 mL beakers
sugar
sulfur
water

Procedure

Preparation

1. Place the following in labeled separate beakers:
   a. 18 mL water $\rightarrow$ 1 mol H_2O
   b. 342 g sugar $\rightarrow$ 1 mol sugar
   c. 256 g sulfur $\rightarrow$ 1 mol sulfur
   d. 342 mL water $\rightarrow$ 342 g H_2O

Presentation

1. Show the students the beakers each containing 1 mole.
   a. Note differences in mass and volume.
   b. Note sameness in number of molecules (6.022×10^{23} in each case).
2. Now use beaker containing sugar and one containing 342 g H_2O.
   a. Note same mass.
   b. Note different number of molecules.

Additional Information

1. In the beakers containing the same mass the sugar contains 6.022×10^{23} molecules while the water contains $19\ (6.022 \times 10^{23}) = 1.14 \times 10^{25}$ molecules of water.

Questions for the Students

1. Write formulas for each substance.
2. In the first comparison why are the mass and volume so different if the number of molecules are the same?
3. In the second comparison how many molecules of water are in the beaker?

4. What is the ratio of molecules in the sugar beaker to molecules in the water beaker? How does this compare to the ratio of moles from sugar to water?

Disposal

Chemicals can be reused for the demo in the future.

Reference

Humphreys, D. Demonstrating Chemistry, 1983.