

Viewing Moles

The mole is the central chemical counting unit. Atoms and molecules are small, so you need lots of them present in order to see or even measure them accurately. The mole is a number that brings atoms and molecules to a usable human scale. The mole is based on Avogadro's number.

$$1 \text{ mole} = 6.022 \times 10^{23} \text{ things}$$

To have a mole of something, it does not matter what it is but just how many of them are present. A mole of apples is 6.022×10^{23} apples and a mole of grapes is 6.022×10^{23} grapes. It is clear that if you have the same number of apples and grapes, the volume of the apples will be the larger of the two, and the mole of apples will weigh more than the mole of grapes.

This short laboratory exercise is intended to give you a good feeling for the size of a mole.

What to do:

Work in teams with the other students at your lab bench.

Each of you measure out one mole of one of the following, using either a graduated cylinder or the balance:

water (H₂O, 18 g/mol, density 1.00 g/mL)

ethanol (C₂H₆O, 46 g/mol, density 0.78 g/mL)

table salt (NaCl, 58 g/mol)

sodium carbonate (Na₂CO₃, 106 g/mol)

sand (SiO₂, 60 g/mol)

copper (Cu, 64 g/mol)

Show these samples to your lab instructor before answering the questions below.

A mole of sugar (sucrose) is provided at the front of the room for viewing (C₁₂H₂₂O₁₁, 342 g/mol)

Answer the following:

1. A mole of a chemical is about the size to fit in which of the following?
a. a large truck b. a bathtub c. your palm d. a thimble
2. Which of the items has the greatest number of molecules present?
a. water b. ethanol c. salt d. potassium carbonate e. they are equal
3. Which of the items has the greatest number of atoms present?
a. water b. ethanol c. salt d. potassium carbonate e. copper

Hand in this page at the end of the lab period.