

## Objectives:

Students will be able to determine the mass of 1 mole of a substance.

Students will be able to convert from molecules to moles to grams using dimensional analysis.

# What is a Mole?



In chemistry it is not a cute animal that lives in the ground.

A mole is the SI unit that describes the amount of a substance.

One mole =  $6.02 \times 10^{23}$  “particles”

In chemistry the “particles” are atoms, for. units and molecules.

Let’s think how large a mole really is... Let’s think of things we see everyday!

◇A mole of marshmallows would cover the planet Earth 12 miles high

◇A mole of seconds would last so long, the universe would die out before it was done!

◇1 Mole of marbles would fill the entire Grand Canyon and there would still be enough left over to displace all the water in Lake Michigan and all the lakes in the world!

◇Computers can count at the rate of over 800 million counts per second. *At this rate it would take a computer over 25 million years to count to  $6.02 \times 10^{23}$*

◇A mole of hockey pucks would be equal to the mass of the Moon.

◇Assuming that each human being has 60 trillion body cells ( $6.0 \times 10^{13}$ ) and the Earth's population is 7 billion ( $7 \times 10^9$ ), the total number of living human body cells on the Earth at the present time is  $4.21 \times 10^{23}$  of a mole.

◇If one mole of pennies were divided up among the Earth's population, each person would receive  $1 \times 10^{14}$  pennies. Personal spending at the rate of one million dollars a day would use up each persons wealth in about three thousand years. Life would not be comfortable because the surface of the Earth would be covered in copper coins to a depth of at least 400 meters.

## Activity for the mole concept-

**1 mole is  $6.02 \times 10^{23}$  particles (Memorize this!!!!)**

Particles- formula units, atoms, molecules, etc. ( I call them particles)

What if we were to have a mole of pennies?

### Exercise 1

1-If we have a mole of pennies and divide them equally among the 7 billion people on earth how much money would each person receive? Please express answer in terms of dollars.

2-If you spend 1 million dollars a day how long would it be before you ran out of money? Express answers in days and years.

### Exercise 2

Obtain 30 pennies from the teacher and stack them one on top of the other. Measure the height of the stack in centimeters. Record measurement.

\_\_\_\_\_ cm

- A. What is the average height of a penny?
  
  
  
  
  
  
  
  
  
  
- B. Using the average height determine the height of a stack of  $6.022 \times 10^{23}$  pennies in km.
  
  
  
  
  
  
  
  
  
  
- C. How many light years is this? (Light travels  $9.461 \times 10^{12}$  km per year)
  
  
  
  
  
  
  
  
  
  
- D. How many round trips is this to the sun? (Distance to sun from earth  $1.496 \times 10^{12}$  km)