

# Stoichiometry

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“stochio” = element (Greek)

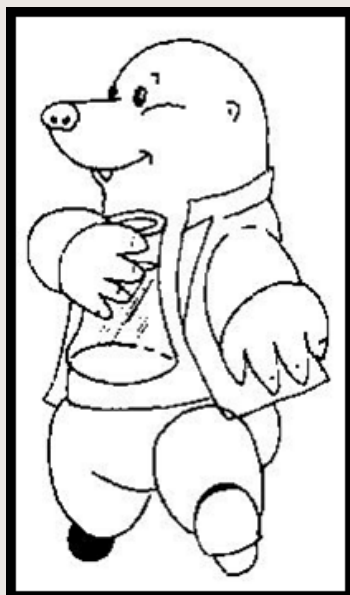
“metry” = measurement

Stoichiometry is about measuring the amounts of elements and compounds involved in a reaction

First, let's talk about units of measuring elements and compounds in chemistry.....we use the

MOLE

# The Mole



## Objectives:

- What is a mole?
- How many particles are in a mole?
- How do you find the mass of a mole of an element ?
- How do you find the mass of a mole of an compound or molecule?
- How do you convert moles to mass (and back)?

# The Mole Concept

No, not that kind of mole!



What is a mole?  
How many particles are in a mole?

The mole is a number.....

A **HUGE** number.....

still just a number.....

A mole is a collection of

602,000,000,000,000,000,000,000 particles

or

$6.02 \times 10^{23}$  particles

(also known as Avogadro's number)

These particles may be atoms, molecules, ions, or electrons

**1 dozen = 12**

**1 gross = 144**

**1 ream = 500**

**1 mole =  $6.02 \times 10^{23}$**

**Just how large is this number?**

**602,000,000,000,000,000,000,000**

**It is really hard to relate to a number this large .....but let's try and see if we can make sense the enormity of the number.**

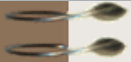


**If all 5 billion people on Earth were to do nothing but count the atoms in 1 mole of an element, 24 hours a day, at the rate of 1 atom per second.....**

**It would  
take 4  
million  
years !!**



1 mole of marbles is enough  
marbles to cover the entire  
**Earth...**



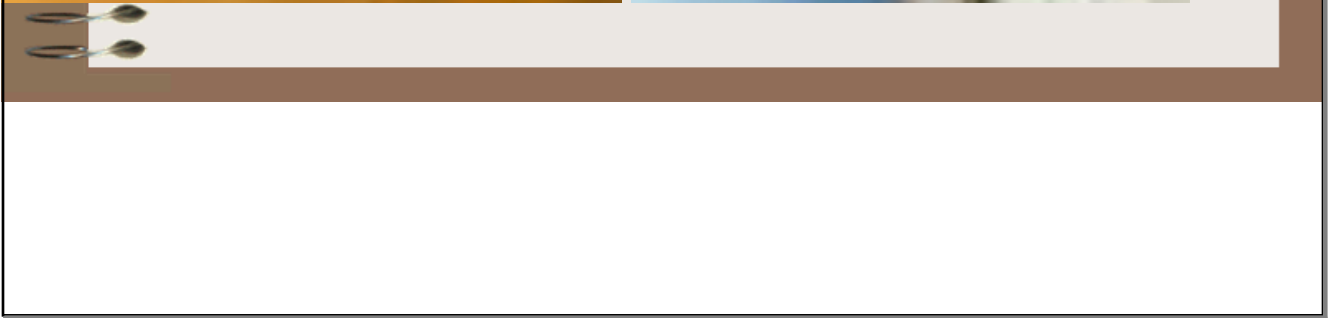




to a depth of  
**50 miles**



**A mole of dollars ??**



How many years would it take you to spend 1 mole of dollars, if you spend at a rate of \$1 billion per second ?

$\$ 6.02 \times 10^{23}$  → Years



\$1,000,000,000 per second



Using dimensional analysis/ factor label:

$$\begin{array}{c|c|c|c|c|c} \$6.02 \times 10^{23} & 1 \text{ sec} & 1 \text{ min} & 1 \text{ hr} & 1 \text{ day} & 1 \text{ yr} \\ \hline & \$1 \times 10^9 & 60 \text{ sec} & 60 \text{ min} & 24 \text{ hr} & 365 \text{ day} \end{array}$$

$$= 19,089,294.77 \text{ years}$$

over 19 million years!!!

What would you be called if you have 1 mole of dollars?

a mole-onaire!



And yet there is...

**1 mole of H<sub>2</sub>O molecules**

**(that's  $6.022 \times 10^{23}$  molecules of water)**

**in only 18 mL of water !!**

