Pg. 29

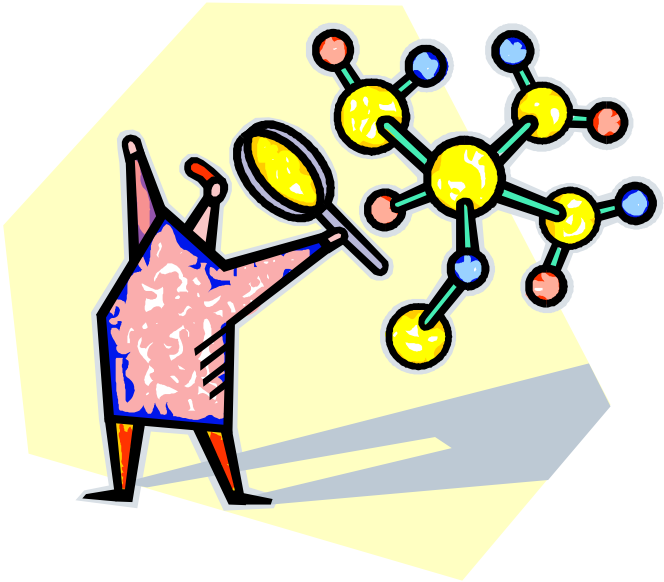
Target:

I can calculate molar mass

ATOMS ARE REALLY SMALL!!

- We can't work with individual atoms in the LAB

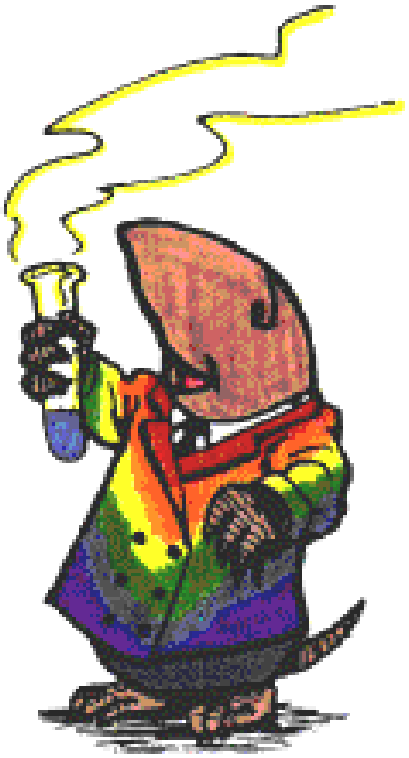
- Because we can't see things that small



So let's count a <u>WHOLE BUNCH</u> all at once!

A NEW UNIT OF MEASURMENT
THE MOLE

6.02×10^{23}

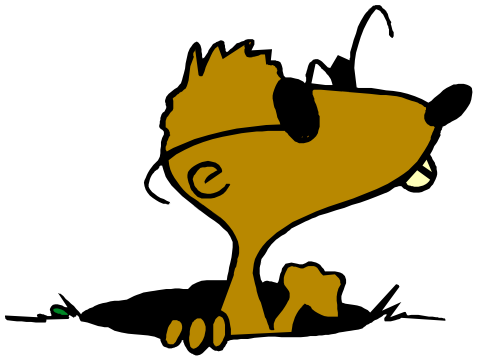


The Mole

- A counting unit

- Similar to a dozen, except instead of 12, it's 602 billion trillion

  602,000,000,000,000,000,000,000

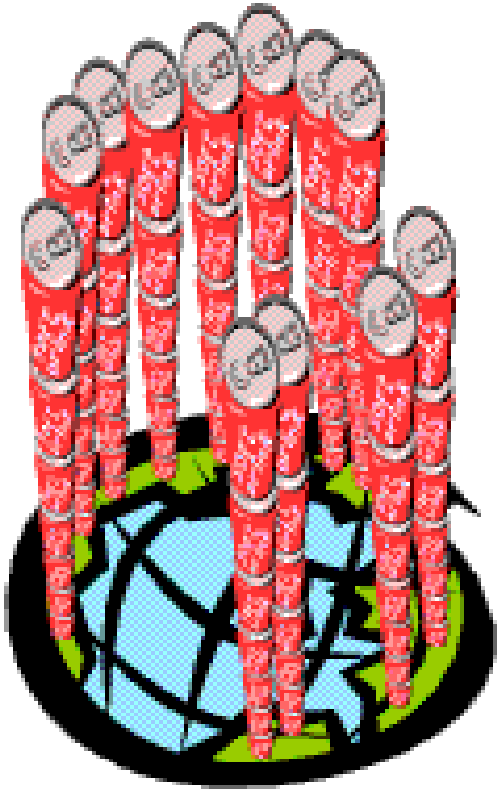


Avogadro's Number

- Amedeo Avogadro
  1776 – 1856
- The number of atoms in 1 mole

Just How Big is a Mole?

- Soda cans to cover the surface of the earth over 200 miles deep.
- Avogadro's number of unpopped popcorn kernels spread across the USA…over 9 miles deep.
- Count atoms at the rate of 10 million per second, it would take about 2 billion years to count the atoms in one mole.



COUNTING VERSUS WEIGHING!

- 1 dozen cookies = 12 cookies
- 1 mole of cookies = 6.02 X 10^{23} cookies

- 1 dozen cars = 12 cars
- 1 mole of cars = 6.02 X 10^{23} cars

- 1 dozen Al atoms = 12 Al atoms
- 1 mole of Al atoms = 6.02 X 10^{23} atoms

The NUMBER is always the same, but the MASS is very different!

MASS OF AN ATOM

- **TINY TINY TINY!!!! - USE A SPECIAL UNIT:**

Atomic mass unit = "amu"

1 amu = 1.66×10^{-24} grams

1 atom of H = 1 amu

1 atom of C = 12.01 amu

1 atom of O = 16 amu

- **How much does a mole of something weigh???**

1 mole of C atoms	**=**	**12.0 g**
1 mole of Mg atoms	**=**	**24.3 g**
1 mole of Cu atoms	**=**	**63.5 g**

MOLAR MASS - HOW MANY GRAMS PER MOLE?

Molar Mass of C = 12.01g/mol

Molar Mass of Mg = 24.3 g/mol

THE CONVERSION FACTOR VERSION!

Like saying 12in/ft

Molar Mass of Molecules & compounds

Add up the mass for each part of the molecule

1 mole of $CaCl_2$ = 1 Ca + 2 Cl

Ca = 40.1 g/mol Cl = 35.5 g/mol

1Ca + 2Cl =

40.1 + 35.5 + 35.5 = 111.1 g/mol

Molar Mass of N_2O_4 = ?

N = 14.0 g/mol O = 16.0 g/mol

2N + 4O =

(2* 14.0) + (4*16.0) = 92 g/mol

LEARNING CHECK!

A. **Molar Mass** of K_2O = ? Grams/mole

2K + 1 O

K = 39.1 g/mol O = 16 g/mol

(2* 39.1g/mol)+(1*16.0g/mol) = 94.2g/mol

B. **Molar Mass** of antacid $Al(OH)_3$ = ?

1Al + 3 O + 3H

Al = 27.0 g/mol O = 16 g/mol H = 1.0 g/mol

(1* 27.0g/mol)+(3*16.0g/mol) + (3*1.0)= 78g/mol

LEARNING CHECK!

Find the molar mass

(usually we round to the tenths place)

1) Br = 79.9 g/mole

2) Sn = 118.7 g/mole

The Mole is a Unit Song

https://www.youtube.com/watch?v=1R7NiIum2TI

A Mole of Particles

Contains 6.02×10^{23} particles

1 mole C = 6.02×10^{23} C atoms

1 mole H_2O = 6.02×10^{23} H_2O molecules

1 mole $CaCl_2$ = 6.02×10^{23} $CaCl_2$ compounds

6.02×10^{23} Ca^{2+} ions and

1.204×10^{24} Cl^- ions