

What is the mole?

We are now going to consider the actual number of particles of a substance. Because this number will be very large, we will need a way to deal with it- an appropriate counter.

A counter is simply a grouping.

dozen - 12

pair - 2

mole -  $6.02 \times 10^{23}$

Why do we use counters?

# The Mole

1 mole is 602,000,000,000,000,000,000,000

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

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

This equivalence statement can be used to do conversions.

Do you remember how to enter  $6.02 \times 10^{23}$  into your calculator?

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

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

How many moles of water do I have if I have  $1.8 \times 10^{24}$  molecules of water?

$$\frac{1.8 \times 10^{24} \text{ molecules}}{(6.02 \times 10^{23} \text{ molecules})} \left| \frac{1 \text{ mole}}{1} \right. = 2.99 \approx \boxed{3.0 \text{ moles}}$$

How many atoms of aluminum do I have if I have 2.45 moles of aluminum?

$$\frac{2.45 \text{ moles}}{1 \text{ mole}} \left| \frac{6.02 \times 10^{23} \text{ atoms}}{1} \right. = 1.4749 \times 10^{24} \approx 1.47 \times 10^{24} \text{ atoms of Al}$$

If I have a mole of aluminum atoms how many atoms do I have?

If I have a mole of BBs, how many BBs do I have?

If I had half a mole of marbles, how many would I have?