

# Mole Calculations- Mass and Particles

## Mass:

Mass has the units of grams and can be measured on a balance. Formula mass from the periodic table gives the grams/mole.

What is the mass, in grams, of 2.55 moles of iron?

How many moles are there in 56.20 grams of oxygen?

## Representative particles can be determined based on bond type:

Atom- NO BONDS, a substance in its elemental form (NOT DIATOMICS)

Molecule - atoms chemically combined and held together with covalent bonds (two nonmetals) (INCLUDES DIATOMICS)

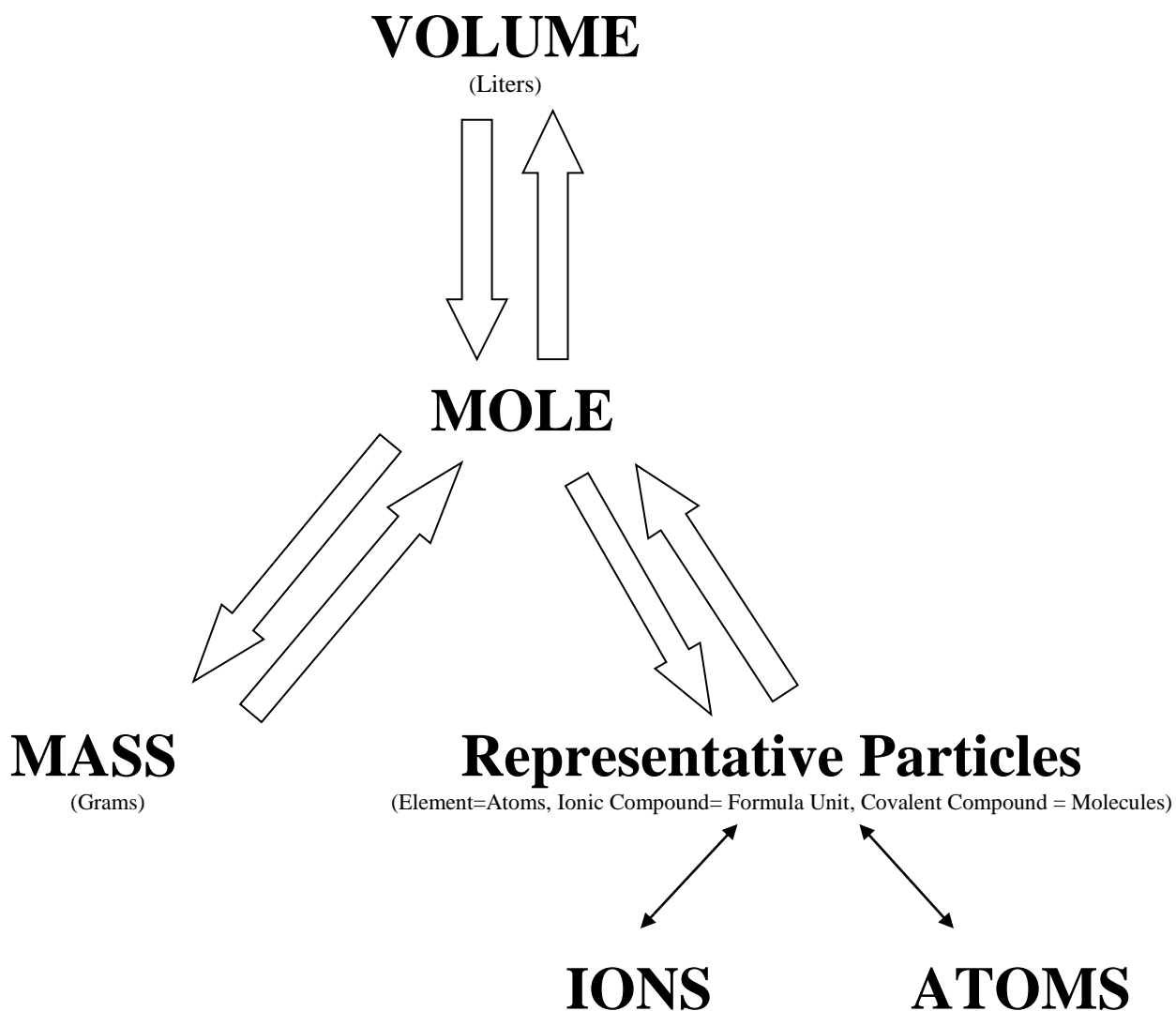
Formula unit - the simplest ratio of atoms held together by ionic bonds (metal or  $\text{NH}_4^{+1}$  and a nonmetal). Remember that polyatomic ions stay together as an ION!

	Element (E), Ionic compound (I), Covalent Compound (C)	Representative Particle	Number of ATOMS	Number of IONS
$\text{Na}_2\text{S}$				
$\text{N}_2$				
$\text{BCl}_3$				
He				
$\text{Ba}_3(\text{PO}_4)_2$				
$(\text{NH}_4)_2\text{SO}_3$				

How many nitrogen atoms are present in 65.12 moles of nitrogen dioxide gas?

How many carbonate ions are there in 1.50 moles of aluminum carbonate?

What would be the mass, in grams, of  $7.12 \times 10^{25}$  formula units of potassium sulfate?

**Volume:**

A mole of any gas at STP occupies 22.4 L. Since the space between gas molecules is so large compared to the actual size of the molecules, the differences in the size of the molecules don't make an appreciable difference in the total space occupied.

STP = \_\_\_\_\_

Standard temperature:

Standard pressure:

Calculate the volume in liters of 5 moles ammonia ( $\text{NH}_3$ ) gas at STP.

If a 5.00 L container is filled with hydrogen gas at STP, how many grams of  $\text{H}_2$  does it contain?

## HOMEWORK: Mole Calculations

Work out the following mole calculations using dimensional analysis as done in class. No work, no credit!

1. Express 3.55 moles of  $\text{K}_2\text{SO}_4$  in grams.
2. Convert  $5.69 \times 10^{24}$  formula units of barium nitrate into moles.
3. Convert 8.75 grams of  $\text{P}_2\text{O}_5$  into moles.
4. How many oxygen atoms are present in 8.98 moles of dinitrogen pentoxide?
5. How many molecules of  $\text{SF}_6$  are present in a sample of 0.325 moles?
6. How many chlorite ions are present in a 25.0 g sample of  $\text{Zn}(\text{ClO}_2)_2$
7. How many oxygen atoms are present in 0.523 grams of magnesium nitrate?
8. How many individual oxygen atoms are present in a 50.3 gram sample of oxygen,  $\text{O}_2$ , gas?
9. What is the mass of 18.0 L of methane,  $\text{CH}_4$ ?
10. How many hydrogen **atoms** are in 0.50 L of hydrogen gas ( $\text{H}_2$ )?