Molar Mass

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Moles

- we cannot (in a practical sense) count atoms individually
  - too small, too many
- we use a counting unit called the mole

1 mole =

- the definition is called number
  - sometimes expressed as

Atomic mass units

- to convert numbers of atoms using something easily measurable (mass in grams), we use AMU's
  - these have units of grams for 1mol, or:
- carbon is used to standardize the mole, since $^{12}_{6}C$ is a very common isotope of carbon
  - thus, $12g\ Carbon \equiv 12mol\ Carbon$
- the periodic table average atomic mass can be used to calculate number of moles from a given mass, or how much mass goes into a given number of moles

Ex Calculate the number of moles of each mass.

a) 110.g Au

b) 0.16g He

c) 19.25g Si

d) 453.6g C

Ex Calculate the mass in grams equivalent to the given number of moles.

a) 3.00 mol K

b) .0025 mol Xe

c) 7.5 mol Al

d) 1.5mol Na

Molar Mass

- for compounds, we calculate the molar mass by simply adding up the atomic masses of each element
- molar mass can then be used for the same calculations we just did for atomic mass

Ex Calculate the molar masses of each compound.

a) N_2

b) MgS

c) C_2H_5Br

d) $KMnO_4$

e) H_2O

f) CH_3OH

g) $Mg(NO_3)_2$

h) $Ca_3(PO_4)_2$

Ex Calculate the mass in grams equivalent to the given number of moles.

a) 5.00mol $AgCl_2$

c) 6.00mol Al_2O_3

b) 2.50mol NaOH

d) 3.333mol H_2SO_4

Ex Calculate the number of moles of each mass.

a) 25.11 g KCl

b) .0578 g SO_2

Percent Composition

- in analyzing compounds, it is very important to know how much of a given element is present
- to figure out the composition, we can divide the contribution of each part
  - note that the parts must add up to

Ex Calculate the percent composition of

a) H_2O

b) $AgNO_3$.

Formula Units: Empirical vs Molecular Formula

- application of Law of Multiple Proportions
- since atoms must come in distinct units, we can find the proportion based on percent composition
  - this may not be the actual compound!

Ex	Formaldehyde	Glucose
Uses		
Formula		
Simplest ratio		
Molar Mass		

The two different proportions are called:

EMPIRICAL FORMULA

MOLECULAR FORMULA

Ex A common white pigment in paint is made of 59.9% Ti and oxygen. Find the empirical formula.

Ex Find the empirical and molecular formula for the compound with molecular weight 98.96g/mol and composition: 71.65% Cl, 24.27% C, and 4.07% H.

Ex Analysis shows a mass percent composition of 30.93% Al, 45.86% O, 20.32% Cl, and 2.89% H. What is the formula of this compound?

Ex	Caffeine is composed of 49.48% C, 5.15% H, 28.87% N, and 16.49% O by mass. It has a molecular weight of 194.2g/mol. Find the molecular formula.