Chemical Composition

Molar Mass of Compounds

Where we have been

- Moles->Atoms, Atoms->Moles
- Moles->Mass, Mass->Moles
- For single elements only-Au, K, C, etc..

Where we are going

- Moles->Atoms, Atoms->Moles
- Moles->Mass, Mass->Moles
- For compounds NaCl, H₂O, C₆H₁₂O₆

Molar Mass of Compounds

- A chemical compound is a collection or grouping of atoms.
- Methane is a molecule that contains 1 carbon atom and 4 hydrogen atoms (CH₄).



What's the same? Avogadro's number is still the same-1 mol of methane is still 6.02 x 10⁷³ particles or more accurately, 6.02 x 1023 CH4 molecules.

What's different? The way we find the mass methane is a molecule....

CH4 molecule contains 1 C alom and 4 H aloms, Which means CH4 contains 1 mol of C atoms and 4 mol of H atoms.

In order to calculate the mass of 1 mol of methane, we have to add the masses of carbon and hydrogen together-

- Don't worry-it's eqsy

 How can we calculate the mass of 1 mol of methane? CH4



The molar mass of CH₄=16.05 grams (In 1 mol of CH₄)

Molar Mass of Compounds

- So...
- The quantity 16.05 g is called the molar mass for methane: the mass of 1 mole of CH₄ molecules.
- Molar mass → is the mass (in grams) of 1 mol of the substance.

1 **mol** CH₄ molecules (6.02 x 10²³ CH₄ molecules)

Molar Mass of Compounds

• The molar mass is obtained by summing the masses of the component atoms.

Calculating Molar Mass of Compounds

Polyvinyl chloride, called PVC, which is widely used for floor coverings ("vinyl") as well as for plastic pipes in plumbing systems, is made from a molecule with the formula C_2H_3CI . Calculate the molar mass of this substance. Solution Where do we want to go? Molar mass (C_2H_3CI) \longrightarrow ? g/mol

Calculating Molar Mass for a compound

Solution (cont'd) What do we know?

- The formula for PVC (polyvinyl chloride) is C₂H₃Cl
- Atomic masses:
 - C = 12.01 g/mol
 - H = 1.01 g/mol
 - CI = 35.45 g/mol

Calculating Molar Mass for a compound

Solution (cont'd)

How do we get there?

We need to find the mass of 1 mol of C₂H₃Cl molecules -- the molar mass for PVC.

1 mol C₂H₃Cl molecules = 2 mol C atoms, 3 mol H atoms, and 1 mol of Cl atoms

Calculating Molar Mass for a compound

Solution (cont'd)

Does it make sense?

The units obtained here (g/mol) are correct for molar mass.

The answer is given 2 decimal places because it is an atomic mass.

Calculating Moles for a compound

Let's try another one. Calculate the molar mass for sodium sulfate, Na₂SO₄. **Solution** Where do we want to go? Molar mass (Na₂SO₄) _____ ? g/mol

Calculating Moles for a compound

Solution (cont'd) What do we know?

- The formula for sodium sulfate is Na₂SO₄
- Atomic masses:
 - Na = 22.99 g/mol
 - S = 32.07 g/mol
 - O = 16.00 g/mol

Calculating Moles for a compound

Solution (cont'd) How do we get there? Na₂SO₄

Mass of 2 mol of Na⁺ = 2 x 22.99 g = 45.98 g

REAL SECTION

Let's Review

- The molar mass of a substance can be obtained by summing the masses of the component atoms.
- The molar mass (in grams) represents the mass of 1 mol of the substance.
- This is the same as finding the Molar Mass of individual elements (from periodic table) except we have to do an addition step to add up all the molar masses in a compound.

