

2012/09/18

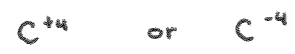
Test on Chapters 1-4 on Tuesday September 25th

→ Problem solving type questions

→ Full class

Nomenclature (Continued)

→ Column with Carbon is the most versatile



↳ Carbon doesn't like ionic compounds. Along with other non-metals it tends to form molecular compounds.

Naming molecular compounds

1st Rule:

We indicate the number of atoms of a particular element using Latin prefixes.

Mono - 1

Penta - 5

Di - 2

Hexa - 6

Tri - 3

Tetra - 4

Example: N_2O_5 → DiNitrogen Pentoxide

CO_2 → Carbon Dioxide

NO → Nitrogen Monoxide

P_2O_5 → Diphosphorous Pentoxide

Hydro Carbons

Rule: Contains ONLY Carbon and Hydrogen

Simple Hydrocarbons

↳ Alkanes (single bonds)

↳ Alkenes (double bonds)

↳ Alkynes (triple bonds)

Prefixes are for the number of carbons

in the compound:

1 - meth

5 - pent

2 - eth

6 - hex

3 - prop

7 - hept

4 - but

8 - oct

9 - non

10 - dec

Example: 4 C's, single bonds → butane

7 C's, double bonds → heptene

"propyne" → 3 C's, triple bonds

*Need to memorize the nomenclature ONLY

Why do we have two types of compounds and ways to name them?

Two compounds:

Ionic compound

- ↳ between ions (charged species)
- ↳ compound is formed by attraction of opposite charges
- ↳ Electrostatic interactions
- ↳ Strong bonds
- ↳ stable solids
- ↳ Very high melting & boiling points
- ↳ ~~crystal~~ crystalline structure
- ↳ Formula represents the smallest whole number ratio between the elements in the crystal, but you cannot isolate one unit of Na-Cl.

Molecular compounds

- ↳ Formed between non-metals
- ↳ You can isolate 1 molecule of the compound.
- ↳ Have low melting & boiling points
- ↳ sometimes form crystals, but often forms gases, powders, and liquids
- ↳ Weak bonds, which is why they have low melting/boiling points

How to determine what type of compound we have? ~~to use?~~

- ↳ Expensive tools can be used such as:
 - Mass Spectrometry
 - X-Ray Diffraction
 - NMR
- ↳ Or one can use simple tools, like a simple combustion analysis

STOICHIOMETRY

Definition: Fancy word for "proportions"

Example: What is the % (by mass) composition of C, H, and O in Ethanol?
~~C₂H₅OH~~ C₂H₅OH.



Approach: Find the total mass of 1 mol of Ethanol, Find the mass of C, H, and Oxygen in 1 mol of ethanol. Percent will be individual mass / total mass.

Calculations:

$$\begin{aligned}
 \text{MM of Ethanol} &= 2\text{MM}_C + 6\text{MM}_H + \text{MM}_O \\
 &= 2(12.01\text{g/mol}) + 6(1.00\text{g/mol}) + (15.9994\text{g/mol}) \\
 &= 24.02 + 6 + 15.9994 \\
 &= 42.02\text{g/mol}
 \end{aligned}$$

$$\begin{aligned}
 \% \text{ of Carbon} &= (2\text{MM}_C) \div (\text{MM}_{\text{Ethanol}}) \\
 &= 24.02 \div 42.02 \\
 &= 0.57
 \end{aligned}$$

$$\begin{aligned}
 \% \text{ of Hydrogen} &= (6\text{MM}_H) \div (\text{MM}_{\text{Ethanol}}) \\
 &= (6.048) \div (42.02) \\
 &= 0.14
 \end{aligned}$$

$$\begin{aligned}
 \% \text{ of } \overset{\text{Oxygen}}{\text{Carbon}} &= (\text{MM}_O) \div (\text{MM}_{\text{Ethanol}}) \\
 &= (15.9994) \div (42.02) \\
 &= 0.38
 \end{aligned}$$

Given %ges, how will you find the formula?

Example: A particular compound is 92.3% Carbon and contains only C and H. What is its formula?

* Assume a 100g sample.

\therefore In a 100g sample, 92.3g is C
7.7g is H

$$N_{\text{carbons}} = \frac{m_C}{\text{MM}_C} = \frac{92.3\text{g}}{12.01\text{g/mol}} = 7.68$$



$$N_{\text{hydrogens}} = \frac{m_{\text{H}}}{MM_{\text{H}}} = \frac{7.7 \text{ g}}{1.01 \text{ g/mol}} = 7.64$$



