Ch. 1 – The BASICS

- organic chemistry as an entity – differentiated from inorganic in 1780s.

organic chemicals – those isolated from living organism.

Now: organic chemistry is the study of compounds containing carbon + hydrogen.

1784 – Lavoisier – empirical / md. formulas

↓ 1860 * combustion analysis

$$X + O_2 \longrightarrow H_2O + CO_2 + \cdots$$

Late 1800s - structural Theory of organic chemistry

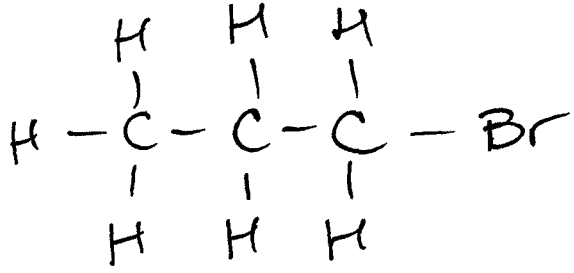
1. The atoms of elements in organic cmpds. can form a fixed # of bonds, using the e's in outermost shell (valence e's).

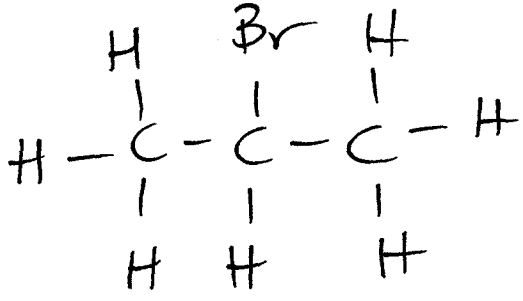
   C - tetravalent - forms 4 bonds
   H - monovalent - forms 1 bond
   O - divalent
   N - trivalent
   X (halogens) - monovalent

2. A carbon atom can use one or more of its valences to form bonds to other carbons.

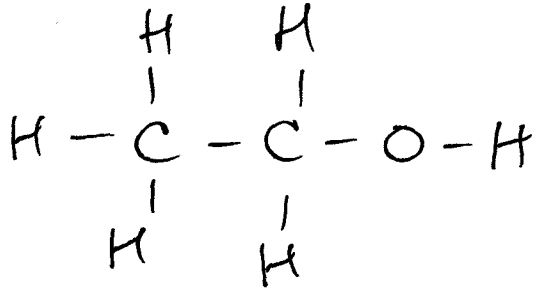
Isomers - compounds w/ same molecular formula but different arrangement of atoms. (aka structural + constitutional isomers)

C_3H_7Br





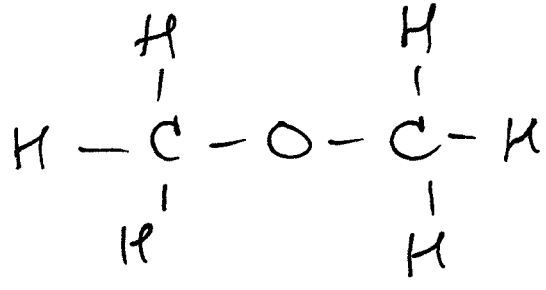
Isomers have different chemical + physical properties - they are different molecules!



ethyl alcohol

b.p. 78.5°C

vs.



dimethyl ether

b.p. -24.9°C

The way a molecule behaves is directly related to the atoms + the bonds.

everyone wants a noble gas configuration.

metals tend to lose e's
nonmetals tend to gain e's
* directly related to e' neg.
* more e' neg elements hold onto their e's + try to get more e's.

extra e's ⇒ anion (negatively charged)
given up e's ⇒ cation (positively charged)

opposite charges attract - form ionic bonds.

unionized

$Na^{\bullet}$ - one v.e. ⟩ $Na^{\oplus}$ $Cl^{\ominus}$

Cl - 7 v.e. ↙

There are very few ionic bonds in organic molecules.

1916 - Gilbert Lewis (Weymouth)

Hydrogen atom - only has one e'. H•

If two H atoms share their e's, we now have a noble gas (He) config.

H:H ≡ H-H

Sharing e's forms a covalent bond

Amt. of energy required to break a covalent bond homolytically (one e' back to each atom) => bond dissociation energy.

most (virtually all) organic molecules are held together by covalent bonds.

* Both atoms are the same - equal sharing
  nonpolar covalent

* Atoms have differing e'neg - unequal sharing
  polar covalent

(* Big enough e'neg diffence => ionic)