ORGANIC CHEMISTRY

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The chemistry of carbon/hydrogen containing compounds

VITALISM

(prominent idea of the 1700's)

Vitalism was the belief that certain chemicals,
ORGANIC CHEMICALS,
could only be made by living organisms.

INORGANIC CHEMICALS

were found primarily in the earth as mineral deposits, but could also be prepared by man.

Friedrich Wöhler (German), 1828

Critical Experiment

Synthesized Urea (organic) from ammonium chloride and silver cyanate (inorganic)

$$\begin{array}{ccc} NH_4CI + AgNCO & \xrightarrow{\Delta} & & O \\ & & & \\$$

..... defeated the vitalism idea

I challenge you to find a single item in this lecture room, your dorm room, your car or your house that hasn't seen the influence of an organic chemist

- paints, varnishes, waxes, finishes (acrylics, latex, silicones)
- plastics (formica, vinyl, polystyrene, polyurethane, PVC)
- adhesives (contact cements, epoxy resins, cyanoacrylates)
- -fabrics (nylon, acetates, synthetics, dyes, brighteners)
- synthetic carpets, mats
- -foods (packaging, coloring, preservatives)
- medicines, vitamins, pharmaceuticals
- gasoline, oils, lubricants, solvents
- paper, cardboard
- rubber, tires, elastomers

10's millions organic compounds

Contain C & H plus a few other elements

1.5 million inorganic compounds

Contain ALL the elements

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The great diversity of carbon compounds makes carbon a natural element on which to base complicated LIVING SYSTEMS

UNIQUE MOLECULES CAN BE FOUND TO CODE EVERY BIOCHEMICAL PROCESS

WHY CARBON?

Why is carbon the chosen element on which to base living systems?

1.2 BONDING PROPERTIES OF CARBON

1. Carbon FORMS COVALENT BONDS

2. Carbon FORMS BONDS WITH ITSELF

-C-C-C-

The tetrahedral shape of carbon

109.5°

A carbon with 4 single bonds is known as: sp³

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1.2 BONDING PROPERTIES OF CARBON (continued)

Carbon IS TETRAVALENT (2 SINGLE & 1 DOUBLE covalent bond)

Trigonal planar with a bond angle of 120°

1.2 BONDING PROPERTIES OF CARBON (continued)

Carbon IS TETRAVALENT — C= sp

Carbon IS TETRAVALENT — C= (2 DOUBLE covalent bonds) sp

Linear with a bond angle of 180°

UNIQUE PROPERTIES OF CARBON (continued)

4. COVALENTLY BONDS WITH A FEW OTHER COMMON ELEMENTS

(H N O P S F CI Br I)

H

C
N
O
F
P
S
CI
Br
I

UNIQUE PROPERTIES OF CARBON (continued)

SUMMARY

- 1. Carbon forms covalent bonds
- 2. Carbon bonds to itself
- 3. Carbon forms 4 bonds (tetravalent)
- 4. Bonds are single, double or triple
- 5. Carbon bonds to other elements

GENERAL CHEMISTRY TOPICS THAT APPLY TO ORGANIC CHEMISTRY

Lewis structures (covalent compounds)

VSEPR (covalent compounds)

- Shapes
- Bond angles

Polarity of Organic Molecules

- · electronegativity of bonded atoms
- shape and symmetry of polar bonds

Intermolecular forces

- London forces
- Dipole-dipole
- H-boinding

Acids and bases (pH)

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ORGANIC	INORGANIC
Liquid	solid
Low melting/boiling pt	High melting/boiling pt
Non-polar	Polar
Volatile	Non-volatile
Flammable	Non-flammable
Low water solubility	High water solubility
Non-electrolyte (molecular in water)	Electrolyte (ionic in water)

STUDY OF ORGANIC CHEMISTRY

- Learn elements involved
- · Learn bonding
- Write molecular formulas
- Write structural formulas from molecular formulas

STUDY OF ORGANIC CHEMISTRY (cont)

- Determine physical properties, like water solubility and mp and bp
- Learn some chemical properties (reactions)
- Apply this knowledge to biologically important compounds