Introduction

Alaa Arafat Hayallah

Weighting of Assessment:

Written exam.	50 %
Midterm exam	15 %
Practical exam.	25 %
Oral exam.	10 %
Total	100%

Main Topics

- Introduction to Organic Chemistry
- Aliphatic Hydrocarbons (Alkanes, Alkenes, Alkynes and Alkyl Halides)
- Stereochemistry
- Aromatic Compounds

Recommended Textbook:

(by Graham Solomons) Organic Chemistry

What is mean by organic chemistry?

Is a chemistry sub discipline involving the scientific study of the structure, properties, and reactions of organic compounds and organic materials, i.e., matter in its various forms that contain carbon atoms.

Study of structure includes using spectroscopy (e.g. IR, NMR), and mass spectrometry, and other physical and chemical methods to determine the chemical composition and constitution of organic compounds and materials.

Study of properties includes both physical properties and chemical properties, as well as methods to evaluate chemical reactivity, with the aim to understand the behavior of the organic matter in its pure form

Structure of the atom

The atomic number of an atom equals the number of protons in its nucleus
The mass number of an atom is the *sum* of its protons and neutrons
Isotopes have the same atomic number (i.e., the same number of protons), but different mass numbers because they have different numbers of neutrons.

The Distribution of Electrons in an Atom

- **The electrons in an atom can be thought of as occupying a set of concentric shells that surround the nucleus.**
- **The first shell is the one closest to the nucleus.**
- **The second shell lies farther from the nucleus, and even farther out lie the third and higher numbered shells. Each shell contains subshells known as atomic orbitals.**

- **An important point to remember is that *the closer the atomic orbital to the nucleus, the lower is its energy*.**

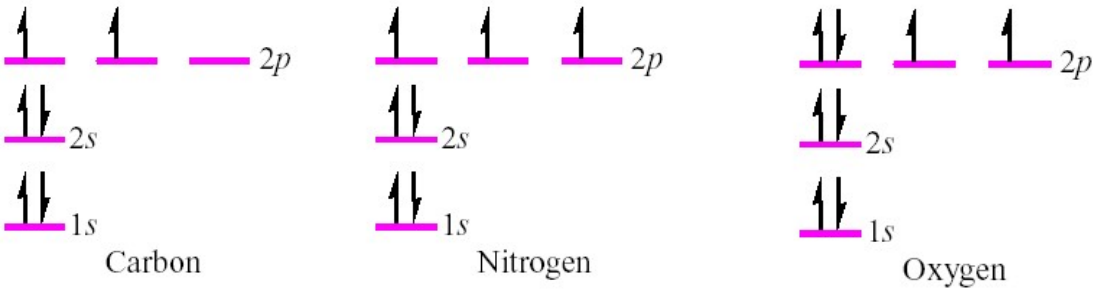
- **The first shell consists of only an *s* atomic orbital;**
  the second shell consists of *s* and *p* atomic orbitals;
  the third shell consists of *s*, *p*, and *d* atomic orbitals.

Filling the orbitals

- **Because a maximum of two electrons can coexist in an atomic orbital according to the Pauli exclusion principle it states that:**
  (a) no more than two electrons can occupy each atomic orbital
  (b) the two electrons must be of opposite spin.

- **Hund's rule states that when there are degenerate orbitals—two or more orbitals with the same energy—an electron will occupy an empty orbital before it will pair up with another electron.**
  In this way, electron repulsion is minimized.

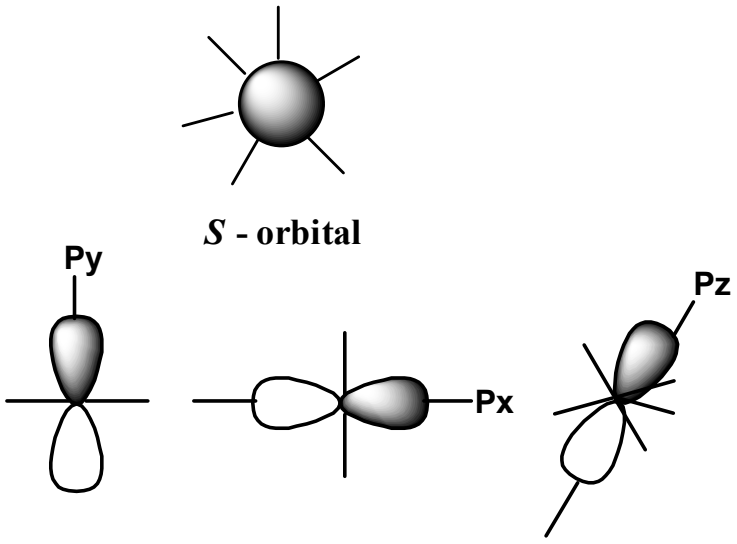
Energy level	Atomic Orbitals				
1	1s				
2	2s	$2p_x$	$2p_y$	$2p_z$	
3	3s	$3p_x$	$3p_y$	$3p_z$	Plus 5 3*d*



Atomic Orbitals

We have seen that electrons are distributed into different atomic orbitals.

An orbital is a three-dimensional region around the nucleus where there is a high probability of finding an electron



S - orbital

P - orbital

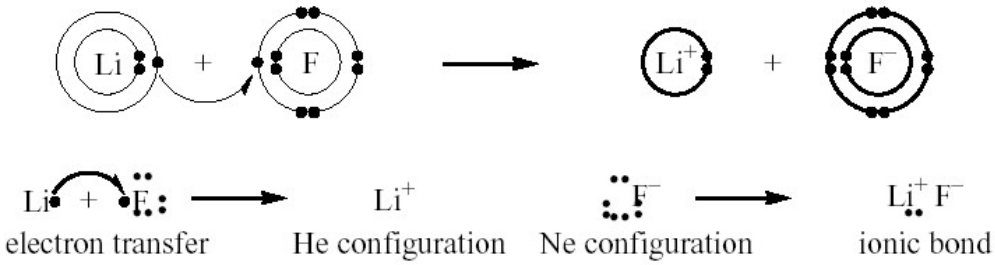
Table: Electronic distributions

Element	Atomic number	1*s*	2*s*	2*p*
H	1	1		
He	2	2		
Li	3	2	1	
Be	4	2	2	
B	5	2	2	1
C	6	2	2	2
N	7	2	2	3
O	8	2	2	4
F	9	2	2	5
Ne	10	2	2	6

Chemical bonding

In trying to explain why atoms form bonds, G. N. Lewis proposed that an atom is most stable if its outer shell is either filled or contains eight electrons and it has no electrons of higher energy.

1- Ionic bonding



The atom that loses electrons becomes a positive ion, or cation. The atom that gains the electrons becomes a negative ion or anion.

The ionic bond results from the electrostatic attraction between these oppositely charged ions.