Unit 1-2

- Types of matter
- Isotopes
- Ions
- Quantum Mechanical Model
- Electron configurations
- Naming Ionic Compounds
- Naming Molecular Compounds
- Empirical and Theoretical Properties of Acids/Bases

Atom → C

Element → C, O_2, S_8

Compound → CO_2, $C_{12}H_{22}O_{11}$

Molecule → O_2, CH_4

p+n

Isotope Name	Atomic Number	Mass Number	Symbol	# of Protons	# of Neutrons
carbon-13	6	13	$^{13}_{6}C$	6	7
iron-56	26	56	$^{56}_{26}Fe$	26	30
fluorine-20	9	20	$^{20}_{9}F$	9	11
	15	33			

		+	−
Name	**Symbol**	**Protons**	**Electrons**
calcium ion	Ca^{2+}	20	18
fluoride ion	F^-	9	10
copper (1) ion	Cu^+	**29**	**28**
		16	**18**

Binary Ionic Compounds - Type I

$CaCl_2$

Ca^{2+} Cl^-
Cl^-

calcium chloride

sodium oxide

Na^+ O^{2-}
Na^+

Na_2O

Binary Ionic Compounds - Type II

$FeCl_3$

Fe^{3+} Cl^-
Cl^-
Cl^-

iron (III) chloride

copper (II) sulfide

Cu^{2+} S^{2-}

CuS

Binary Ionic Compounds - Polyatomic

$LiNO_3$

Li^+ NO_3^-

lithium nitrate

sodium sulfate

Na^+ SO_4^{2-}

Na^+

Na_2SO_4

Ionic Hydrates

$Ca(NO_3)_2 \cdot 3H_2O$

Ca^{2+} NO_3^-
NO_3^-

calcium nitrate - 3 - water
" " trihydrate

Molecular Compounds

N_2O_5 dinitrogen pentoxide

Quantum Mechanical Model of an Atom

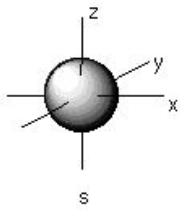
The quantum mechanical model determines the allowed energies an electron can have and how likely it is to find the electron in various locations around the nucleus.

atomic orbital - region of space in which there is a high probability to find an electron

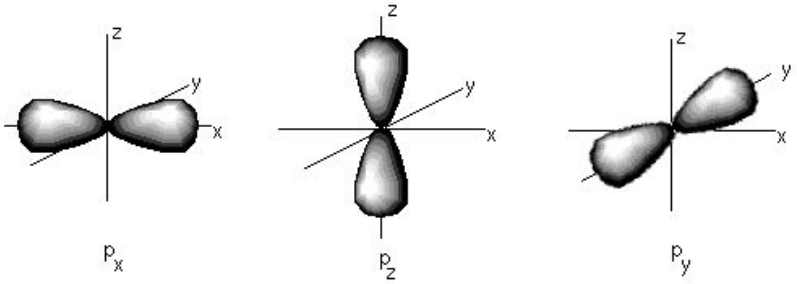
Principal quantum numbers (**n**) represent energy levels of electrons (i.e., n = 1, 2, 3, 4, etc.)

There may be several orbitals with different shapes at different energy levels.

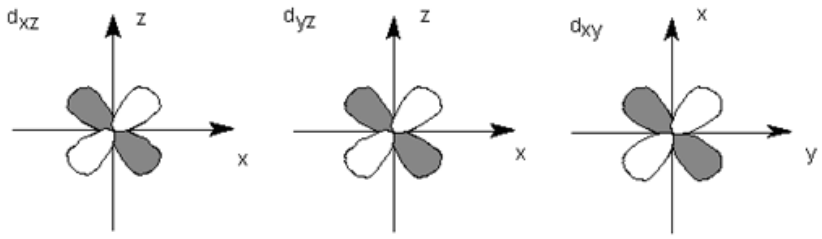
s orbital

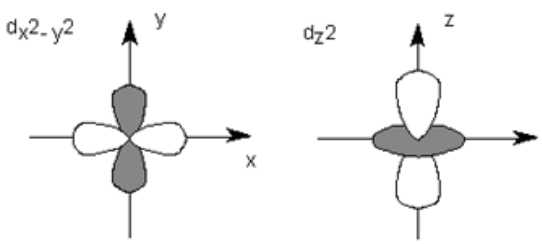


p orbitals

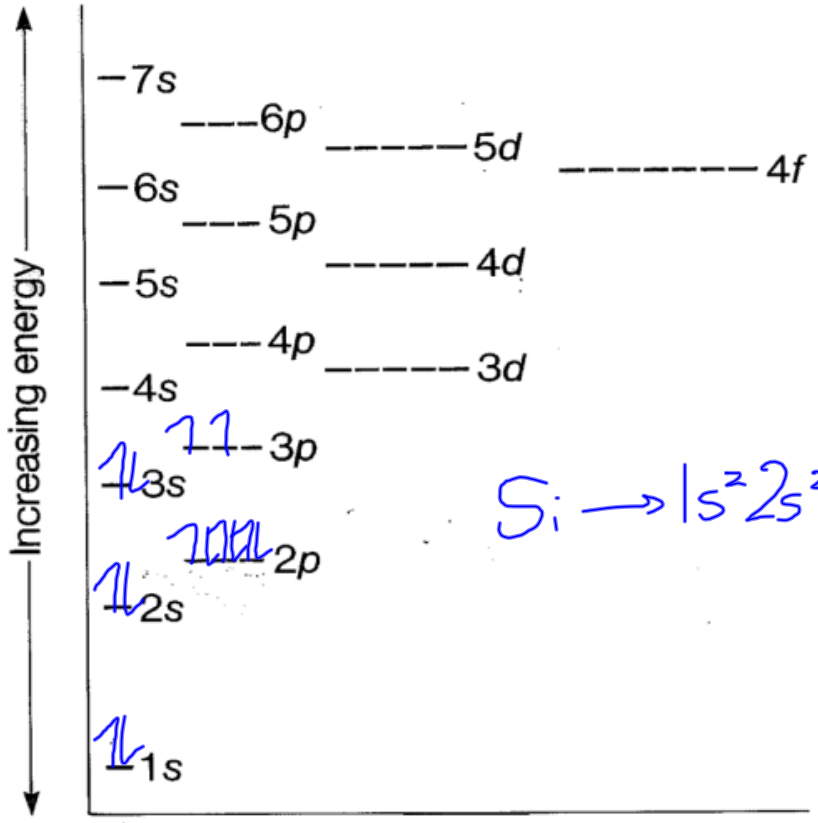


d orbitals





Aufbau Diagram



Si

Si → $1s^2 2s^2 2p^6 3s^2 3p^2$

Aufbau principle - electrons occupy orbitals of lowest energy first

Pauli exclusion principle - an atomic orbital can describe at most two electrons

Hund's rule - one electron enters each orbital until all orbitals contain one electron with the same spin