Units 1-2

- Types of matter
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Atom – smallest particle

Element - one type of atom Ex. C, O_2

Compound - two or more elements Ex. H_2O, NaCl

Molecule - more than one atom Ex. O_2, H_2O

$Ca(OH)_2$

$Fe_{(s)} + K_2SO_{4(aq)} \rightarrow K_{(s)} + Fe_2(SO_4)_{3(aq)}$

$Fe_{(s)} + K^+_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow K_{(s)} + Fe^{3+}_{(aq)} + SO_4^{2-}{}_{(aq)}$

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

Carbon-12

$6p^+$

6n

Carbon-13

$6p^+$

7n

		+	−
Name	Symbol	Protons	Electrons
Calcium ion	Ca^{2+}	20	18
fluoride ion			
		29	28
		16	18

Binary Ionic Compounds - Type I

$CaCl_2$

sodium oxide

Binary Ionic Compounds - Type II

$FeCl_3$

copper (II) sulfide

Binary Ionic Compounds - Polyatomic

$LiNO_3$

sodium sulfate

Ionic Hydrates

$Ca(NO_3)_2 \ 3H_2O$

Molecular Compounds

nonmetals
share electrons

N_2O_5

dinitrogen pentoxide

Quantum Mechanical Model of an Atom

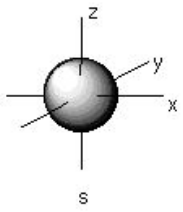
The quantum mechanical model determines the allowed energies an electron can have and how likely it is to find the electron in various locations around the nucleus.

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

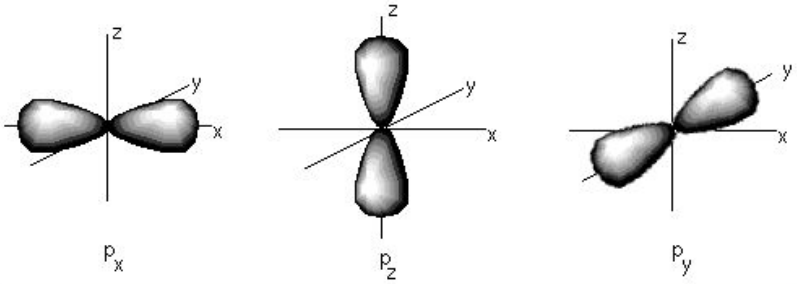
Principal quantum numbers (**n**) represent energy levels of electrons (i.e., n = 1, 2, 3, 4, etc.)

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

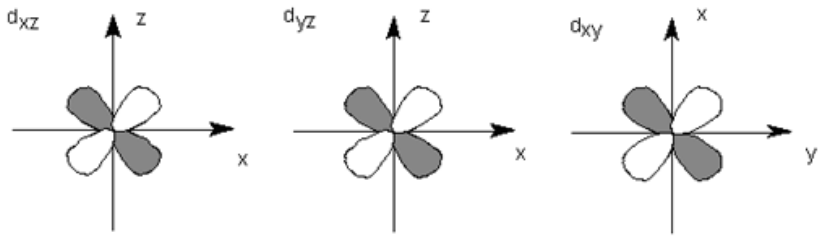
s orbital

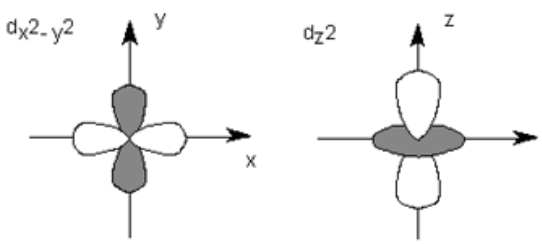


p orbitals

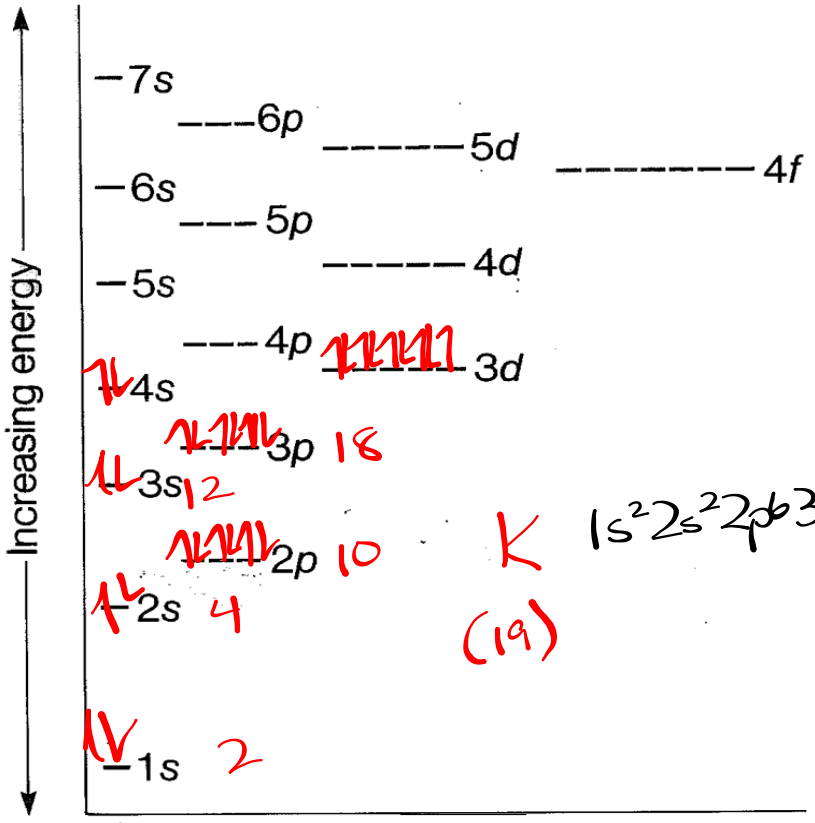


d orbitals





Aufbau Diagram



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