

Periodic Table of Elements

1	1 H																	2 He														
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne														
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar														
4	19 K	20 Ca											21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr				
5	37 Rb	38 Sr											39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe				
6	55 Cs	56 Ba	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Uuq	115 Uup	116 Uuh	117 Uus	118 Uuo

Alkali metals	Alkaline earth metals	Lanthanides	Actinides	Transition metals
Poor metals	Metalloids	Nonmetals	Halogens	Noble gases

State at standard temperature and pressure

- Atomic number in red: gas
- Atomic number in blue: liquid
- Atomic number in black: solid

solid border: at least one isotope is older than the Earth (Primordial elements)
dashed border: at least one isotope naturally arise from decay of other chemical elements and no isotopes are older than the earth
dotted border: only artificially made isotopes (synthetic elements)
no border: undiscovered

Electron Configurations.notebook

Periodic Table of the Elements

The periodic table shows elements from Hydrogen (1) to Oganesson (118). It includes the Lanthanide Series (elements 57-71) and the Actinide Series (elements 89-103). The groups are color-coded as follows:

- Alkali Metal: Pink
- Alkaline Earth: Light Blue
- Transition Metal: Light Green
- Basic Metal: Orange
- Semimetals: Yellow
- Nonmetals: Light Purple
- Halogens: Yellow
- Noble Gas: Light Blue
- Lanthanides: Light Green
- Actinides: Pink

identify:

family or group

period

metal

nonmetal

metalloid

transition metal

lanthanide series

actinide series

alkali metals

alkali earth metals

halogens

noble gases

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Full valence shell= stability (lower energy state)
 (outer)

Octet Rule - atoms gain or lose e⁻ to achieve 8 e⁻ in the valence shell for stability

-stability of noble gases (except He stable at 2e⁻)



Periodic Table of the Elements

Legend:
 ■ Alkali metals (yellow)
 ■ Alkaline earth metals (orange)
 ■ Transition metals (pink)
 ■ Lanthanide series (light blue)
 ■ Actinide series (purple)
 ■ Poor metals (light green)
 ■ Nonmetals (dark green)
 ■ Noble gases (cyan)
 ■ Solid (C)
 ■ Liquid (Br)
 ■ Gas (H)
 ■ Synthetic (Yc)

Common charges indicated above the table:
 +1, +2, +3, +4, -3, -2, -1, 0

Note: The subgroup numbers 1, 2 were adopted in 1984 by the International Union of Pure and Applied Chemistry. The names of elements 112-118 are the Latin abbreviations of those numbers.

5 val. electron or more
 gain to make full shell of 8

3 val. electrons or less
 lose **all** val electrons
 to eliminate shell and have next shell full

4 val. electron
 (could gain or lose 4 electrons, or share electrons)

electron configurations
 show last noble gas and electrons added since that noble gas

find outer shell electron (s and p orbitals), add electrons

Periodic Table of Elements

Group

s - block	d - block										p - block						18
+1 1 H											+3 +4 13 B	+4 14 C	metalloid -3 15 N	-2 16 O	-1 17 F	He	
+2 2 Li Be											+3 13 Al	+4 14 Si	-3 15 P	-2 16 S	-1 17 Cl	Ar	
Na Mg																	
K Ca																	
S	d																
												f - block					
												f					
*Lanthanides																	
**Actinides																	

ssc.in

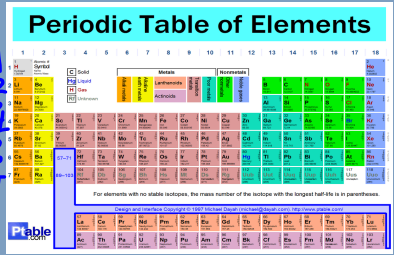
Objectives:

Investigate the current model of electron structure through the following objectives:

I can determine electron configurations, orbital diagrams and quantum numbers for electrons in an atom

I can apply the Aufbau principle, Hund's rule and the Pauli Exclusion Principle to electron configurations

e⁻ Configurations



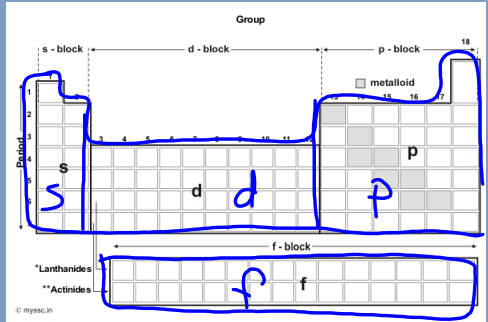
principal, n

n = main energy level of e⁻
 n = 1, 2, 3, 4, 5, 6, 7
 energy increases with higher number

angular momentum, l

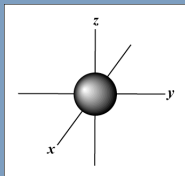
l = shape of orbit, (s, p, d, f)

letter	l
s	0
p	1
d	2
f	3



s orbital

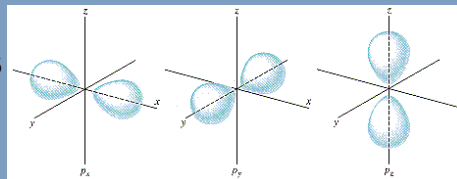
l = 0



1 sublevel, 2 e⁻ each (2 total e⁻)

p orbitals

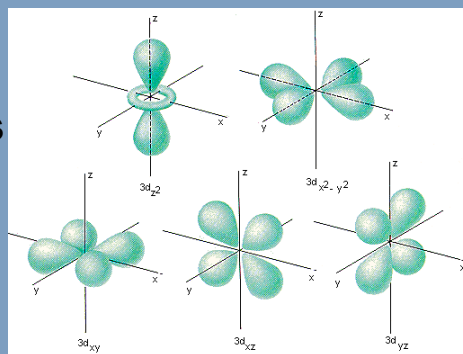
l = 1



3 sublevels, 2 e⁻ each (___ total e⁻)

d orbitals

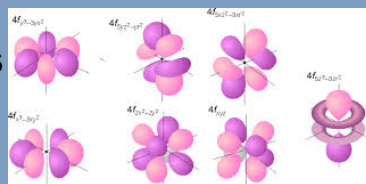
l = 2



5 sublevels, ___ e⁻ each (___ total e⁻)

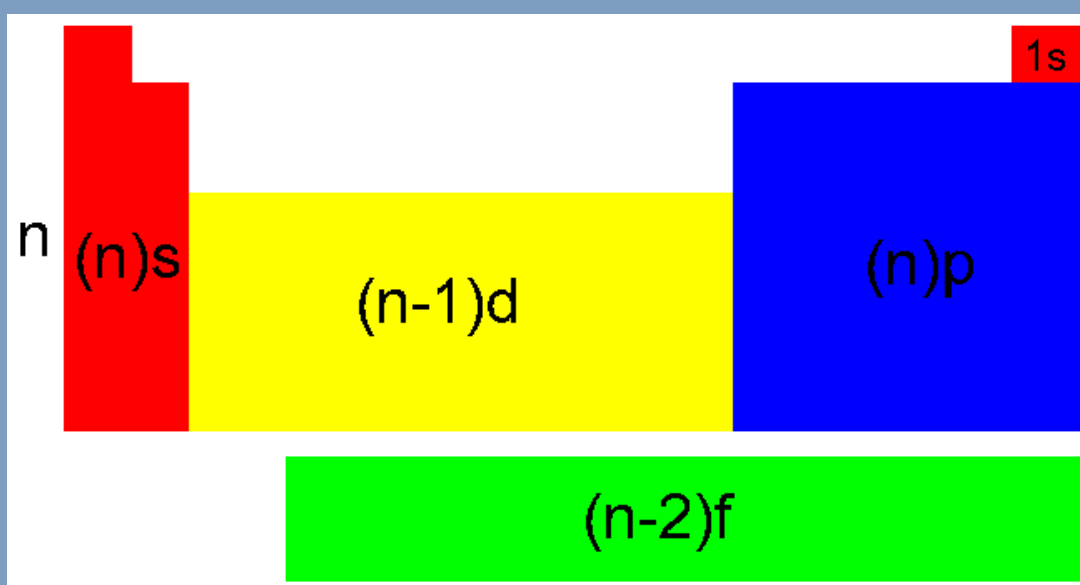
f orbitals

l = 3



7 sublevels, ___ e⁻ each (___ total e⁻)

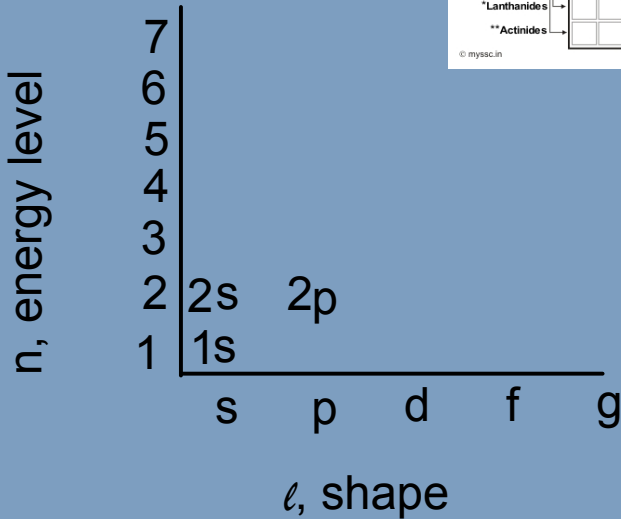
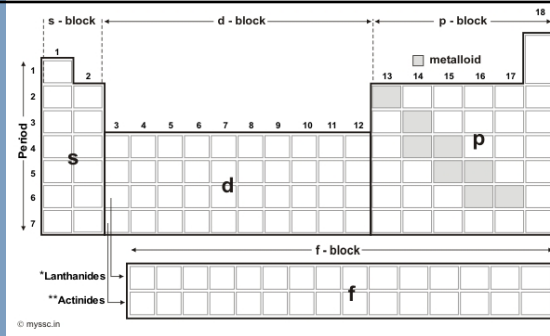
n and l:



Order of e-

Aufbau Chart

show order that electrons are added



e-configurations

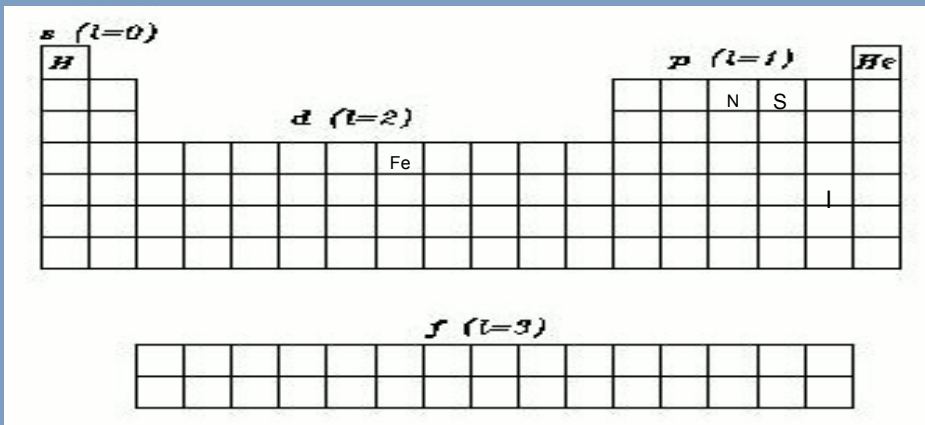
H :

N :

He :

S :

Li :



Fe:

shorthand - use previous noble gas

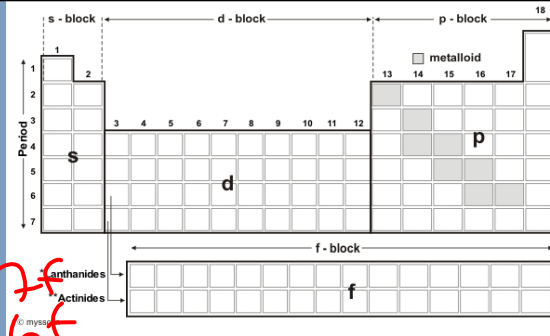
Fe:

I :

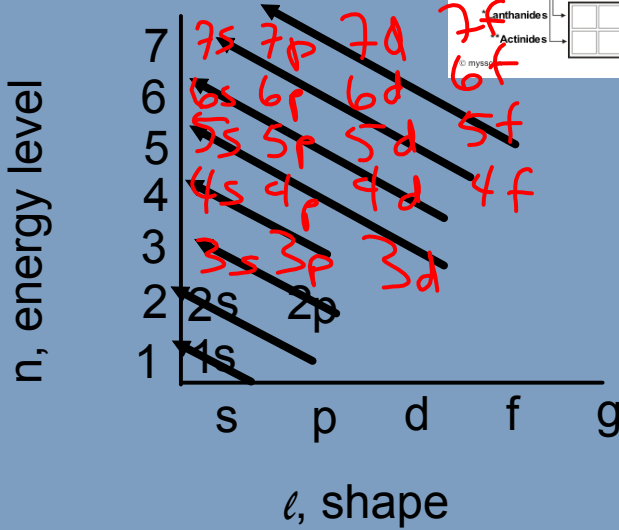
I⁻¹ :

I⁻¹ is isoelectronic with _____

Order of e-



Aufbau Chart

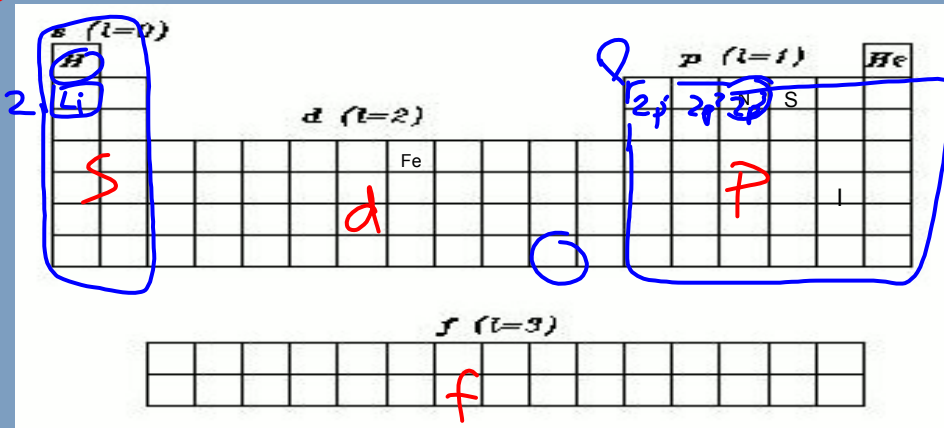


e-configurations

Principal energy level

H: $1s^1$
 He: $1s^2$
 Li: $1s^2 2s^1$

N: $1s^2 2s^2 2p^3$
 S: $1s^2 2s^2 2p^4$



Fe:

shorthand - use previous noble gas

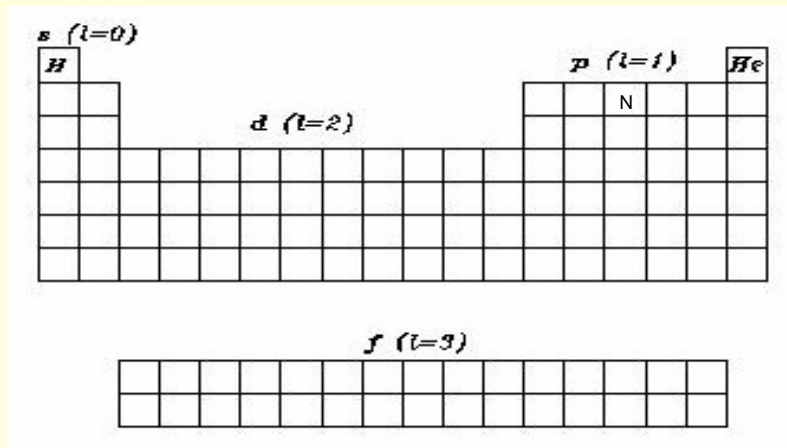
Fe:

I:

I⁻¹:

I⁻¹ is isoelectric with _____

Orbital Diagrams

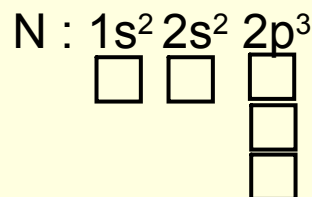
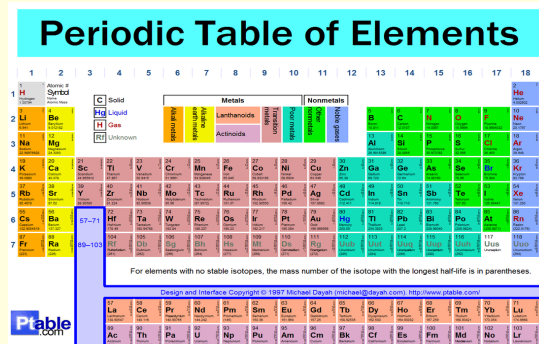


N has 7 p⁺ and 7 e⁻

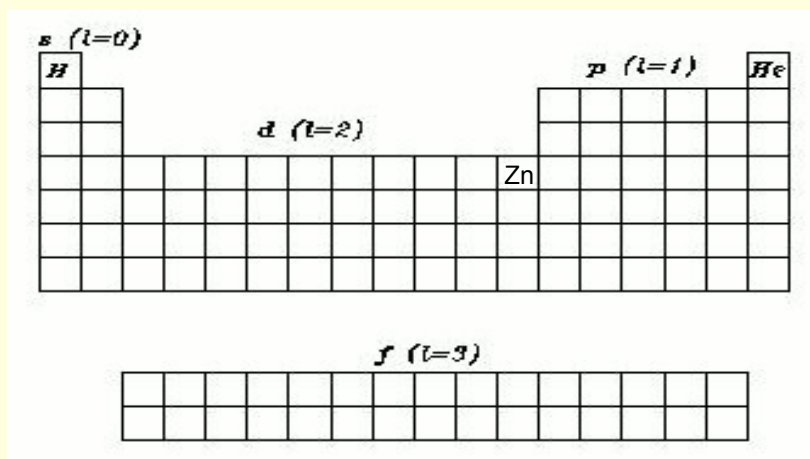
N :

4 quantum numbers

<u>principal</u>	<u>angular momentum</u>	<u>magnetic</u>	<u>spin</u>
main energy level	shape of orbital	suborbital	direction
n	l	m	s
n=1,2,3,4,5,6,7	s, l=0 p, l=1 d, l=2 f, l=3	s has 1 sublevel m=0 p has 3 sublevels m=+1,0,-1 d has 5 sublevels m=+2,+1,0,-1,-1 f has ___ sublevels m=	s= +1/2, -1/2 ↑ ↓ each sublevel has 2 e ⁻ , one in each direction



Hund's rule: fill each sublevel separately first



Zn has 30 protons

Zn⁺² has ____ e⁻

orbital diagram

Zn⁺²:

shorthand

Zn⁺²:

quantum number
for an electron

Pauli Exclusion Principle:

no 2 e⁻ can have the same set of quantum numbers