Tuesday 1/21/20

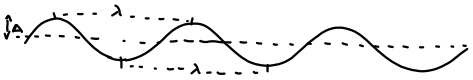
Arrangement of...

Start of Ch 4 "Electrons in atoms"

Electrons exhibit wave-particle duality

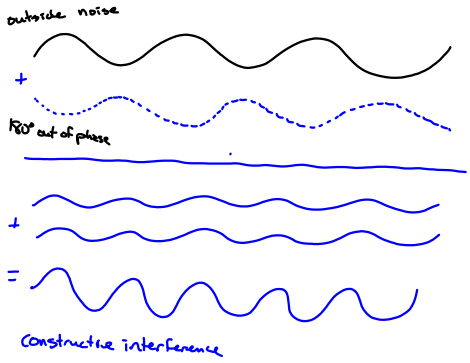
electrons as particles → Television (compact / rare)

as waves → constructive & destructive interference patterns in double-slit experiment



wave speed = wavelength x frequency

For light (& other electromagnetic radiation the speed is fixed. → $c = 3.00 \times 10^8$ m/s



Constructive interference

photons (light) also exhibit wave-particle duality

photon - a mass-less wave-packet of energy

acting as a wave → mirage effect on a hot road
rainbows effect through a prism or off of a CD surface.

acting as a particle → LASER cutting of materials
the photo-electric effect.

shorter wavelengths are diffracted through large angles

longer wavelengths are diffracte through much smaller angles

Raleigh scattering

For light waves

$c = \lambda \nu$

c = S.O.L. = 3.00×10^8 m/s

λ = wavelength (m)

ν = the frequency (m)

ν = "nu" pency "vee"

Energy of on photon $E = h\nu$

Energy (Joules)

h = Planck's constant 6.626×10^{-34} J·s

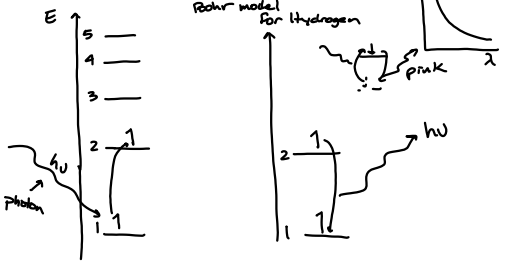
ν = frequency $\frac{1}{s}$ (s^{-1}) Hz

i) $c = \lambda \nu$

ii) $\nu = \left(\frac{c}{\lambda}\right)$

$E = h\nu$

$E = \frac{hc}{\lambda}$



Read: ~

DO: 15-22 p. 126

Quantum #s (there are four in total)

① The principal Q.N. n can take integer values (from $1 \rightarrow \infty$)

n tells us i) relative energy of the orbital

ii) relative average distance from nucleus the orbital projects.

② Angular momentum quantum number l can take integer values from 0 to $(n-1)$

l tells us i) the type of sublevel the orbital is in

ii) the shape of the orbitals in that sublevel.

If $l = 0$ then s-sublevel

$l = 1$ then p-sublevel

$l = 2$ then d-sublevel

$l = 3$ then f-sublevel

③ The magnetic quantum number m_l can take integer values from $(-l$ to $+l)$

m_l tells us i) how the orbitals project into space

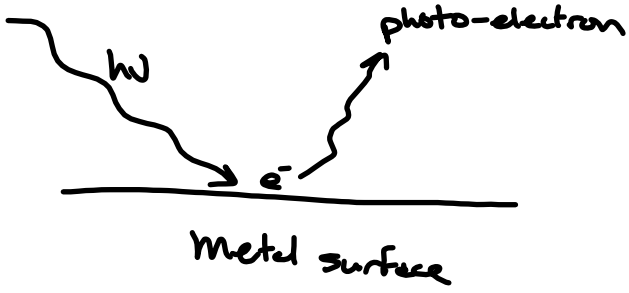
i) really, how many different orbitals are in the sublevel

So: when $l =$

	l	m_l	# of orbitals	shape
s	0	0	1	
p	1	-1, 0, +1	3	p_x p_y p_z
d	2	-2, -1, 0, 1, 2	5	
f	3	-3, -2, -1, 0, 1, 2, 3	7	right

④ The electron spin quantum # m_s $[-1/2, +1/2]$

this qn tells us i) the maximum occupancy of any orbital is $2e^-$.



ϕ = work function = the amount of energy required to release 1 electron from surf.

Wed. 1/22/20

from the homework #22

How many e^- in the following main energy levels?

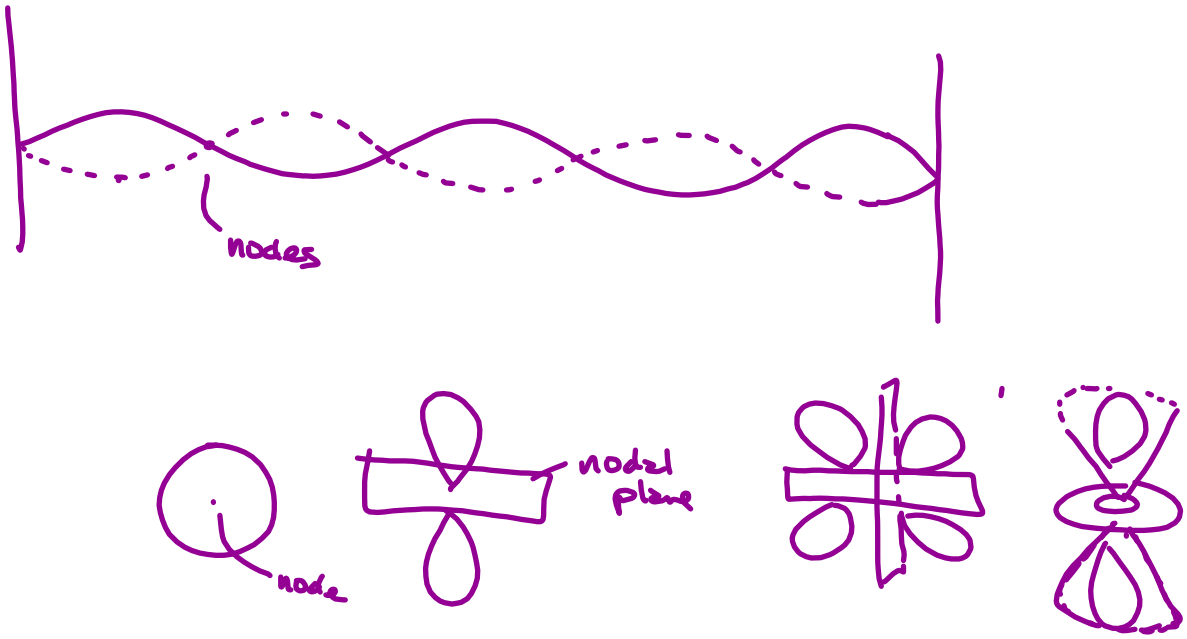
	n ($1 \to \infty$)	l [$0 \to (n-1)$]	m_l ($-l \to +l$)	m_s $-1/2; +1/2$	$\#e^-$
22) a) n=1	1	0 - s	0	$-1/2, +1/2$	2
b) n=3	3	0 - s	0	$-1/2/+1/2$	2
		1 - p	-1,0,+1		6
		2 - d	-2,-1,0,1,2		10
					18e⁻
c) n=4	4	0 - s	0 (1)		2
		1 - p	-1,0,+1 (3)		6
		2 - d	-2,-1,0,+1,+2 (5)		10
		3 - f	-3,-2,-1,0,+1,+2,+3 (7)		14
					32e⁻

d) n=6 $\#e^- = 2n^2 = 72e^-$

1	1-orb
2	3-orbs
3	5-orbs
4	7-orbs
5	9-orbs
6	11-orbs

36 orbitals x 2 = 72e⁻

Chem 1A
Homework Due 1/23/20
Read: 4.3
DO: 1-6 p.122


nodes
node
nodal plane

Thurs 1/23/20

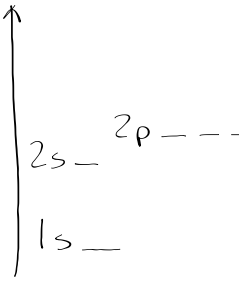
Ground State Electron Configurations in atoms

3 rules for assigning electrons to orbitals for atoms in the ground state.

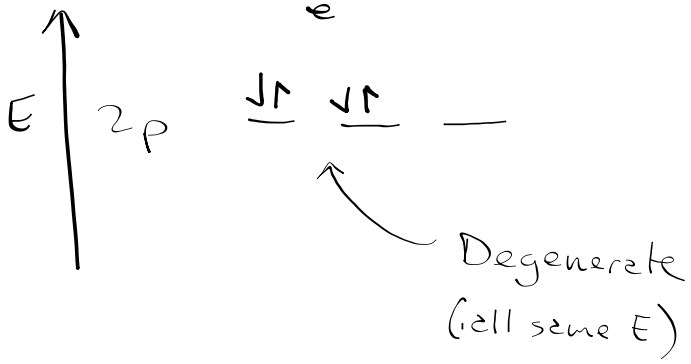
① Aufbau rule
→ "Building up"
→ lowest energy orbitals fill 1st

n l m_l m_s
2 1 0

② Pauli Exclusion Principle
→ 1 set of quantum (4) numbers can describe only 1 e^-
→ Orbitals can hold up to 2 e^- each



③ Hund's Rule
→ When e^- fill orbitals that are degenerate they fill each orbital singly before pairing up.
→ Ski Trip



Write complete electron configurations for the following

a) $_6C$

$1s^2\ 2s^2 2p^2$

b) $_{34}Se$

$[1s^2 2s^2 2p^6 3s^2 3p^6] 4s^2 3d^{10} 4p^4$

$[Ar]\ 4s^2 3d^{10} 4p^4$

$[Ar]\ 3d^{10}\ \underline{4s}^2\ \underline{4p}^4$

E ↑

$2s$ ↑↓ $2p$ ↓ ↓ —

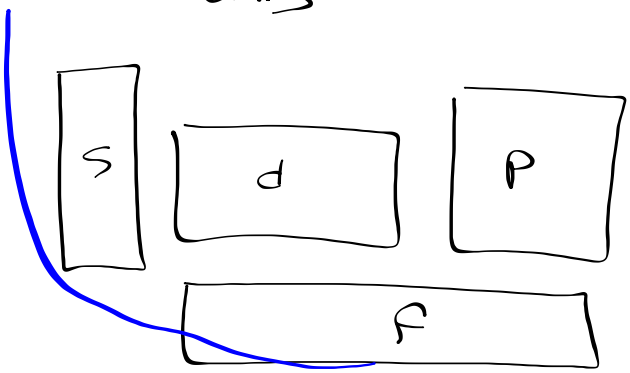
$1s$ ↑↓

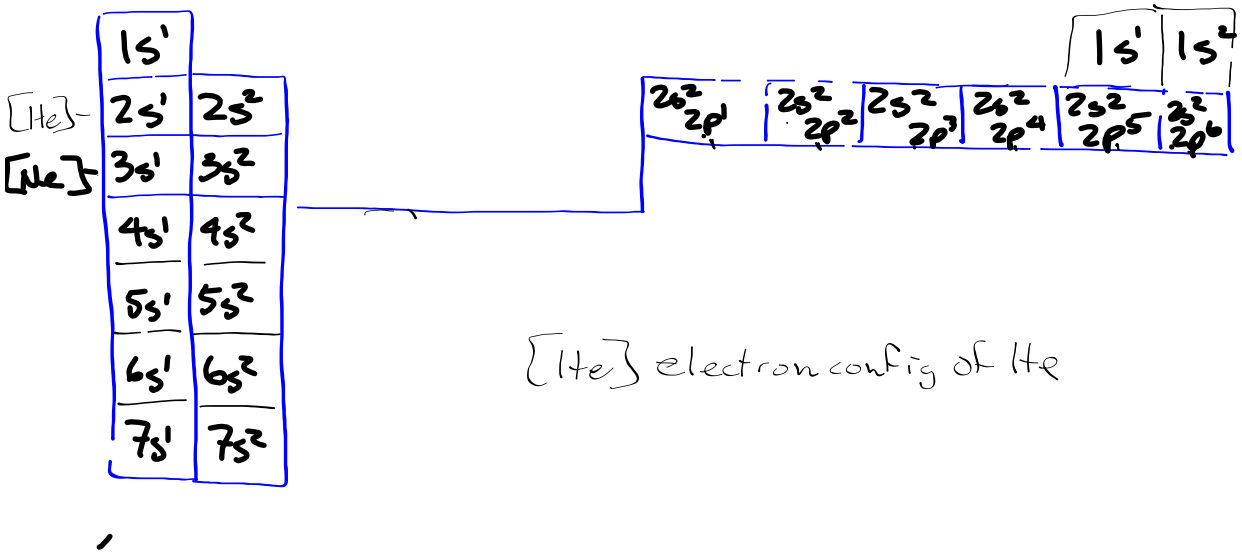
c) Cl

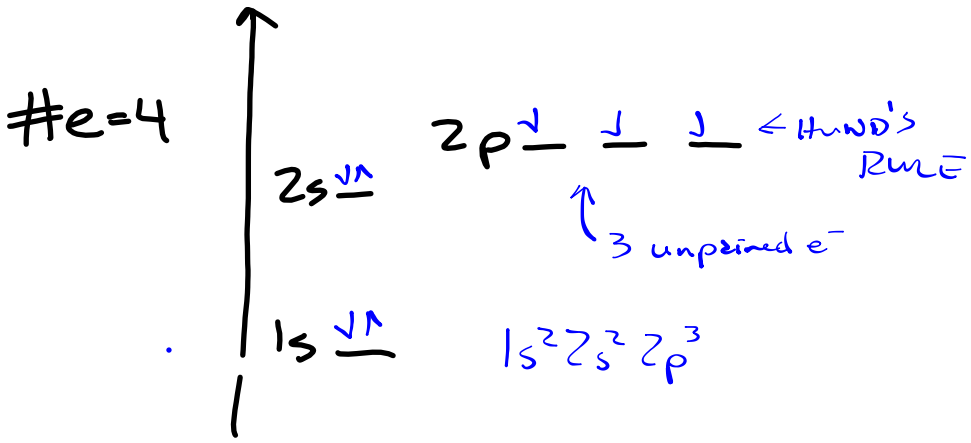
$1s^2 2s^2 2p^6 3s^2 3p^5$

d) Ca^{2+} $1s^2 2s^2 2p^6 3s^2 3p^6$

$[Ar]$

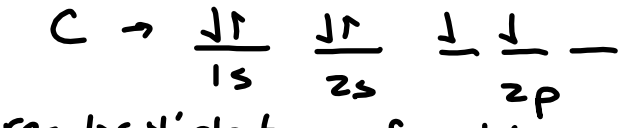



1s¹
[He]
2s¹ 2s²
3s¹ 3s²
[Ne]
4s¹ 4s²
5s¹ 5s²
6s¹ 6s²
7s¹ 7s²
1s¹ 1s²
2s² 2p¹
2s² 2p²
2s² 2p³
2s² 2p⁴
2s² 2p⁵
2s² 2p⁶
[He] electron config of He


#e=4
2s
1s
2p
← Hund's Rule
3 unpaired e⁻
$1s^2 2s^2 2p^3$

"Orbital Notation"

for

C → 

regular el' electron config notation

$1s^2 2s^2 2p^2$