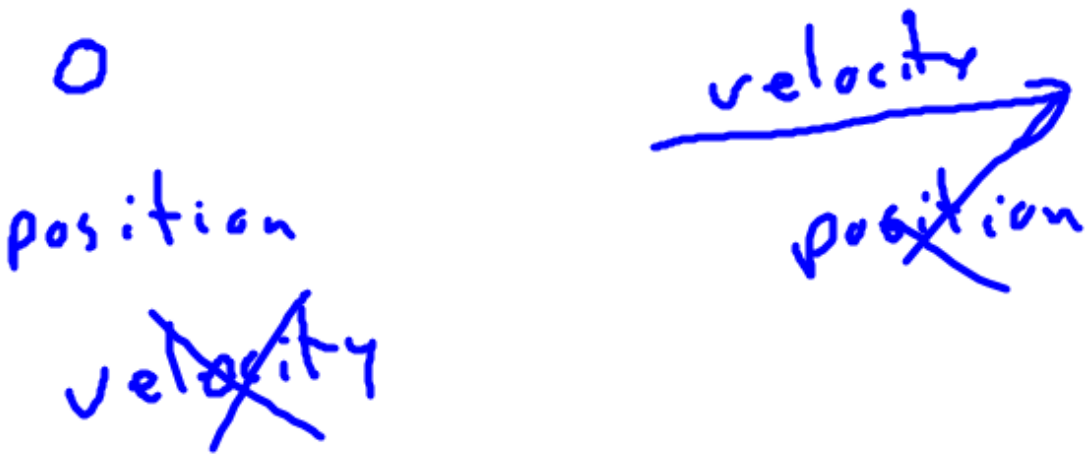
Heisenberg uncertainty principle



Quantum numbers (4)

1s
2s 2p
3s 3p

① principal quantum number (n)

values 1, 2, 3 .....

size and E

② angular momentum q.n. (ℓ)

values : 0 to n-1

n = 1	n = 2	n = 4
ℓ = 0	ℓ = 0, 1	ℓ = 0, 1, 2, 3

③ magnetic q.n (m_l)

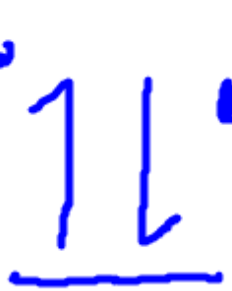
values from $-l$ to l

$l = 1$

$m_l = -1, 0, 1$

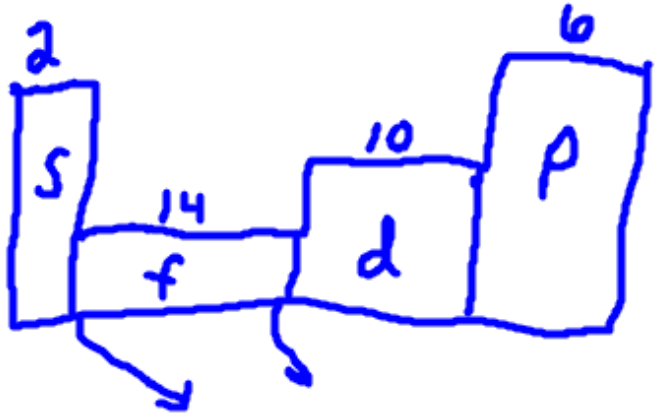
④ magnetic spin q.n (m_s)

$+\frac{1}{2}$ or $-\frac{1}{2}$



E.C. 10.D.

$m_\ell = -\ell \to +\ell$



$K = [Ar]\ 4s^1$

19 e^- 18 e^-

$\frac{1}{0}$

$n = 4$

$\ell = 0$

$m_\ell = 0$

$m_s = +\frac{1}{2}$

$\ell = 0 = s$

$\ell = 1 = p$

$\ell = 2 = d$

$\ell = 3 = f$

$\ell = 4 = g$

$Cl - [Ne]\ 3s^2\ 3p^5$

17 e^- 10 e^-

$\frac{1}{0}\ \frac{1}{0}\ \frac{1}{-1}\ \frac{1}{0}\ \frac{1}{1}$

$n = 3$

$\ell = 1$

$m_\ell = -1$

$m_s = -\frac{1}{2}$

8 val e⁻

Xe - $[Kr]$ $5s^2$ $4d^{10}$ $5p^6$

54 36

$n = 5$ $\ell = 0$ $m_\ell = 0$ $m_s = +1/2$

$n = 5$ $\ell = 1$ $m_\ell = 0$ $m_s = +1/2$

$n = 4$ $\ell = 2$ $m_\ell = 1$ $m_s = +1/2$

$n = 4$ $\ell = 2$ $m_\ell = 1$ $m_s = -1/2$

Pauli's - no 2 e⁻ can have the same 4 quantum numbers

Sublevel shapes (s, p, d, f)
0, 1, 2, 3

s

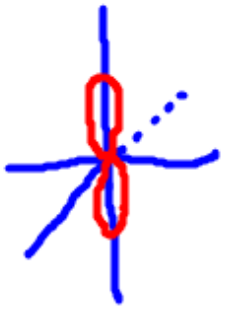
empty nodal or Node

n = 1

n = 2

p

p_x



p_y

p_z

d

p^{311}

History of P.T.

Mendeleev - put similar Element together
pattern

predicted missing elements

Eka Eka

Moseley - our P.T.

Aufbau Principle

Goofy E.C/O.D.

Groups 6 + 11

Cr - [Ar] $4s^1 3d^5$

why?

Cu - [Ar] $4s^1 3d^{10}$

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6$

Pt $[Xe]_{54\ e^-}\ 6s^2\ 4f^{14}\ 5d^8$ ∴∴∴ Bs 2 val e^-

core e^- inner

$\frac{\uparrow\downarrow}{0}$, $\frac{\uparrow\downarrow}{-3}\ \frac{\uparrow\downarrow}{-2}$ $\frac{\uparrow\downarrow}{-1}$ $\frac{\uparrow\downarrow}{0}\ \frac{\uparrow\downarrow}{1}$ $\frac{\uparrow\downarrow}{2}\ \frac{\uparrow\downarrow}{3}$, $\frac{\uparrow\downarrow}{-2}\ \frac{\uparrow\downarrow}{-1}\ \frac{\uparrow\downarrow}{0}\ \frac{\uparrow}{1}\ \frac{\uparrow}{2}$

7.1 ⟷ 7.11

n =	4	4	6	4	5	5	4	4
ℓ =	3	3	0	3	2	2	3	3
m_ℓ =	3	0	0	2	-2	0	-1	-3
m_s =	$+\frac{1}{2}$	$-\frac{1}{2}$	$+\frac{1}{2}$	$-\frac{1}{2}$	$+\frac{1}{2}$	$+\frac{1}{2}$	$+\frac{1}{2}$	$-\frac{1}{2}$