Example: Write the four quantum numbers of the last three electrons in the titanium atom of atomic number 22 (^{22}Ti), indicating the symbol of the orbital and the type of the shell.

Answer:

$^{22}Ti\ 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^2$

رقم الالكترون	n	l	ml	ms	الاوربتال	الغلاف
20	4	0	0	$-\frac{1}{2}$	4s	N
21	3	2	+2	$+\frac{1}{2}$	3d	M
22	3	2	+1	$+\frac{1}{2}$	3d	M

$\underset{0}{\boxed{\uparrow\downarrow}}$ $\begin{array}{|c|c|c|c|c|} \hline \uparrow & \uparrow & & & \\ \hline +2 & +1 & 0 & -1 & -2 \end{array}$

ملاحظة :

$\overset{0}{s}\ \overset{1}{p}\ \overset{2}{d}\ \overset{3}{f}$

$l = (n-1)$

Note: The two electrons are supposed to repulsion (تنافر) if they are present in a single orbital because they carry the same negative charge. So why do electrons do not repulsion each other when they are in the same orbitale?

Answer:

Each electron is spin around its axis at the same time the electron around the nucleus. When the electrons are coupled in one orbital, one of them will twist around its axis toward the rotation of the clock and give it the symbol . That is, one of them will be spin the opposite of the other, which eliminates their repulsion.

Example: Hw

Type the four quantum numbers of the last five electrons of NaCl

If a positive loses an electron Na^+

If a negative acquires an electron cl^-

Sodium chloride is a constant salt because the sodium is lost electron and the chloro acquires electrons and the orbital is saturated and thus same the noble gas.

Example:

Type the four quantum numbers of the last five electrons of NaCl

If a positive loses (يفقد) an electron

If a negative acquires (يكتسب) an electron

$^{11}Na \longrightarrow {}^{10}Na^{+}$ $1s^2\ 2s^2\ 2p^6$

P_x	P_y	P_z
↑↓	↑↓	↑↓
+1	0	-1

رقم الالكترون	n	l (اوربتال م)	m_l	m_s
6	2	1	0	$+\frac{1}{2}$
7	2	1	-1	$+\frac{1}{2}$
8	2	1	+1	$-\frac{1}{2}$
9	2	1	0	$-\frac{1}{2}$
10	2	1	-1	$-\frac{1}{2}$

كلوريد الصوديوم ملح ثابت لأن الصوديوم يفقد الكترون والكلور يكتسب الكترون
فالاوربتال تكون مشبع مشابه الغاز النبيل

Sodium chloride is a constant salt because the sodium is lost electron and the chloro acquires electrons and the orbital is saturated and thus same the noble gas.

تكتسب

مشبع

$$^{17}Cl \longrightarrow {}^{18}Cl^{-} \quad 1s^2\, 2s^2\, 2p^6\, 3s^2\, 3p^6$$

$3p^6$: $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}$

رقم الإلكترون	n	l (اوربيتال)	m_l	m_s
14	3	1	0	$+\frac{1}{2}$
15	3	1	-1	$+\frac{1}{2}$
16	3	1	$+1$	$-\frac{1}{2}$
17	3	1	0	$-\frac{1}{2}$
18	3	1	-1	$-\frac{1}{2}$

A:The rule $n + \ell$: gives the correct electronic order where the rule states p The lower value of $n + \ell$ gives the advantage to the orbital by filling with the electrons.

ايهما

Example: Orbital 3s, 3p whichever is low powered and filled with electrons first

	3s	3p
$n+\ell$	3+0	3+1
	3	4

اوطأ

So 3s energy down from 3P.

B: When the value of $n + \ell$ is equal to more than orbital we use the value n, the lower value of n gives the preference for the Orbital to fill with the electrons.

افضلية

Example: orbital 3d, 4p, 5s . whichever is low powered and filled with electron first.

3d	4p	5s
3+2	4+1	5+0
5	5	5

بما ان 3d اوطأ بالطاقة من 4P وبدوره اوطأ بالطاقة من 5S

$\therefore$ 3d , 4P , 5S

Example: Find the four quantum numbers of the last four electrons in the vanadium atom? V=23

$^{23}V\ 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^3$

$\underset{0}{\boxed{\uparrow\downarrow}}\quad \underset{+2}{\boxed{\uparrow}}\underset{+1}{\boxed{\uparrow}}\underset{0}{\boxed{\uparrow}}\underset{-1}{\boxed{\ \ }}\underset{-2}{\boxed{\ \ }}$

Electron NO.	n	ℓ	$m\ell$	ms	orbital	shell
20	4	0	0	$-\frac{1}{2}$	4s	N
21	3	2	+2	$+\frac{1}{2}$	3d	M
22	3	2	+1	$+\frac{1}{2}$	3d	M
23	3	2	0	$+\frac{1}{2}$	3d	M

Note: Be careful of chromium metal elements ^{24}Cr and copper ^{29}Cu as it is stable in the case of full saturation and half saturation

$^{24}Cr\ 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^4 \longrightarrow 4s^1\ 3d^5$

غير مستقرة ينتقل e من 4s الى 3d

حالة مستقرة
نصف مشبع

$\underset{4s}{\boxed{\uparrow\downarrow}}\quad \underset{3d}{\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}\boxed{\ \ }} \rightarrow \overset{4s^1}{\boxed{\uparrow}}\quad \overset{3d^5}{\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}}$

Where the electron transfer from 4s to 3d and in this case where orbital 3d is saturated (more stable).

$^{29}Cu\ 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^9 \longrightarrow 4s^1\ 3d^{10}$

فلا انتقال اوربيتالين
احدهما مشبع والاخر نصف مشبع

اكثر استقرار

Copper ^{29}Cu (transition metal) two Orbital one saturated and the other half saturated (more stable) $4s^1\ 3d^{10}$

In the case of ionization the transition metals lose electrons, as the 4s loses before 3d.

Example:

$^{23}V \quad 4s^2 \quad 3d^3$

$V^{+1} \quad 4s^1 \quad 3d^3$

$V^{+2} \quad 4s^0 \quad 3d^3$

$V^{+3} \quad 4s^0 \quad 3d^2$

$^{24}Cr \quad 4s^1 \quad 3d^5$

$Cr^{+1} \quad 4s^0 \quad 3d^5$

$Cr^{+2} \quad 4s^0 \quad 3d^4$

Example: Write the four quantum numbers of the last three electrons of the chromium element?

$^{24}Cr \ 1s^2 \ 2s^2 \ 2p^6 \ 3s^2 \ 3p^6 \ 4s^1 \ 3d^5$

↿	↿	↿	↿	↿
+2	+1	0	-1	-2

Electron NO.	n	ℓ	$m\ell$	Ms
22	3	2	0	$+\frac{1}{2}$
23	3	2	-1	$+\frac{1}{2}$
24	3	2	-2	$+\frac{1}{2}$