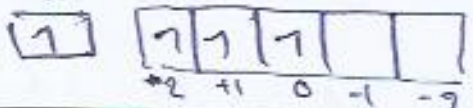
Example: Write the four quantum numbers of the last four electrons in the vanadium ion V^{+1} atomic number 23?

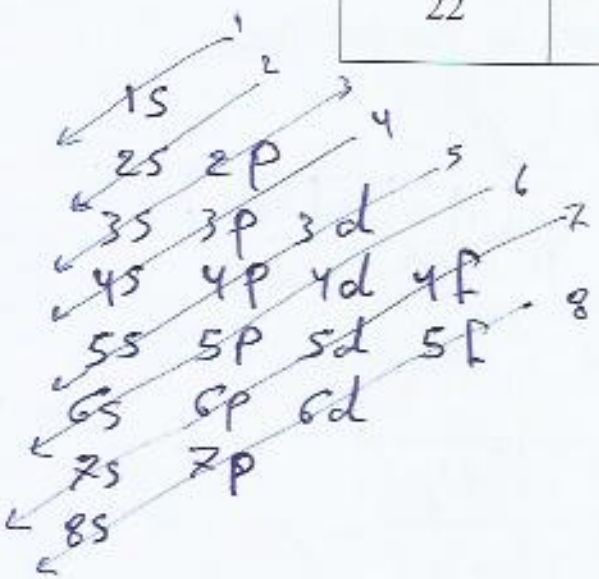
$^{23}V \; 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$

V^{+1} - - -

$4s^1 \; 3d^3$



Electron NO.	n	ℓ	mℓ	Ms
19	4	0	0	$+\frac{1}{2}$
20	3	2	+2	$+\frac{1}{2}$
21	3	2	+1	$+\frac{1}{2}$
22	3	2	0	$+\frac{1}{2}$



يمكن اتباع المخطط لمعرفه الترتيب الالكتروني للاوربيتالات في الاذى طاقه ومن الاعلى طاقه

1s 2s 2p 3s 3p 4s 3d 4p 5s 4d 5p 6s
4f 5d 6p 7s 5f 6d 7p 8s

امثله : الترتيب الالكتروني للعناصر

$^{5}B \; 1s^2 2s^2 2p^1$

$^{8}O \; 1s^2 2s^2 2p^4$

$^{10}Ne \; 1s^2 2s^2 2p^6$

$^{12}Mg \; 1s^2 2s^2 2p^6 3s^2$

$^{15}P \; 1s^2 2s^2 2p^6 3s^2 3p^3$

$^{21}Sc \; 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$

^{25}Mn ?

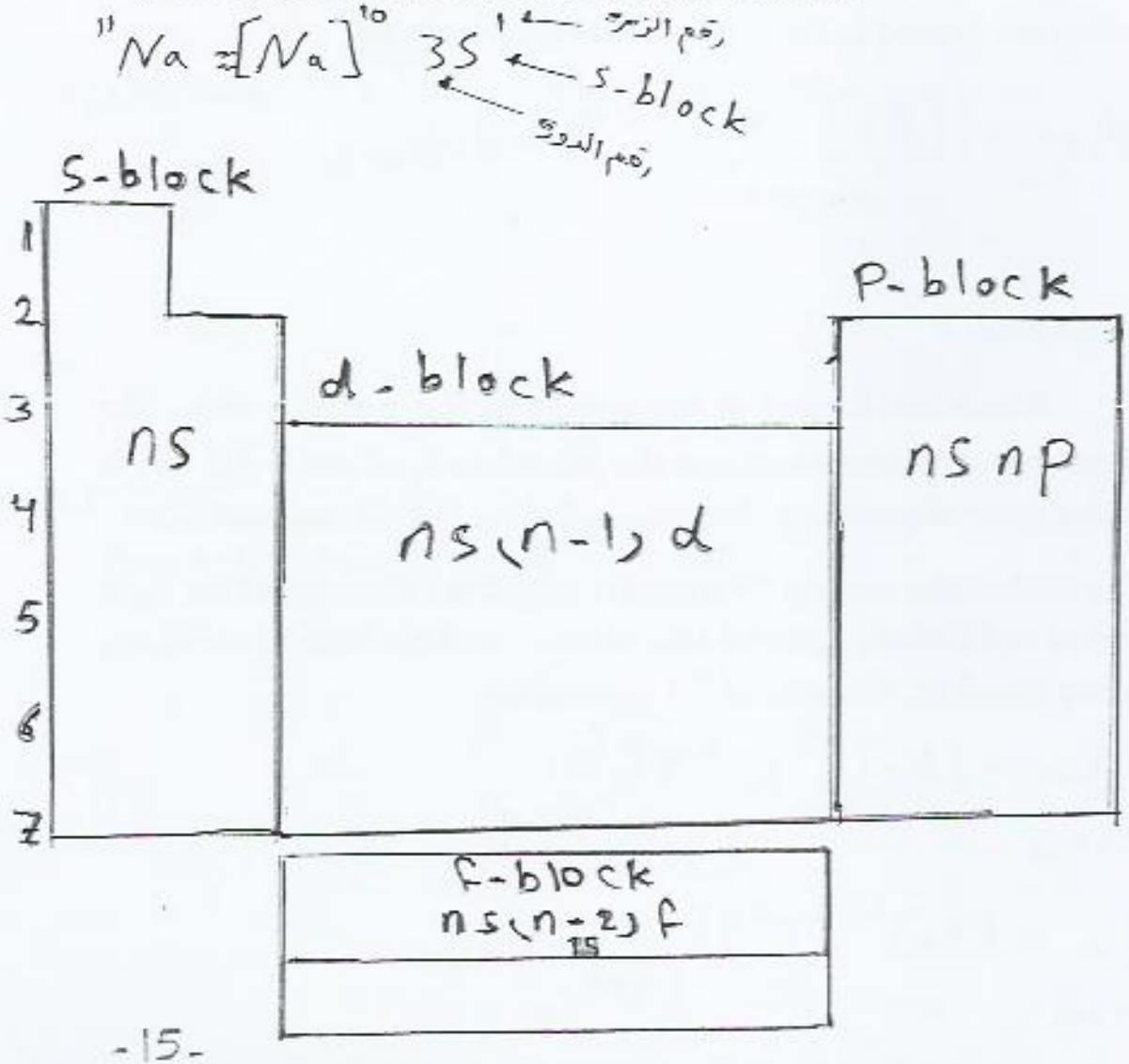
^{28}Ni ?

Periodic Table of the Elements

Periodic table: A table of elements arranged by elements according to the increase of their atomic numbers and contains 8 groups (Vertical) and 7 period (Horizontal).

Equivalent electrons, the electrons in the external energy levels, determine the physical and chemical properties of the element. Classification of elements depends on these properties. The elements can be divided into four groups depending on the type of secondary level s, p, d, f.

1. s-block : The elements are located to the left of the periodic table and include the groups IA, IIA and end the electronic arrangement at the secondary energy level (S) except helium where it is placed with the noble elements in the far right ns and n represents the main outer shell number as well as the periodic number and the main quantum number.



2. p-block

Which are located at the right of the periodic table. And its electronic structure ends at the secondary level (ns np) and includes six groups IIIA, IVA, VA, VIA, VIIA, VIIIA

n represents the last shell number as well as the period number. The number of the group equals the sum of electrons ns np

$^{16}S = [Ne]^{10}\ 3s^2\ 3p^4$ — p-block

رقم الدورة — الزمرة السادسة = 2+4

3- d-block

These are metal elements that terminate the electronic arrangement ns (n-1)d and are called the main transition elements, which are located in the middle of the periodic table

$^{25}Mn = [Ar]^{18}\ 4s^2\ 3d^5$ — d-block

الدورة الرابعة — الزمرة السابعة = 2+5

4 - f-block

Which are located at the bottom of the periodic table. The electronic arrangement ends at the secondary level ns(n-2)f and is called internal transition elements, including lanthides and lactinides. — Lanthanids

The lanthanides contain 14 elements, which are elements of the sixth period and include elements with atomic numbers from 57 to 70, not group found for elements of the lanthanides

يحتوي على ١٤ عنصر في كل دورة

$^{62}Sm = [Xe]^{54}\ 6s^2\ 4f^6$

Samarium — الدورة السادسة — عدد الإلكترونات في الفلك الفرعي f

$^{57}La = [Xe]^{54}\ 6s^2\ 4f^1$

Lanthanium — الدورة السادسة — عدد الإلكترونات في الفلك الفرعي f

The actinides include 14 elements, the elements of the seventh period, n = 7, and the elements with the atomic numbers from 89 to 102, not group found for elements of the actinides.

يورانيوم $^{92}U = [Rn]^{86} 7s^2 5f^3 6d^1$

الدورة السابعة — قطاع f

Important Notes:

1- Within a single period, the number of the main quantum n is constant by increasing the atomic number and changed of quantum number for ms, mℓ, and ℓ.

2-Within the same group, the main of the quantum number n varies by increasing the atomic number and stay the quantum number of ms, mℓ, ℓ is similar to the elements of the group. Therefore, the elements of the same group are similar in chemical properties and their effectiveness change with the atomic number.

3-The electronic structure is supposed to be $[Rn]\,7s^2\,5f^4$ But the rapprochement of the 5f and 6d energy level, the electrons in all the actinides elements enter 5f and 6d at the same time, so all the elements of the actinides are abnormal in their electronic order.

4- Noble gases are the elements of the group VIIIA (VIII) $ns^2\ np^6$ and the helium element and the outer shell is saturated with electrons and helium $1s^2$.

$^{2}He, {}^{10}Ne, {}^{18}Ar, {}^{18}Kr, {}^{54}Xe, {}^{86}Rn$

5- Abnormal in the electronic arrangement where d^5 is half saturated so these elements are more stable

^{24}Cr $^{18}[Ar]$ $4s^1$ $3d^5$

^{42}Mo $^{36}[Kr]$ $5s^1$ $4d^5$ Molybdenum

^{74}W $^{54}[Xe]$ $6s^1$ $4f^{14}$ $5d^5$ Tungsten

Where d^{10} is saturated so these elements are more stable and be less effective.

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

Ag [Kr] $5s^1$ $4d^{10}$

Au [Xe] $6s^1$ $4f^{14}$ $5d^{10}$

Some periodic properties of atoms

Shielding constant

The effective charge of the nucleus (the nuclear charge): This is what any electron in an atom feels from an actual attraction by the nucleus.

The effective charge of the nucleus is denoted by the letter Z * and given by the relationship

$Z^* = Z - S$

S = Shielding constant

Z = atomic number

To calculate Z * we need value S ...

S is calculated for electrons, s, p, differently than electrons.

In orbital (d).

To calculate the shielding constant of the electron in orbital s, p:

1. All electrons in the same shell (same quantum layer n) with the electron in question are shielded by 0.35.
2. All electrons in the shell (n-1) relative to the electron in question are shielded by 0.85.
3. All electrons in the shell (n-2) and below the proportion of the electron in question block a complete shielded equal to 1.

As for the electrons in orbital d and f are the base.

- The electrons in orbital d are shielded by 0.35 and all the remaining electrons to the left of d in the electronic order block a complete blockage equal to 1.

The electronic range for the purpose of calculating the shielding constant shall be written as follows:

(1s) (2s=2p) 3s=3p, 3d, (4s=4p, 4d, 4f), (5s=5p)

Example: Calculate the effective charge of the nucleus on the end of the electron in the fluorine atom, the atomic number equals 9?

Answer:

^{9}F $(1s)^2$ $(2s^2=2p^5)^7$

$S = 6 * 0.35 + 2 * 0.85$

$S = 2.10 + 1.70$

$S = 3.80$

$Z^{*} = Z - S$

$= 9 - 3.8$

$= 5.2$ الشحنه المؤثره للنواه

Example: Calculate the effective charge of the nucleus felt by the tenth electron in the calcium atom ^{20}Ca?

Answer: $(1s)^2$ $(2s=2p)^8$ $(3s=3p)^8$ $3d^0$ $(4s=4p)^2$

$S = 7 * 0.35 + 2 * 0.85$

$S = 2.45 + 1.70 \longrightarrow 4.15$

Note: $Z^{*} = 20 - 4.15 = 15.85$

All the electrons to the right of the electron concerned, المعنى whether the electron in question, s, p, d, does not enter into the shielding constant calculation.