

## TD Sheet N°03 of Chemistry 1

### Exercise 1

- 1- Provide the various atomic orbitals that can describe the behavior of the electron in the hydrogen atom in the  $n = 3$  level.
- 2- Also provide the number of corresponding orbitals.
- 3- What is the maximum number of electrons that this shell can contain?

### Exercise 2

The quadruplets that can define the state of an electron in an atom are given below:

$(5,0,0,1/2)$  ;  $(2,1,2,-1/2)$  ;  $(2,2,2,1/2)$  ;  $(3,-1,1,-1/2)$  ;  $(4,1,-1,-1/2)$  ;  $(4,2,2,1)$  ;  $(5,2,2,-1/2)$  ;  $(7,3,-2,0)$  ;  $(8,1,-1,1/2)$  .

1. Among these quadruplets, which ones are impossible? Specify the reason for this impossibility.
2. Provide the symbols of the atomic orbitals corresponding to the possible quadruplets.
3. An electron occupies a 5f atomic orbital. In which quadruplets can this electron be described?

### Exercise 3

Using the Klechkowsky rule, arrange the following subshells in order of increasing energy:

6s; 3s; 3d; 2s; 3p; 4s; 4f; 2p; 5s; 5p; 4d; 6p; and 7s.

### Exercise 4

The following chemical elements are given in their ground state:  ${}^3\text{Li}$  ;  ${}^{12}\text{Mg}$  ;  ${}^9\text{F}$  ;  ${}^{22}\text{Ti}$  ;  ${}^{25}\text{Mn}$  and  ${}^{36}\text{Kr}$

- 1- Provide the position of each element in the periodic table (period and group).
- 2- Provide the quantum numbers (n, l, m, s) of the last electron for each element.
- 3- Among these elements, which ones are not transition elements? Are there any noble gases?

### Exercise 5

1- Molybdenum (Mo) belongs to the chromium (Cr) family with  $Z=24$  and is in the fifth period. Provide its electron configuration and atomic number.

2- Cesium (Cs) belongs to the same family as potassium (K) and the same period as gold (Au). Provide its electron configuration and atomic number.

### Exercise 6

In each of the following two series:

Series 1:  ${}^{55}\text{Cs}$  ;  ${}^9\text{F}$  ;  ${}^{19}\text{K}$  ;  ${}^3\text{Li}$  ;  ${}^7\text{N}$

Series 2:  ${}^{13}\text{Al}$  ;  ${}^{49}\text{In}$  ;  ${}^9\text{F}$  ;  ${}^8\text{O}$  ;  ${}^{14}\text{Si}$  ;  ${}^{16}\text{S}$

- 1- Classify the elements in ascending order of the radius of their atoms.
- 2- Classify the elements in ascending order of 1st ionisation energy.

### Exercise 7

1) Give the Lewis forms for the following molecules and molecular ions:

$\text{F}_2$    2)  $\text{CO}_2$    3)  $\text{HCN}$    4)  $\text{SO}_2$    5)  $\text{NO}_2^+$    6)  $\text{ClO}^-$