BADJI MOKHTAR UNIVERSITY - ANNABA
MATERIALS SCIENCE 2026-2027
CHEMISTRY 1 Series No. 4: Periodic Classification of Elements

Exercise1 :
a) Consider the electronic states corresponding to the following notations: $1s, 3p, 3f, 2d, 5p, 4d$. Which ones cannot exist? Applying Klechkowski's rule, classify the remaining orbitals in order of increasing energy. Justify.
b) Among the possible combinations, which ones are permitted for an electron of the same atom? Specify the corresponding orbital and deduce the atomic number Z of each atom:

Quantum Numbers of the Electron	n	l	m	s
A	1	1	0	$-\frac{1}{2}$
B	2	1	0	$-\frac{1}{2}$
C	3	0	+1	$-\frac{1}{2}$
D	4	3	-3	$+\frac{1}{2}$
E	5	2	0	$+\frac{1}{2}$

c) Give the four quantum numbers characterizing the five electrons of Boron (B) in its ground state.

Exercise 2 :
1- Give the atomic number of the elements whose quantum numbers of the last electron are:

- **A**/ $n = 4, l = 2, m = -1, s = -1/2$;
- **B**/ $n = 5, l = 0, m = 0, s = -1/2$;
- **C**/ $n = 5, l = 1, m = +1, s = -1/2$.

2- What are the electronic configurations of the transition elements having 4 and $9d$-electrons and belonging to the fourth period?

3- Give the electronic configurations of the following elements (period, group) and deduce their atomic numbers: I(period, VIIA); Hg(period, IIB); Te(period, VIA).

Exercise 3:
I- Let the following atoms and ions be given:
^{18}Ar, ^{19}K, $^{20}Ca^{2+}$, ^{30}Zn, $^{35}Br^{-}$, $^{37}Rb^{+}$, ^{40}Ca, ^{36}Kr, and $^{27}Co^{2+}$.
1- Give the electronic configurations. Are there any isoelectronic species?
2- Find their positions in the periodic table.

II- Classify in order of increasing electronegativity, first ionization energy, and atomic radius the following elements: ^{19}K, ^{30}Zn, ^{35}Br, and ^{37}Rb.

Exercise 4 : An element with an atomic number less than 20possesses one unpaired electron.

- What are the various possibilities?
- If, furthermore, this element belonged to the p-block, what would the possibilities be then?
- If this element belonged to the Astatine group ($Z = 85$), what would the possibilities be then?
- Identify the element if it belonged to the period of Argon.