Mohamed Khider University of Biskra
Faculty of Exact Sciences and Natural and Life Sciences

1st year LMD – SNV Biology **Academic year: 2024/2025**
Subject: Chemistry 1

Applied exercises series No. 1

(Fundamentals of chemistry)

Exercise 1:

$$^{A}_{Z}X^{q}$$

1. Numerical indications in the three positions A, Z and q can be given to the symbol X of an element. What exactly does each of them mean?

2. Give the numbers of protons, electrons and neutrons of the different elements:

$$^{59}_{28}Ni\ ,\quad ^{127}_{53}I^{-}\ ,\quad ^{27}_{13}Al^{3+}\ ,\quad ^{9}_{4}Be$$

3. Calculate the mass of the Beryllium atom in grams and atomic mass units (a.u.m.).
We give: $m_p=1.67\ 10^{-27}$; $m_N=1.67\ 10^{-27}$; $m_e = 9.11\ 10^{-31}$ (en Kg).

Exercise 2:

1. Calculate the charge of $^{A}_{Z}X^{q}$ an iron core (Fe, A=56, Z=26)

2. An atom has the symbol $^{A}_{z}X$ its nucleus has a charge equal to $1.12\ 10^{-18}$ C and it has 7 neutrons.

Determine A and Z.

Exercise 3:

1. Four nuclides A, B, C and D have nuclei made up as shown below:

	A	B	C	D
Protons number	21	22	22	20
Neutrons number	26	25	27	27
Masses number	47	47	49	47

Are there isotopes among these four nuclides?

2. Magnesium is a mixture of the following three isotopes: ^{24}Mg (78.99%); ^{25}Mg(?); ^{26}Mg (11.01%).

a. Calculate the abundance of the second isotope.

b. Calculate the average relative atomic mass (isotope average) of magnesium.

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Applied exercises series No. 2

(Nuclear reactions and radiation)

Exercise 1:

Complete the following nuclear reactions and indicate their nature:

$$^{63}_{29}Cu + {}^{1}_{0}n \longrightarrow {}^{64}_{30}Zn + ...$$

$$^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{132}_{51}Sb + ... + 3\,{}^{1}_{0}n$$

$$^{1}_{1}H + ... \longrightarrow {}^{4}_{2}He + \gamma$$

$$^{27}_{13}Al + ... \longrightarrow {}^{30}_{15}P + {}^{1}_{0}n$$

$$^{10}_{5}B + {}^{4}_{2}He \longrightarrow {}^{13}_{6}C^{*} + ...$$

Exercise 2:

The β- decay period of carbon-14 is $5.7\ 10^3$ years.

1. Write the decay reaction of carbon-14.

2. Calculate the decay constant λ.

3. Calculate the time after which 90% of the element has disintegrated.

Exercise 3:

Write in detail the following reactions and complete them with the missing particles:

$$^{43}_{20}Ca(?, p)\,{}^{46}_{21}Sc \quad ; \quad {}^{14}_{7}N\,(?, \gamma)\,{}^{15}_{7}N \quad ; \quad {}^{26}_{12}Mg\,(?, p)\,{}^{27}_{12}Mg \quad ; \quad {}^{212}_{84}Po(\alpha) \quad ; {}^{106}_{47}Ag(\beta^-)$$