

Series N°1 Chemistry

Exercise 01:



- The three positions A, Z and q can be assigned to the X symbol of an element. What exactly does each one mean?
- Consider the following elements represented by the symbols A, B, C, D, E and F:
 ${}^{24}_{12}A$, ${}^{16}_8B$, ${}^{20}_{10}C$, ${}^{26}_{12}D$, ${}^{22}_{10}E$, ${}^{25}_{12}F$
 Give in table form the number of protons, neutrons, electrons and nucleons making up each element.
 How many different elements are there?
 Are there isotopes among the elements?

Exercise 02:

How many moles, atoms and molecules are there in 2 g of dihydrogen (H₂)?

Exercise 03:

Which of the following samples contains the most iron?

- 0.3 atom-gram of iron.
- $2.5 \cdot 10^{23}$ iron atoms.
- 0.2 mole of Fe₂(SO₄)₃.
- 20g iron.

Data: $M_{Fe} = 56 \text{ g}\cdot\text{mol}^{-1}$; $M_s = 32 \text{ g}\cdot\text{mol}^{-1}$ Avogadro number $N = 6.023 \cdot 10^{23}$.

Exercise 04:

- The nucleus of the nitrogen atom N (Z=7) is made up of 7 neutrons and 7 protons.
 - Calculate the theoretical mass of this nucleus in u.m.a., and compare it with its real value of 14.007515u.m.a.
 - Calculate the cohesive energy of this nucleus in J and eV.

Data: $m_p = 1.007277 \text{ u.m.a.}$ $m_n = 1.008665 \text{ u.m.a.}$ $m_e = 9.109534 \cdot 10^{-31} \text{ kg.}$ $c = 3 \cdot 10^8 \text{ ms}^{-1}$

- Calculate the atomic mass of natural nitrogen, knowing that :
 ${}^{14}\text{N}$ has a mass of 14.007515u.m.a and an isotopic abundance of 99.635%.
 ${}^{15}\text{N}$ has a mass of 15.004863u.m.a and an isotopic abundance of 0.365%.

Exercise 05:

Natural magnesium is a mixture of three isotopes with the following atomic masses and relative abundances:

Isotope	Atomic mass	Relative abundance (%)
${}^{24}_{12}\text{Mg}$	23,9850	78,99
${}^{25}_{12}\text{Mg}$	24,9858	10,00
${}^{26}_{12}\text{Mg}$	24,9826	11,01

How many atoms are there in a 3.00 g sample of magnesium?