

Exercise no. 1:

Complete the following table by indicating the isotopic elements:

Atoms and ions	Nucleon number	Atomic number	Neutrons	Protons	Electrons	N/Z	N/e ⁻
X ₁	208					1,536	
X ₂	40			20			
X ₃		53				1,396	
X ₄		82	125				
X ⁻	127						1,370
X ²⁺			20		18		

Exercise no. 2:

The masses of the proton, neutron, and electron are respectively $1.6723842 \cdot 10^{-24}$ g, $1.6746887 \cdot 10^{-24}$ g, and $9.10934 \cdot 10^{-28}$ g.

1. Define the atomic mass unit (a.m.u.). Give its value in (g) with the same number of significant figures as the masses of particles of the same order of magnitude.
2. Calculate the masses of the proton, neutron, and electron in a.m.u. to the nearest 10^{-4} .
3. Using Einstein's relation (mass-energy equivalence), calculate the energy content of one a.m.u. expressed in MeV ($1 \text{ eV} = 1.6 \cdot 10^{-19}$ Joules).

Exercise no. 3: Which of the following samples contains the most iron?

- 0.3 gram-atom of iron.
- $2.5 \cdot 10^{23}$ iron atoms.
- 0.2 mole of $\text{Fe}_2(\text{SO}_4)_3$.
- 20 g of iron.
- Data: $M_{\text{Fe}} = 56 \text{ g} \cdot \text{mol}^{-1}$; $M_{\text{S}} = 32 \text{ g} \cdot \text{mol}^{-1}$; Avogadro's number $N = 6.023 \cdot 10^{23}$.

Exercise no. 4:

At exists as two isotopic forms: $^{210}_{85}\text{At}$ and $^{212}_{85}\text{At}$ with atomic masses of 209.64 u and 211.66 u respectively.

- a- What are the numbers of protons and neutrons in the 2 isotopes? b- Knowing that the atomic mass of natural At is 210.197 u, determine the relative abundance of the 2 isotopes.

Exercise no. 5:

- 1- Consider the nuclide $^{20}_{9}\text{F}$: a- What is the composition of the nucleus? b- What is the corresponding mass defect? Deduce the binding energy per nucleon (J/nucleon and MeV/nucleon). The masses given are: proton = 1.00758 u, neutron = 1.00897 u, and ^{20}F nucleus = 20.0063 u.