Problem 1:
A radionuclide $^{62}_{29}Cu$ emits $\beta^+$ radiation with a half-life $T_{1/2} = 9.76$ min. Determine the particle composition of the daughter’s nuclide atom coming from this decay and determine a decay constant $\lambda$.

Problem 2:
A uranium nucleus $^{238}_{92}U$ is gradually changing to other nuclei (the decay series). This uranium series consist of eight alpha decays and six beta decays. What is the final product of this decay series?

Problem 3:
Determine $^A_ZX$ in the following nuclear reactions:

a) $^1_1H + ^A_ZX \rightarrow ^4_2He + ^4_2He$

b) $^{14}_7N + ^A_ZX \rightarrow ^{17}_8O + ^1_1H$

c) $^A_ZX \rightarrow ^{60}_{27}Co + \gamma$

d) $^A_ZX + ^4_2He \rightarrow ^{12}_6C + ^0_0n$

Problem 4:
During bombardment of carbon nucleus $^{12}_6C$ by deuterons $^2_1H$ a nuclear reaction in which the emergence of a radioactive nucleus of nitrogen and emission of neutron take place. (a) Write down this nuclear reaction by using the symbols of chemical elements. (b) The nitrogen nucleus is further transformed while a positron is emitted. Which nucleus is formed from this transformation?
Problem 5:
The half-life $T_{1/2}$ is defined as the time at which half of the nuclei from the original amount $N_0$ will decay. Does that mean that over $2T_{1/2}$ all nuclei $N_0$ will decay?

Problem 6:
The RaA element arises from $^{238}\text{U}$ by emitting five successive alpha and two beta particles. Identify the RaA element.

Problem 7:
An alpha emitter contains $10^{12}$ radioactive nuclei with a half-life $T_{1/2} = 3$ min. How many nuclei decay in 1 s, in 1 min., in 3 min. and in 6 min.?

Problem 8:
A radioactive isotope with a half-life $T_{1/2}$ emits one particle in each nucleus decay. There are $N_0$ nuclei at the beginning. How many particles were emitted in time $3T_{1/2}$?

Problem 9:
A thermal neutron beam with a kinetic energy $E_{\text{thermal}} = 0.025$ eV is brought out from a nuclear reactor. Calculate what fraction from a total number of neutrons $N_0$ will decay on the length of one meter. The neutron half-life is 10.37 min.

Problem 10:
A solution with a radioisotope $^{24}\text{Na}$ of activity $A_0 = 2$ kBq was injected into the blood of man. Volume activity $a_v$ of the blood was measured 5 hours after the injection and it was determined to be 265 kBq/m$^3$. Determine a volume of the man’s blood in liters. The half-life of $^{24}\text{Na}$ is 15 hours.