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:
By simultaneously conserving energy and momentum, find the alpha-particle energy emitted in the decay of a nucleus with mass number 210 if the Q-value of the decay is 5.50 MeV.

Problem 4:
During bombardment of carbon nucleus $^{12}_{6}C$ by deuterons $^{2}_{1}H$ 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 $^{238}_{92}U$ 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.
**Problem 11:**
What is the lowest wavelength limit of the X-rays emitted by a tube operating at a potential of 195 kV?

**Problem 12:**
Calculate the specific activity of pure tritium (\(^3\text{H}\)) with a half-life of 12.26 years.

**Problem 13:**
What is the highest energy to which doubly ionized helium atoms (alpha particles) can be accelerated in a direct current accelerator with 3 MV maximum voltage?