

1 What is the energy in Joules corresponding to 10MeV ?

Use the conversion factor that is

$$1eV = 1.6 \times 10^{-19} J.$$

$$10MeV = 10 \times 10^6 eV = 1.0 \times 10^7 eV$$

Now we have,

$$1.0 \times 10^7 eV * 1.6 \times 10^{-19} \frac{J}{eV} = 1.6 \times 10^{-12} J$$

2 What particle is emitted during nuclear alpha decay? Can alpha particles penetrate a thin layer of lead ?

During alpha decay an atomic nucleus decays and emits an α -particle. The α -particle looks identical to the helium-4 nucleus that has been stripped of both its electrons (completely ionized).

Since the α -particle is heavy and moves very slow once emitted, it is very likely to interact with other atoms strongly, due to the fact that it's missing both of its electrons. Since the lead is very dense material, the α -particle should interact with a thin layer of lead and not be able to pass through it. In fact, even a piece of paper should stop an α -particle.

3 There are two isotopes of uranium, U-235 and U-238. What is the main difference between them ?

The main difference between them is their number of neutrons. U-235 has 143 neutrons and U-238 has 146 neutrons. They both have the same number of protons, which is 96. Both are alpha particle emitters, that is they decay by emitting an α -particle. The half life of U-235 is roughly 700 million years while U-238 is roughly 4.4 billion years which makes a great isotope for dating the age of earth.