



# What is radioactivity?

**The atoms making up matter are generally stable, but some of them are spontaneously transformed by emitting radiations which release energy. This is called radioactivity.**

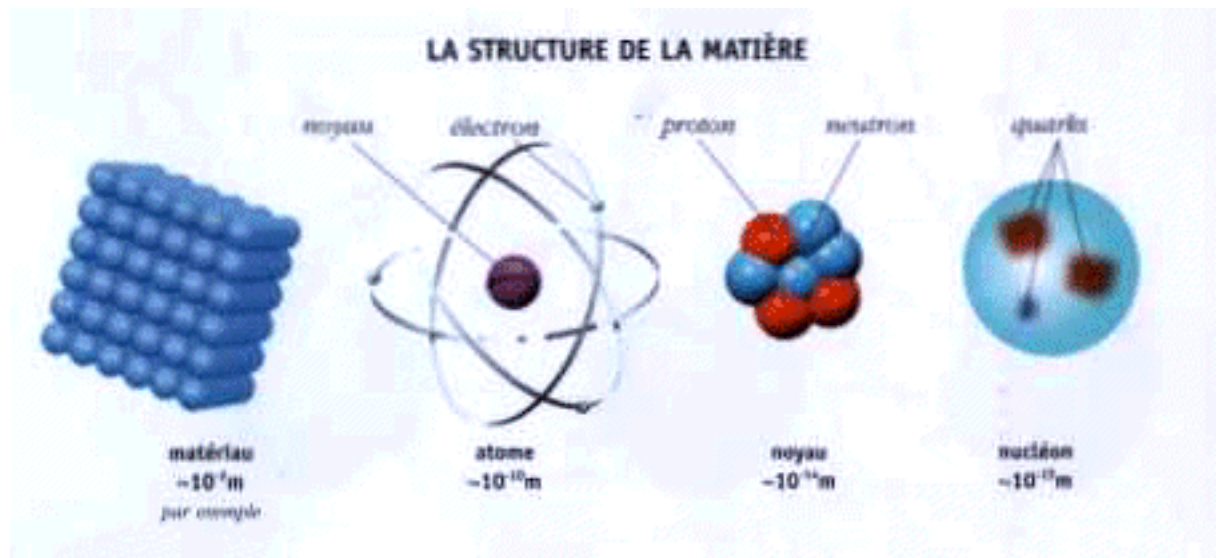
## Atoms

In nature,  
matter -  
whether  
water, gas,  
rocks, living  
beings -  
consists of  
molecules,  
which are  
combinations  
of atoms.  
Atoms  
include a  
positively  
charged  
**nucleus**,  
around which  
move  
negatively  
charged  
**electrons**.  
The atom is  
neutral.

**The structure of matter**

The nucleus of the atom includes positively charged protons as well as neutrons. It is this nucleus that is transformed when a radiation is emitted by radioactivity.

Protons and neutrons are, in turn, composed of quarks.



## Isotopes

All atoms with nuclei having the same number of protons form a **chemical element**. Having the same number of protons, they have the same number of electrons, hence the same chemical properties. When they have different numbers of neutrons, they are called "**isotopes**". Each isotope of a given element is designated by the total number of its **nucleons**, i.e. protons plus neutrons.

For instance, Uranium-238 and Uranium-235 both have 92 electrons. Their nuclei have 92 protons. Isotope 238 has 146 neutrons, and Uranium-235 has 143 neutrons.

## Radiations from radioactivity

There are three types of radiations corresponding to three types of radioactivity.

### alpha radioactivity

corresponds to the emission of a helium nucleus, a particularly stable structure consisting of two protons and two neutrons, called an alpha particle.

### beta radioactivity

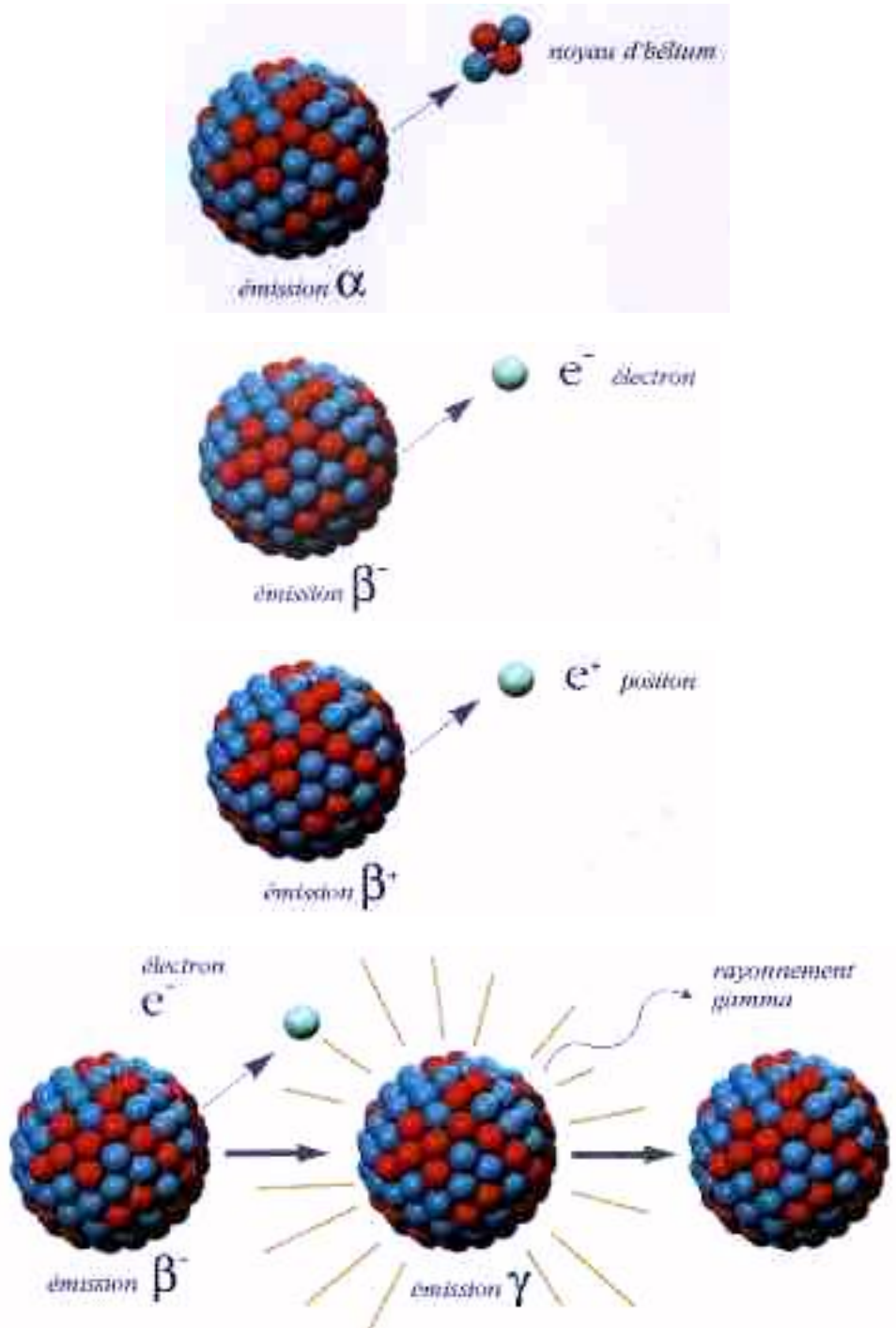
corresponds to the transformation, in the nucleus:

- either of a neutron into a proton, beta<sup>-</sup> radioactivity, characterised by the emission of an electron e<sup>-</sup>

- or of a proton into a neutron, beta<sup>+</sup> radioactivity, characterised by the emission of an anti-electron or positron e<sup>+</sup>. It only appears in artificial radioactive nuclei produced by nuclear reactions.

**gamma radioactivity**, unlike the other two, is not related to a transmutation of the nucleus. It results in the emission, by the nucleus, of an electromagnetic radiation,

### THE various types of radioactivity



What is radioactivity ?

like visible light or X-rays,  
but more energetic.

gamma radioactivity can  
occur by itself or together  
with alpha or beta  
radioactivity.

