

BASIC PHYSICS TERMINOLOGY

Atomic (proton) number = is the number of protons found in the nucleus of an atom.

Neutron number = is the number of neutrons found in the nucleus of an atom.

Mass number (atomic mass number or nucleon number, A) = is the number of nucleons (protons and neutrons) in an atomic nucleus.

Nuclide = species of atom characterized by its nucleon number and proton number.

Radionuclide = is an atom with an unstable nucleus. The radionuclide undergoes radioactive decay by emitting a gamma ray(s) and/or subatomic particles. Radionuclides may occur naturally, but can also be artificially produced.

Isotopes = nuclides that have the same proton number but different mass numbers.

Radioisotope = radioactive species of a given element

Isomers = two nuclides that differ from one another in that one is a metastable state of the other.

Isobars = nuclides with the same mass number (A) but different proton number.

Isotons = nuclides with the same neutron number but different proton number.

Radioactivity = property of certain nuclides of spontaneously emitting particles, gamma radiation, or X radiation.

Radioactive disintegration = spontaneous nuclear transformation in which particles and/or gamma radiation are emitted, or X radiation is emitted following orbital electron capture, or the atomic nucleus undergoes spontaneous fission.

Alpha particles = are a highly ionizing form of particle radiation that have low penetration. They consist of two protons and two neutrons bound together into a particle identical to a helium nucleus; hence, it can be written as He^{2+} .

Alpha decay (α) = is a form of radioactive decay in which an atomic nucleus ejects an alpha particle through electromagnetic force and transforms into a nucleus with mass number 4 less and atomic number 2 less.

Beta minus decay (β^-) = is a type of radioactive decay in which an electron is emitted. In β^- decay, the weak interaction converts a neutron (n^0) into a proton (p^+) while emitting an electron (e^-) and an anti-neutrino ($\bar{\nu}_e$): $n^0 \rightarrow p^+ + e^- + \bar{\nu}_e$.

Beta plus decay (β^+) = is a type of radioactive decay in which a positron is emitted. In β^+ decay, a proton is converted into a neutron, a positron and a neutrino: $\text{energy} + p^+ \rightarrow n^0 + e^+ + \nu_e$.

Orbital electron capture = radioactive transformation in which the atomic nucleus captures a orbital electron.

Internal conversion = emission of an electron and characteristic X ray from an atom due to the liberation of energy from its excited atomic nucleus.

Isomeric transition = is called the decay of the metastable or isomeric state by the emission of a gamma ray. The daughter nucleus of a radioactive parent may be formed in a “long-lived” metastable or isomeric state, as opposed to an excited state.

Bremsstrahlung = ionizing radiation produced by the deceleration or the acceleration of charged particles.

Characteristic radiation = ionizing radiation with a discrete energy spectrum, emitted in a nuclear transition from a high-energy electron shell to a lower one.

X radiation = ionizing radiation consisting of photons, originating in the extranuclear part of the atom, comprising bremsstrahlung and characteristic radiation.

Auger electron = electron ejected from the outer shells due to the return to the ground state of an atom that has been ionized in an inner shell.

Activity = quotient, for an amount of radionuclide in a particular energy state at a given time, of dN by dt , where dN is the expectation value of the number of spontaneous nuclear transitions from this energy state in the time interval of duration dt : $A = dN/dt$

Specific activity (mass activity, activity per unit mass) = quotient of activity by the total mass of the sample, $A_m = A/m$ [$\text{MBq}\cdot\text{kg}^{-1}$]

Volume activity (activity concentration, activity per unit volume) = quotient of the activity by the total volume of the sample, $A_v = A/V$ [$\text{MBq}\cdot\text{cm}^{-3}$]

Radioactive half-life (physical half-life) = time required for the activity of radionuclide to decrease to a half of its initial value.

Biological half-life = time required for half of a substance to be removed from an organism by biological process.

Effective half-life = combination of physical and biological half-lives

Annihilation = interaction between an elementary particle and its antiparticle resulting in their disappearance and emission of different particles

Linear energy transfer (LET) = quotient of dE by dI , for a material and for charged particles, where dE is the energy lost by a charged particle in traversing a distance dI due to those collisions with electrons in which the energy loss is less than a chosen value Δ .

Compton effect = scattering of photon by an electron when the electron can be considered to be free and stationary. Part of the energy and momentum of the incident photon is transferred to the electron and the remaining part is carried away by the scattered photon.

Pair production = simultaneous formation of a positron and an electron as a result of an interaction of a photon of energy, higher than 1,022 MeV, with a field of an atomic nucleus or other particle.