

17.9: End of Chapter Key Terms

Definition: Nuclear Physics

- Atom: Once thought to be the smallest piece of matter. Composed of protons, neutrons and electrons.
- Electron: A negatively charged fundamental particle that orbits the nucleus of the atom.
- Atomic Nucleus: The center of the atom, containing most of the atom's mass; composed of protons and neutrons.
- Proton: A positively charged particle located in the atom's nucleus.
- Neutron: An uncharged (neutral) particle with about the same mass as the proton, located in the nucleus.
- Nucleon(s): A (collective) term for protons and neutrons in general.
- Isotope: Atoms with the same number of protons, but different numbers of neutrons.
- Empirical Radius Relationship: A way to find the nuclear radius as a function of nucleon number.
- Coulomb Force: A force of attraction or repulsion between charged particles.
- Strong Force, AKA the Strong Nuclear Force: An attractive force between nucleons that counteracts the Coulomb force.
- Radioactive Decay: The spontaneous transformation of one element into another with the emission of radiation.
- Half-Life: The time required for half the atoms in a radioactive sample to decay.
- Decay Constant: A measure of how likely the atom is to undergo radioactive decay. Related to half-life.
- Mean (average) Lifetime: How long (on average) that a particular atom will exist before decaying.
- Mass Defect: The difference in mass between the initial state of the system and the final state of the system.
- Binding Energy: The energy required to disassemble a nucleus.
- Binding Energy per Nucleon: The energy required to remove a single nucleon from the nucleus. A measure of nuclear stability.
- Antiparticle: A particle that has the same mass as another but opposite charge and magnetic moment.
- Alpha Decay/Alpha Particle: A decay mode that emits an alpha particle (${}^2_2\alpha$).
- Beta Decay/Beta Particle: A decay mode that emits a beta particle, which is an electron (${}^0_{-1}e$) or a positron (${}^0_{+1}e$).
- Gamma Decay: A decay mode that emits a high energy photon.
- Fission: The splitting of a heavy atomic nucleus into two lighter nuclei, releasing energy.
- Liquid Drop Model: Treating the nucleus like a drop of liquid to explain fission by neutron bombardment.
- Fusion: The process of combining two light atomic nuclei to form a heavier nucleus, releasing energy.
- Quarks: Fundamental particles that combine to form everything except electrons.
- Radioimmunoassay: Nuclear medicine technique used to screen for diseases and drugs.
- Radiopharmaceutical: Drug containing radioactive isotope. Used to track blood flow, drug absorption and perform imaging.
- Brachytherapy: The practice of inserting radioactive 'seeds' into the body in order to kill cancer cells.
- Ionizing Radiation: Radioactive decay products that change the structure of molecules in cells by ionizing atoms.
- Radiation Dose/rad: Definition of radiation exposure in terms of energy per kilogram of body mass.
- Relative Biological Effectiveness: A multiplier that affects radiation dose based on the type of radiation involved.
- Roentgen Equivalent Man: A way to estimate effective biological dose; the product of rad and RBE.

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