

Radioactivity and Radioisotopes

Radioactivity is the phenomenon of the disintegration of heavy elements into comparatively lighter emission in the form of radiations. This was discovered by Henri becquerel in 1896. It emits radioactive elements viz- alpha , beta, gamma rays

While radioisotopes are any of the several species of the same chemical element with different masses whose nuclei are unstable.

This article will give a brief description of Radioactivity and Radioisotopes. The information from this article will be useful when candidates attempt the Science and Technology segment of the IAS Exam.

Definition of Radioactivity

Radioactivity, property exhibited by certain types of matter of emitting energy and subatomic particles spontaneously. It is, in essence, an attribute of individual atomic nuclei.

An unstable nucleus will decompose spontaneously, or decay, into a more stable configuration but will do so only in a few specific ways by emitting certain particles or certain forms of electromagnetic energy. Radioactive decay is a property of several naturally occurring elements as well as of artificially produced isotopes of the elements. The rate at which a radioactive element decays is expressed in terms of its half-life; i.e., the time required for one-half of any given quantity of the isotope to decay.

What are Radioisotopes

Radioisotopes are radioactive isotopes of an element. They can also be defined as atoms that contain an unstable combination of neutrons and protons, or excess energy in their nucleus. This excess energy can be used in one of three ways: emitted from the nucleus as gamma radiation; transferred to one of its electrons to release it as a conversion electron; or used to create and emit a new particle (alpha particle or beta particle) from the nucleus. During those processes, the radionuclide is said to undergo radioactive decay. These emissions are considered ionizing radiation because they are powerful enough to liberate an electron from another atom.

Uses of Radioisotopes

Radioactive isotopes have many useful applications. In medicine, for example, cobalt-60 is extensively employed as a radiation source to arrest the development of cancer.

Other radioactive isotopes are used as tracers for diagnostic purposes as well as in research on metabolic processes. When a radioactive isotope is added in small amounts to comparatively large quantities of the stable element, it behaves exactly the same as the ordinary isotope chemically; it can, however, be traced with a Geiger counter or other detection device.

Frequently Asked Questions related to the Radioactivity and Radioisotopes

What is the difference between an isotope and a radioactive isotope?

Isotopes are atoms of the same element that have different numbers of neutrons but the same number of protons and electrons. Radioactive (unstable) isotopes have nuclei that spontaneously decay over time to form other isotopes.

What are 3 uses of radioactive isotopes?

The most widely used radioactive pharmaceutical for diagnostic studies in nuclear medicine. Different chemical forms are used for brain, bone, liver, spleen and kidney imaging and also for blood flow studies. Used to locate leaks in industrial pipe line and in oil well studies.