

Radioactive isotopes essay



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Introduction: – Radioactive isotopes are kind of isotopes, which have an unstable nuclide and react in assorted ways, they are derived from isotopes that also hold an unstable nucleus but they do not react as radioisotopes do[i]. These factors are categorized by the extra energy which is present in them and which would be used to react and produce some other particle. The reaction, which would result in various emissions of Gama, rays, alpha particles, beta particles. The reaction, which causes these emissions, is called radioactive decay (Radioactivity). The discharge of the radioactive decay is harmful in various ways, only due to the progress in technology now these disadvantages have been converted to advantages and now radioisotopes are used in several facial expressions, which also let in various medical aspects, which would be compensated in the report.

The concept of Radioactivity was found by a French physicist, Antoine Henri Becquerel. As most of the discoveries, this also was by a very honest observation and accidental. During the research of phosphorescent materials (The elements which glow in black). Studying Uranium for his research, he kept the uranium on the photographic film, it was a routine for him to hold it under the sunlight for some days and then examine it later. On a cloudy day, he kept the film and the uranium inside. Later on some days he took an observation when he watched the video, the image of the uranium appeared in the film, from his experience, he concluded that it was not because of the sun and it was some reaction which had taken place and lead to this.[ii]After some rigorous testing, he came to know about radiation, which had this

reaction. In 1903, he was awarded with a Noble prize for his discovery; Uranium is still the most radioactive element present.

As all the reactive isotopes have some spirit, i. e. the time until they crumble, this phenomena is called as ' Half-Life'. Half-life marks the time in which isotope mass reduces by half. For example, an isotope has a mass of 10 Grams and its half-life is 5 years, Five years later mass of the isotope would be 5 Grams, in the next five years, its mass would be 2. 5 Grams and this procedure will decrease exponentially until the mass is Zero.[iii]As isotopes are available in nature, they are sorted into three main categories ' primordial' is the former type. Being naturally radioactive the people who exist on this planet release artificial radionuclides. However, the land was formed about 5 billion years ago with various unstable nuclides reacting with each other. The majority of the elements have decayed and formed into various stable elements, there are some who possess a long half-life and yet survive in nature; these isotopes are addressed as " Primordial Isotopes"[iv]. The second type of isotopes is called " Radiogenic Isotopes." These kinds of isotopes are derived from the format character. The Primordial Isotopes always decay and form radiogenic isotopes. Compared to the format they have a shorter half-life[v]. They hold a parent-daughter pair with the former type; their usage will always depend on the half-life of their parent isotope. The third " cosmogenic isotopes," these kinds of isotopes is continuously created in the air. These are organized because of the cosmic rays and various human experiments, which include various reactions of radioactive isotopes; In addition, the nuclear explosions also lead to the formation of cosmogenic isotopes.[vi]

Radioactive isotopes have various uses for example it is directly given to clean the lab equipment in which the radioactivity would sterilize the equipment and make it useful for the further experiments, compared to other cleaning methods this method is one of the most clever manner.

Radiolabelling is a concept in which the original chemical compound is being altered by using scientific techniques, there are some changes made in the atom, as one or two atoms are put back by radioisotopes. The further study is done until the reactant transforms into a product. The tracers used in various plants and animals help us in studying the organs, cell, and various other aspects of the body. Example if we take a molecule of water and we want to modify it further, we modify one of the hydrogen atoms with a hydrogen-3 atom. This molecule will be a perfect replacement for the original hydrogen atom. Therefore, if we want to trace the atom it is possible, because Tritium atom (Hydrogen-3) is traceable using various radiation detection equipment's.[vii]As explained above the study of cells become easy using this. Supposedly a scientist has to study the plant and find out how much a particular vitamin is used, he would particularly just modify that vitamin and then feed the plant with it, when the plant uses it up it simply could be discovered by a scanner. This will enable us to know where a particular vitamin is used; the same can be done on animals. This technique helps in improving and discovering new medications.

Carbon Dating is another concept, which is related to the radioactivity of carbon. This concept has helped us to solving the question when did the organism died. The amount of carbon-14 determined can tell us how old the organism is. It works in the following way, when a particular organism dies;

there is a specific mass of Carbon 14 to Carbon 12, which is present in some ratio. Comparing both carbons 12 is more stable. Then, when we see an organism we would regulate the amount of carbon 14, because it must have disintegrated at a considerable pace, which is quite predictable. Using the concept of Half Life in this carbons half like is around 5700 Years, which will allow it to stay with the body for 5700 years.[viii]

Smoke detectors are very useful and have become mandatory for everyone, have we ever wondered how do they work? Yes, it is because of the Radioisotopes, which make it possible. There is a negligible amount of americium-241, which makes it possible. Americium is an artificially created element. This element always emits a low amount of alpha and beta rays. These are mixed with some oxygen and are given a small amount of charge. The smoke detectors and two electrons in them, thus the voltage applied keeps the electron flow stable and continues. During the time of smoke, when it enters in the chamber the smoke particles are drawn towards the charged ions, this disturbs the current stream in between the two electrodes and therefore activates the alert. Using these substances for makes the detection of smoke faster compared to the older methods. The half-life of the isotope also makes it available for a long time and not is spoilt.[ix]

Various radioactive isotopes are also used for security purposes, like detection of various explosives. The compound is as Californium-252 and Cobalt-60 are used for the detection for the explosives. They sense the nitrogen chemical compounds, which are found in major explosives and thus trigger the alarm. They also sense the gama radiations, wich enhance their capabilities.[x]

Radioactive metals decay at a considerable rate, while this procedure they produce radiation, which consists energy that can break electrons, which would produce two different charged ions. The radiation also would cause damage to various human tissues. Some radiations are so harmful that they do not yet even possess a remedy. Various health starting from nausea to death are caused by exposure to radiation. They deviate from the quantity of radiation exposed to a special individual.[xi]

Conclusion: Radioactive Isotopes have been useful for us in several ways, but this all has been to the jeopardy of our lives. For example: The isotopes of lead are very radioactive and have a direct effect on the brain and nervous system. Radioactive isotopes are the ones, which have yielded a wage hike to various bad and incurable diseases, but then also assisted us to heal them at the same time. The merits and demerits of this factor cannot be likened.

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