Uses of Radioisotopes

Each distinctive property of radioisotopes has been put to use in many fields ranging from chemical synthesis to medicine, to agriculture, to manufacturing and engineering.

Since radioisotopes continuously emit radiation that can be detected and measured, thus it is possible to monitor the location of the isotope. Specific isotopes find their way in the body to specific organs, and by emitting radiation from these locations, it is thus possible to view the organ by means of a radiation-detecting camera. For example, thallium–201 concentrates in normal heart muscle, allowing determination by the dark areas on the film of the amount of damage caused by a heart attack. Further, complementary information is obtained with technetium–99, which is taken up by damaged heart cells, but not by healthy ones.

Radiation therapy employs the ability of radioisotopes to destroy cells, i.e. for the destruction of malignant cancer cells. Another application of this property is where the male insects are irradiated to destroy their reproductive cells.

Radioactive tracers are used to follow the course of underground water supplies. In chemistry and biochemistry, radioactive labelling of compounds has revealed much information about how reactions take place, i.e. about reaction mechanisms. By determining in which of the reaction products the radioactive atom winds up, the route of the atom through intermediate chemical and metabolic processes can be determined.

The heat generated by radioactive decay can be converted to electricity in nuclear -powered batteries. Plutonium-238 powers a tiny battery used in heart pacemakers implanted in the human body. The long life of the isotope allows the battery to function for almost 10 years before an operation must be performed to replace it.

Your Task: I would like you to do a short research project on any one radioisotope.

Your report should include relevant chemistry information such as:

- indicate clearly the isotope in the format: ${}^{A}_{Z}X$
- the number of nucleons: i.e. number of protons and neutrons in the isotope
- the type of radiation emitted by the isotope, (including the balanced equation of the decay)
- the half-life of the isotope
- the most stable/abundant isotope of the element chosen by you
- an explanation of the use of the isotope.