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**300LEVEL**

**MEDICAL PHYSICS ASSIGNMENT**

**1. What are radioactive tracers?**

A radioactive tracer is a radioactive element or compound or specific radiolabeled molecule added to a material to monitor the material's distribution as it progresses through a system, it also monitors the in vivo behaviour of a functional molecule, and can be used to provide biological information in a living system.The use of a radioactive tracer is called radiolabeling, which is one form of isotopic labeling. Radiotracing is also the radioactive form of isotopic labeling. A radioactive tracer is a chemical compound consisting of an endogenous or exogenous carrier molecule that partakes in human metabolism1. in which one or more atoms have been replaced by a radioisotope. Monitoring its radioactive decay, a radiotracer can be used to explore the mechanism of chemical reactions by tracing the path that the radioisotope follows from reactants to products. Radioactive tracers form the basis of some medical imaging systems, such as Positron Emission Tomography [PET scans], Single Photon Emission Computed Tomography [SPECT scans]etc.Examples of commonly used radioactive tracers include sulfur-35 ,tritium, iodine-123, carbon-14, oxygen-15, fluorine-18 etc.

Radioactive tracers are also used to determine the location of fractures created by hydraulic fracturing in natural gas production.

**2. One application of tracer in Medicine.**

It is applied in Nuclear Medicine

Nuclear medicine is medical specialty that uses radioactive tracers (radiopharmaceuticals) to assess bodily functions and to diagnose and treat disease. Specially designed cameras allow doctors to track the path of these radioactive tracers.

For most diagnostic studies in nuclear medicine, the radioactive tracer is administered to a patient by intravenous injection. However a radioactive tracer may also be administered by inhalation, by oral ingestion, or by direct injection into an organ. The mode of tracer administration will depend on the disease process that is to be studied.

Nuclear medicine uses radiation to provide diagnostic information about the functioning of a person's specific organs, or to treat them. Diagnostic procedures using radioisotopes are now routine. Nuclear medicine uses radiation to provide information about the functioning of a person's specific organs, or to treat disease. In most cases, the information is used by physicians to make a quick diagnosis of the patient's illness. The thyroid, bones, heart, liver, and many other organs can be easily imaged, and disorders in their function revealed. In some cases radiation can be used to treat diseased organs, or tumours. Five Nobel Laureates have been closely involved with the use of radioactive tracers in medicine.

In nuclear medicine therapy, the radiation treatment dose is administered internally (e.g. intravenous or oral routes) rather than from an external radiation source.

The radiopharmaceuticals used in nuclear medicine therapy emit ionizing radiation that travels only a short distance, thereby minimizing unwanted side effects and damage to noninvolved organs or nearby structures. Most nuclear medicine therapies can be performed as outpatient procedures since there are few side effects from the treatment and the radiation exposure to the general public can be kept within a safe limit.

Nuclear medicine imaging, in a sense, is “radiology done inside out" or "endoradiology" because it records radiation emitting from within the body rather than radiation that is generated by external sources likeX-rays. In addition, nuclear medicine scans differ from radiology, as the emphasis is not on imaging anatomy, but on the function. For such reason, it is called a physiological imaging modality . It is applied in Single Photon Emission Computed Tomography (SPECT) and Positron Emission Tomography (PET) scans are the two most common imaging modalities in nuclear medicine and scintigraphy.

Diagnostic techniques in nuclear medicine use radioactive tracers which emit gamma rays from within the body. These tracers are generally short-lived isotopes linked to chemical compounds which permit specific physiological processes to be scrutinised.