**COURSE TITLE: MEDICAL PHYSICS**

**COURSE CODE: MLS 314**

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**ASSIGNMENT 1**

***Q1. What Are Radioactive Tracers***

A radioactive tracer is a chemical compound in which one or more atoms have been replaced by a radioisotope.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. They are also used for flow visualization through different technologies, such as Single Photon Emission Computed Tomography (SPECT), Position Emission Tomography (PET) and Computed Radioactive Particle Tracking (CARPT).Radioactive tracers are widely used to diagnose industrial reactors, for instance by measuring the flow rate of liquids, gases and solids. It can also be defined as a radioactive element or compound added to a material to monitor the material's distribution as it progresses through a system. The use of a radioactive tracer is called radio labeling, which is one form of isotopic labeling.

***Q2. Discuss Explicitly One Application of Radiotracer in Medicine***

* ***Diagnostic application***

Medical tests of this kind involve administering a radioactive tracer, chosen carefully for its ability to follow a metabolism or provide information about the working of a given organ. The tracer can be an individual atom (for instance Iodine 123), a marked molecule (such as a diphosphonate marked with Technetium 99m), a hormone or even an antibody marked with an isotope. The isotope has to be chemically attached to the relevant molecule without altering its properties and metabolism. The bond must also be a solid one in order to follow the molecule and not an eventually shaken off radioactive atom. Radiopharmaceutical products (molecules containing radioactive isotopes) are generally inserted intravenously, though some can also be inhaled or even swallowed. When it comes to internal body scans, the game is to localize the radiopharmaceutical product inside the body from an external detection while exposing the body to a minimal dose of radiation. Gamma emitters are therefore the ideal radio elements, gamma rays are relatively low ionizers’ and simultaneously penetrative enough to be detected outside of the body. Technetium 99m is by far the most commonly used radioelement as it allows for the exploration of numerous body parts and emits only gamma rays whose energy is well adapted to the gamma-camera detectors. Beta-plus emitters are used in the field of positron emission tomography' (PET scans). In the field of metabolic therapy, beta-minus emitters are used to deliver a highly localized dose of radiation. An example is using radioactive iodine-131 to test for thyroid activity. The thyroid gland in the neck is one of the few places in the body with a significant concentration of iodine. To evaluate thyroid activity, a measured dose of iodine-131 is administered to a patient, and the next day a scanner is used to measure the amount of radioactivity in the thyroid gland. The amount of radioactive iodine that collects there is directly related to the activity of the thyroid, allowing trained physicians to diagnose both hyperthyroidism and hypothyroidism. Iodine-131 has a half-life of only 8 days, so the potential for damage due to exposure is minimal. Technetium-99 can also be used to test thyroid function. Bones, the heart, the brain, the liver, the lungs, and many other organs can be imaged in similar ways by using the appropriate radioactive isotope.