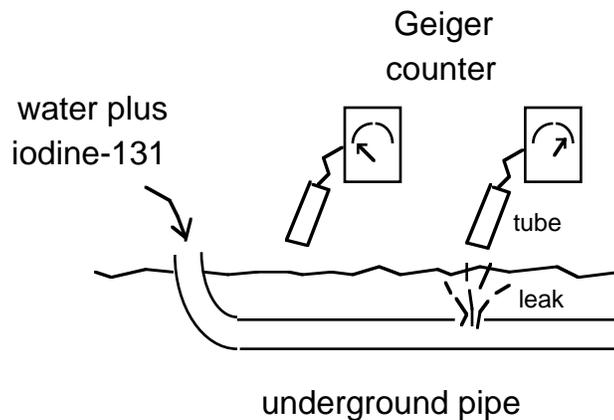


Radiation : Notes/W.S.-30

Radioactive isotopes can be used in the radioactive dating of materials. They also have many other uses. Some other uses are given below.

Tracers

Some isotopes can be used as tracers. A tracer is something that can be used to find leaks in pipes. An isotope that is used for this purpose is iodine-131, which has a short half-life of 8 days. In this case, beta particles are emitted as the iodine isotope decays. The radiation can be detected by using a device called a Geiger counter. It consists of a tube connected to an electronic counter. The Geiger counter can detect alpha particles, beta particles, or gamma rays, near the leak.



A similar method can be used to check a person's blood circulation. A radioactive isotope that is used for this purpose is sodium-24, which emits beta particles (half-life = 15 hours). A small amount is injected into the blood. If the circulation is poor in a certain area of the body, then there will be a low reading on a Geiger counter.

Cancer

Some isotopes can be used to treat cancer. Cobalt-60 is an isotope that emits gamma rays. The gamma rays are directed towards a cancerous tumor to kill cancer cells. The isotope is outside the body in this case. Some cancers can be treated by injecting an isotope into the body.

Industry

Radiation from some isotopes is used to kill bacteria to sterilize medical instruments. Also, gamma rays can be used to "see" inside a piece of metal and check welds for defects, just as doctors will take an X-ray to check for broken bones. Also, certain radioisotopes such as americium-241 (an alpha emitter) are used in smoke detectors.

Questions:

- 1) What is a Geiger counter?
- 2) What is a tracer?
- 3) Explain how cobalt-60 is used to treat cancer.
- 4) Give a use for each of the following radioactive isotopes.
 - a) iodine-131, b) cobalt-60, c) americium-241.
- 5) Give the number of protons and neutrons in each of the following isotopes.

isotope	protons	neutrons
a) iodine-131		
b) cobalt-60		
c) americium-241		
- 6) What is the half-life for sodium-24? Why is it a good idea to use this isotope which has a short half-life when it is used in the body?
- 7) Explain how gamma rays are both harmful and beneficial to people.

Answers: 1) It is a device that can detect alpha, beta, or gamma radiation., 2) It is a substance that is used to find leaks in pipes., 3) Cobalt-60 is a gamma emitter. Gamma rays kill cells. The rays must be directed towards the cancer cells in the tumor., 4)a) tracer, b) cancer therapy, c) smoke detectors, 5)a) 53, 78, b) 27, 33, c) 95, 146, 6) 15 hours. It is to minimize harm to the body., 7) Gamma rays are useful to us, but we must be careful when using them, because they can be dangerous.