



IONIZING RADIATION

Ionizing radiation may exist in the form of a high-energy photon or charged particles. When ionizing radiation passes through matter, some of the energy is absorbed and electrons are knocked out of atoms. This creates a trail of positive ions.



In living organisms this residual energy can be damaging to tissue, cellular processes, or DNA, especially if received in large amounts within a short period. This is the main mechanism by which ionizing radiation can cause immediate harm or long-term illness (e.g., cancer). However, at levels of exposure associated with natural and man-made radiation sources in the environment around us, our bodies are generally able to deal with the residual energy in a similar manner that they have adapted to deal with environmental levels of chemical and biological toxins.

X-rays and gamma rays have large amounts of energy and can ionize atoms in most types of matter. Although the atmosphere surrounding the Earth blocks most of the x-rays and gamma rays emitted by the Sun, some do manage to get through. On the other hand the atmosphere itself is also a significant source of ionizing radiation: when cosmic rays (mostly protons) interact with the upper atmosphere they create secondary x-rays and subatomic particles such as muons, which contribute to our background radiation exposure.

As mentioned earlier, ionizing radiation can exist in the form of moving particles. When radioactive elements and isotopes decay, they eject particles. These particles include photons, alpha particles, beta particles and neutrinos. Because ionizing radiation cannot be detected by our senses, we cannot see, smell or taste it. To detect ionizing radiation we must use special devices such as Geiger-Müller counters (often referred to as simply "Geiger counters"), dosimeters or cloud chambers.



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Name: _____ Period: _____ Date: _____

Read through the “Ionizing Radiation” section in the *What is Radiation?* module on the **Nuclear Technology: Exploring Possibilities Website** then answer the following questions.

Ionizing radiation exists in two forms. What are they?

What happens when ionizing radiation passes through matter?

Where in the electromagnetic spectrum does ionizing radiation exist?

How can ionizing radiation pose a health risk?

Looking at the diagram of the electromagnetic spectrum, which type of electromagnetic radiation has the highest frequency and the shortest wavelength?

Ionizing radiation can also exist as particles. What are these particles?

Can ionizing radiation be detected by our senses?
