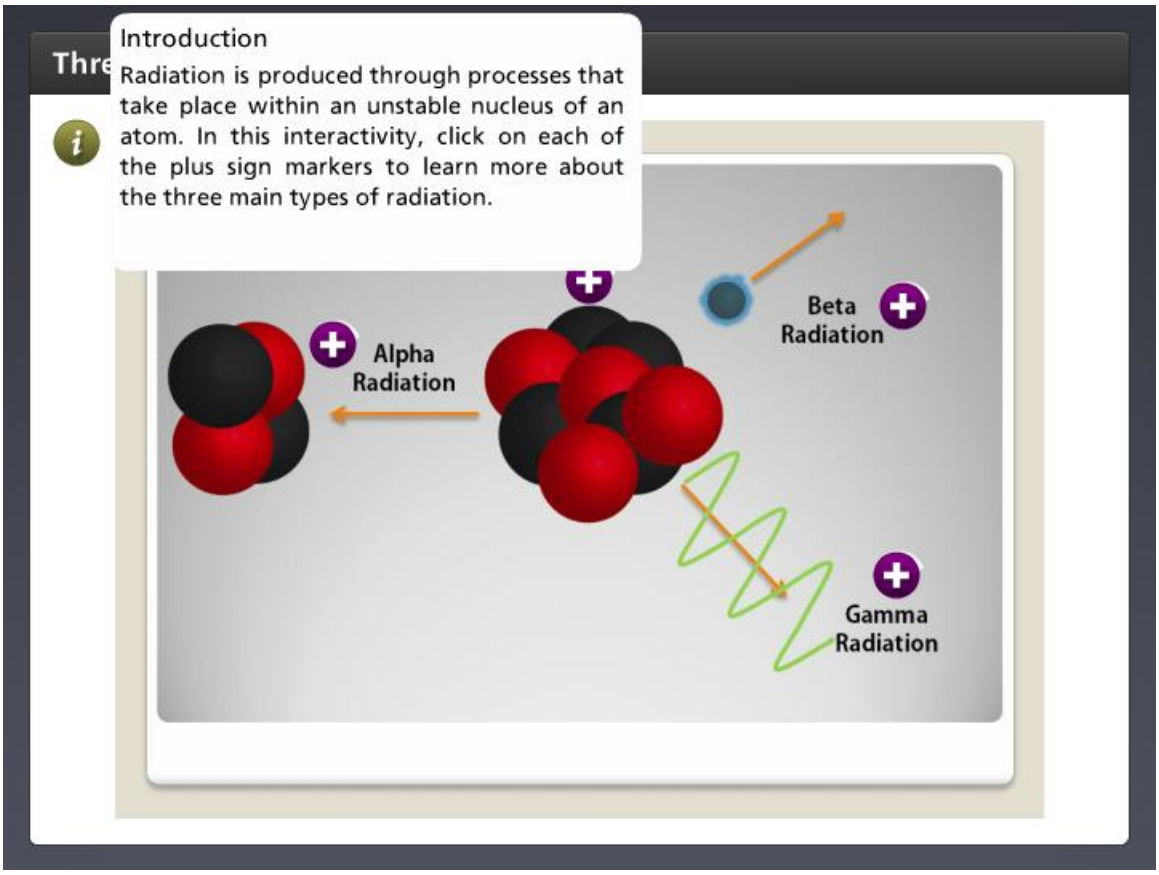
Module 2: Atomic Structure and the History of Atomic Theory
Topic 5 Content: Three Types of Radiation Presentation Notes

Introduction



Radiation is produced through processes that take place within an unstable nucleus of an atom. In this interactivity, click on each of the plus sign markers to learn more about the three main types of radiation.

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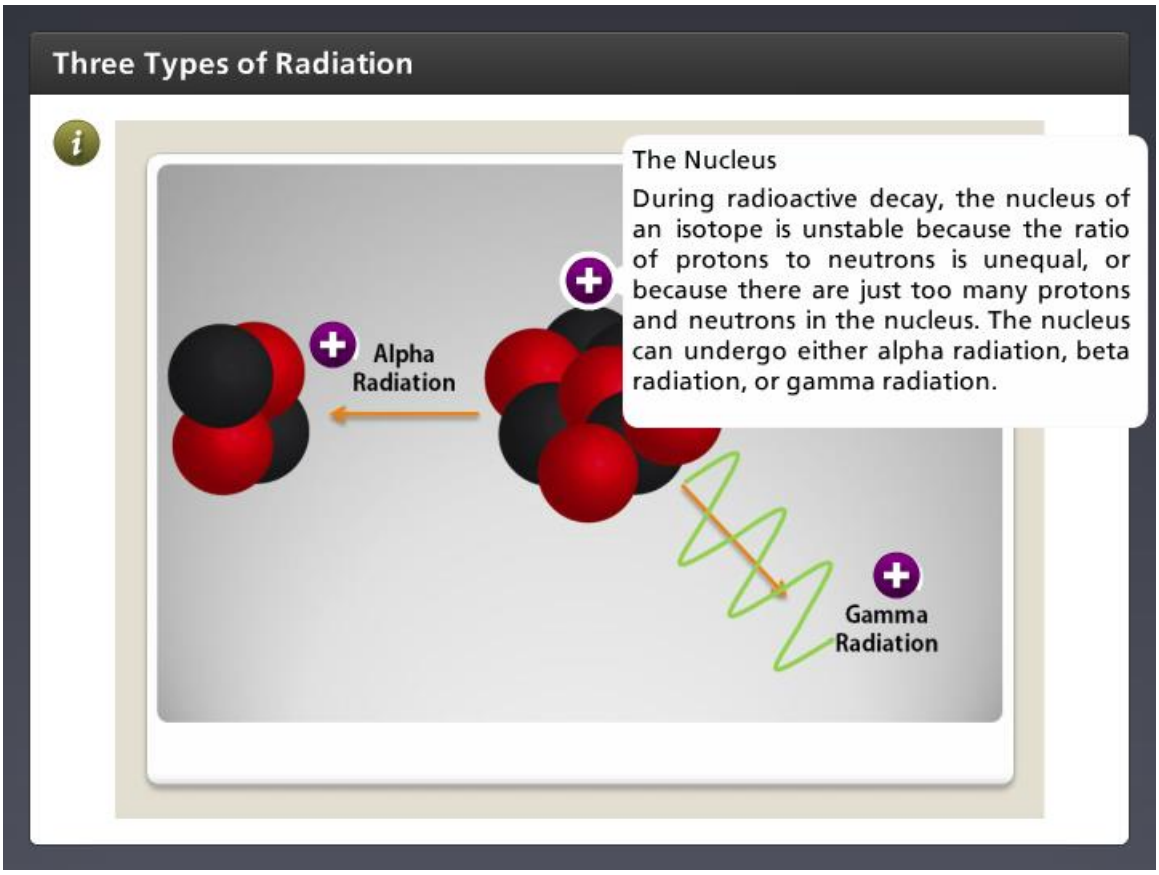
The Nucleus



During radioactive decay, the nucleus of an isotope is unstable because the ratio of protons to neutrons is unequal, or because there are just too many protons and neutrons in the nucleus. The nucleus can undergo either alpha radiation, beta radiation, or gamma radiation.

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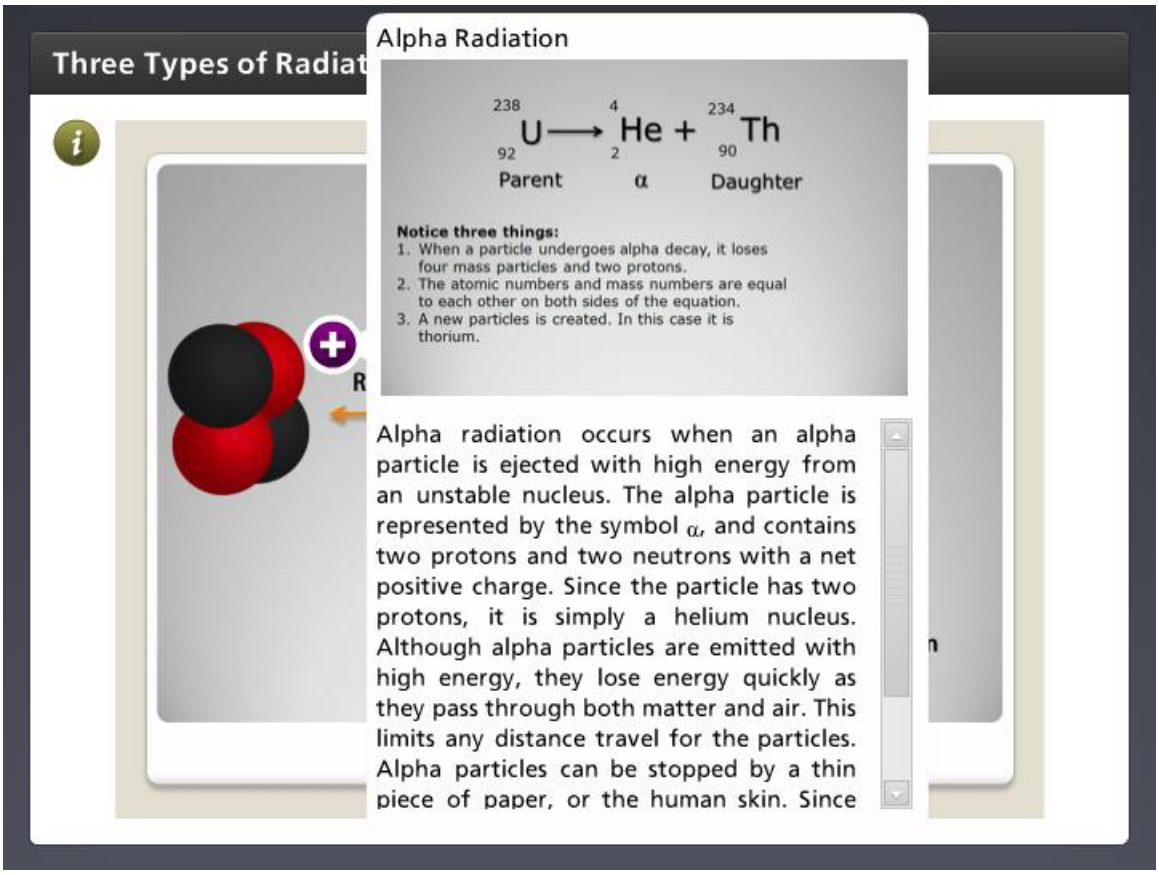
Alpha Radiation



Alpha radiation occurs when an alpha particle is ejected with high energy from an unstable nucleus. The alpha particle is represented by the symbol α, and contains two protons and two neutrons with a net positive charge. Since the particle has two protons, it is simply a helium nucleus. Although alpha particles are emitted with high energy, they lose energy quickly as they pass through both matter and air. This limits any distance travel for the particles. Alpha particles can be stopped by a thin piece of paper, or the human skin. Since the particles are slow moving, the end result is a heavy element. View the image to see how the element uranium-238 undergoes alpha radiation.

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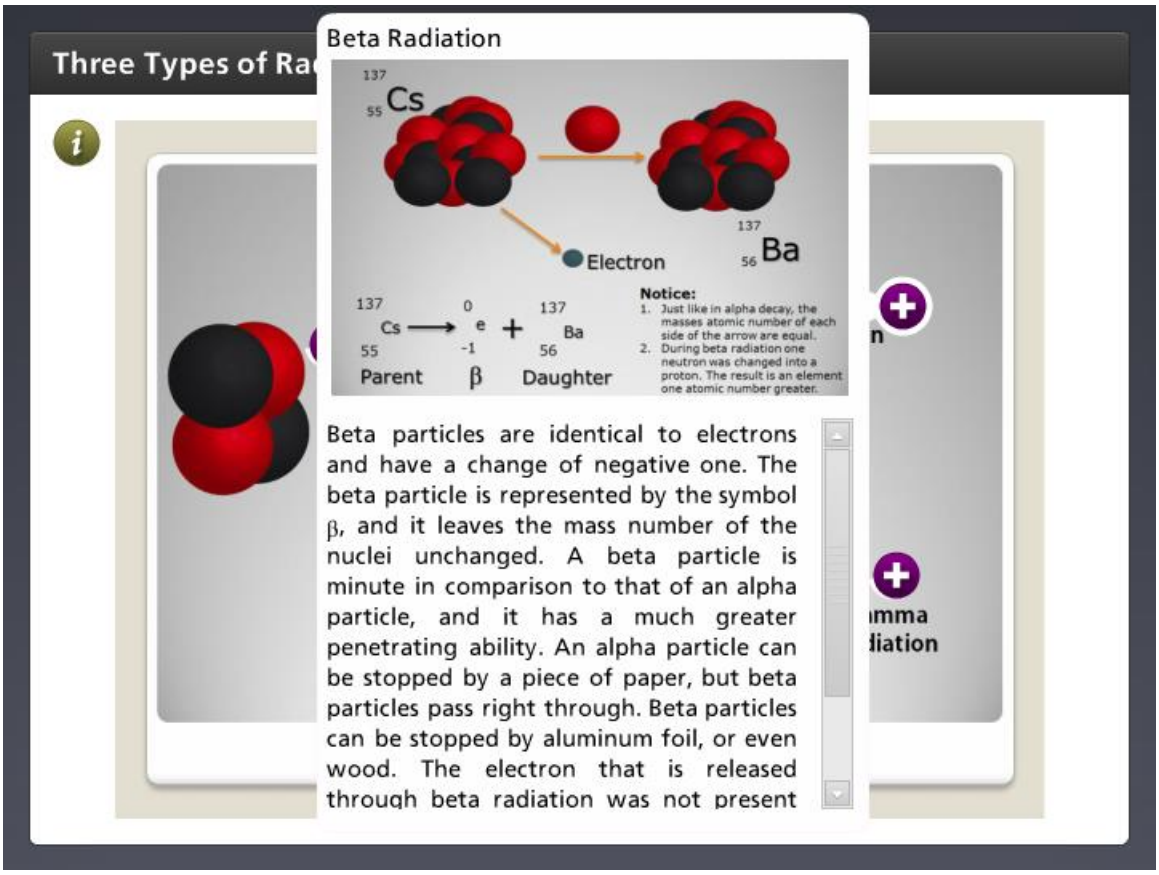
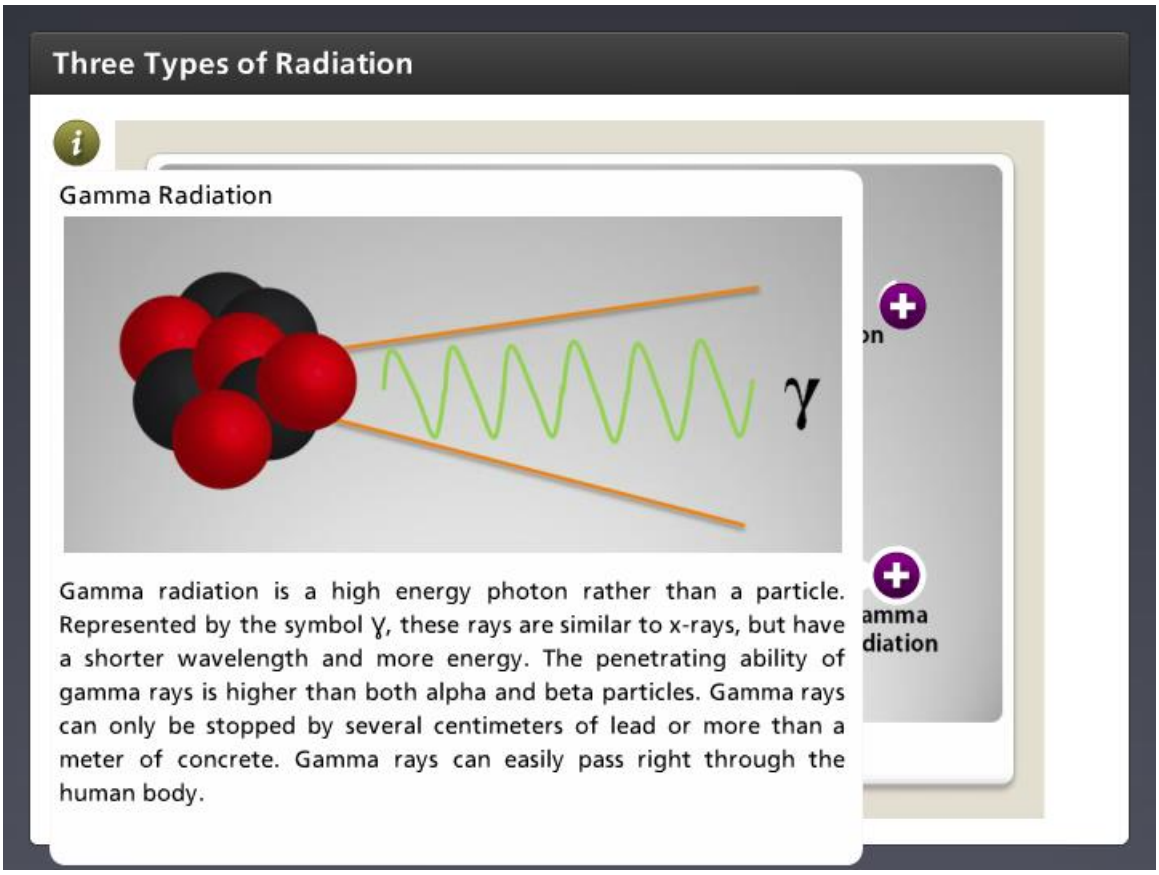
Beta Radiation



Beta particles are identical to electrons and have a change of negative one. The beta particle is represented by the symbol β, and it leaves the mass number of the nuclei unchanged. A beta particle is minute in comparison to that of an alpha particle, and it has a much greater penetrating ability. An alpha particle can be stopped by a piece of paper, but beta particles pass right through. Beta particles can be stopped by aluminum foil, or even wood. The electron that is released through beta radiation was not present before the decay process. It is actually created during decay. View the image to see how cesium-137 decays into barium during beta decay.

Gamma Radiation



Gamma radiation is a high energy photon rather than a particle. Represented by the symbol γ, these rays are similar to x-rays, but have a shorter wavelength and more energy. The penetrating ability of gamma rays is higher than both alpha and beta particles. Gamma rays can only be stopped by several centimeters of lead or more than a meter of concrete. Gamma rays can easily pass right through the human body.