

Module 2: Atomic Structure and the History of Atomic Theory

Topic 5 Content: Nuclear Processes Presentation Notes


Introduction

Nuclear Processes

Fission

Fusion

Introduction



Protons and neutrons are held together in the nucleus with an energy that is much greater than what holds atoms together in molecules. This is why changes in the nucleus are capable of producing enormous amounts of energy. There are two types of nuclear processes that produce energy, nuclear fusion and fission. In this interactivity, click on each of the tabs to investigate the processes of nuclear fusion and nuclear fission.

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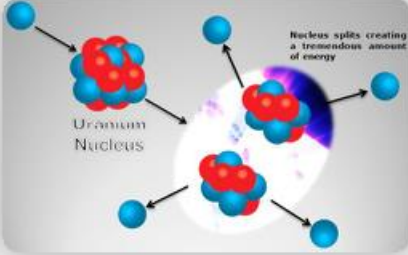
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Fission

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The diagram illustrates the process of nuclear fission. On the left, a large red and blue sphere represents a 'Uranium Nucleus'. An arrow points to the right, where the nucleus is shown splitting into two smaller red and blue spheres. A text box above the split nucleus states: 'Nucleus splits creating a tremendous amount of energy'. Several small blue spheres are shown flying away from the split nucleus, representing released particles.

Fusion

In nuclear fission, one large isotope is broken down into two smaller isotopes, unleashing a tremendous amount of energy. When one kilogram of uranium-235 fissions, it releases energy equal to the explosion of 20 thousand tons of uranium. The energy created in nuclear power plants uses nuclear fission. Nuclear power plants are considered quite safe because the fuel elements are too far apart to produce the mass needed for a nuclear explosion; however, they do create nuclear waste, which remains radioactive for generations.

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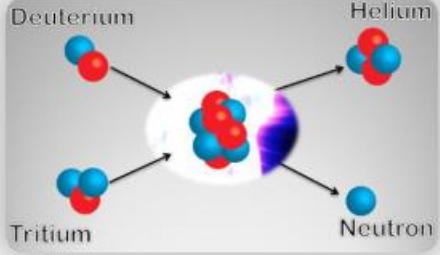
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Fusion

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Fusion



The diagram illustrates the fusion of two isotopes. On the left, a Deuterium nucleus (one red proton and one blue neutron) and a Tritium nucleus (one red proton and two blue neutrons) are shown. Arrows point from both towards a central point where they meet. From this point, arrows point to the products: a Helium nucleus (two red protons and two blue neutrons) and a single Neutron (one blue neutron). The Helium nucleus is shown with a purple and blue glow, indicating energy release.

This type of reaction occurs when two small isotopes come together to fuse into a larger element. This is the source of energy that is created on the Sun. Fusion reactions occur only at extremely high temperatures, above 40 million degrees Celsius. There is no known structural material which can withstand this temperature, so fusion is not a viable alternative for energy.

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