Nuclear Change

Physical Science Topic 21

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Objectives

From this lesson, you should be able to:

- Contrast nuclear change from chemical change
- Recognize the two types of nuclear change
  - Fusion
  - Fission
- Describe the sun's process of fusion

Key Terms

Chemical change

Chemical change is usually an irreversible chemical reaction. These reactions involve the rearrangement of the atoms of one or more substances. The result is a change in their chemical properties.

Nuclear change

A nuclear change is one involving either fission (splitting) of the nucleus of an atom, or fusion (combining) of neutrons and protons to form heavier atoms. (Involves about 1,000,000 times the energy as a chemical change).

Fusion

Fusion is a nuclear reaction in which atomic nuclei of low atomic number fuse to form a heavier nucleus with the release of energy.

Fission

Fission is a nuclear reaction in which a heavy nucleus splits spontaneously or on impact with another particle, with the release of energy.

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Prerequisite Concept

Chemical change examples

Burning wood.

Souring milk.

Mixing acid and base.

Digesting food.

Cooking an egg.

Heating sugar to form caramel.

Baking a cake.

Rusting of iron.

Example of Fusion

Fusion

Fusion is a nuclear reaction in which atomic nuclei of low atomic number fuse to form a heavier nucleus with the release of energy.

The sun fuses four protons (Hydrogen) to form a helium nucleus, two positrons (and two neutrinos)

This reaction example, generates 24.7 MeV of energy

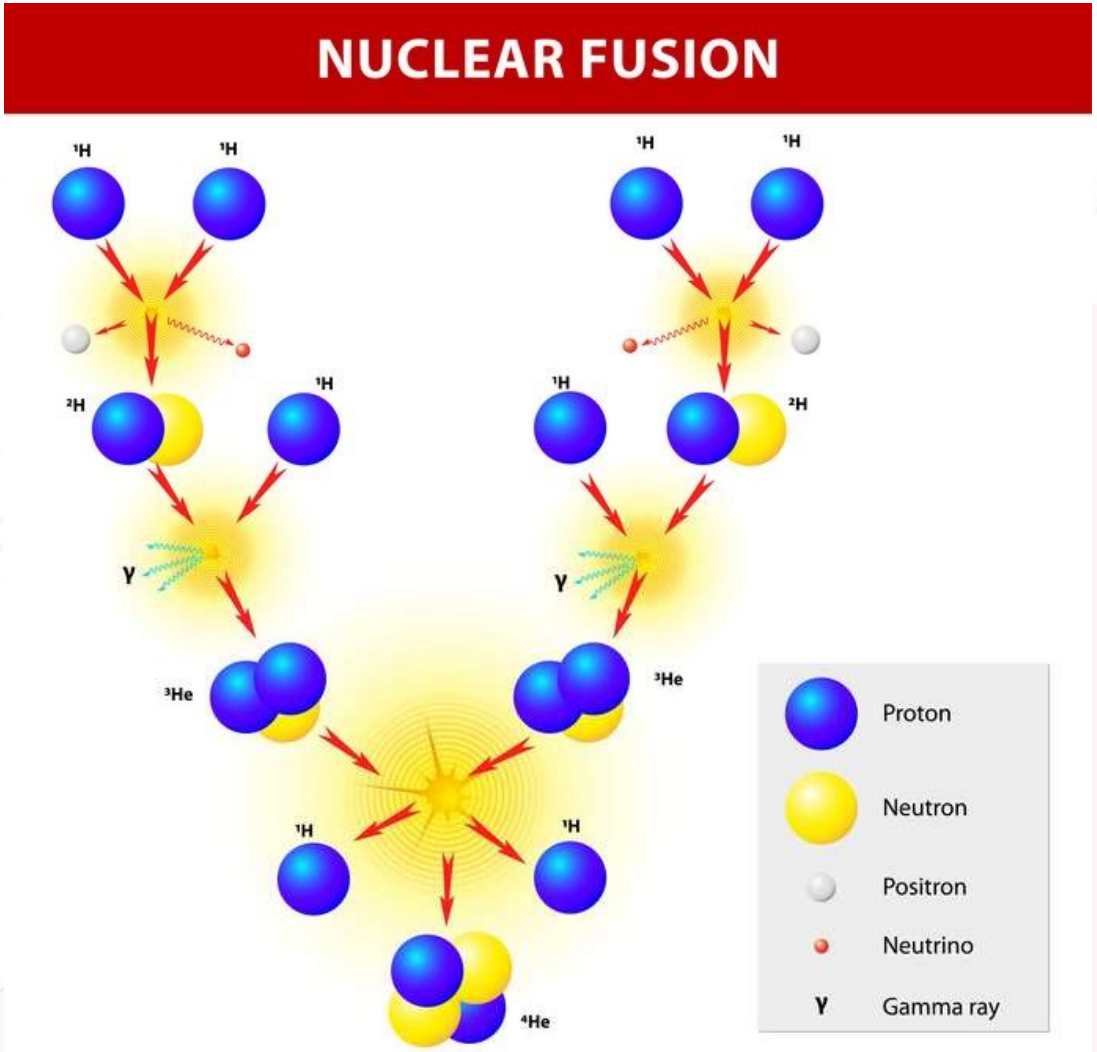
Most of the energy radiated from the surface of the sun is produced by the fusion of protons to form helium atoms within its core.

Fusion reactions have been duplicated in man-made devices

Fusion Illustration

The sun fuses four protons (Hydrogen) …

to form a helium nucleus, two positrons (and two neutrinos).



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Example of Fission

Fission

Fission is a nuclear reaction in which a heavy nucleus splits spontaneously or on impact with another particle, with the release of energy.

A common fission reaction produces barium-141 and krypton-92.

In this particular reaction, one uranium nucleus breaks into a barium nucleus, krypton nucleus, and two neutrons.

These two neutrons can go on to split other uranium nuclei, resulting in a nuclear chain reaction.

Fission Illustration

Fission

This illustration shows a “chain reaction” of nuclear fission.