



Vocabulary: Nuclear Reactions



Vocabulary

- **Chain reaction** – a sequence of reactions where the product of the reaction is also a reactant. As the reaction proceeds, the reaction rate increases as more reactive products are generated.
 - Nuclear *fission* is an example of a reaction that can trigger a chain reaction.
- **Catalyst** – a substance that increases the rate of a reaction without being altered by the reaction.
 - Because the catalyst is unchanged by the reaction, it can be recovered from the reaction and reused.
- **CNO cycle** – the carbon-nitrogen-oxygen cycle is the sequence of nuclear *fusion* reactions that occurs in stars bigger than the sun.
 - In the CNO cycle, protons are added to carbon-12 to create nitrogen-15. The addition of one more proton results in a helium-4 atom and a carbon-12 atom.
 - The CNO cycle requires temperatures greater than about 15,000,000 K.
- **Deuterium** – an isotope of hydrogen that contains one proton and one neutron.
- **Electron volt** – a measurement of energy equal to about $1.6 \cdot 10^{-19}$ joules.
 - An electron volt is equal to the energy an electron gains by moving across a voltage of one volt.
 - A megaelectron volt, MeV, is one million electron volts.
- **Fission** – a *nuclear reaction* in which a large nucleus splits into two or more smaller nuclei.
 - Fission reactions are triggered by the impact of a neutron with a large, radioactive nucleus. More neutrons are released from the fission reaction.
- **Fusion** – a nuclear reaction where two nuclei combine into a larger nucleus.
- **Isotope** – one of several forms of the same element.
 - All isotopes of a given element have the same number of protons, but differ in the number of neutrons.
 - Most isotopes are radioactive. Usually only one or two stable isotopes exist for a given element.
- **Nuclear reaction** – a change in the nucleus of an atom.
 - Examples of nuclear reactions include nuclear decay, fission, and fusion.
 - Most nuclear reactions result in the emission of energy.



- Positron – the positively charged antimatter counterpart of an electron.
 - If a positron meets an electron, the two particles will annihilate one another in a burst of gamma rays.
- Positron emission – a nuclear reaction that involves the creation of a positron and a neutron from a proton.
- Proton – a positively charged particle located in the nucleus of an atom.
 - Protons have slightly less mass than neutrons.
 - The number of protons determines the element.
- Proton-proton chain – the set of fusion reactions that occurs in stars like the sun.
 - In the proton-proton chain, hydrogen nuclei are fused to form helium nuclei.
 - The proton-proton chain requires temperatures greater than about 4,000,000 K.

