Physics

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Modern
Fission and Fusion

Fission – The splitting of an atom (nuclide) into two or more parts.

Fissile vs. Fissionable

A nuclide capable of undergoing fission after capturing a low-energy neutron is fissile. A nuclide capable of undergoing fission after capturing a high-energy neutron is fissionable. Fission produces excess neutrons that may allow for a sustained fission reaction, also known as a chain reaction. Nuclides that produce excess neutrons with sufficient energy to sustain a chain reaction are fissile materials. Nuclides that produce excess neutrons with insufficient energy to sustain a chain reaction are fissionable materials. An example of a fissile material is Uranium 235; a fissionable material is Uranium 238.

Two possible fission reactions for Uranium 235 are given below.

$$ {}^{1}_{0}n + {}^{235}_{92}U \rightarrow {}^{141}_{56}Ba + {}^{92}_{36}Kr + 3\,{}^{1}_{0}n $$

$$ {}^{1}_{0}n + {}^{235}_{92}U \rightarrow {}^{94}_{38}Sr + {}^{140}_{54}Xe + 2\,{}^{1}_{0}n $$

Question #1 - Barium 141 and Strontium 94 are both radioactive isotopes. Improper containment or accidental release of fission products has serious environmental and health concerns. Using you knowledge of chemistry and a periodic table (http://www.webelements.com), identify at least one environmental or health concern.

Fusion – The combining of two or more nuclei into a single nucleus.

Two possible fusion reactions are given below.

$$ {}^{1}_{1}H + {}^{2}_{1}H \rightarrow {}^{3}_{2}He $$

$$ {}^{2}_{1}H + {}^{3}_{1}H \rightarrow {}^{4}_{2}He + {}^{1}_{0}n $$

Question #2 – Identify any environmental or health concerns related to fusion.

Watch this short video on fission vs. fusion then answer the following questions.
http://www.bbc.co.uk/schools/gcsebitesize/science/add_edexcel/fission_fusion/fissionfusionact.shtml

Question #3 – What do nuclear fission and fusion both produce?

Question #4 – How many elements are fissile?

Question #5 – How is a fission reaction controlled?

Question #6 - Compare and contrast fission and fusion

Fission	Fusion