



Chapter 16 – Atomic Energy



Section 2 – Energy from the Nucleus

Essential Questions

- Compare and contrast nuclear fission and nuclear fusion.
- What are the advantages and disadvantages of nuclear fission?
- What are the advantages and disadvantages of nuclear fusion?

Nuclear Fission

- Nuclear fission – large nucleus splits into two small nuclei and releases energy
- Some atoms undergo fission naturally
- Atoms can also be forced to undergo fission by hitting them with neutrons
- Fission can change matter into energy
 - Small amount of the total mass is changed to energy

Nuclear Chain Reactions

- Nuclear chain reaction – a series of continuous fission reactions
- Uncontrolled chain reaction – huge amounts of energy are given off very quickly
 - Ex: atomic bomb
- Controlled chain reaction – energy released can be used to generate electricity

Advantages and Disadvantages of Nuclear Fission

- Advantages:
 - Nuclear [power plants](#) cause more to build, but less to run than fossil fuel plants
 - Nuclear power plants do not pollute the atmosphere
- Disadvantages:
 - Accidents – explosions like the one at Chernobyl can cause catastrophic damage
 - Nuclear waste continues to be radioactive for thousands of years: storage is a problem

Nuclear Fusion

- Nuclear fusion – two or more nuclei combine to form large molecules
- Fusion takes place when the state of matter is plasma – even more active than gas
 - Plasma – is made of ions and electrons (electrons have been separated from the atoms)
 - Must have REALLY HIGH temperatures – the [sun](#) is one such place

Advantages and Disadvantages of Nuclear Fusion

- Advantages:
 - Less prone to accidents than fission
 - Fusion products are not radioactive
 - Excellent resource: enough hydrogen water to provide fuel for millions of years!
- Disadvantages:
 - Very high temperatures are needed
 - Currently unable to use fusion