


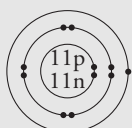


- Atomic Theory Describes Isotopes and Radioactive Decay
 - Radiation refers to high-energy rays and particles emitted by radioactive sources.
 - Isotopes are atoms of the same element that differ in the number of neutrons that they possess; isotopes of an element have the same atomic number but different mass number.
 - Radioisotopes are natural or human-made isotopes that decay into other isotopes, releasing radiation.
 - The three major types of radiation are alpha (helium nucleus), beta (fast-moving electron), and gamma (high-energy electromagnetic radiation).
- A Half-Life Can Be Used to Describe the Rate of Radioactive Decay of an Isotope
 - All radioactive decay rates follow a similar pattern called a decay curve.
 - A half-life measures the time needed for half the radioisotopes in a sample to decay. The half-life is a constant that does not change regardless of the amount of a given radioisotope that is present.
 - Carbon dating is a method of absolute dating of the remains of organisms based on carbon-12 to carbon-14 ratios, to a maximum of 50 000 years in the past.
 - The Common Isotope Pairs Chart relates parent and daughter isotopes, half-life of parent and the effective dating range that a given isotope pair is useful for.
- Nuclear Reactions Can Be Described as Fission or Fusion
 - Fission reactions cause changes to the nucleus involving the splitting of a more massive nucleus, releasing two lower mass nuclei as well as other particles and energy.
 - Fission reactions can be induced by colliding some large nuclei such as uranium-238 with neutrons or other small particles.
 - Fission reactions are used in nuclear powered generating stations (and were used in the first atomic weapons).
 - Fusion reactions are the result of two lower mass nuclei fusing to form a new, more massive one. Fusion reactions can release large amounts of energy.
 - The Sun's energy is produced through nuclear fusion reactions at its core, mostly involving isotopes of hydrogen.
 - Modern nuclear weapons use fission reactions involving uranium or plutonium to ignite fusion reactions involving hydrogen. The fusion reaction releases most of the energy.

CHAPTER REVIEW ANSWERS

Checking Concepts

- Radiation refers to high-energy rays and particles emitted by radioactive sources.
- Radioisotopes are natural or human-made isotopes that decay into other isotopes, releasing radiation.
- (a) Alpha, beta, gamma
(b) Alpha particles are helium nuclei, beta particles are fast-moving electrons, and gamma rays are high-energy electromagnetic radiation.
(c) Alpha particles have a 2+ charge, beta particles have a 1- charge, and gamma rays have no charge.
- $\frac{4}{2}\alpha$ or $\frac{4}{2}\text{He}$
- (a) They have the same number of protons (12 each).
(b) They have differing numbers of neutrons (12 and 14).
- Proton
- Protons and neutrons
- A beta particle is an electron, which has a negative charge.
- With the loss of an alpha particle, a nucleus loses two protons and two neutrons. With a different number of protons, the new nucleus is a different element.
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