What Is Nuclear Physics?

Worksheet

Nuclear physics is the study of atomic nuclei, covering radioactive decay, binding energy, and the fission and fusion reactions that release enormous amounts of energy.

E = @Delta m c^2

Questions

1. What is the half-life of a radioactive substance?

A) The total time it takes to decay completely
B) The time for half the sample to decay
C) The time for the sample to double
D) The energy released during decay

2. Which process splits a heavy nucleus into smaller ones?

A) Fusion
B) Fission
C) Ionization
D) Beta decay

3. What powers the sun?

A) Nuclear fission
B) Chemical combustion
C) Nuclear fusion
D) Radioactive decay alone

4. A sample with a 5-year half-life starts at 200 g. How much remains after 10 years?

A) 100 g
B) 50 g
C) 25 g
D) 150 g

5. A 100 g sample of a radioactive isotope has a half-life of 10 years. How much remains after 30 years?

6. Iodine-131 has a half-life of about 8 days. Starting with 40 g, how much is left after 24 days?

7. A sample decays from 80 g to 20 g in 12 years. What is its half-life?

8. Define: What is inside an atomic nucleus?

9. Define: What is radioactive half-life?

10. Define: What is nuclear fission?

Answer Key

1. B) The time for half the sample to decay - Half-life is defined as the time needed for half of a radioactive sample to decay.
2. B) Fission - Fission splits a heavy nucleus (like uranium-235) into lighter nuclei, releasing energy.
3. C) Nuclear fusion - The sun generates energy by fusing hydrogen nuclei into helium in its core.
4. B) 50 g - 10 years = 2 half-lives 200 (1/2) = 50 g.
5. 30 years = 3 half-lives N = 100 (1/2) N = 100 0.125 = 12.5 g
6. 24 days 8 days = 3 half-lives N = 40 (1/2) = 40 0.125 N = 5 g
7. 20/80 = 1/4 = (1/2) 2 half-lives occurred 2 half-lives = 12 years t = 12 / 2 = 6 years
8. Protons and neutrons (collectively called nucleons), held together by the strong nuclear force.
9. The time it takes for half of a radioactive sample to decay.
10. The splitting of a heavy nucleus into smaller nuclei, releasing energy - used in nuclear reactors.