

Nuclear Fission: The splitting of a large, unstable atomic nucleus (e.g., Uranium-235 or Plutonium-239) into two or more smaller nuclei, releasing energy, gamma radiation, and two or three neutrons.

Chain Reaction: Neutrons released during fission can be absorbed by other unstable nuclei, causing them to fission, leading to a self-sustaining reaction.

Nuclear Fusion: The joining of two light atomic nuclei to form a heavier nucleus, releasing a tremendous amount of energy. This process requires extremely high temperatures and pressures to overcome the electrostatic repulsion between the positively charged nuclei.

Section A: Key Terms & Processes

1. Figure 1 illustrates the process of nuclear fission. Label the components and products indicated by the letters A, B, C, and D.

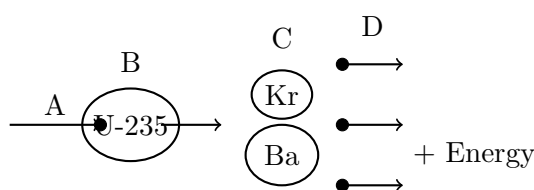


Figure 1: Nuclear Fission Process

- A: _____
- B: _____
- C: _____
- D: _____

2. Complete the sentences below using the words **splitting**, **joining**, **high**, **low**, **neutrons**, or **protons**:

- Nuclear fission is the _____ of a large, unstable nucleus.
- Nuclear fusion is the _____ of two light nuclei.
- A chain reaction in nuclear fission is sustained by the release of _____.
- Nuclear fusion requires extremely _____ temperatures and pressures.

Section B: Core Concepts & Explanations

3. Answer the following questions related to nuclear fission and fusion:

- Describe the process of nuclear fission in a uranium-235 nucleus.

- Explain what a chain reaction is in the context of nuclear fission and how it is controlled in a nuclear reactor.

c) Describe the conditions required for nuclear fusion to occur and explain why these conditions are necessary.

d) Explain why nuclear fusion is difficult to achieve and sustain on Earth for energy generation.

Section C: Exam Application & Extended Writing

4. The table below compares some features of nuclear fission and nuclear fusion.

Feature	Nuclear Fission	Nuclear Fusion
Type of nuclei involved	Large, unstable	Small, light
Process	Splitting	Joining
Energy release	Significant	Very significant
Conditions required	Neutron absorption	Extremely high T & P
Radioactive waste	High level	Low level (or none)

a) Using the information in the table, state two advantages of nuclear fusion over nuclear fission as an energy source.

b) Compare and contrast nuclear fission and nuclear fusion as processes for generating energy, discussing their mechanisms, conditions, and practical implications for power generation. (6 marks)
