Nuclear Fission and Nuclear Fusion

SECTION 4

OBJECTIVES

- Define *nuclear fission, chain reaction,* and *nuclear fusion,* and distinguish between them.
- Explain how a fission reaction is used to generate power.
- Discuss the possible benefits and the current difficulty of controlling fusion reactions.

Nuclear Fission

Review **Figure 1,** which shows that nuclei of intermediate mass are the most stable. *In* **nuclear fission,** *a very heavy nucleus splits into more-stable nuclei of intermediate mass.* This process releases enormous amounts of energy. Nuclear fission can occur spontaneously or when nuclei are bombarded by particles. When uranium-235 is bombarded with slow neutrons, a uranium nucleus may capture one of the neutrons, making it very unstable. The nucleus splits into medium-mass nuclei with the emission of more neutrons. The mass of the products is less than the mass of the reactants. The missing mass is converted to energy.

Nuclear Chain Reaction

When fission of an atom bombarded by neutrons produces more neutrons, a chain reaction can occur. *A* **chain reaction** *is a reaction in which the material that starts the reaction is also one of the products and can start another reaction.* As shown in **Figure 14,** two or three neutrons can be given off when uranium-235 fission occurs. These neutrons can cause the fission of other uranium-235 nuclei. Again neutrons are emitted, which

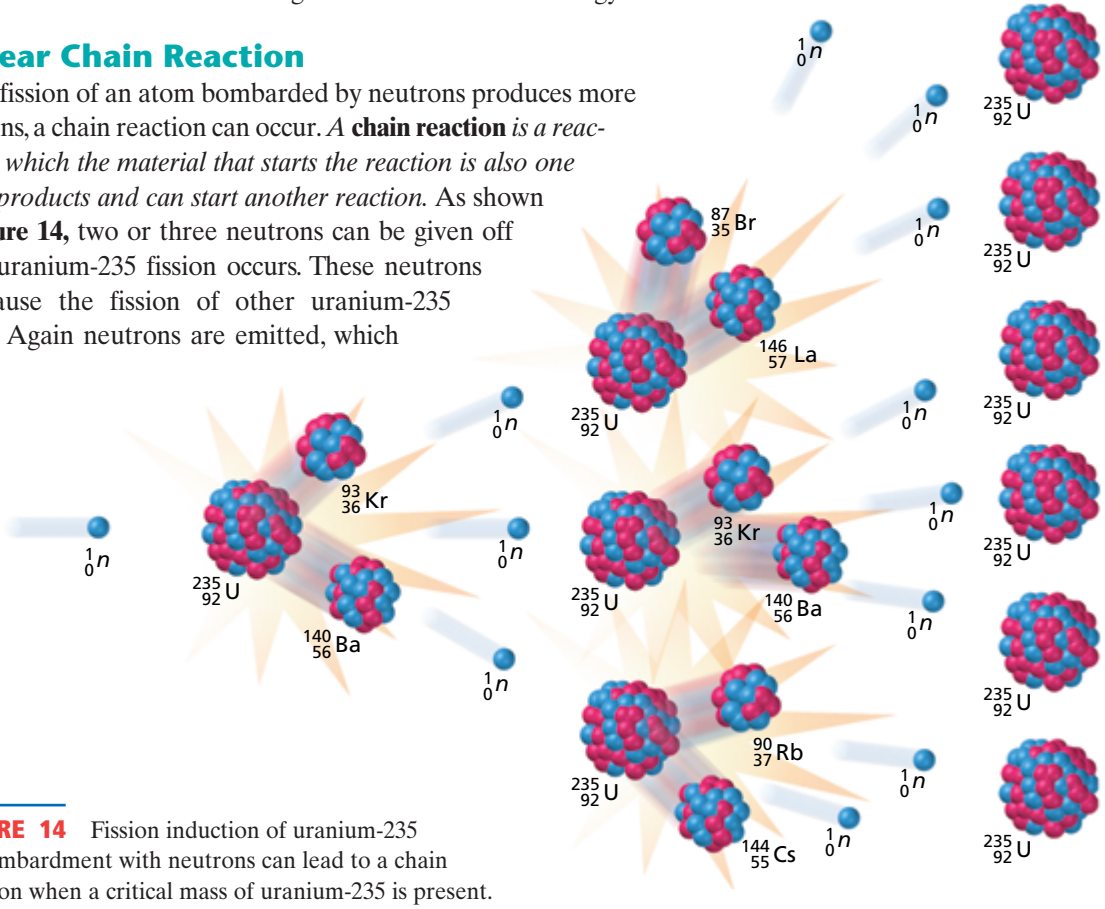

FIGURE 14 Fission induction of uranium-235 by bombardment with neutrons can lead to a chain reaction when a critical mass of uranium-235 is present.