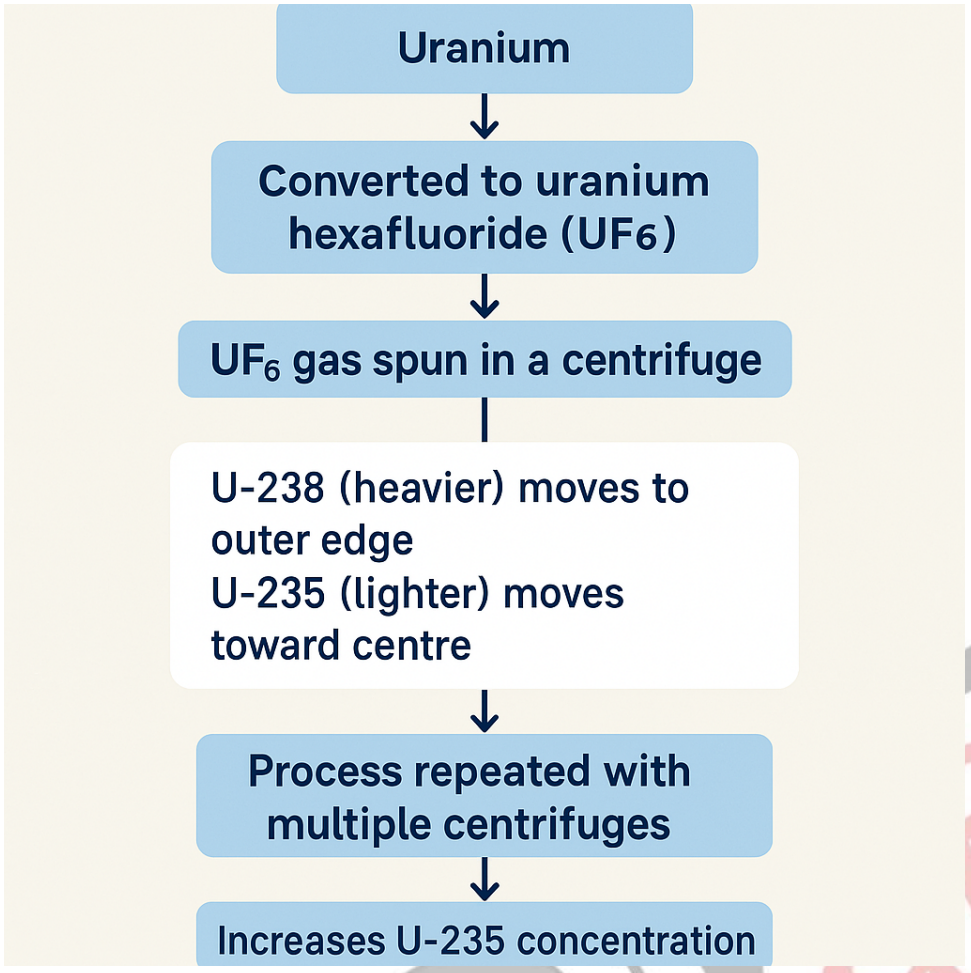
Centrifuge Process of Uranium Enrichment

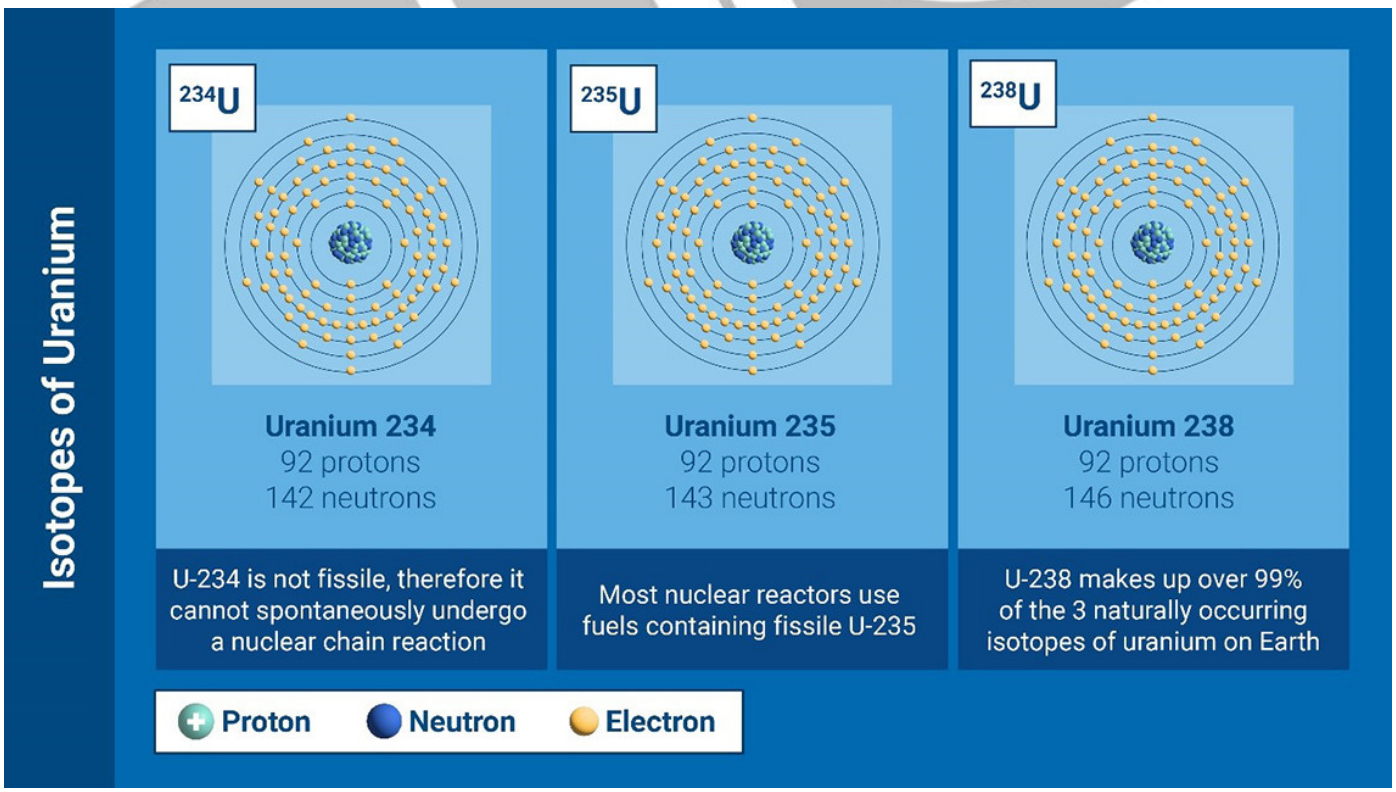
Source: TH

Uranium Enrichment is used to **increase U-235 concentration to the desired level.**

- **Need for Enrichment**: Natural uranium has **99.3% U-238 and 0.7% U-235.** Nuclear **reactors require 3–20% U-235**, while **nuclear weapons** require about **90% U-235.**
  - Uranium enriched **beyond 20%** is considered as **highly enriched.**
- **Centrifuge Process of Uranium Enrichment:**
  - In this method, uranium is first converted into a gas called **uranium hexafluoride (UF_6)**.
    - **UF_6** is the **only gaseous** form of uranium suitable for centrifuge separation.
  - Uranium has two main isotopes **U-238 (heavier)** and **U-235 (lighter and used in nuclear reactors/weapons)**, having a **small mass difference of 1.27%.**
  - When the UF_6 gas is spun at **very high speeds (around 50,000 rpm)** inside a centrifuge, the **heavier U-238 moves to the outer edge,** and the l**ighter U-235 stays closer to the centre.**
    - This process is **repeated across many centrifuges**, gradually **increasing the U-235 concentration** in the final product.



- **Centrifuge Design:**
  - The centrifuge has a **rotor chamber** made from **strong, lightweight material (like carbon fibre)** to withstand **extreme speeds and force**s without breaking.



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