



How does nuclear fission work?

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Ages 11-16 ⌚ 2 min read

Deep inside every atom lies a tiny but incredibly powerful centre called the **nucleus**. Most of the time, this nucleus holds together perfectly well, like a tightly packed snowball. But some atoms — particularly heavy ones like uranium — have nuclei that are a bit wobbly and unstable.

The Great Nuclear Split

Nuclear fission happens when one of these unstable nuclei gets hit by a tiny particle called a neutron. Think of it like throwing a pebble at a precariously balanced tower of blocks — sometimes that small nudge is enough to make the whole thing come tumbling down.

Imagine a massive dominoes setup where knocking over one domino causes two more to fall, and each of those knocks over two more. That's exactly how nuclear fission works — one split atom releases neutrons that split more atoms, creating a chain reaction.

When a uranium nucleus splits, it breaks into two smaller pieces (called fission fragments) and releases several neutrons. But here's the remarkable bit: it also releases an enormous amount of energy. This happens because the pieces weigh slightly less than the original nucleus, and that missing mass gets converted into energy according to Einstein's famous equation $E=mc^2$.

Controlling the Chain Reaction

In nature, this chain reaction would happen incredibly quickly — far too quickly to be useful. So nuclear engineers use special materials called **control rods** to absorb some of the neutrons, rather like having referees in our domino analogy who catch some of the falling dominoes before they can knock others over.

By carefully moving these control rods in and out of the reactor, engineers can control exactly how fast the chain reaction happens. This controlled fission generates heat, which turns water into steam, which spins turbines to generate electricity.

Why Fission Releases So Much Energy

The energy locked inside atomic nuclei is absolutely colossal. Just one kilogram of uranium contains roughly the same amount of energy as 3,000 tonnes of coal. That's why nuclear power plants can run for months on relatively small amounts of fuel, and why nuclear energy is so incredibly powerful — both as a source of electricity and, unfortunately, as a weapon when the chain reaction is allowed to run wild.