

LISE MEITNER

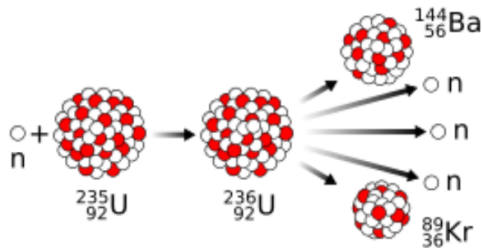


Lise Meitner was a Jewish Austrian-Swedish **nuclear physicist**, who is responsible for the discovery of **nuclear fission** alongside Otto Hahn. Hahn received the 1944 Nobel Prize in Chemistry for the discovery, while Meitner did not get the credit she deserved. She was the second woman from the University of Vienna to ever earn a doctorate in physics and continued her research in Germany. However, she lost her research positions due to the **Nuremberg Laws** enacted by Nazi Germany. Nuclear Fission was essential to the Manhattan Project, but Meitner had no interest in building a bomb. She was later "sorry that a bomb had to be invented".

"Science makes people reach selflessly for truth and objectivity; it teaches people to accept reality with wonder and admiration, not to mention the deep awe and delight that the natural order of things brings to the true scientists"

Nuclear Fission

To this day, Nuclear Fission is still used for energy development as it better for the environment than coal or fossil fuels and can generate energy much faster than solar power. The Shoreham Nuclear Power Plant used to be operational here on Long Island but was later decommissioned over safety concerns after accidents on the Three Mile Island and Chernobyl Nuclear Plants.



[Nuclear Fission](#)

More information

[Lise Meitner](#)

[The Manhattan Project](#)

[Shoreham Nuclear Power Plant](#)

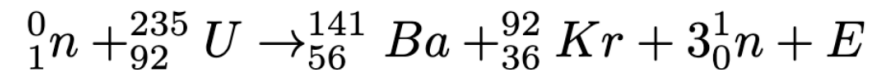
Experiment: Nuclear Fission for Energy Development

What you need

Pen/Pencil and Paper and/or Digital writing tool

Procedure

The following is the chemical equation for nuclear fission:



The energy $E = 200\text{MeV}$. This chemical equation describes one neutron colliding with Uranium-235, producing Ba, Kr, three other neutrons, and energy. Of the energy, 180MeV can be used for power production (90% efficiency). The three neutrons then stimulate three new chemical reactions.

Questions:

Can you derive a formula for (approximately) how much energy is released after n-timesteps? For example, after 3 timesteps, $180\text{MeV} + 3(180\text{MeV}) + 9(180\text{MeV}) = 2340\text{MeV}$ are created. This means energy is released exponentially fast!

There are 2.56×10^{21} atoms per gram of Uranium-235. How much energy is released from this amount of Uranium-235, assuming 90% efficiency?

If $1\text{MeV} = 1.60218 \times 10^{-13}\text{Joules}$, how much energy did you calculate above in Joules?

It takes $5.184 \times 10^6\text{Joules}$ to power a 60-Watt lightbulb for one day. How long will this fission reaction power the lightbulb for?

Find a creative way to present the answers to these questions!

