

In this activity, you will be investigating Nuclear Fission by using a simulation (<https://phet.colorado.edu/en/simulation/legacy/nuclear-fission>). The simulation has three different components that cover:

- One Atom
- Chain Reaction
- Nuclear Reactor

➤ The first segment will cover One Atom, which is uranium-235.

1. What is the composition of a uranium-235 nucleus?

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2. How do you make uranium-235 unstable?

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3. Look at the graph at the bottom. The yellow line represents the Total Energy of the system. What happens to the total energy of the system when the neutron gun is fired?

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4. What does uranium-235 turn into when it captures the neutron?

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5. What happens to the nucleus after it captures the neutron? What free particles are emitted?

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➤ Next, click on the Chain Reaction tab at the top of the window.

6. Set the number of uranium-235 nuclei to 25, and fire the neutron gun. How many nuclei decay after one firing? What is the percentage of nuclei that decay after one firing?

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➤ When the radioactive decay of one nucleus leads to more nuclei decaying, this is called a chain reaction.

7. Increase the number of uranium-235 nuclei to 50, 75, and 100, and determine the percentage of these nuclei that decay after one firing of the neutron gun. What happens to the percentage of nuclei that decay when the number of uranium-235 nuclei increases?

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8. Now, change the number of uranium-235 nuclei to zero, and put in one nucleus of uranium-238. What happens when a uranium-238 nucleus captures a neutron?

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9. Why is uranium-235 a good source for a chain reaction compared to uranium-238?

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➤ Finally, click on Nuclear Reactor at the top of the window.

10. Click on Fire Neutrons. What happens when the neutrons are fired?

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11. Repeat this process five to ten times. What happens to the uranium-235 over time? Do all of the neutrons that are fired cause nuclear reactions? Explain.

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12. Why does the reaction not take place all throughout the entire reactor? What is the purpose of the control rods?

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13. When the reactions are taking place, there is a reading on the Power Output energy graph. What determines the amount of power that is being output at any given time?

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14. What happens to the Energy Produced graph over time?

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