Nuclear Fission WebLab

Name and date submitted (3 pts):

Go to the Nuclear Fission simulation <https://phet.colorado.edu/en/simulation/nuclear-fission> and start the App. (You don’t need to actually *download* the App unless you want to). This App requires Java in order to run. Java is a free download. Make sure to adjust your browser settings (Google Chrome, etc etc) to allow Java to run this application.

**Background:** In this simulation, you will be using two isotopes of uranium. Complete the following information about uranium-235 and uranium-238.

1. ***Isotope # protons # neutrons atomic mass***

|  |  |  |  |
| --- | --- | --- | --- |
| uranium-235 |  |  |  |
| uranium-238 |  |  |  |

**Using the Fission: One Nucleus tab**

1. Describe how you can trigger a fission reaction in the uranium-235 atom.
2. How many neutrons are released when the atom undergoes fission?

**Using the Chain Reaction tab**

1. What happens when you shoot a neutron at a uranium-238 atom?
2. What happens when you shoot a neutron at a uranium-239 atom?
3. What happens when you have one hundred U-235 (no U-238) atoms and shoot one neutron?
4. What happens when you have one hundred U-238 atoms (no U-235) and shoot one neutron?
5. We want to know *how the percentage of U-235 atoms affects the percentage of U-235 nuclei fissioned.* Describe what happens in each of the following situations when you shoot ONE neutron into the field of nuclei on the screen.
**Note:** When you shoot your neutron, make sure it hits a U-235 atom.

 **Atoms % U-235 % of Nuclei Fissioned
 (#U-235 ÷ Total) (see bottom right corner)**

|  |  |  |
| --- | --- | --- |
| 100 U-2350 U-238 |  |  |
| 80 U-23520 U-238 |  |  |
| 60 U-23540 U-238 |  |  |
| 40 U-23560 U-238 |  |  |
| 20 U-23580 U-238 |  |  |
| 0 U-235100 U-238 |  |  |

1. Determine the variables (look these up on Internet if you don’t remember them)
a. Independent Variable:

b. Dependent Variable:

c. Constant Variable(s):
2. Make a line graph of your data. (Use a drawing tool if you want). Remember to:

 - Use equally-spaced intervals for both axes.

 - Place numbers at a LINE (not between the lines).

 - Label both axes with words (the column titles from your data table).

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1. How does the number of U-235 atoms affect the percentage of U-235 atoms fissioned?
2. Using your observations in this simulation, explain why your answer to #11 makes sense.
3. Based on your experiment, what isotope of uranium is used in a nuclear reactor? Why must that be the case?
4. Use the internet to discover what percentage of natural uranium is U-235. Explain why uranium mines do not start a chain reaction and blow up.

**Using the “Nuclear Reactor” tab**

1. Generate electricity! Adjust the control rods to generate power without letting the temperature get too high. You may need to adjust them as the reaction is taking place.
***\*In order to maintain a steady power output, do you need to put the control rods farther in or slowly take them out as the fission reaction takes place? Explain why this is the case.***