Nuclear Fission PhET Simulation

Open the PhET simulation Nuclear Fission, this is an embedded JAVA simulation, it may take some time to open.

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

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?

3. Briefly describe the process by which Uranium-235 can be made unstable. Write a nuclear equation for the process.

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. Suppose that you have 100 atoms of Uranium-235 and you fire a neutron into a single atom. Sketch a qualitative graph of Fissioned U-235 Atoms vs. Time.

4. Using the “Chain Reaction” tab within the model, **validate** your prediction from question 7.

5. **Explain** how the PhET model validates/invalidates your prediction made in question 7, citing specific observations.

6. 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.

   Please add your data to the following spreadsheet: Critical Mass Determination

   *Note: When you shoot your neutron, make sure it hits a U-235 atom.

Atoms		% U-235 (#U-235 / Total)
U-235	U-238	% U-235
100	0	100
90	10	90
80	20	80
70	30	70
60	40	60
50	50	50
40	60	40
30	70	30
20	80	20
10	90	10
0	100	0

7. According to the data, **determine** the criteria and settings needed to create an atomic bomb.

8. **Explain** why “weapons-grade” Uranium would not likely contain very much Uranium-238.