**Nuclear Fission Simulation**

**Name: Period:**

Open the “Nuclear Fission” sim: <http://phet.colorado.edu/simulations/sims.php?sim=Nuclear_Fission>

Start at the tab “Fission: One Nucleus”

#1) Define fission: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#2) Run the simulation. Before the gun is fired, is the material stable, or does it seem likely to radioactively decay?

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#3) When you operate the gun, what type of particle does it fire?

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#5) Switch the tab to “chain reaction” and add some uranium-238. The atom used in the previous tab was uranium-235. Is uranium-238 “fissionable”? How does firing the gun on a uranium-238 atom change it? (Note you can aim the gun.)

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#6) Reset the sim (using the button) and add lots of fissionable (≈ 50) uranium-235. What happens and why?

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#7) Normal levels of the uranium-235 isotope are about 0.72%, with the majority being uranium-238. Round the level up to 1% (in the favor of uranium-238), to one atom of uranium-235 and 99 atoms of uranium 238. Use the simulation to discover if naturally-derived uranium can start a chain reaction (and therefore be useful in either nuclear weapons or nuclear power plants): Is naturally derived uranium able to start a chain reaction, or must the sample be “enriched”?

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#8) Use the simulation to find a minimum ratio of uranium-235 to uranium-238 (keep your total of atoms always at 100); what is the smallest percentage that still starts a chain reaction?

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#10) Use the simulation to make a nuclear weapon. What conditions are needed? (Hint, you’ll need to check the box “containment vessel”, and a certain level of enrichment that you must determine.)

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**Nuclear power plants:**

Switch to the “Nuclear Reactor” tab.

#12) What is needed to start the nuclear reactor?

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