Name:_____ **Half Life Simulation**

Background Information: Radioactive isotopes decay to form other, more stable isotopes at a rate that is fixed for each isotope. The half-life of an isotope is the time it takes for one half of the atoms in a sample to decay. This lab will be used to simulate the process.

Objective: Simulate the time it takes for a sample of 100 atoms of Francium-220 to decay.

Pre-Lab Questions:

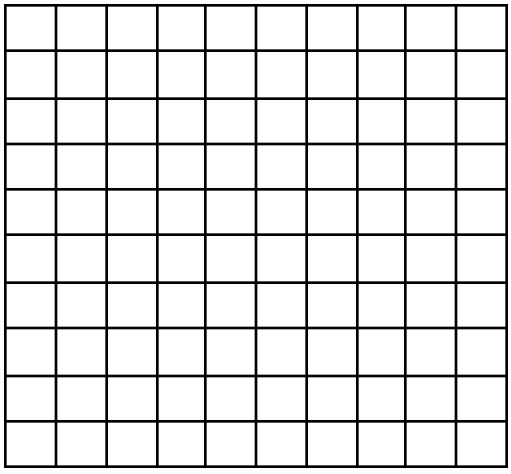
1. According to Table N, what is the half-life of Fr-220?

2. Using table N, write the natural transmutation equation for the decay of Fr-220.

Procedure:

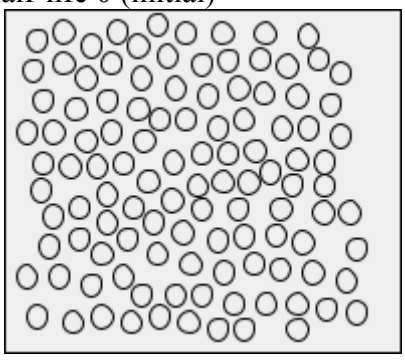
1. Count the "atoms" of Fr-220 provided and ensure you are starting with 100 atoms.
2. Place all atoms in a container and shake them up for 27 seconds.
3. Carefully dump the container of atoms.
4. Count and record the number of atoms that show Fr-220. Place these back into the container.
5. Count and record (or subtract from 100) the number of atoms that show the daughter particle. Leave these on the desk.
6. Calculate the time it takes to approach that half-life by adding all the times the particles have been shaking together. Record the total time shaken in the table below.
7. Shake the remaining Fr-220 for 27 seconds and then repeat steps 3-7.
8. Graph your results: time (s) on the x axis and Fr-220 remaining on the y-axis.

Half Life Trial	Number of Fr-220 Remaining	Total Number of Daughter Particles Created	Total Time (s)
0	**100**		**0**
1			
2			
3			
4			
5			

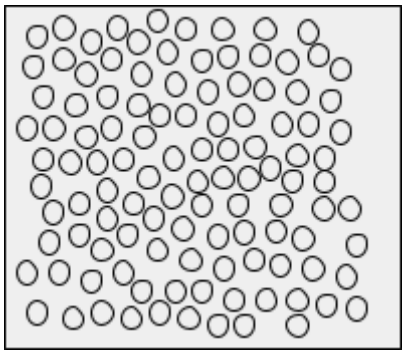


1. Use the diagrams to represent your atoms that decayed to the daughter particle. Provide a key.

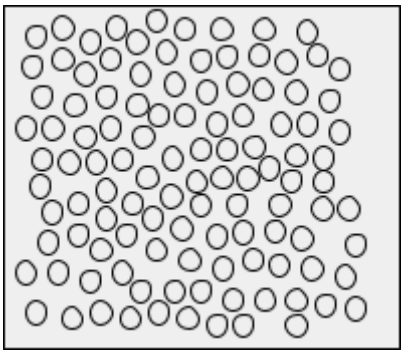
Half-life 0 (initial)



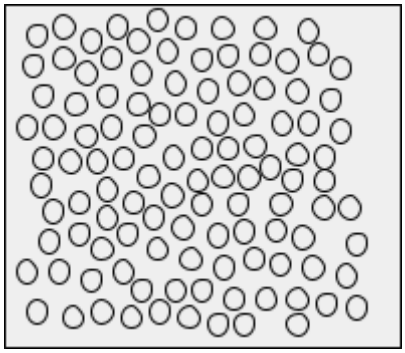
Half-life 1



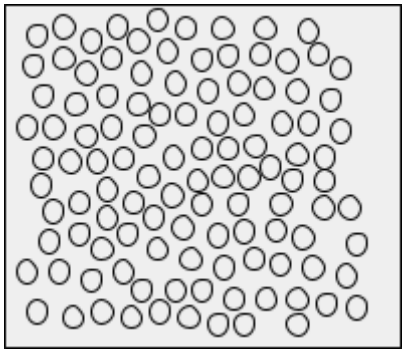
Half-life 2



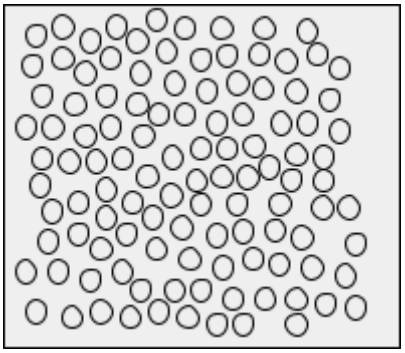
Half-life 3



Half-life 4



Half-life 5



2. Roughly, what percent of Francium particles **decayed** after 54.8s?

3. Roughly, what percent of Francium **remained** after 54.8s?

4. If 200g of Fr-220 was used instead of 100 atoms, what mass of Fr-220 would **remain** after 54.8s?

5. Roughly, what fraction of Francium particles **decayed** after 109.6s?

6. Roughly, what fraction of Francium **remained** after 109.6s?

7. If 400g of Fr-220 was used instead of 100 atoms, what mass of Fr-220 would **decay** after 109.6s?

8. How long would it take Fr-220 to decay to 1/128 of the original sample size?

9. How many half-lives would it take Fr-220 to decay from 300g to 75g?

Pre-lab and data checked by teacher: