Extra Practice Radioactivity Test -Key

Fill in the blanks with the correct term:

___Geiger Counter_______	A device used to measure radiation
___Chain Reaction_______	A single action that causes the same reaction to occur over and over
___Alpha Decay_________	Radioactivity that can be blocked by paper but is still dangerous
___Half-life______________	The amount of time it takes for a radioactive substance to lose half its mass
___Fusion_______________	Two nuclei forced together, releasing energy
___C-14 (Carbon-14)_____	Decay of this is used to determine the age of formally living material (was isotope)
___Beta Decay___________	Radiation that can be blocked by wood but not paper
___Gamma Decay_______	Emission of high energy radiation, foes through all but thick concrete and lead
___Fission______________	The nucleus splits apart, releasing energy
__Cadmium Control Rods__	Used in nuclear power plants to control reaction rate by absorbing particles
___Radiation____________	Can cause and cured cancerous cells
___Irradiation____________	Is used to make foods safe to eat by filling bacteria and microorganisms
__Marie Curie____________	One of the first female scientists to discover radioactive isotopes
___Tracers______________	Used in medicine to follow chemical reactions inside the body
___Background Radiation__	Radiation that comes from the sun, soil and building materials

Fusion vs. Fission

Sort the following statements into the categories below:

- Used by nuclear power plants
- The splitting of a nucleus
- The joining of two nuclei
- Used by the sun
- Used in nuclear bombs
- Release energy
- Creates stable atoms
- Creates a chain reaction once started

Fusion

- **Used by the sun**
- **The joining of two nuclei**

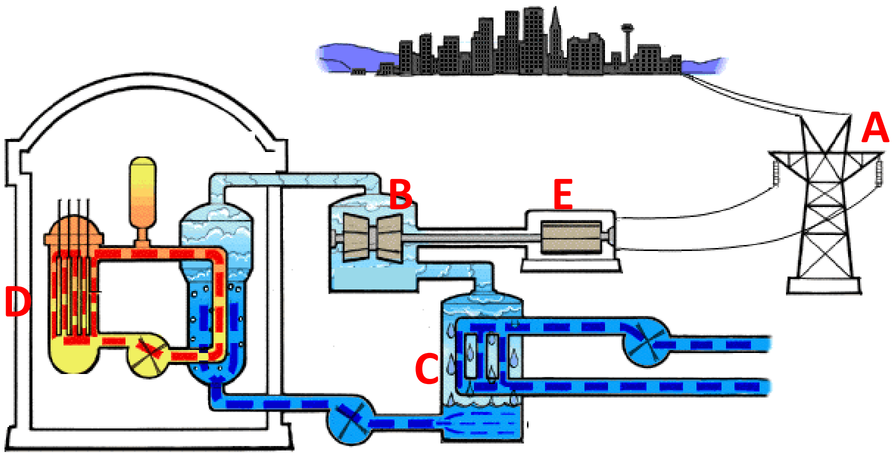
Both

- **Creates Stable Atoms**
- **Releases energy**

Fission

- **Used in nuclear power plants**
- **The splitting of a nucleus**
- **Used in nuclear bombs**
- **Creates a Chain Reaction**

Nuclear Power Plants



Match the following terms with the letters above:

1. Cadmium Control Rods (used to control the rate of reactions) **D**
2. Uranium (radioactive isotope that under goes fission to release energy) **D**
3. Turbine (turned by the steam to create electricity) **B**
4. Cooling system (continually pumps in cool water to keep the uranium from overheating) **C**

Nuclear Bombs

Briefly describe how nuclear weapons have been used by the United States.

The USA has tested over 1000 bombs to date but has only used them once during war time. Towards the end of WWII we dropped two bombs on Japan (Hiroshima and Nagasaki) killing thousands of people and causing devastating after effects.

Half-lives Practice

The half live of Carbon-14 is 5,730 years, answer the following questions based off of this data.

What is the age of a fossil with 25% C-14 left? If it has 25% left… and I would have started at 100%... I need to figure out how many times I would have to cut 100% in half to get to 25%... So 100/2 = 50%, 50/2=25%... so 2 half lives… each half life in 5,730 years… so 2 x 5,730 = **11,460 years old**

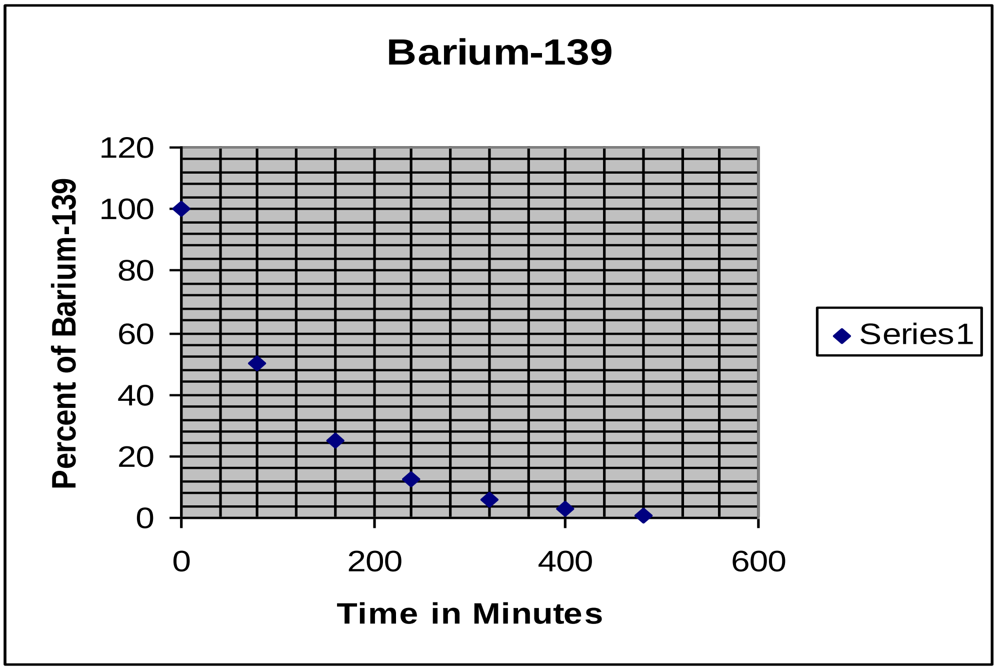
How much of a 240 gram sample of C-14 **will be left** after 4 half-lives? So I start with a 240 gram sample…. There have been 4 half lives, so I need to cut it in half 4 times… 240/2 = 120g (1 half life), 120/2=60g (2 half lives), 60/2=30g (3 half lives), 30/2 = 15g (4 half lives)… **so the answer is 15g would be remaining**

How many half lives would have passed by the time a 150g sample of C-14 decays into 18.75g? Ok so how many times would I have to cut 150g in half to get to 18.75g?... 150/2=75 g (1 Half Life), 75/2=37.5g (2 Half Lives), 37.5/2=18.75g (3 Half Lives)…. **So the answer would be 3 half lives**

How many years does it take for a 1200g sample of C-14 to decay into a 300g sample? Ok so it asks for how many years, but first I need to figure out how many half lives it would take to go from 1,200g to 300g… 1200/2=600g (1 half life), 600/2=300g(2 half lives)… ok so I know if took 2 half lives, each half life is 5,730 years… so 2 x 5,730 = **11,460 years olf**

What percentage of a sample of C-14 **remains** after 17,190 years? So I need to figure out the percent remaining, but first I need to figure out how many half lives would have happened in 17,190 years… after 7,730 years 1 half life would have passed, after 11,460 years 2 half lives would have passed, after 17,190 years 3 half lives would have passed… so 3 half lives… Now I need to figure out what percent would be left after 3 half lives… so if I start with 100%... 100/2=50% (1 half life), 50/2 =25% (2 half lives), 25/2=12.5% (3 half lives)... so after 17190 years, 3 half lives would have happened so **12.5% of the sample would remain**

Use the graph below to answer the following questions:



What is the half-life of barium-139? Tricky graph… First after looking at it… it appears that each tick mark on the percentage side equals 4%, and each tick like on the bottom representing time equals 40 minutes… now that I've figured this would to solve for half-life I would look at the time that elapsed between when the sample was 100% and went to 50% (1 half life)… looking at the graph, that would be **80 minutes**

How long would 3 half-lives be for Ba-139? There is two ways to figure this out, first looking at the graph… the third half life would the fourth dot (the first one is time zero)… so I would extrapolate and find it is **240 minutes** by looking at the x axis… OR I can do the math since I know the time for one half life… 1 half life = 80 minutes, 2 half lives = 160, 3 half lives = **240 minutes**

What percent would be left after 3 half-lives? Again, I could go to the graph and realize the fourth dot represents the 3rd half life (first dot it time zero) and extrapolate to the y axis and find **12.5%**... OR I can do the math, 3 half lives means I need to cut 100% in half 3 times…. 100/2 = 50%, 50/2 = 25%, 50/3=**12.5%**

If you had 60 grams of Ba-139, **how much would be left** after 240 minutes? Alright, I know what I start with in grams and how long has passed, it wants me to solve for how much would be left after that time… first I need to figure out how many half lives have happened in that time… 240 minutes and each half life of B-139 is 80 minutes… 80 min =1 half, life, 160 minutes = 2 half lives, 240 minutes =3 half lives…. Ok so 3 half lives have happened so now to figure out how much is left after 3 half lives so I cut what I started with in half three times… in this case I started with 60 grams…. 60/2=30g, 30/2=15g, 15/2=7.5g…. So if I started with 60 grams, 240 minutes or 3 half lives have happened… so I'm left with **7.5g**

If you had 50 grams of Ba-139, **how much would be left** after 4 half lives? Similar to the question above, except I don't need to figure out how many half lives… I've already told you, 4…. So start with my initial sample of 50 g, and cut it in half 4 times…. 50/2=25g, 25/2=12.5g, 12.5/2=6.25g, 6.25/2=3.125g… so after 4 half lives when I start with 50 grams… I would end with **3.125g**

If you have 50% of Ba-139 left, **how old** would the sample be? So it is asking me how old the sample would be… I know what 50% I have left… so if I figure out how many half lives would get me to that percentage and I know how long one half life is I can figure out how old it would be… so if I started with 100%... 100/2=50%... and I have 50% of the sample left so only 1 half life must have happened… well Ba-129 has a half life of 80 minutes… so if only one half life happened only **80 minutes** must have passed