Nuclear Review Slides
For each Nuclide, show complete notation for their decay reactions

Nuclide	Name of Radiation emitted	Complete Decay Reaction
Fe-53		
H-3		
Th-232		
U-238		
Cs-137		
P-32		

ANSWERS

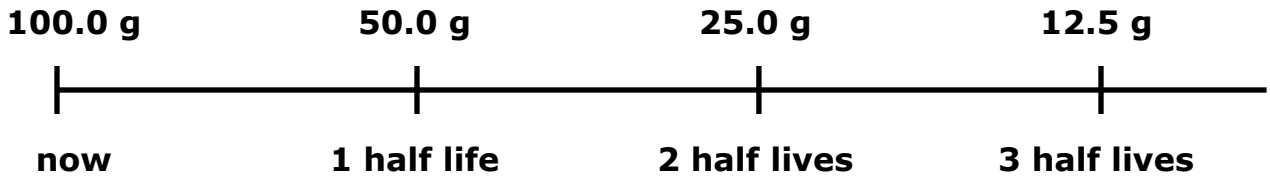
Nuclide	Name of Radiation emitted	Complete Decay Reaction
Fe-53	positron	$^{53}_{26}\text{Fe} \rightarrow {}^{0}_{+1}e + {}^{53}_{25}\text{Mn}$
H-3	beta	$^{3}_{1}\text{H} \rightarrow {}^{0}_{-1}\text{e} + {}^{3}_{2}\text{He}$
Th-232	alpha	$^{232}_{90}\text{Th} \rightarrow {}^{4}_{2}\text{He} + {}^{228}_{88}\text{Ra}$
U-238	alpha	$^{238}_{92}\text{U} \rightarrow {}^{4}_{2}\text{He} + {}^{234}_{90}\text{Th}$
Cs-137	beta	$^{137}_{55}\text{Cs} \rightarrow {}^{0}_{-1}\text{e} + {}^{137}_{56}\text{Ba}$
P-32	beta	$^{32}_{15}\text{P} \rightarrow {}^{0}_{-1}\text{e} + {}^{32}_{16}\text{S}$

If you start with 100.0 grams of K-42, how long until you have just 12.5 grams left? What are you other 87.5 grams now?

Someone hands you 512 grams of P-32 and you misplace it in your messy garage for a while. When you find it you find that only 2.0 grams of the stuff remains. How long has it been lost?

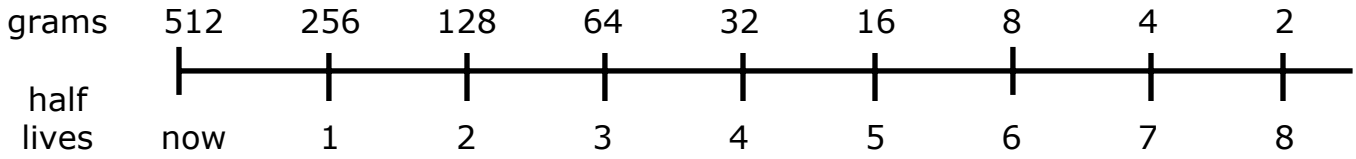
If a scientist finds a frozen horse and measures that is contains only one quarter of the radioactive C-14 present that normal, that scientist could state that this horse died how many years ago?

If you start with 100.0 grams of K-42, how long until you have just 12.5 grams left? What are you other 87.5 grams now?



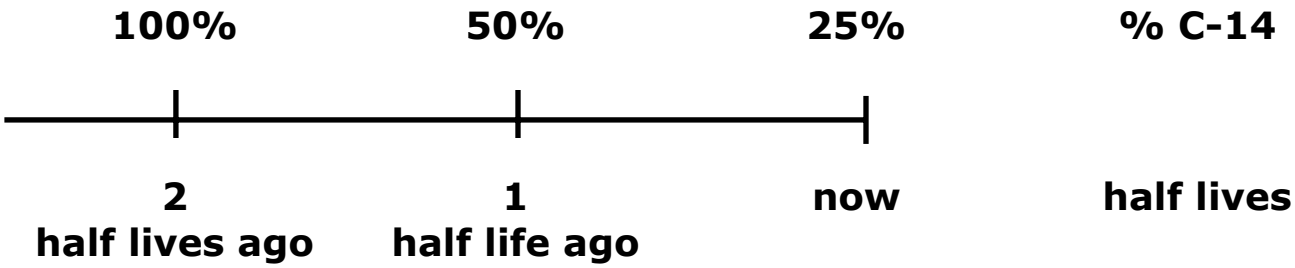
12.4 hours x 3 half lives = 37.2 hours It Transmutes to Ca-20.

Someone hands you 512 grams of P-32 and you misplace it in your messy garage for a while. When you find it you find that only 2.0 grams of the stuff remains. How long has it been lost?



8 half lives X 14.3 days = 114.4 days

If a scientist finds a frozen horse and measures that is contains only one quarter of the radioactive C-14 present that normal, that scientist could state that this horse died how many years ago?



2 half lives ago this horse had 100% of the radioactive C-14 that is normal. Each half life is 5730 years, so two half lives, when this horse died, was 11,460 years ago.

Compare and contrast FISSION and FUSION reactions.

Explain $e=mc^2$

What is mass defect?

Compare and contrast natural and artificial transmutation.

Define HALF LIFE.

Define ISOTOPE.

Define Radioactivity.

What makes an isotope’s nucleus unstable?

Compare and contrast FISSION and FUSION reactions.
Fission is the splitting of atoms, one larger nucleus breaks apart into two or more smaller nuclei, plus neutons and energy. Fusion squishes together two or more small nuclei (usually H) into a larger isotope (usually He), plus neutrons and energy. Fusion is more energetic by many times over.

Explain $e=mc^2$
Energy equals mass times the speed of light squared. Energy is the same thing as mass, according to Albert Einstein, and he was right.

What is mass defect?
Mass defect is that in every nuclear reaction that there is a loss of mass from the reactants as they form products. This mass is converted to energy according the equation just above.

Compare and contrast natural and artificial transmutation.
Natural transmutation is when an unstable radioisotope breaks down into a new isotope in a quest to become more stable. It's not stoppable, you can't speed it up or slow it down. Artificial transmutation is when an isotope is bombarded with neutrons to cause transmutation. It does not happen without human help.

Define HALF LIFE. Half life is how long it takes for one half a radioisotope to undergo natural transmutation. For every isotope this time frame is different but measurable.

Define ISOTOPE. Isotopes are chemically identical atoms with different numbers of neutrons. Some are stable, and some are not.

Define Radioactivity. Energy and particles emitted by an unstable radio-isotope in its attempt to become more stable.

What makes an isotope's nucleus unstable? There is a "band of stability" or ratio of neutrons: protons inside of a nucleus that are stable. Ratios that fall outside this band are unstable. This makes the nucleus emit particles and energy to get a more stable ratio.