**GC B12 Radioactive Decay**

Script

Instructions: Advance the PowerPoint slides at every new paragraph and anywhere you see “/”

[1] Absolute Dating--Radioactive Decay

[2] Recall that relative dating involves figuring out the order in which various geologic events happened.

[3] Except in rare circumstances, lower layers are older than upper layers. But just by looking at them, we cannot tell exactly how old they are or how much time elapsed between them.

[4] But scientists often talk –not just about relative age, but about the actual age of rock layers or fossils found in them. How are these actual ages calculated?

[5] By using a process called radiometric dating., which we’ll learn about that in the next video…

[6] …but first we need to understand a process called radioactive decay

[7] To do this, Imagine you have 100 pennies.

[8] Statistically, if you flip them all, about half will be heads and half will be tails.

[9] So when we flip the 100 pennies…

[10] We aren’t surprised that 50 are heads and 50 are tails

[11] We will leave the 50 heads in a pile. / One minute later, we will re-flip the 50 pennies that were tails

[12] When we do, about half the pennies flipped are heads and the other half are tails.

[13] So now we have about 75 heads in one pile with about 25 tails in the other.

[14] One minute later, we will flip the remaining 25 pennies again.

[15] After adding the heads to our growing group, / we wait a minute and flip the other pennies one more time

[16] About half come up heads and we continue to repeat the process.

[17] Notice that as we continue to flip the pennies, the group of heads continues to get larger, while the group we’re flipping gets smaller and smaller.

[18] Every minute, we flip the remaining pennies again (click several times till all pennies are in heads group)

[19-21 no script, just continue to advance the slides]

[22] …until all our pennies are in the heads group.

[23] One group increased steadily while the other group decreased steadily. / Both groups changed steadily as we flipped the pennies every minute. / We could not know for sure whether any individual penny would be heads or tails, but we knew that about half the group would be heads and half tails. Keep these three things in mind as we learn about radioactive decay.

[24] An element is the simplest substance possible. It cannot be separated into simpler substances.

[25] Think about water—H20. / Because water is made up of both hydrogen and oxygen, it is not an element. But the individual hydrogen and oxygen atoms that make up water ARE elements because neither of them can be separated into simpler substances.

[26] This is called the Periodic Table of the Elements. Each square in this table represents an element that scientists have discovered.

[27] Some of these elements are things you’re familiar with—/ like nitrogen, / carbon, / and hydrogen. Other things may be less familiar—/ like rubidium or / strontium.

[28] Each element is made up of protons and neutrons. / The top number tells how many protons are in an atom of the element.

[29] Isotopes are atoms of the same element that have the same number of protons…

[30] …but different numbers of neutrons.

[31] Some isotopes are stable, / which means they do not break down. Other isotopes are unstable, / which means that over time they do break down, or decay into isotopes of a different element.

[32] One example of radioactive decay / is when rubidium decays over time into strontium.

[33] Another example / is when potassium decays overtime into argon.

[34] The original unstable isotope is called the parent isotope, / and the new isotope formed when the parent isotope decays is called the daughter isotope.

[35] Think back to the three things we noticed about the penny flipping activity: / Just like one group of pennies increased steadily while the other group decreased steadily, / the parent isotope decreases steadily / while the daughter isotope increases during the process of radiative decay.

[36] Both groups of pennies changed steadily because we purposely flipped the pennies every minute. / We did that to show that unstable parent isotopes decay at known, steady rates. This rate—called the half-life / is the amount of time it takes for one half of the amount of parent isotope to decay into daughter isotope.

[37] The curve on this graph illustrates how half the parent isotope decays during each half life. / This dot represent the full amount of parent isotope present at the beginning. / After one half life, only half of the original is left. / After the second half life only a quarter is left. / After three half-lives only an eighth remains. / With each successive half-life, smaller and smaller amounts of the parent isotope remain until it is too small to measure.

[38] Let’s let this gray shape represent a rock. / Rocks are made of individual crystals. / They come in many different shapes, but we will represent them with these green boxes. / Each crystal is usually made up of several individual elements (like silicon, oxygen, and iron). / When the crystal includes any unstable elements (represented by these peach-colored shapes) / they will eventually decay into different isotopes. This radioactive decay is a random process.

[39] Just like we could not know for sure whether any individual penny would be heads or tails, / we cannot know for sure when any individual atom in a crystal will decay. / But just like we know that about half the group would be heads and half tails, / we know how long it takes for half the radioactive atoms in the rock to decay.

[40] To learn how this process helps scientists estimate the age of the rock layers, watch our next video…