**GC B13 Radiometric Dating**

Script

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

[1] Radiometric dating

[2] In the last presentation, we learned about the process of radioactive decay, / where an isotope of one element decays into an isotope of another element. After a quick review, we will learn how scientists use this process to estimate the age of rock layers in the geologic column.

[3] One example of radioactive decay / is the parent isotope rubidium / decaying to form the daughter isotope strontium.

[4] This decay process from each parent isotope to daughter isotope occurs at a known, steady rate called the half-life.

[5] This table shows the half-lives of several sets of parent and daughter isotopes. / In this example you can see that the half-life of rubidium-87 is 48.8 billion years.

[6] This curve shows that with each half life, half the remaining parent isotope decays until it is too small to measure.

[7] You can think of the area under the curve as the ever decreasing amount of the parent isotope. But remember it doesn’t just disappear completely. It turns into daughter isotope…

[8] … which is represented by the increasing area above the curve.

[9] So, at any given place on the curve / a certain amount of parent product / and a certain amount of daughter product / make up the whole sample. (wait till all three bars show)

[10] In the process of radiometric dating, scientists measure the amount of parent and daughter isotopes in a rock sample. Then they compare the measurements to see how many half-lives of decay would have produced that ratio of parent and daughter isotopes.

[11] Let’s say that a sample is found to be half uranium 238, which is the parent isotope,

[12] and half lead 206, which is the daughter isotope. / Half of each would mean that one half-life had passed. / Since the half-life of uranium 238 is 4.5 billion years, the sample’s age should be about 4.5 billion years.

[13] Notice how the bar that represents uranium and the bar that represents lead / meet at the location of one of the red dots, / which indicates how many half-lives have passed.

[14] Now let’s say that only one quarter of the sample is parent product—/ like uranium 238 again/ and three quarters of the sample is its daughter product lead 206. / As we slide the bars to the right, watch to see when the place where the two bars meet / lines up with one of the red dots. / Because it lines up with one of the red dots here / that indicates that two half-lives have passed. / Since the half-life of uranium 238 is 4.5 billion years, twice that would be 9 billion years.

[15] In real life, samples are more likely to be between exact half-lives, which just means that the scientists have to do math that is a little more challenging in order to calculate the age of whatever material they are dating.

[16] Radiometric dating methods are used mostly to date igneous rocks—like granite, for example—which are formed when magma or lava cools and solidifies.

[17] Radiometric dating is *not* used to date sedimentary rocks / like sandstone, / shale, / and limestone.

[18] Since most of the geologic column is made up of sedimentary layers, where do geologists find the igneous material to try to date? / Wherever anything from a volcano has been preserved in the rocks.

[19] Sometimes lava flows over an existing sedimentary layer (click past next slide)

[20] (no script—just advance the slide)

[21] and then is covered by another sedimentary layer. / While the sedimentary layers cannot be used for radiometric dating, / the lava layer can.

[22] Other times, magma that is still underground can push its way into or between sedimentary layers. Preserved layers of volcanic ash can also be used for radiometric dating.

[23] These things are widespread enough throughout the geologic column that geologists have been able to calculate the dates suggested by the geologic time scale.

[24] Just how accurate is this process for determining how old rock layers and fossils are?

[25] Find out in the next presentation