**GC B14 Accuracy and Assumptions of Radiometric Dating**

Script

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

[1] Accuracy and assumptions of radiometric dating

[2] Because scientists know that certain radioactive elements decay at consistent, known rates

[3] They are able to compare the amount of parent isotope / to daughter isotope in a sample and estimate its actual age.

[4] But is this process accurate?

[5] When they estimate that certain rock layers are 541 million years old, is that really true?

[6] In order for radiometric dating to be accurate, careful procedures must be followed when samples are collected, when samples are prepared in the laboratory, and when parent and daughter isotopes are measured. / In addition, at least three other assumptions must be true.

[7] To help us understand those assumptions, it may be helpful to look at another analogy sometimes used to illustrate radioactive decay. / Imagine that the sand in the top part of the hour glass is like the parent isotope. / The sand in the bottom is like the daughter isotope. / Over time, the sand trickles from the top to the bottom, representing the radioactive decay that turns the parent isotope into the daughter isotope.

[8] Think back to the three points we made about radioactive decay using our penny illustration. Two of the three points are made well by the hour glass illustration as well.

[9] In number 1, it was easy to see one group of pennies steadily increasing, while the other group was steadily decreasing. / This point is easy to see in the hour glass illustration as well. We can see how the sand in top steadily decreases as the sand in the bottom steadily increases. / In number 3, 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. / In the hour glass illustration, we don’t know exactly when one individual grain of sand will fall to the bottom, but we know how long it takes for all the sand to fall. / The hour glass analogy fails to illustrate point number 2. While the number of pennies being flipped got smaller each time, the amount of sand falling through the hour glass remains the same. But as long as we don’t expect the hour glass to accurately illustrate half-life, it will still be useful to us in understanding the assumptions of radiometric dating.

[10] With that in mind, we are ready to learn the three assumptions that must be true in order for radiometric dating to be accurate. / Number 1—we assume the decay rate has always been the same. Most scientists do not think there is reason to doubt the theory of the decay process.

[11] Number 2—we assume that the rock has experienced no chemical exchange with the rocks around it. / In other words, nothing inside the rock has gotten out, / and nothing outside the rock has gotten in. / In the hour glass example, this would mean that there is not a hole in the bottom letting any of the sand escape, and that no additional sand is being added to the top.

[12] Number 3—we assume that the initial concentration of daughter product can be determined. In our hour glass illustration, this would mean that if there was already some sand in the bottom when we turned the hour glass over, it is possible to determine how much was there so we could adjust our calculations. If scientists did not know some old daughter product was leftover when a new rock formed, the rock would date as much older than it really is.

[13] Some scientists have raised questions about the accuracy of radiometric dating. / Although some individual dates have been shown to be inaccurate, / the overall pattern of dates suggested by radiometric dating is generally quite consistent.

[14] While many scientists have accepted radiometric dating as an accurate theory, / others still consider it a hypothesis to be tested. Why? / Because the long ages suggested by radiometric dating conflict with what the Word of God teaches.

[15] The Bible is very clear about the creation of life on Earth in six literal days with a seventh added for worship and rest. / The chronogenealogies in Genesis 5 and 11 seem to indicate that this happened several thousand—rather than million—years ago.

[16] Besides the concerns raised by the Bible about the accuracy of radiometric dates, there are pieces of geological evidence that are difficult to explain if they were formed over millions of years. We learned about some of these in video 11.

[16] Although the creation story in Genesis is not something that science can prove or disprove, some scientists believe it to be a reliable history of Earth’s origins and have chosen to accept it as accurate. / These scientists look for alternate explanations of radiometric dates that would be consistent with the biblical record. More study is needed, / and scientists who believe in the biblical creation story predict that there are discoveries yet to be made that will shed light on this issue and see this as an exciting mystery to solve.

[17] To learn about a specific kind of radiometric dating that scientists use to calculate the age of fossils, watch our next presentation.