**GC B15 Radiocarbon Dating**

Script

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

[1] Radiocarbon dating

[2] We have already learned how scientists use the process of radiometric dating to calculate the age of rocks.

[3] In this presentation, we will learn about one specific kind of radiometric dating called radiocarbon dating, which is used to calculate the age of things that used to be alive—like fossils.

[4] Remember that this chart represents all the elements that have been discovered so far.

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

[6] Different isotopes of the same element have the same number of protons…

[7] …but different numbers of neutrons.

[8] Two different carbon isotopes—carbon 12 and carbon 14—are involved in the radiocarbon dating process. / Carbon 14 is involved in the process because its amount decreases. / Carbon 12 serves as the standard because its amount does not change.

[9] Take a look at this nitrogen-14 atom. / It has 7 protons / and 7 neutrons. / In our atmosphere, when a neutron produced by a cosmic ray reaction collides with a nitrogen atom / it displaces a proton. / Because the atom now has 6 protons and 8 neutrons / it is no longer a nitrogen-14 atom. / It is now an atom of carbon-14. / The lone displaced proton is an atom of hydrogen. This process explains why carbon-14 exists in our atmosphere.

[10] Just like carbon 12, the carbon-14 combines with oxygen to form carbon dioxide which is absorbed by plants during photosynthesis.

[11] Animals and people who eat the plants take in carbon-14.

[12] Carbon-14 is only a tiny fraction of the carbon found in the atmosphere. For every trillion atoms of carbon-12, there is only l1 atom of carbon-14. This ratio of carbon-12 to carbon-14 in the air and all living things is nearly constant, but after they die, living things no longer take in new carbon.

[13] After the death of trees, animals, or people, / wood and bones lose carbon-14 as it changes by beta decay back to nitrogen-14.

[14] Scientists can measure the amount of carbon-14 with a mass spectrometer.

[15] By comparing the amount of carbon-12, / which continues to remain the same, / with the amount of carbon-14, which is decreasing / and then comparing that ratio with the expected decrease in carbon-14 with time, scientists can calculate how long ago the living thing died.

[16] Remember that to begin with / there is only 1 carbon-14 atom for every trillion carbon-12 atoms. / Detecting carbon-14 atoms after several half-lives is a little like trying to find one red grain of sand in an entire football stadium filled with sand.

[17] Carbon-14 has a relatively short half-life-- / only 5,730 years.

[18] Because it is so difficult to detect carbon-14 after ten half-lives, radiocarbon dating can only be used to date previously-living things that are less than about 50,000 years old

[19] Like other forms of radiometric dating, the accuracy of carbon dating is dependent on the accuracy of certain assumptions. / Carbon dating assumes that the decay rate has always been constant. / Even though we know that the amount of carbon-14 in the atmosphere has changed over time, we believe we can correct for that.

[20] Interestingly, even though radiometric dating methods suggest that the rock layers of the geologic column are many millions of years old…

[21] …trace amounts of carbon-14 have been found in fossils from those very same rock layers. If the fossils are really millions of years old, no carbon-14 should be left.

[22] In other words, the millions of years calculated for the rock layers conflict with the thousands of years implied by the presence of carbon-14 found in the fossils.

[23] This just means that there are still things about radiometric dating that scientists don’t understand yet.

[24] Scientists who believe the Bible to be a reliable account of Earth’s origins are looking for alternate explanations for radiometric dates

[25] They predict that there are discoveries yet to be made that will explain the data in ways that are consistent with Scripture.