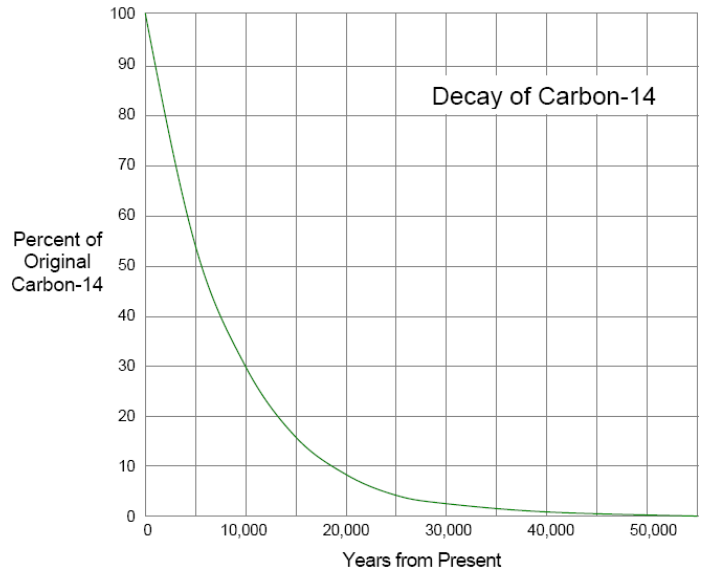




II. Using the decay graph for carbon-14, complete the following half-life problems:

7. In 1991, hikers in the Tyrolean Alps of Europe made a remarkable discovery. They found an almost perfectly preserved body of a prehistoric man, whom scientists named Ötzi. The discovery was made possible because recent warming of the atmosphere had caused glaciers in the region to retreat, exposing objects that had been buried under the ice for millennia. Ötzi's fate was matched by a variety of well-preserved plant and animal species that were found close by. As discoveries of such quality are rare, the event was a genuine treasure trove for scientists. They reasoned that Ötzi and the other organisms must have been trapped by a sudden snowfall and virtually "flash frozen." This singular event was followed immediately by an extended cold period that preserved the specimens until the present glacial retreat. Carbon dating of samples from the site established the time of Ötzi's demise at approximately 5,300 years ago. What percentage of the original carbon-14 in Ötzi's body was remaining in 1991?



8. Scientists have been rethinking the nature of past climates. A 1998 study provided evidence that the tropics were much colder during the last glacial maximum than previously thought. Prior understanding had been that tropical regions were mostly unaffected by past ice ages. Constructing an accurate history of ancient climates is important, since the knowledge gained may have relevance to global climate change today. In the study just mentioned, investigators used a solar-powered drill to bore through the ice cap at the summit of an extinct Bolivian volcano named Sajama. They retrieved two ice cores at the bottom of the glacier, more than 132 meters (433 feet) deep. Trapped within the cores were insects and bark fragments from local trees. Carbon from organic material near the bottom of the cores dated to the coldest period of the last ice age. If those samples had 5.5 percent of their original carbon-14, approximately how many years ago did the glacier atop Sajama begin to form?

9. The authenticity of the Shroud of Turin has long been debated. In 1988, scientists received permission to remove small samples for carbon dating. Three different laboratories in Arizona, U.S.; Oxford, England; and Zurich, Switzerland analyzed the samples. All three laboratories came to the same conclusion: The shroud had lost about 8 percent of its carbon-14 atoms to radioactive decay. Given this result, what was the approximate date of origin of the Shroud of Turin?