HONORS CHEMISTRY
HOMEWORK 13c. Name: _____

1. Living plants in equilibrium with the atmosphere contain about the same isotopic fraction of ^{14}C (half-life = 5730 yr) as the atmosphere as a whole, and this fraction produces 13.6 counts per minute per gram of carbon. If a sample from a petrified tree gives 1.2 counts/min/g, how old is the tree? Assume that the atmosphere has not significantly changed over this time span.

2. Fresh rainwater or groundwater has enough tritium (^{3}H, half-life = 12.3 yr) to show 5.5 counts per minute per 100 g of water. You are asked to check a bottle of wine that claims to have been produced in 1946 (vintage 1946). What rate of decay (counts/min/100g) would you expect to find?

3. An old painting purchased from a flea market looks very much like the paintings done by Rembrandt during his "dark period" (1642-1672). A curious buyer takes the painting to a local university for testing. The wood on which the painting was done has a ^{14}C activity of 15.1 counts per minute per gram of wood, while a sample of present-day wood gives a ^{14}C activity of 15.3 counts/min/g (half-life of ^{14}C = 5730 yr). Could the painting be a genuine Rembrandt?

4. During World War II, tritium (^{3}H, half-life = 12.3 yr) was used to make fluorescent watch dials and hands. If such a watch was made in 1944, and at least 17% of the original amount of tritium is needed to allow a person to read the watch in a dark place, until what year would the watch be readable in the dark?