HONORS CHEMISTRY
WORK SHEET 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. If this fraction produces 13.6 counts per minute per gram of carbon, how many counts/min/g would you expect in a 15,000 yr old sample of plant tissue (such as wood)? Assume that the atmosphere has not significantly changed over this time span.

2. A rock contains 0.688 mg of ^{206}Pb for every 1.000 mg of ^{238}U (half-life = $4.5 * 10^9$ yr). Find the age of the rock, assuming that all of the ^{206}Pb now present was derived from the radioactive decay of ^{238}U (none was present initially, and none has escaped), and assuming that only insignificant and negligible quantities of ^{238}U have begun to decay but have not yet fully decayed into ^{206}Pb.

3. Nuclear wastes are sometimes stored in caves or deep mine shafts. One of the most toxic of these wastes is plutonium-239 (half-life = 24,100 yr). If a storage site must be geologically stable for as long as it takes for the radioactivity to decrease to 0.1% of its original value, how long is this time for ^{239}Pu?