Chemistry 485

Spring, 2o1o — Problem Set #2
Distributed: Wed., 27 Jan. 2010 — Due: Mon., 1 Feb. 2010
(10 points)

1. The isotope ^{15}O is used in some biological studies but it has to be prepared and used rapidly.

   (a) Calculate the decay rate of a sample at the end of a 5.00 minute irradiation if the production rate from the nuclear reaction is 2.51×10^7/s.

   (b) Calculate the fractional gain in the sample decay rate if the irradiation is extended to a total of 6.00 minutes. That is, calculate the ratio:

$$(A_0(t = 6) - A_0(t = 5))/A_0(t = 5)$$

2. Estimate the age of an organic sample that was found to have an activity due to ^{14}C equal to 0.022Bq/g of carbon.

3. Estimate the age of another organic sample that was found to have a ^{14}C content of 1.2×10^{10} atoms/gram of carbon.

4. The data in the table below presents the concordance data for the Rb/Sr dating of a series of rocks from Mount Bohemia in the U.P. of Michigan.

   (a) Plot the data and determine the y-intercept and slope.

   (b) Use the information from (a) to determine the concordance age of the samples.

Table 1: Analytical data from Mount Bohemia, Michigan

Sample	$^{87}Rb/^{86}Sr$	$^{87}Sr/^{86}Sr$
217	1.255	0.7238
219	1.867	0.7345
220	1.192	0.7223
221	0.656	0.7150
222	0.709	0.7162