Biophysical Chemistry – CH 4404 01
Assignment 7

Due Friday, November 1 at 5:00 pm

Please complete the answers to this assignment on a separate page (or pages), showing your work and sources (if you referred elsewhere for constants, enthalpies, etc.).

1. Consider the following stoichiometric equation:

$$A + B + C \rightarrow D$$

By measuring the initial rate of the formation of D, you obtain the following table.

Initial [A] (mM)	Initial [B] (mM)	Initial [C] (mM)	Initial Rate (mM s^{-1})
10.0	10.0	10.0	0.100
20.0	10.0	10.0	0.141
20.0	30.0	10.0	0.423
20.0	20.0	20.0	1.131

(a) Give the reaction order with respect to A, B, and C. What is the overall reaction order? (10 points)

(b) Write a differential equation for the appearance of D. (2 points)

(c) Calculate the rate constant *k* for this reaction, including units (3 points)

2. You are performing experiments on liver alcohol dehydrogenase (LADH), which can oxidize ethanol (EtOH) to acetic acid according to a zero-order rate law under certain conditions. If your sample contains 50 mM EtOH, how long would it take for you to have 25 mM EtOH if LADH has a *k* of 2 mM min^{-1}? (5 points)

3. Radioactivity is frequently measured in disintegrations per minute (dpm) – where a disintegration represents a single radioactive decay event. In the familiar ticking of a Geiger counter, each "tick" represents a certain number of disintegrations, and therefore many ticks per unit time corresponds to a high *rate* for dpm. You measure a sample having 1.0×10^5 dpm, and two days later you measure the same sample and read 0.5×10^4 dpm. Given that one day is 1,440 minutes:

(a) What is the half-life of the isotope in minutes? (5 points)

(b) How many radioactive atoms were in the sample when you started (when the *rate* was 1.0×10^5 dpm)? (5 points)

4. Tinoco Chapter 7, question #8 (10 points)