

Chem 155 Homework #5 Due at the start of class on Mon. Feb 11.

Reading: Chapter 19, Nuclear Chemistry

Chapter 18 Problems

18.38

18.48

18.50

Additional Problems

1) **(re)download** the article by M. Levy and A. D. Ellington in PNAS Vol. 100, p 6416-6421 (2003). If you are on campus you will automatically be able to use the university subscription to the Proceedings of the National Academy of Sciences to download this article. From off-campus you can use the UW library proxy server (instructions are available at <http://www.lib.washington.edu/help/connect.html>).

Read the data from Figure 2 for the reaction of L_B with C_A and enter them into Excel to determine the Michaelis-Menten parameters

i) In applying the Michaelis-Menten equation to this data set, does $[C_A]$ or $[L_B]$ correspond to $[S]$ (substrate concentration).

ii) Replot these data as described in Oxtoby and lecture. Fit your data in Excel determine K_m and k_2 Include the printout of your fit in the homework.

Chapter 19 Problems

19.3

19.8

19.26

19.31

19.36

19.63

19.66

Additional Questions:

1) Why don't all the positively charged protons in the nucleus cause it to fly apart? (Give a 2-3 sentence explanation).

2) Use Einstein's formula to calculate the momentum (in units of MeV/c) of a proton with a total energy of 1400 MeV. What is this in kg m/s? How fast is this proton moving (in m/s)? Comment.

3) List the conservation laws for nuclear reactions given in lecture. What are baryons and leptons?

4) Download and read the series of news focus articles from Science Magazine from August 2005 Science v 309 p 1168-1179, and vol 315 p174. As well as Chapter 24 from David J. C. Mackay's excellent book "Sustainable Energy: Without the Hot Air" (the chapters are available for free online) before answering the following:

3A) What fraction of U.S. electricity is currently generated by nuclear power?

3B) What will replace the electricity produced by our aging nuclear reactors once they are decommissioned?

3C) In 1/4-1/2 of a page, explain your opinion as to whether you think nuclear power should be considered as a viable energy source at present. There is *NO right answer* but you should justify your opinion with facts and *data* from the articles provided (or fact checked sources of your choosing – for instance if you want follow one line of reasoning there are references predicting the number of cancer deaths that will likely result from the Fukushima accident, and others analyzing costs and health risks associated fossil fuel use, and so on). The key to getting your points here is to make statements based on numbers. How you decide to interpret them is up to you!