030.306 "Physical Chemistry Instrumentation Lab II" | Handbook

1. Instructor Information:

Prof. Thomas J. Kempa	NCB 111	email: tkempa@jhu.edu	office hrs: Thu 2–3 pm

2. Teaching Assistants:

Ryan Brady	Remsen 231	email: rbrady10@jhu.edu	office hrs: Thu 4–5 pm
Tylar Clark-Winters	Remsen 231	email: tclark60@jhu.edu	office hrs: Thu 3–4 pm
Rachel Dziatko	Remsen 231	email: rdziatk1@jhu.edu	office hrs: Thu 4–5 pm
Marta Sliwa	NCB 133	email: msliwa1@jhu.edu	office hrs: Wed 5–6 pm
Dara Weiss	NCB 135	email: dweiss16@jhu.edu	office hrs: Fri 3–4 pm

3. Time and Location:

Lecture (*section 1*):	Mon 1:30 pm – 2:20 pm in Remsen 233
Lab (*section 1*):	Mon 2:30 pm – 6:30 pm in UTL G86
Lab (*section 2*):	Tue 2:30 pm – 6:30 pm in UTL G86

4. Description:

This second installment of the Physical Chemistry Instrumentation Lab will focus on both **classical and modern experiments in the spectroscopy of chemical compounds**. Lab experiments will focus on using optical, magnetic, and electronic methods to probe the properties of matter. The last experiment of the semester will harken back to the electronic circuits you were exposed to in PChem Lab I, and you will have the opportunity to build an optical amplifier from circuit components and to do real-world tests with it! Lectures will focus on introducing modern and state-of-the-art spectroscopic techniques that are beyond the scope of the course, but nevertheless build on classical tools conceived decades ago. Also, knowing about these modern techniques may be of direct use to you in your future careers.

5. Materials:

Lecture notes, pre-lab reading materials, and additional references will be provided *via* Blackboard. Supplementary reading materials may be drawn from the following online and print sources:

- C. W. Garland, J. W. Nibler, D. P. Shoemaker *Experiments in Physical Chemistry*, 8th edition, McGraw-Hill, New York (NY), 2009.
- H. A. Strobel W. R. Heineman *Chemical Instrumentation: A Systematic Approach*, 3rd edition, Wiley-Interscience, Hoboken (NJ), 1989.
- D. A. Skoog, J. J. Leary *Principles of Instrumental Analysis*, 6th edition, Brooks Cole, Pacific Grove (CA), 2006.
- G. Herzberg *Molecular Spectra and Molecular Structure: Spectra of Diatomic Molecules*, 2nd, Krieger Pub. Co., Melbourne (FL), 1989.
- Sheridan Libraries (JHU) – http://www.library.jhu.edu/
- Web of Science – http://databases.library.jhu.edu/databases/proxy/

6. Grading Policy:

Pre-Lab Quiz (15%) – Before each lab, you will take a ~10 min written quiz testing your knowledge of the pre-lab materials you have been assigned to read before your lab. The quiz will consist of several short-answer questions and you will be allowed to use any notes you've taken during your readings.

Day of Lab Performance (10%) – The Prof. and TAs will assess your performance on the day of the lab on the basis of several criteria, including: (1) how well you problem solve and troubleshoot during the setup or execution of the experiment, (2) how well you distribute and rotate the work load (experimental execution or record keeping) during the lab session, (3) quality of your record keeping, and (4) quality of your responses to verbal questions.

Lab Report (75%) – You are expected to prepare a lab report consisting of two key parts. The first of these is a **1 page** summary of the lab containing sections for (i) key theoretical principles tested in the lab, (ii) principal features of the instrumentation used, (iii) key data obtained, (iv) discussion of how reliable these data are, how these data relate to the theoretical principles outlined in 'i', and what additional experiments or modifications you would perform to improve your understanding of the theoretical principles in 'i.' Note that you must **be succinct in your reasoning and writing**. This is a vital skill to develop as you go forth and pursue your careers. The second part of the lab report consists of your short answers to the questions highlighted in yellow throughout the lab handout. Each part is worth 50% of the lab report grade. **See Section 10 for an example lab report.** The hardcopy of the lab report is **due at 6:30 pm 2 weeks after the conclusion of the lab**. You should leave the report in the mailbox of the TA(s) responsible for the lab. Your TAs will inform you of the location of their mailbox.

You can expect that your lab reports will be graded and returned to you within 1 week.

7. Lecture Schedule:

Date	Lecture Topic
28 Jan	Lecture 1: Introduction to Course
04 Feb	
11 Feb	Lecture 2: Time-Resolved Optical Spectroscopies
18 Feb	Lecture 3: Non-Linear Optical Spectroscopies
25 Feb	
04 Mar	Lecture 4: Solid-State and Multi-Dimensional NMR Spectroscopies
11 Mar	
18 Mar	Spring Vacation
25 Mar	Lecture 5: Electronic Spectroscopy of Low-Dimensional Systems
01 Apr	Lecture 6: Refresh of Electronic Circuit Essentials
08 Apr	Lecture 7: Amplifiers and Preparation for Lab 7
15 Apr	
22 Apr	
29 Apr	