Physical Chemistry Lab

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Office hours:

Th	10:00-11:30
F	10:00-12:00

Dr. Michele Foster
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Office hours:

M	10:30 – 11:30
Tu	12:00 – 1:00

Lecture: S-2-066
Monday: 1:00-1:50

Labs: S-2-47
Monday: 2:00-5:00 Lab1
Tuesday: 2:00-5:00 Lab2

Introductions:

Name
Major
Hometown
Favorite lab experiment

Chemistry is an experimental science

Objective #1: To match the basic theories of physical chemistry with hands-on experimental work

- Review(?) basic physical chemistry theories
- Introduce analytical methods for physical chemistry measurements
- Develop the skills needed to carry out physical experiments and, most importantly, to extract information from experimental data

Objective #2: To learn to write like scientists

- Introduce/Review the components and formatting of a peer-reviewed journal article
- Develop the skills needed to communicate scientific discovery to your peers and to the community

Objective #3: To learn to *think* like scientists

- How is this different than thinking like a student?

Before the laboratory

- Review the physical chemical concepts involved in the experiment
- Be familiar with the experimental procedures ***before coming to lab***
- Bring your lab notebook

After Laboratory

- Analyze YOUR data carefully with the proper tools (e.g. software)
- Finish and hand in your report on time.
- See the syllabus for the proper format and some general guidelines

After Laboratory

- Your *initial* analysis of a given lab's data is due the next Monday before lecture. You will email your completed Excel template to Dr. Foster.
- Final lab reports are due 2 weeks after the experiment (with a few exceptions for holidays), and are graded out of 30 points.
- *Late reports will be penalized 1 point, plus 1 additional point for every 24 hours after the due date. Reports will not be accepted more than one week late.*

Grading

75% of your grade will be based on your lab reports

25% of your grade will be based on weekly quizzes due before the labs

Quizzes

Each week that we have an experiment, we will also have a “quiz”

The quizzes will be posted online the Friday before the experiment

They will be due when you arrive in the lab

You will not be allowed to enter the lab and begin your experiment without turning in your quiz!

Quizzes

Each quiz will consist of 2 questions

The first question will be related to the **procedure** of the experiment that you will be performing that day

The second question will be related to the **calculations** you will be expected to perform for that day's experiment

Lab Reports

The general guidelines for lab reports are included in your syllabus

You are hoping to write your reports in the style of a peer-reviewed journal, such as the *Journal of Physical Chemistry*

A sample JPC paper is posted on the course web page – read it and be prepared to discuss *the structure of it* next week

Lab Reports

For this class, the most important components of the report are the calculations and the discussion

What is different about this class – as opposed to previous labs – is the discussion

We're hoping to train you to *think* like research scientists, rather than like undergraduates

Discussion

So far, you've been asked to perform an experiment according to set instructions. At the end of the experiment, you obtained an answer - a percent yield, or a titration endpoint - and you then calculated the error in those answers.

Why is this the "wrong" way?

That's **not** how science actually takes place in the laboratory.

In the research lab, you very rarely know what the "right" answer is! If everyone knew the answer, nobody would still be measuring it.

A simple example: Experiment One is designed to determine the value of absolute zero temperature. You already know the "right" answer (so why are we doing the experiment?)

Discussion

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When Lord Kelvin made his thermodynamic calculation, he didn't have that luxury.

Contemporary measurements and estimates ranged from -240 °C to -3000 °C.

If you don't know the correct answer, how do you assess error?

- How do you know when you're right?
- How do you know when you're wrong?
- How do you know ***why*** you're wrong?
- How do you know what to do differently?

Discussion

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- How do you know when you're right?
- How do you know when you're wrong?
- How do you know ***why*** you're wrong?
- How do you know what to do differently?

These are the questions you'll have to ask yourself in writing your discussions. And learning to answer them will go a long way toward training you to be useful colleagues in a science lab

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Speaking of which… you should now be starting to think about joining a research group to do your senior thesis

Logistics

There is no lab this week, and thus no quiz

There is a lecture next Monday on how to calculate systematic error

Instead of lab next week, we will meet to discuss a sample paper from JPC, and there will be no quiz

There **is a lecture on 2/11 and a lab on 2/11 and 2/12**, and so there will be quiz on the procedure for that first lab, and on the error calculations you will learn about next week