INSTRUMENTAL ANALYSIS LABORATORY, CHMA-315

Institute Hall 73-2090 and 73-2190

This syllabus constitutes constructive notice of all policies, responsibilities, and issues of time sensitivity described herein.

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Introduction

Welcome to CHMA-315, Instrumental Analysis Laboratory. In this laboratory you will do six experiments, each using a different instrument available in the laboratory and covered in the lecture. As the name of the course suggests, you will be analyzing different samples using instrumental methods. The emphasis is on understanding the strengths, weaknesses, similarities, differences, and appropriate use of the instrumental methods, and in accordance with that, the wet chemical preparation has been minimized. Of course, the necessary wet chemistry is extremely important and must be done carefully.

Table 1. List of experiments, Instruments, and report type.

Experiment	**Instrument**	**Abbreviation**
UV Recording Spectroscopy	Shimadzu 2600	UV
Fluorescence Spectroscopy of Quinine	Shimadzu RF-5301PC	FL
Determination of Mg by Atomic Absorption	Shimadzu AA-7000	AA
Infrared Analysis	Shimadzu IR-Affinity	IR
NMR Spectroscopy	Magritek 47 MHz	MR
GC-MS	Shimadzu QP2010SE	GC

You are expected to do all your laboratory work during your regular lab period. All this can add up to a real challenge, but with planning and good preparation everything should go smoothly. **This means read and understand the protocol before coming to lab**. Also, the experiments work quite well and are a good demonstration of the theory discussed in class.

Scheduling

Please pick a lab partner and a group number and sign up with your instructor. Your sequence through the experiments is determined by your group number. The schedule coordinates use of the instruments as we do not have enough instruments for everyone to do the same experiment each week. You will have to perform some experiments before the corresponding theory has been discussed in class. In this case, you are expected to seek out and digest applicable theory and techniques.

Table 2. Lab partners and group numbers.

Group	Sec. 1 (Tu8-11)	Sec. 2 (W2-5)	Sec. 3 (Th8-11)
1	Kristen, Mia, & Delila	Gabriela, Logan, & Jennifer	Alex & Carson
2	Daniel & Kailey	Trinity & Alex	Lee & Riese
3	Mya & Myles	James & William	Mary & Celine
4	Anna & Morgan	Maria & PJ	Brenna & Olivia
5	Navraj & Aidan	Yoonjung & Liam	
6		Griffin & Sebastien	
7			

To use the schedule in Table 3, find your color coded lab section and your group number. Read down to an entry and across to see the date. This is the lab you will be doing on that date. Due to holidays, the different lab sections get out of synchronization with each other. Each experiment is allotted two lab periods, although some may be done in one. There are a few times at the end of the semester for possible makeup due to instrument problems. Use of these times are at the instructor's discretion and may result in a sooner due date on reports.

Table 3. Instrumental Analysis Instrument Schedule

								11 JPH							13 KAM							8 KAM						
								Section 1						Tu8-11	Section 2						W2-5	Section 3						Th8-11
								Group							Group							Group						
	S	M	T	W	R	F	S	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
1	27	28	29	30	31	1 Sep	2																					
			Z		Z			Zoom Recordings														Zoom Recordings						
				Z											Zoom Recordings													
2	3	4	5	6	7	8	9																					
			Intro		Intro			Introduction (live in lab)														Introduction (live in lab)						
				Intro											Introduction (live in lab)													
3	10	11	12	13	14	15	16																					
								UV	UV	UV	UV	UV	FL	FL								UV	UV	UV	UV	UV	FL	FL
															UV	UV	UV	UV	UV	FL	FL							
4	17	18	19	20	21	22	23																					
								UV	UV	UV	UV	UV	FL	FL								UV	UV	UV	UV	UV	FL	FL
															UV	UV	UV	UV	UV	FL	FL							
5	24	25	26	27	28	29	30																					
								FL	FL	IR	IR	MR	AA	AA								FL	FL	IR	IR	MR	AA	AA
															FL	FL	IR	IR	MR	AA	AA							
6	1 Oct	2	3	4	5	6	7																					
								FL	FL	IR	IR	MR	AA	AA								FL	FL	IR	IR	MR	AA	AA
															FL	FL	IR	IR	MR	AA	AA							
7	8	9	10	11	12	13	14																					
																						AA	AA	MR		GC	IR	IR
															AA	AA	MR		GC	IR	IR							
8	15	16	17	18	19	20	21																					
								AA	AA	MR		GC	IR	IR								AA	AA		MR	GC	IR	IR
															AA	AA		MR	GC	IR	IR							
9	22	23	24	25	26	27	28																					
								AA	AA		MR	GC	IR	IR								IR	IR	GC		FL	MR	
															IR	IR	GC		FL	MR								
10	29	30	31	1 Nov	2	3	4																					
								IR	IR	GC		FL	MR									IR	IR		GC	FL		MR
															IR	IR		GC	FL		MR							
11	5	6	7	8	9	10	11																					
								IR	IR		GC	FL		MR								MR		FL	FL	AA	GC	
															MR		FL	FL	AA	GC								
12	12	13	14	15	16	17	18																					
								MR		FL	FL	AA	GC										MR	FL	FL	AA		GC
																MR	FL	FL	AA		GC							
13	19	20	21	22	23	24	25																					
									MR	FL	FL	AA		GC														
14	26	27	28	29	30	1 Dec	2																					
								GC		AA	AA	IR	UV	UV								GC		AA	AA	IR	UV	UV
															GC		AA	AA	IR	UV	UV							
15	3	4	5	6	7	8	9																					
									GC	AA	AA	IR	UV	UV									GC	AA	AA	IR	UV	UV
																GC	AA	AA	IR	UV	UV							

Grading

Your laboratory grade will be based on three general components listed in Table 4. You will not be able to pass the course by just attending the labs. You must also submit good lab reports.

Table 4. Overall Grade

Component	Description	% Lab Grade
Prelab Assignments	Prelab quizzes.	15
Notebook	Reading the lab ahead of time and entering notes on the procedure, glassware needed, solution preparation, etc in your notebook.	15
Lab Reports	See Lab Reports below.	65
Lab Citizenship	Coming to lab consistently on time.	5
	Cleaning up your lab space and instrument when finished.	
	Following lab hygiene/safety procedures.	
	Keeping your phone stowed during lab.	

Lab reports are due 1 week after scheduled or rescheduled completion date. Experiments are to be performed by groups of two students but lab reports and unknowns are to be done on an individual basis. It is very important that you keep up with the submission of your lab reports as the end of the semester comes very quickly. Grade penalties will be assessed for late reports.

Safety Training

Everyone planning to work in a chemistry laboratory at RIT must take the online laboratory safety training and successfully pass the associated test. These can be found at the location

https://rit.sabacloud.com/Saba/Web_spf/NA3P1PRD0049/common/leclassview/dowbt-0000121309

In addition, you will need to take the Gas Cylinder safety training and pass the quiz.

https://rit.sabacloud.com/Saba/Web_spf/NA3P1PRD0049/common/leclassview/dowbt-0000121304

Once you have completed the quizzes, please upload your certificate to the Assignments tab on MyCourses. You must do this before you can start working in the lab.

Prelab Assignments

There are two general types of prelab assignments: quizzes and lab notebook entries. The prelab assignments are designed to force you to read and understand the lab handout before starting the lab. This is partly a safety thing, but also a time management thing. Being unprepared = unfinished labs = lower grade. I suggest reading the lab procedure and entering the notes in your notebook should be done first, then the quiz, then revise your lab notebook if needed. See below for what your lab notebook should contain. Prelab quizzes can be found on MyCourses. You must successfully complete a prelab quiz with a score of 85% by 18 hours before the lab start. Starting a prelab quiz 15 min before the deadline will not work as there is some work involved, and you might need help. You will have five attempts at these prelab quizzes before the 18 hour deadline. If you do not complete the quiz by the deadline, you will not be allowed to start the lab during your assigned period. Those of you with poor time management or planning skills need to develop them quickly!

Lab Notebooks

The prelab entries in your notebook should contain brief notes on the procedure you will follow. Your notes are to help you expeditiously perform the lab experiment. The details may vary from person to person. If your instructor sees you fumbling around and looking confused at the beginning of a lab, you have not written enough notes. You may or may not need a step by step procedure on how to use the instrument (unless necessary), but perhaps notes like the clean glassware, prepare solutions, turn on instrument 10 min before using, type of data needed, shut down procedure, and waste disposal procedure. A table of solutions to prepare, volumes of stock solution to use, and glassware type and size are necessary. The previously mentioned table should also contain the uncertainties in your concentrations. (See propagation of errors part of course notes.) A note on dangers associated with any chemicals you will be using (from a MSDS). Lastly, a brief statement of the theory and definition of new terms will be helpful. The best way to finish a lab on time (or early) is to come in prepared with a good lab notebook. Each of you should record information and data taken during the experiment in your own lab notebook. Lab notebooks will be checked at the beginning of each lab to determine if appropriate prelab information is entered, and at the end of the lab period to determine if appropriate information is entered during the lab.

Lab Reports

Lab reports contain four basic components: 1.) Instrumental, 2.) Figures, 3.) Results & Calculations, and 4.) Question Answers. The specifics for each vary from lab to lab and can be found at the end of each lab procedure. Each report should be type (word processed) and have a title consisting of the lab name, your name, your partner's name, and the date the experiment was performed. Proofread and check your report before submission. Check for all required information, the format, entered results, and equations. Please include only what is asked for.

The Instrument section contains a description of the major parts of the instrument and the general instrumental technique (absorption of what type of photon by molecules/atoms/nuclei with what type of energy levels). For example, if it is a UV-Vis instrument you want to mention Beer's law, absorption type, major instrumental components and their function, wavelenghs, and sample type (s, l, or g).

Figures are typically spectra, calibration curves, and result plots. The axes of all of these should be clearly labeled and have units. All figures need a number and a meaningful caption. Figures do not have a title. All plotted data must have error bars associated with each marker (data) point. Error bars reflect the uncertainty in the measurement. Remember, no connect the dots plots. Spectra do not have markers but do have the points connected by straight lines. You only need to include the figures requested in the lab procedure. Please adhere to the figure format specified (individual or all-on-one) plots. All figures with more than one set of data or spectrum must have a legend. Grading of figure format will be strict.

Your Results & Calculations sections should contain the specific information requested in the lab handout. Tables, calculations, and the result with units and uncertainty may be necessary. Tables have titles and numbers but no captions.

Each lab handout contains a set of Questions designed to direct your interpretation and understanding of the results. Answer each question associating your answer with the question number.

Lab reports are submitted electronically through the assignment tab on MyCourses in **PDF format only**. All material must be in one file. (Only one file per report.) Each report is worth the same fraction of the lab report component. Remember, your lab instructor has many lab reports to look at. Make it easy for the instructor to find things in your report. The more searching the instructor needs to do, the higher the frustration level, and the lower your score becomes. For each week that a lab report is late, the maximum possible grade for the lab will be reduced by 1/4. For example if a report is graded out of 20 points and you pass it in one week late, your maximum grade would be a 15 out of 20. If you earn a 14, you would get a 14, but if you earn 16 or higher, the grade would still be only a 15. The last day a lab report is accepted is 6:00 PM EST December 12th 2022. (RIT has grading deadlines we must meet.) No lab reports will be accepted after that date (6:01 PM on 12/12/2022 is too late).

Again, experiments are to be performed by groups of two students but lab reports and unknowns are to be done on an individual basis. Even though experiments utilize lab partners, all reports are to reflect an individual written effort.