CHEM 372 – Advanced Lab: Inorganic – Spring 2018

W 13:10 – 16:00

Instructor: Vivian Ezeh (Tomsich Hall 314, ezehv@kenyon.edu, 17404275355)

Office hours: Mon – Thurs, 10 – 11 am or by appointment

Experimental Inorganic Chemistry is a collection of interesting research topics/questions. The field can be divided into solid-state, material, transition-metal, bio-inorganic, organometallic, main-group, nuclear chemistry etc. In CHEM 372, we will learn/explore transition metal coordination compound & organometallic compound synthesis. We will also learn characterization techniques such as UV-vis, FTIR, Cyclic voltammetry, paramagnetic/diamagnetic NMR and magnetism. There is also an opportunity to apply our gained knowledge to create new chemistry.

Course requirements:

Inorganic Chemistry Textbooks: Recommended texts to refresh your inorganic chemistry and analytical techniques. 1) Geoff Rayner-Canham & Tina Overton "Descriptive Inorganic Chemistry" 6th ed (CHEM243 text). 2) Housecroft & Sharpe "Inorganic Chemistry" 4th ed (QD151.3.H69 2001). 3) Skoog, Holler & Crouch "Principles of Instrumental Analysis" 5th ed (A department copy is available).

Moodle: Visit the class Moodle site often as various resources will be available on this platform. Links for submitting pre-lab and lab reports can also be found here.

P-drive: All your data will be transferred to the P-drive for storage & access (\\potomac.kenyon.edu\public → Class → Chemistry → CHEM372).

Peer collaborator: Choose a peer for each new synthesis experiment (A different colleague each time). While you are responsible for all synthesis and data, your peer collaborator is someone to strategize with, can give you feedback on your report and if necessary can collaborate on obtaining measurements.

File naming: Choose a good naming convention for all measurements that you will make. For example: an IR spectrum is labelled "VCEIR1" – the name consist of my initials, the type of technique & 1: the first IR measurement.

Programs: Obtain or update the following programs: ChemDraw (for drawing chemical structures), Scifinder (for literature search), Delta (for processing NMR data) & Refworks (for organizing & formatting references). Another option for organizing your references is to create a Google form with the following questions: Authors names, title, journal name abbreviation, year, volume, page number, main findings. The result will be displayed on a Google sheet and can be copied to your reports.

Reference format: Use the *JACS* (Journal of American Chemical Society) style to format your references. Style: Last name, initials.; Last name, initials. *Journal name abbreviation.* **Year**, *volume*, starting page. Example: Schlabach, M.; Limbach, H.-H.; Shu, A.; Bunnenberg, E.; Tolf, B.; Djerassi, C. *J. Am. Chem. Soc.* **1993**, *115*, 4554.

This syllabus is subject to change. Any changes will be communicated either verbally in class or via email.

Assessment: Final grade for the class will be based upon completing all experiments, submitting all assignments, preparing for each lab and participation exercises. Point distribution can be found in the following table. Letter grade at the end of the semester will be assigned using the following scale. The instructor reserves the right to assign whatever final grade is deemed appropriate.
Grade scale: 100 – 94 % (A +/-), 93 – 80 % (B +/-), 79 – 70 % (C +/-), 69 – 50 % (D +/-) & < 50 % (F).

Technique summary	20 %	Notebook & safety	10 %
Planning tasks	15 %	Lab reports	30 %
Experiment complete	10 %	Final exam	15 %

Technique summary: After each technique measurement, the plotted data should be posted to the provided Google sheet before the next class time. The completed technique summary is due **Feb 16th** at 11:59 pm. The six techniques are: FTIR, UV-vis, Cyclic voltammetry, magnetic susceptibility (Evans balance), magnetic susceptibility (Evans method), NMR (diamagnetic & paramagnetic sample). These techniques will be used to characterize $[Co(NH_3)_5Y]X_2$ complexes that were synthesized in CHEM 123. Included in your report are: A brief summary of the technique; the information you can get from the technique; plot, label and annotate the data from your measurement; discuss the data you obtained and document all questions that you have.

Notebook: Record all measurements, observations, file names etc. in your notebook/journal as you perform the experiment. When you have completed an experiment, submit to me & update your pre-lab notes with actual measurement data and file names.

Safety: Perform experiments in a safe manner. Safety considerations can be summarized as: use goggles, wear appropriate attire, use gloves when handling chemicals, clean up your work space, use a secondary containers when travelling between labs and dispose of used chemicals in the correct waste container. Consult the safety data sheet (SDS) and be aware of safety information for every chemical we will use in lab.

Planning tasks: There are several tasks to be completed outside of class meeting time. **1)** Review transition metal and organometallic concepts (01/17 – 01/24). **2)** Organize your references (01/24 – 02/07). **3)** Write a synthetic plan for cobalt-cage and ferrocene compound (02/07 – 02/14). The plan should have synthetic procedure, required glassware and safety information. **4)** Literature survey and Idea board (02/14 – 04/11). Lit survey: browse the just published section of a chemistry journal (Inorganic Chemistry, Coordination Chemistry, European Journal of Inorganic Chemistry, Journal of the American Chemical Society, Organometallics) for **a** paper that catches your eye. Add the paper to your reference management program. Idea board: inspired by the paper you have read or previous knowledge, submit an idea for class project.

Lab reports: There are three lab reports: Co-cage complex, ferrocene complex and project. The reports will be Google slide presentation for each synthesis and characterization of compound(s). Submit by 11:59 pm of the due dates listed on the schedule.

Experiment complete: This grade is for a successful completion of each synthesis and project work.

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Final exam: A final exam will take place in **May 11th 2018** at 8:30 am. The exam can only be rescheduled with the permission of the Associate Provost, plan accordingly.

Locations:

Activity	Room
Synthesis & sample prep	TOM 001 & 105
Storage of compounds and glassware	TOM 001
NMR	TOM 001
UV-vis	TOM 001, 109, 309
FTIR	TOM 109, 209
CV	TOM 311
Meeting and workshop	TOM 206

Tentative Schedule:

Dates	Topic/event
01/17	Introduction, syllabus, planning, Technique = FTIR (acac, $[Co(acac)_2]$ & $[Co(acac)_3]$)
01/24	Technique = UV-vis $[Co(NH_3)_5X]^{3/2+}$, X = NH_3, H_2O, Cl or NO_2. λ_{max} & ε
01/31	Techniques = CV (ferrocyanide & $[Co(NH_3)_5X]^{3/2+}$) & Evans balance
02/07	Techniques = NMR (^1H) (diamagnetic & paramagnetic) and Evans method
02/14	Technique workshop & synthesis planning. Tech summary due: **02/16**
02/21	Cobalt cage
02/28	Cobalt cage
03/07 & 14	Spring break
03/21	Cobalt cage. Cobalt cage report due: **03/23**
03/28	Ferrocene (Co & Ni)
04/04	Ferrocene (Co & Ni)
04/11	Ferrocene (Co & Ni). Ferrocene report due: **04/13**
04/18	Experiment
04/25	Experiment
05/02	Experiment. Project report due: **05/05**
05/11	UV-vis of a transition metal complex

Important class policies:

Attendance: Attendance at all class meeting is expected. If you will be absent, discuss with me about making up your work. To be considered for extension on academic work, a notice from the Dean will be required.

Academic accommodation: Students who anticipate they may need accommodation in this course because of the impact of a learning, physical or psychological disability are encouraged to contact Erin Salva (salvae@kenyon.edu, 740-427-5453), Director of Student Accessibility and Support Services. Early contact will help avoid unnecessary inconvenience and delays.

Academic Honesty: All work turned in for credit must adhere to the principles of academic integrity (see Academic Honesty and Questions of Plagiarism in the Course Catalog). Copying colleague's texts, not citing source materials are examples of incidences that could potentially violate academic integrity. Potential violations will be forwarded to the Academic Infractions Board for

adjudication, as is required by University policy. If the ethical implication of any situation is not clear, do ask me for clarification.

Bias/Discrimination/Harassment: Kenyon College seeks to provide an environment that is free of bias, discrimination, and harassment. If you have been the victim of sexual harassment/ misconduct /assault we encourage you to report this. If you report this to a faculty member, she or he must notify our college's Title IX coordinator about the basic facts of the incident (you may choose whether you or anyone involved is identified by name). For more information about your options at Kenyon, please go to: http://www.kenyon.edu/directories/offices-services/title-ix/sexual-assault-and-harassment/