

RESEARCH IN CHEMISTRY I

Dr. Ray

Chemistry 4160 (CRN 51996)

Summer 2021

Prerequisites:	Chem 4600 with grades of C or higher, or equivalent
Instructor:	Dr. Gigi B. Ray , gbray@gsu.edu , 212 Courtland North, Kelsey Jordan , Science Librarian, kjordan44@gsu.edu Teaching Assistants: Stefanie Casa and MaryAnn Hill
Class:	Tuesdays 9:30am –11:30am via WebEx in iCollege – attendance required (3-credits) Additional weekly Individual Virtual Meetings with instructor or TA, to discuss research progress and improvements.
Office Hours/ Appointments:	Mondays 1:00 – 3:00pm, Wednesdays 11:00am – 1:00pm; Fridays 1:30 – 3:30pm Schedule via Doodle Polls
Text:	Class notes, handouts and videos will be posted In iCollege: <u>RESEARCH IN CHEMISTRY I - CTW SECTION 090 SUMMER SEMESTER 2021</u>
Course Objectives:	<p>Concurrent enrollment in Chem 4160 & 4170 is not allowed.</p> <p><i>Signature Experience: Independent research on a special topic related to chemistry. Capstone project that integrates different aspects of chemistry: biological, organic, physical, analytical and computational.</i></p> <p>Individual projects involve exploring a topic in depth, doing research using a variety of sources, integrating knowledge, demonstrating mastery and understanding of material by communicating this knowledge in written, oral and visual form.</p> <p>Develop research skills by becoming proficient in the use of science databases: SciFinder-n, Web of Science, Reaxys, Medline (PubMed), PubChem, and EndNote reference management system.</p> <p>Develop practical skills by becoming proficient in the use of ChemBioDraw Ultra software to represent chemical reactions and mechanisms. Examine literature synthesis routes to research compound, explain reaction types & mechanisms, analyze ¹H-NMR spectra and experimental data sets.</p> <p>Develop critical thinking and scientific writing skills (CTW), by writing and revising reports on semester-long research project. Have regular individual virtual meetings with research advisor to improve understanding, writing and presentation skills. Final Chem 4160 Report is submitted to Chemistry Department.</p> <p>Develop verbal and visual presentation skills, and digital technology skills by preparing and recording two oral presentations (using PowerPoint), and a poster presentation on the research project. Attend webinars to observe presentation style of others & explore new areas of science.</p> <p>Develop molecular visualization skills by learning to use the Protein Data Bank (PDB) visualization modules for 3D-protein structure analysis. Probe intermolecular interactions between research compound and macromolecules to which it binds. Apply structure-function analysis skills to explain how compound effects its environment.</p> <p>Develop career building skills by exploring potential career paths, internships & training opportunities, and individual development plan. Develop job searching skills by writing and revising a technical resume, personal statement, cover letter and LinkedIn profile useful for networking.</p>

Class Policies and Assignments:	<p>1) Students will select a research topic of interest to them (from list), and by mid-semester write a report, do one oral presentation (15 mins) using PowerPoint, on several distinct aspects of their research topic/theme. Students will also present a cumulative 30min Oral Presentation (with 4+ key subtopics), a brief Elevator Speech, and submit a Final Chem4160 Report in ACS Journal style on entire project (12-15 pages of text, plus illustrative figures, and ACS style references).</p> <p>2) Students are required to schedule and come prepared to a 30-min appointment with instructor or TA, every week outside of class to discuss paper / presentation content & organization, improving written work, oral presentation, & career documents.</p> <p>3) Students are required to complete the Responsible Conduct of Research (CITI) online courses at http://www.citiprogram.org (CITI Basic and Physical Science) and submit quiz completion report & RTK Hazardous waste training report.</p> <p>4) Students are required to attend a virtual research webinar during the semester. Submit half page synopsis of the seminar (describe content and style).</p> <p>5) Attendance, timely arrival and participation in all virtual class meetings required. If absent, it is the student's responsibility to makeup missed work. Students must have their video on, and pay attention to speaker (instructor, guest speaker, or classmate). Do not browse the internet, play on your phone, or do other work during class.</p> <p>6) Assignment submission: Completed assignments need to be uploaded to the assignment folder in iCollege by 11:30pm on the due date (unless otherwise indicated). Assignments will only be accepted up to one day past the due date, with 10% points deducted for lateness. Some online quizzes will occur.</p> <p>7) Students will need access to a Laptop or Desktop computer with a WebCam and Microphone to download course software (freeware), record videos of their oral presentations, and have internet access for attending Tuesday & Thursday morning interactive virtual class meetings. Other electronics need to be turned off during class.</p> <p>8) Friday July 2nd is last day to withdraw from the class and receive "W". You are responsible for withdrawing before the deadline if you need to do so. The University requires that faculty members must, on a date after the mid-point of the course to be set by the Provost (or his designee): 1. Give a WF to all those students who are on their rolls but no longer taking the class 2. Report the last day the student attended or turned in an assignment.</p>
Grading:	<p style="text-align: center;"><u>Total points: 200</u> (see grading rubric)</p> <p>40 points: Final Chem 4160 Semester Report 2*</p> <p>20 points: Report 1*, Final Oral Presentation Video</p> <p>15 points: Final PowerPoint 2, Class Attendance/Participation/Appointments</p> <p>10 points each: 1st Oral Presentation Video, PowerPoint 1, Online Quizzes</p> <p>5 points each: CITI & RTK #1, SciFinder Database Searches #2, Semester Project Outline & Abstract #3, ChemBioDraw #4, ¹H-NMR Spectrum #6, Career Descriptions & IDP #9, Personal Statement #10, Technical Resume #11, Cover Letter & Job Adds #12, LinkedIn Profile #13, EndNote Database #14</p> <p>2 points each: Elevator Speech, Webinar Summary #5, Peer Evaluation of Student Presentations (1 & 2) #7, PDB Structure Figure #8</p> <p><i>*Final grade for Reports 1 & 2 will be an average of original and revised grade.</i></p>
Grading Scale:	<p>A+ 97% A 90% A- 87% B+ 84% B 80% B- 76% C+ 71% C 65% C- 59% D 50% F <50%</p>

Date	Day	Topics	Meeting
Jun 8 Preparation		Watch Video – Literature Searches using SciFinder-n Video – PubChem, Video – Web of Science	
Jun 8	T	Introduction to Course, Syllabus, Class Schedule Selection of Research Topics Reading Technical Papers & Critically Analyzing Information Introduction to Literature Searching & Library Services 4160 Report Guidelines & Content → submit Hwk #1 – CITI Quiz Scores & RTK Report (due Wed Jun 9)	1
Jun 9 - 11	W-F	→ meet with Dr. Ray to discuss semester topic (virtual appointment)	
Jun 10 Preparation		Finalize Selection of Research Project Topic (by 5pm Wed Jun 9) Video – Reaction Synthesis Searches using SciFinder-n Video – Outlines & Abstracts Video – ACS Style References	
Jun 10	R	Introduce Synthesis and Reaction Mechanism Assignment Discuss Report Outline & Abstract Assignment, ACS Style References → submit Hwk #2 – SciFinder-n Literature Search on student topic → submit 2 review articles on semester topic, including mechanism of action → submit Quiz 1 & 2 – Database Searches (due Fri Jun 11)	2
Jun 10 - 14	R-M	→ meet with Librarian if need assistance with literature search (virtual)	
Jun 15 Preparation		Video – Designing Oral Presentations & PowerPoints Video – Using ChemBioDraw for Synthesis & Reaction Mechanisms	
Jun 15	T	Discuss Drawing Synthesis & Reaction Mechanisms using ChemBioDraw Discuss Preparing Oral Presentations, PowerPoint Slides & Figures Example PowerPoints → submit Synthesis Article → submit Hwk #3 – Abstract (half page) and Detailed Outline (1 page) on <u>entire</u> 15-page semester Research Report on: Introduction, System Background, Molecule Synthesis, NMR & Experimental Data Analysis, Mechanism of Molecule/Drug Action on System → submit Quiz 3 – SciFinder Reactions	3
Jun 17 Preparation		Video – Writing in the Sciences and Avoiding Plagiarism Video – Drawing Reaction Mechanisms	
Jun 17	R	Discuss Writing in Science, Report Format, Content, Project Objective Discuss Reaction Mechanisms Assignment → submit PowerPoint 1 (9 – 12 slides) on Introduction, and Full Synthesis (indicate all reaction steps, reaction types and mechanisms) → submit Hwk #4 – ChemBioDraw (Synthesis) → submit Quiz 4 – Writing & Plagiarism	4
Jun 22 Preparation		Video – NMR Spectra Searches using SciFinder, Reaxys, SDBS Video – NMR Data Interpretation	

Date	Day	Topics	Meeting
Jun 22	T	<p>Discuss $^1\text{H-NMR}$ Spectra Searches, Characterization & Peak Assignments</p> <p>Discuss Project Objective to Explain Mechanism of Action (how molecule interacts with and alters the system)</p> <p>→ submit Hwk #4 – Revised ChemBioDraw (Synthesis, Reaction Mechanisms)</p> <p>→ submit Hwk #5 – Research Webinar Synopsis 1</p>	5
Jun 24 Preparation		<p>Videos – EndNote Reference Database Management</p> <p>Video – ACS Careers Information</p> <p>Video – Writing Personal Statements</p>	
Jun 24	R	<p>Discuss EndNote Use and Link to Microsoft Word</p> <p>Discuss Careers in Chemistry and Personal Statements</p> <p>→ submit Report 1 (6 – 8 pages text plus Figures & References) on:</p> <p>(i) Introduction & Background to <u>entire</u> semester project (system) with details on enzyme/process affected by drug/small molecule, (ii) describe Synthesis of molecule (types of reactions), explain Reaction Mechanisms (curly arrows). <i>Focus on explanations, not just stating facts.</i></p> <p>→ submit HWK #6 – NMR Spectrum with Peak Assignments (due Fri Jun 25)</p>	6
Jun 29 Preparation		<p>Video – Internship and Scholarships</p> <p>Video – Individual Development Plans</p> <p><i>*students complete and record Oral Presentation #1 (using Kaltura Capture)</i></p>	
Jun 29	T	<p>Careers in STEM: Job Searching Strategies, Resumes, and Cover Letters, Internships, Example Technical Resumes</p> <p>→ submit Video Recording of Student's First Oral Presentation on Introduction, detailed Background to System affected by molecule, Molecule Synthesis with Reaction Mechanisms (curly arrows)</p> <p>→ submit PowerPoint 2 (14–18 slides)</p>	7
Jul 1 Preparation		<p>Video – Experimental Data Analysis</p> <p>Video – LinkedIn Training</p>	
Jul 1	R	<p>Discuss Experimental Data Analysis</p> <p>Discuss Mechanism of Molecule/Drug Binding and Effect on System</p> <p>→ submit Revised Report 1 (7 – 10 pages text plus key figures which clarify Text & ACS Format References): Introduction of Problem, System Background, and focus on Explanation of Synthesis (reaction types), Reaction Mechanisms, and $^1\text{H-NMR}$ Analysis</p>	8
Jul 2	F	Last day to Withdraw and possibly receive a W	
Jul 6 Preparation		<p>Video – Searching the Protein Data Bank</p> <p>Video – 3 Dimensional Protein Structure Analysis</p>	
Jul 6	T	<p>Introduce PDB to Visualize Protein Structures on Research Topic</p> <p>Discuss PDB 3-D Structure Searches for semester project</p> <p>Discuss Creating Protein Structure Figure showing Molecule Binding</p> <p>→ submit PPT 3 (18 – 22 slides) with revised slides from PPT 2 plus $^1\text{H-NMR}$ Spectrum Analysis, and Experimental Data Analysis</p> <p>→ submit Hwk #7 – Peer Evaluations of Student Presentations</p> <p>→ submit Hwk #9 – Career Descriptions and Individual Development Plans</p>	9

Date	Day	Topics	Meeting
Jul 8 Preparation		Video – Preparing an Elevator Speech	
Jul 8	R	<p>Introduce Elevator Speech on Entire Semester Project Discuss Molecule/Drug Targeting, Activation and Binding to Specific Protein or DNA Macromolecule</p> <p>→ submit PPT 4 (22 – 28 slides) on entire semester project (all components): Revised PPT 2, ¹H-NMR Analysis, Experimental Data Analysis, and focus on Mechanism of Action (how molecule binds to and alters system)</p> <p>→ submit Hwk #8 – PDB Structure Article & Figure → submit Hwk #13 – LinkedIn Video Completion Report</p>	10
Jul 13 Preparation		Video – EndNote Library Sharing	
Jul 13	T	<p>Discuss Proposing New Research Direction Discuss Sharing EndNote Library Databases</p> <p>→ submit Final Report 2 (12 – 15 pages text, plus Figures & References) on: (i) Introduction & Background, (ii) Synthesis/Mechanism, ¹H-NMR Spectra Analysis, (iii) Experimental Data Analysis, Protein Structure Analysis with focus on Mechanism of Action (<i>detailed explanation of how drug or molecule is activated and binds to and perturbs the system</i>)</p>	11
Jul 15 Preparation		Video – Designing a Scientific Research Poster	
Jul 15	R	<p>Students Present Elevator Speech during Class Meeting Introduce Preparing Science Posters and Example Posters</p> <p>→ submit Hwk #10 – Personal Statement → submit Hwk #11 – Technical Resume → submit Hwk #12 – Cover Letter (reply to a specific job Ad) and 3 Job Advertisements for related positions, with different educational qualifications (BS, MS, PhD or Professional Degree) → submit Hwk #13 – LinkedIn Profile</p>	12
Jul 20 Preparation		<i>*students complete and record Final Semester Oral Presentation #2 Video</i>	
Jul 20	T	<p>Course Wrap Up Appointments</p> <p>→ submit Video Recording of Student's Final Semester Oral Presentation on entire semester project: Introduction & Background, Molecule Synthesis and Characterization, Protein Structure Analysis, and Mechanism of Action of Molecule on System → submit Final Semester PowerPoint (26 - 30 slides)</p>	13
Jul 22 Preparation		<i>*students complete Revised Final Semester Report and EndNote Database Library</i>	
Jul 22	R	<p>Appointments → submit Revised Final 4160 Report including New Research Direction in lieu of Final Exam → submit Hwk#14 – EndNote Database library</p>	14

Date	Day	Topics	Meeting
Jul 26	M	→ submit Hwk#10 - Revised Personal Statement → submit Hwk#11 - Revised Technical Resume → submit Hwk #7 – Peer Evaluations of Student Final Presentations → submit Poster (3' x 4' format) for Extra Credit	
Jul 27	T	<i>*last day to submit all course materials by 5pm</i>	

Color Key in Schedule:

Blue = Class Meetings (WebEx)

Black = Research Activities Online

Red = Research Reports, Oral Presentations, PowerPoints

Websites:

- **Resources for GSU students for Learning Away from Campus:** <https://cetl.gsu.edu/resources/resources-for-learning-remotely/>
- Resources online training using GSU LinkedIn Learning: <https://technology.gsu.edu/technology-services/it-services/training-and-learning-resources/linkedin-learning/>
- **GSU Career Services:** <http://career.gsu.edu/>
- Chemistry Department webpage: <http://chemistry.gsu.edu/>
Research (Area of Focus), Faculty Research Brochure, Undergraduate Resources
- GSU Center for Diagnostics & Therapeutics: <https://cdt.gsu.edu/>
CDT Seminars: <https://cdt.gsu.edu/events-and-seminars-2/current-events-and-seminars/>
- Molecular Basis of Disease: <https://mbd.gsu.edu/>
- GSU STEM Resources: <http://cas.gsu.edu/stem/>
STEM Conferences: <https://cas.gsu.edu/academics-admissions/undergraduate-learning/stem-education-programs/stem-conference/>
- Honors Resources: <http://honors.gsu.edu/research/>
Georgia State Research Conference: gsurc.honors.gsu.edu
- Center for the Advancement of Students and Alumni (CASA) - graduate studies <http://casa.gsu.edu>
CASA Seminars: <https://casa.gsu.edu/news-events-2/>
- Library Resources: <http://research.library.gsu.edu/chemistry>
Chem 4160 Resources: <https://research.library.gsu.edu/chem4160>
SciFinder-n Access: <https://research.library.gsu.edu/scifinderscholar>
- Chemistry & Engineering News: <http://cen.acs.org/index.html>
- American Chemical Society - Careers: <https://www.acs.org/content/acs/en/careers.html>
_ **ACS College to Career:**
<https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers.html>
_ **Career Planning:**
<https://www.acs.org/content/acs/en/education/students/graduate/gettingready.html>

GRADE SHEET		Student Name:		
Summer 2021 (CRN 51996) Dr. Ray				
CHEMISTRY 4160 (Research in Chemistry I - CTW)				
Online Tuesday/Thursday 9:30 - 11:30am Meetings				
Assignment	Possible Points	Student Points	Draft	Due Date
Report 1*	20		24-Jun	1-Jul
Final 4160 Report*	40		13-Jul	22-Jul
<i>* Reports = average of original & revised scores</i>				
1st Presentation PPT slides	10		17-Jun	29-Jun
Final Presentation PPT slides	15		8-Jul	20-Jul
Oral Presentation 1 - Video Recording	10			29-Jun
Final Oral Presentation 2 - Video Recording	20			20-Jul
Elevator Speech Presentation	2			15-Jul
CITI & RTK Hwk #1	5			9-Jun
SciFinder Search/ Research Sources Hwk #2	5			10-Jun
Abstract & Outline Hwk #3	5			15-Jun
Synthesis - ChemDraw Hwk #4	5		17-Jun	22-Jun
Webinar Synopses Hwk #5	2			22-Jun
NMR Spectra Analysis Hwk #6	5			25-Jun
Peer Evaluations (2) of Presentations Hwk #7	4		6-Jul	26-Jul
PDB Structure Article & Figure Hwk #8	2			8-Jul
EndNote Database Hwk #14	5			22-Jul
Online Quizzes (20 quiz pts / 2)	10		10-Jun to 17-Jun	
Careers:				
Career Descriptions & IDP Hwk #9	5			6-Jul
Personal Statement Hwk #10	5		15-Jul	26-Jul
Technical Resume Hwk #11	5		15-Jul	26-Jul
Cover Letter & Job Ads - Hwk #12	5			15-Jul
LinkedIn Profile Hwk #13	5		8-Jul	15-Jul
Class Attendance / Participation	12			
Appointments / Preparedness	3			
Poster (Extra Credit)	*5			26-Jul
TOTAL SEMESTER POINTS	205			
* Assignments due at 11:30pm on due date (unless otherwise indicated)				
* Submission of Items in BOLD are required to pass the class				

Name _____ Topic _____

PRESENTER	Well Done	Needs Improvement
Speaks clearly, paced, and can be heard from the back of the class.		
Connect with audience via eye-contact, good posture, confident, enthusiastic, and focused.		
POWERPOINT SLIDES		
Text , Fonts, Headings visible, colors		
Text Animation -used appropriately. Slide transitions used.		
Graphics/Photos -clear, cited, used to illustrate a point(s) on the slide and talk.		
Chemical Structures/Equations - correctly written with correct naming where appropriate.		
FLOW OF PRESENTATION		
Well organized, smooth transition, correct grammar.		
Emphasizes main points of focus without unnecessary detail. Stays on track on the topic theme.		
KNOWLEDGE OF SUBJECT/ LIBRARY RESOURCES		
Knowledge of subject- strongly understands the information, does not need to read from slides.		
Awareness -of literature with the topic.		
Citations -Tables, charts, drawings, quotes are cited and correctly.		
QUESTION RESPONSE		
Presentation generates questions.		
Answers questions well in a clear, concise way.		

Comments:



Career Management

- articulate interests, skills, and values
- set and achieve goals
- show attention to detail
- demonstrate an awareness to digital presence
- identify support groups needed to achieve goals

Critical Thinking/Problem Solving

- conduct academic and archival research
- connect valid research to support arguments/claims
- provide useful summaries/precis

Digital Technology

- demonstrate technical and program literacy
- create audience-appropriate layouts
- know and apply field-related technology to solve challenges

Oral/Written Communication

- communicate to a mass audience
- use presentation software effectively
- edit and publish material

Professionalism/Work Ethic

- meet deadlines
- accept responsibility
- solicit and adjust to feedback

Teamwork/Collaboration

- collaborate in group projects
- assist in organizing and planning
- participate in collaborative writing
- follow through on tasks

Global/Intercultural Fluency

- show an awareness of diverse perspectives
- approach team/group communication with sensitivity and openness

CHEM 4160: College to Career Component

Course provides students a structured path to career readiness competencies and the development of transferable skills.

It is linked to Georgia State's College to Career Program which seeks to address both student learning outcomes and student success.

The overall aim of the plan is to help students become:

- **aware** of the career-readiness competencies that are most valued by employers
- **understand the connections** between their educational experiences and the career-readiness competencies they are developing
- **demonstrate** through a variety of media and settings the career-readiness competencies that they have acquired

Career-readiness competencies are based on the National Association of Colleges and Employers (NACE) competencies.

Professional Student Clubs:

<https://cas.gsu.edu/academics-admissions/undergraduate-learning/stem-education-programs/resources/>

- Chemistry Club – ACS Student Affiliate (ChemClub)
- Undergraduate STEM Research Society (USRS)
- American Medical Student Association (AMSA)
- Pre-Pharmacy Professional Society (PPPS)
- American Undergraduate Dental Association (AUDA)
- Pre-Physicians Assistant Association
- Minority Association of Pre-Health Students (MAPS)
- Beta Beta Beta National Biological Honors Society (TriBeta)