



## TEXAS COLLEGE

### Division of Natural and Computational Sciences

#### DEPARTMENT OF BIOLOGY

## Course Syllabus CHEM 2470.01 ORGANIC CHEMISTRY-I

### College Mission

*Texas College is a Historically Black College founded in 1894, by the Colored Methodist Episcopal Church, now the Christian Methodist Episcopal Church (CME). Our mission continues to embody the principles of the Christian Methodist Episcopal Church. The College shall prepare students with competencies in critical and creative thinking related to the knowledge, skills, and abilities as defined in areas of study. Additionally, the College shall provide an environment to inspire intellectual, spiritual, ethical, moral, and social development, which empowers graduates to engage in life-long learning, leadership, and service.*

### **Textbook Required**

Fundamentals of Organic Chemistry, 9th Edition,  
John McMurry (BROOKS/COLE – CENGAGE Learning)  
ISBN-978-0-357539361

### **Other Recommended Readings/Resources:**

1. Chemistry. Provided by: OpenStax CNX. Located at:  
<https://openstax.org/books/chemistry/pages/1-introduction>  
License: CC BY: Attribution. License Terms: Download for free at:  
<https://openstax.org/books/chemistry/pages/1-introduction>
2. Chemistry library. Authored by: Sal Khan. Provided by: Khan Academy. Located at:  
<https://www.khanacademy.org/science/chemistry/>  
License: CC BY-NC-SA: Attribution-NonCommercial-ShareAlike
3. Welcome to AP®/College Chemistry! Authored by: Sal Khan. Provided by: Khan Academy.  
Located at:  
<https://www.khanacademy.org/science/ap-chemistry-beta>  
License: CC BY-NC-SA: Attribution-NonCommercial-ShareAlike
4. Interactive Periodic Table of Elements - INL: <https://inl.gov/periodic-table/>

5. Chemical structure drawing online: PubChem Sketcher V2.4  
<https://pubchem.ncbi.nlm.nih.gov/edit3/index.html>
6. Virtual Chemistry and Simulations - American Chemical Society:  
<https://www.acs.org/content/acs/en/education/students/highschool/chemistryclubs/activities/simulations.html>
7. Student companion website accessible from <https://www.cengage.com/c/fundamentals-of-organic-chemistry-7e-mcmurry>, this site provides online study tools, including practice tests and flashcards.

### **Other Requirements:**

Will be determined by the Instructor; Primarily, all students should have to have the access to Computer or Labtop.

### **Course Description:**

A comprehensive study of the chemistry of carbon compounds. Chemical structures, nomenclature, reaction, and syntheses are emphasized. Three lecture hour and two-hour laboratory per week.

More elaborately, this course is an introductory organic chemistry course. The course will consider the scientific methods and theory development as well as scientific inquiry. In this course we will study the properties and interactions of matter from a molecular viewpoint. The importance of chemistry to many fields of science will be emphasized. We will strive for an understanding of the molecular nature of matter. Important skills such as problem solving, abstract thinking, and logic will be enhanced and our chemistry vocabularies expanded. Historical examples of scientific creativity will be provided as appropriate and their impact on our daily life.

**Prerequisites:** CHEM 1471 and CHEM 1472.

## **TEXAS COLLEGE OUTCOMES**

1. Critical Thinking Skills
2. Communication Skills
3. Empirical and Quantitative Skills
4. Teamwork
5. Social Responsibility
6. Personal Responsibility

Furthermore, **Organic Chemistry-I CHEM 2470** ensures the following institutional objectives:

1. Enhance communicative skills (oral and written)
2. Enhance critical thinking and technology skills
3. Enhance leadership abilities and spiritual awareness
4. Create opportunities for professional and post-graduate pathways

All learning objectives reflect the Texas College Core Values:

**Academic Excellence:** Developing a culture of curiosity and creativity that will challenge the frontiers of teaching/learning; stimulate research; raise the level of analytical reasoning and inquiry; and enable students to acquire leadership, human relations, communication, and technology skills.

**Integrity:** Instilling the pursuit of character, honesty, and sincerity of purpose as the moral rubrics upon which the behaviors of our graduates and College family are anchored.

**Perseverance:** Implanting diligence, enterprise, and pride in the application of skills, knowledge and abilities developed during the course of study at Texas College.

**Social Responsibility:** Promoting in the College community a conscious awareness that we are all stewards of the resources entrusted to our care.

**Tolerance:** Emphasizing openness to divergent points of view, applying an eclectic approach to rational and analytical thinking.

**Community Service:** Encouraging self-extension in service to others as the heart and soul of our educational enterprise.

## STUDENT LEARNING OBJECTIVES & OUTCOMES

### Course Objectives:

When you have completed your study in this course you should be proficient in meeting the following objectives.

Course Objective	Assessment
1. Identify Safety measure while in the laboratory, Working Protocol based on Scientific Method;	Test, Essay
2. Understand atomic structure, electronic configuration, Chemical Bonding, Definition of Acids and Bases. This information will be on <b><u>final exam</u></b> .	Test
3. Illustrate the IUPAC Nomenclature of alkanes and their derivatives. This information will be on the <b>mid-term</b> and <b><u>final exam</u></b> .	Test
4. Identify structures, properties, and IUPAC Nomenclature of alkenes, alkynes and their derivatives. This information will be on <b><u>final exam</u></b> .	Test Focus Questions, Essay
5. Predict mechanisms of reactions related to this syllabus: Alkenes and Alkynes. Identify, understand nomenclature and physical properties of aromatic compounds. This information will be on <b><u>final exam</u></b> .	Focus Questions Test, Essay

**Student Learning Outcomes (SLO):** By the end of this course, the candidate will be able to:

1. Identify Safety facility and procedure while in the laboratory, history of science, and the Scientific Method.
2. Understand atomic structure, electronic configuration, Chemical Bonding, Definition of Acids and Bases.
3. Illustrate the IUPAC Nomenclature of alkanes and their derivatives.
4. Identify structures, properties, and IUPAC Nomenclature of alkenes, alkynes and their derivatives.
5. Predict mechanisms of reactions related to this syllabus: Alkenes and Alkynes.
6. Identify, understand nomenclature and physical properties of aromatic compounds.

## **COURSE METHODS, PROCEDURES, CONTENT, and REQUIREMENTS**

**IMPORTANT:** The instructor provides the environment to facilitate learning; the student must engage his/her mind and actions. The instructor cannot guarantee that students will learn unless they do their part as active participants of their own education. Therefore, (1) Students may vary in their competency levels on these learning outcomes, and (2) they can expect to achieve these learning outcomes only if they honor all course policies, attend classes regularly, complete all assigned work in good faith and on time, and meet all other course expectations. Delete of them as students.

### **Instructional Strategies:**

Class/Online Discussion

Class/Online Presentations

### **Student Activities:**

Participation

Essay Questions

Website

Final Exam

### **Method of Instruction and Expectation:**

Web-based environment

Class discussion to examine the topics on the course outline.

Required readings and online activities.

Use of online tools and resources to facilitate a deeper understanding of the course contents

Students are expected to ask question in the class and submit assignments on the due date. If you submit an assignment late, you will receive no points for the assignment. No excuses will be accepted, including difficulties with technology.

**Note:** Designated time (Office Hours) will be given to all student to discuss student progress. Make an appointment with your instructor.

## **SOFTWARE AND SUPPLIES**

### **Software and Program:**

1. *Access to websites as referenced in class. Students attempting to gain access through cell phones, Mac books, or outdated equipment may experience difficulties with certain websites or videos. It is the student's responsibility to locate viable equipment.*
2. *Access to JICS online classroom. It is the student's responsibility to become familiar with the online classroom and related components.*
3. *Most documents in this course will be PDF, Powerpoint, HTML or Word format. However, you will need the additional software (which can be downloaded free from the Internet): Adobe Reader, ZOOM, Windows Media Player, and Quicktime.*
4. *Students should be prepared to back up files on their own Flash Drive. Work should be saved more than once, as it is not the instructor's responsibility if technology issues suddenly occur and information is lost.*

## **COURSE REQUIREMENTS**

### **SUBMISSION OF ASSIGNMENTS**

All assignments must be submitted on time **in JICS. Please do not submit work through emails.** For each day that an assignment is late, points will be deducted from the final grade of that assignment. If **extenuating circumstances** prevent you from turning in an assignment, please contact me **before** the due date. Late work will be accepted without penalties **only if** emergencies are documented or Texas College has technology outages. Students are required to have access to internet that is JICS compatible.

### **ATTENDANCE POLICY**

For example: Students are expected to participate in class discussions. In order to participate, you must attend class. To receive credit for substantive participation, you should summarize your participation in thoughtful and complete sentences in no fewer than fifty words. You will not receive

credit for participation if you submit bullet points, texting language, slang, profanity, or plagiarized commentaries. Please be advised that poor attendance can be grounds for being administratively withdrawn from the course. **Students should check emails and classroom announcements daily to remain well-informed.**

The student is responsible for attending all lectures, seminars, laboratories, and field work for each registered class—beginning with the first day of class scheduled—in order to verify registration with instructors and to complete all work assigned for the course. If a student does not attend class during the first week (first five instructional days) of the semester, or does not attend five consecutive class sessions, and does not give prior notification to the instructor of reasons for absence, and intent to attend the class, the student may be recommended to the Vice-President for Academic Affairs to be administratively withdrawn from the course. The instructor should read the rules governing class attendance and absences to each of the assigned classes at the beginning of each semester.

These attendance regulations will be strictly enforced.

The student will be held accountable for adhering to the College Attendance Policy. Instructors are not obligated to allow students to submit late assignments because of their absence unless the absences have been officially approved. An officially approved absence, however, gives the individual who missed the class an opportunity to turn in the assignment late but in no way excuses the student from the work required. Official excuses are granted by the vice president for student affairs for authorized College activities, verified personal illness, or illness or death in the student's immediate family. Students should understand that absences may jeopardize their grades. A student will be permitted one unexcused absence per credit hour of the course in which he/she is enrolled. Any student whose unexcused absences exceed the number permitted may, at the discretion of the instructor, be assigned a grade of "**F**" or be dismissed from the class.

Absences will count from the first official date of classes and not from the first day the student attends. It is the responsibility of the instructor to keep an accurate attendance record of all students enrolled. Students receiving veterans' benefits are required to attend classes according to the regulations of the Veterans Administration in addition to those regulations set by the College for all students.

*Students are responsible for following the policies, schedule, and procedures outlined in this syllabus. The syllabus is subject to change in the event of circumstances beyond the instructor's control.*

### **ACADEMIC HONESTY**

Texas College believes that strength of character is as important as academic achievement; therefore, the College expects everyone in the academic community to maintain personal integrity in academic matters and not to contribute or condone the dishonesty of others. Scholastic dishonesty—which includes any form of plagiarism, cheating, falsification of records, and collusion with others to defraud—is improper and will not be tolerated. Texas College reserves the right to apply disciplinary actions including loss of credit, suspension, and dismissal to a student who has been judged guilty of scholastic dishonesty.

The Texas College Catalog describes academic dishonesty in the following manner:

...an act or attempted act of giving or obtaining aid and/or information by illicit means in meeting any academic requirements, including examinations. It also includes any form of cheating, plagiarism, falsification of records and/or collusion.

### **ACADEMIC INTEGRITY:**

Texas College believes that strength of character is as important as academic achievement; therefore, the College expects everyone in the academic community to maintain personal integrity in academic matters and not to contribute or condone the dishonesty of others. Scholastic dishonesty (which includes any form of plagiarism, cheating, falsification of records, and collusion with others to defraud) is improper and will not be tolerated. Texas College reserves the right to apply disciplinary actions to a student who has committed scholastic dishonesty. For further information, see the *Texas College Catalog found on the Texas College website ([www.texascollege.edu](http://www.texascollege.edu)) page 33, Item: Academic Integrity Policy.*

### **COVID-19 REQUIREMENTS:**

#### **Texas College COVID-19 Vaccination Policy:**

Texas College as a private, faith-based institution, strongly suggest that effective Fall term 2021, all students, faculty and staff provide evidence that they have been fully vaccinated. Individuals who have religious beliefs, medical reasons and/or philosophies (or are generally indifferent to taking a vaccination) will be required to provide and/or sign a statement to that effect, which they believe prohibit them from being fully vaccinated.

This is available on the COVID-19 page (<https://www.texascollege.edu/covid-19-information/>), as well as the Fall 2022 page (<https://www.texascollege.edu/fall-2023>).

### **INSTRUCTIONAL METHOD**

Texas College observes **remote synchronous instruction** defined as a two-way, real-time/live, virtual instruction between instructors and students when students are not on campus and observing COVID-19 distance requirements.

In this method, the required amount of instructional time related to courses will be scheduled each day, and communication is generated when attendance is recorded daily at a locally selected time utilizing Bio Signature Software. Synchronous instruction is provided through a computer or other electronic device or over the phone. The instructional method will address the course and degree program requirements. If a student who is originally scheduled to receive instruction through the on-campus or synchronous instructional method is not present at the designated official attendance time, the student will be not be considered present for the day by engaging through the remote synchronous method.

In the remote synchronous instructional method, student engagement is measured daily, and attendance is assigned based on the student's completion of that day's course engagement measure. Students who do not complete the daily measure of engagement will be counted absent for that day, and that absence cannot be changed to remote synchronous present if the student completes the engagement measure on a later date.

Attendance is measured as synchronous interaction for scheduled courses. *Attendance depends on the active participation of students.* Students are expected to attend online sessions just as they would in a face-to-face classroom, by avoiding non-course related activities. We encourage appropriate lighting which promotes better engagement when the video feature of Zoom is in use.

## **PROGRAM FOR WHICH THE COURSE IS REQUIRED**

**Organic Chemistry I** is a requirement for **Biology Majors** which leads to a ***Bachelor of Science (BS) Degree in Biology***.

## **METHOD OF STUDENT EVALUATION**

**LECTURE (75% of Total Grade) + LAB (25% of Total Grade) = 100%**

Type/Item (Evaluation Components)	Maximum Lecture Points/Percent	Actual % Weight/Load		
Pretest	Assessment	Assessment	<b>Grading Scale:</b>	<b>Letter grade</b>
Examinations (Midterm + Final)	100/100%	25%	<b>90 – 100%</b>	<b>A</b>
Test/Quiz (Chapters Examinations)	100/100%	20%	<b>80 – 89%</b>	<b>B</b>
Laboratory (Test/Quiz+Assignment+Lab Activity)	100/100%	25%	<b>70 – 79%</b>	<b>C</b>
Reading/Writing QEP (Research Article / Book Chapter Summary)	100/100%	10%	<b>60 – 69%</b>	<b>D</b>
Class Participation / Attendance	100/100%	10%	<b>Below 60%</b>	<b>F</b>
Class Homework/Assignments	100/100%	10%		
Post-test (Before Final Exam)	Assessment	Assessment		
<b>Total Possible Points/Percentage</b>	<b>600/100%</b>	<b>100%</b>		

**Note: Out of 3-6 Exams (Exam #1, Exam #2, Exam #3, Exam #4, Exam #5 or Exam #6) only the lowest Exam scores will be dropped. The rest exam points will be counted.**

**Grade "C" or above is required to pass the course. The course must be repeated if grade is below "C".**

## **GRADING RUBRIC**

90-100	A	Transformative (and submitted on time)
80-89	B	Proficient
70-79	C	Developing
60-69	D	Beginning
Below 60	F	Not Submitted



**Method of Course Evaluation:** Every Chapter will have homework and a quiz to assess the knowledge of the student. All exams are comprehensive. There will be a Midterm Exam and a Final Exam as well as research papers, all of which will be considered in the final grade. Exams will cover material presented in the textbook, class notes, virtual and actual laboratories, and class assignments. For many of the test questions students will be required to use critical thinking in the use of content knowledge in order to answer the question. This gives a better assessment of the student's understanding of the material presented in each chapter.

**Evaluation Criteria:** At least four major tests (theory), mid-term exam, comprehensive final exam, course and laboratory work assignments will be assessed as an evaluation criteria.

### **Course Content:**

Read entire chapter. Keep a section of your notebook for "Key Terms" throughout the semester. Respond to each Discussion Question. Visit or follow each suggested Resources or Internet Resource.

### **WEEKLY COURSE SCHEDULE**

#### **Lecture and Laboratory (tentative schedule and Book: McMurry's Organic Chemistry):**

Week of	Chapter	Title	Institutional Objectives (TC) and Student Learning Outcomes (SLO) Through Activities	
Week 1		Safety, Pre-test , Review <u>Due</u>	SLO1; TC 1	<ul style="list-style-type: none"> <li>Safety Test, Pretest</li> <li>Virtual Lab – Bonding: Acids and Bases</li> </ul>
Week 2-3	1	Structure and Bonding; Acids and Bases <u>Due</u>	SLO2; TC 1,2	<ul style="list-style-type: none"> <li>Research Paper or SOP on Organic Compounds</li> <li>Homework – Bonding: Acids and Bases</li> <li>Quiz – Organic Acids and Bases</li> <li><b>Exam 1</b></li> </ul>
Week 4	2	Alkanes: The Nature of Organic Compounds	SLO3; TC 1,2,4	<ul style="list-style-type: none"> <li>Lab – Drawing Chemical Structure</li> <li>Homework – Properties of Alkanes</li> <li><b>Exam 2</b></li> </ul>
Week 5-6	3	Alkenes and Alkynes: The Nature of Organic Reactions <u>Due</u> <b>Mid-Term (Sep 30 – Oct 04)</b>	SLO4; TC 1,2,4	<ul style="list-style-type: none"> <li>Lab – Sequence Rules – The E, Z Designation</li> <li>Homework – Kinds of Organic Reactions; Catalysis</li> <li>Quiz – Cis-Trans Isomers of Alkenes <b>Exam 3</b></li> </ul>
Week 7-10	4	Reactions of Alkenes and Alkynes <u>Due</u>	SLO5; TC 1,2,4	<ul style="list-style-type: none"> <li>Lab – Conjugated Dienes</li> <li>Homework - Addition Reactions</li> <li><b>Exam 4</b></li> </ul>
Week 11-13	5	Aromatic Compounds: Structure of Benzene and	SLO6; TC	<ul style="list-style-type: none"> <li>Lab – Aromatic Compounds; Benzene, Aspirin,</li> </ul>

		Naming Aromatic Compounds <b>Due</b>	1,2,4	Acetaminophen • Homework – NSAIDs • <b>Exam 5</b>
<b>Week 14</b>		Review		•
<b>Week 15</b>		<b>Due Comprehensive Final Exam (Dec 02 – 06, 2024)</b>		• Post-Test /Final Exam

*Due to the COVID-19 pandemic and necessary schedule modifications, please note that the dates and activities listed may be subjected to change for the Fall 2023 semester.*

### ASSESSMENT

Students performance and learning will be assessed via tests (chapter exam), mid-term exam, comprehensive final exam, writing, course and laboratory work assignments. At the end of each chapter there will be a case that reflects the learning objectives of each chapter. The writing essay rubric will be used to assess students' comprehension and reflection of content related assignments.

### Rubrics for grading written assignments for CHEM 2470

#### QEP WRITTEN ASSIGNMENTS

	Excellent (5)	Satisfactory (4-3)	Not Satisfactory (2-1)
Content	Clear topic and many interesting details	Somewhat clear topic and some mildly interesting details	Topic not clear and few details
Organization	Details and sequences are clearly evident	Details and sequence are evident but not clear	Details and sequence are not evidence (jumbled/confused)
Fluency	Written in natural language	Some natural and patterned language	Unnatural language patterns
Mechanics	Very few errors (90%) spelling grammar and usage capitalization punctuation	Majority conventions correct (80%) spelling grammar and usage capitalization punctuation	Frequent errors (70% correct) spelling grammar and usage capitalization

**QEP Assignment 1 (2% Bonus pts):**

"Our body made of organic compounds". Explain why do you agree or disagree with this statement. This assignment should be 1-2 pages in length with at least five-paragraph.

**QEP Assignment 2 (2% Bonus pts):**

Write down a short essay on "Knowledge of Organic chemistry is essential in Forensic Science". This assignment should be 1-2 pages in length with at least five-paragraph.

**Submitting Assignments:** Students are expected to submit assignments on the due date. If you submit an assignment late, you will receive no points for the assignment. No excuses will be accepted, including difficulties with technology. Missed assignment cannot be made up. This is a measure of your attendance, and participation, as well as your thinking skills.

**Course Assignments-Lecture and Laboratory:** (Assignments and their Due Dates Posted on JICS Coursework.)

Each student is expected to complete the assignments as specified. There will be **No exceptions**.

### **REMEDICATION PLAN**

Students who have difficulty with the course will have the opportunity to:

State how you will assist the student with remediation. The following are examples.

- Meet with the professor for one-on-one support through face-to-face meetings, telephone sessions, or web conferencing.
- Revise unsatisfactory work until it is satisfactory within a seven (7)-day time limit.

### **DISABILITIES AND SPECIAL NEEDS LEARNING**

Texas College provides equal opportunity to qualified disabled persons in accordance with the requirements of the American with Disabilities Act (ADA). This Act ensures that individuals with current disabling conditions are provided reasonable accommodations to enable them to enjoy the programs, activities, services, and employment opportunities offered by the College. Texas College adheres to this provision once a student/employee self identifies. Students may contact the Office of Academic Affairs for information/assistance at: Texas College, Attn: Vice President for Academic Affairs, Office of Academic Affairs/Martin Hall 2nd floor, 2404 North Grand Avenue, Tyler, Texas 75702 at (903) 593-8311 Extn. 2335 for accommodations as early as possible in the term..

### **NOTICE OF NON-DISCRIMINATION**

Texas College does not discriminate in any employment practice, education program, or educational activity on the basis of race, color, religion, national origin, sex, age, disability, sexual orientation, or veteran status. The Vice President for Academic Affairs has been designated to handle student inquiries regarding non-discrimination policies. Contact information is: Texas College, Attn: Vice President for Academic Affairs, Office of Academic Affairs/Martin Hall 2nd floor, 2404 North Grand Avenue, Tyler, Texas 75702 at (903) 593-8311 Extn. 2335.

### **DIVERSITY STATEMENT**

Texas College is committed to creating a community that affirms and welcomes persons from diverse backgrounds and experiences and supports the realization of their human potential. We recognize that there are differences among groups of people and individuals based on ethnicity, race, socioeconomic status, gender, exceptionalities, language, religion, sexual orientation, and geographical area. All persons are encouraged to respect the individual differences of others.

**Caveat:**

In the event of extenuating circumstances, the schedule and requirements for this course may be modified.

**TECHNOLOGICAL STATEMENT**

This course is infused with technology in order to:

- Participate in Courses Synchronously
- To provide access for course information
- Use the Internet and electronic databases to conduct searches for research projects
- Create multimedia presentations to present class projects to teachers and peers
- PowerPoint Presentations

**WRITING ACROSS THE CURRICULUM**

Strong communication skills are critical for professionals. In an effort to maintain a commitment to developing effective writing skills for all students, all writing assignments will be evaluated for overall communicative competence. The following will be considered when grading written assignments:

- Word-processed (12 font), double-spaced, one inch left, right, top and bottom margins
- Content
- Clarity and Organization
- Source(s)
- Depth of thought/Originality
- Technology and Delivery
- Grammar and mechanics

**References/Resources:**

1. Organic Chemistry, 6th Edition (2020)  
By – Janice Smith (McGraw-Hill Education Publishers)  
ISBN10:1260119106; ISBN13: 9781260119107
2. McGraw-Hill 2021  
Organic Chemistry with Biological Topics, 6th Edition  
By Janice Smith  
ISBN10: 1260325296  
ISBN13: 9781260325294  
Publisher: McGraw-Hill Education 2021.
3. McGraw-Hill 2019  
Organic Chemistry 11th Edition

By Francis Carey (Author), Robert Giuliano (Author)  
ISBN: 126050672x  
Publisher : McGraw-Hill Education 2019

4. McGraw-Hill 2019  
General, Organic, and Biochemistry, 10th Edition  
By Katherine Denniston;  
ISBN-13: 978-1260148954; ISBN-10: 1260148955  
Publisher: McGraw-Hill Education 2019
5. McGraw-Hill 2019  
General, Organic, and Biochemistry, 10th Edition  
By Katherine Denniston;  
ISBN-13: 978-1260148954; ISBN-10: 1260148955  
Publisher: McGraw-Hill Education 2019
6. Pearson, 2017.  
Chemistry: The Central Science (MasteringChemistry) 14th Edition  
by Theodore Brown (Author), H. LeMay (Author), Bruce Bursten (Author), Catherine  
Murphy (Author), Patrick Woodward (Author), Matthew Stoltzfus (Author);  
ISBN-13: 978-0134414232; ISBN-10: 9780134414232  
Publisher: Pearson, 2017.
7. Student companion website accessible from <https://www.cengage.com/c/fundamentals-of-organic-chemistry-7e-mcmurry> , this site provides online study tools, including practice tests and flashcards.
8. Student companion website accessible from [www.cengage.com/chemistry/zumdahl](http://www.cengage.com/chemistry/zumdahl), this site provides online study tools, including practice tests and flashcards.
9. Carbon Anode in Carbon History:  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7662887/pdf/molecules-25-04996.pdf>
10. The Acidity of Atmospheric Particles and Clouds:  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7791434/pdf/nihms-1591474.pdf>
11. Carbon Monoxide and Nitric Oxide as Examples of the Youngest Class of Transmitter-2021:  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8199767/pdf/ijms-22-06029.pdf>
12. Explore Chemistry:  
<https://www.acs.org/content/acs/en/education/whatischemistry.html>
13. Discover Chemistry:  
<https://www.acs.org/content/acs/en/pressroom/presspac/2021/acs-presspac-august-18-2021/the-carbon-footprint-of-delivering-the-goods-with-robots-and-automated-vehicles.html>

14. Chemistry. Provided by: OpenStax CNX. Located at:  
<https://cnx.org/contents/9G6Gee4A@25.9:EuMBjG4i@2/Oxidation-State>. License: CC BY:  
Attribution. License Terms: Download for free at:  
<https://cnx.org/contents/9G6Gee4A@25.9:EuMBjG4i@2/Oxidation-State>
15. Understanding Periodic and Non-periodic Chemistry in Periodic Tables-2021:  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7818537/pdf/fchem-08-00813.pdf>
16. MolView: <https://molview.org>

### **BIOLOGY PROFESSIONAL ORGANIZATIONS/ASSOCIATIONS**

Professional Associations are a great source of information about internships, career pathways, conferences, scholarships, opportunities to meet people in your field, and a whole host of career-related topics. Usually associations will provide a discounted membership rate for students enrolled in college. A few of these organizations include:

- [American Chemical Society](#)
- [American Society for Biochemistry and Molecular Biology](#)
- [American Academy of Forensic Sciences](#)
- [American Association for the Advancement of Science](#)
- [American Institute of Biological Sciences](#)
- [The International Association for Science, Technology and Society](#)
- [National Academy of Science](#)

[https://www.purdue.edu/science/careers/build\\_professional\\_profile/professional\\_orgs/bio\\_orgs.html](https://www.purdue.edu/science/careers/build_professional_profile/professional_orgs/bio_orgs.html)