



Department of Chemistry
and Biochemistry

Periodic Table

CHEM 2261, Spring 2022

Class Topics

This course provides an introduction to the periodic table and its organization while providing a survey of the bonding and chemistry of its elements. This is a concepts-based course that requires little memorization of facts but necessitates critical thinking skills.

Days and Times:

Mondays and Wednesdays
10:30 am – 11:50 am

Instructor:

Dr. Skye Fortier

TA:

Oscar Oehlsen
owoehlsen@miners.utep.edu

Location:

Classroom Bldg, Rm C205

Office:

CCSB 2.0404

Office Hours:

Fridays 9:00 am – 10:00 am
and by appointment

Course Drop Deadline:

April 1st, 2022

Contact information:

747-5195, asfortier@utep.edu

Textbook:

Pannell & Haiduc, *The Periodic Table – A Classification of Elements and their Compounds*

Supplemental Texts:

The following texts are useful references and, from time to time, may be used to supplement class discussion. These texts need not be purchased.

Greenwood and Earnshaw, *Chemistry of the Elements*

DeKock & Gray, *Chemical Structure and Bonding*

Shriver & Weller, et al., *Inorganic Chemistry*

House, *Inorganic Chemistry*

Additional literature material will also be provided for review and discussion.

Topics and their order of discussion are subject to change, but are likely to include:

- Introduction to Quantum Theory of Electrons
- Atomic Properties and Periodic Trends
- Bonding Models using Valence Bond Theory
- Molecular Shapes and Size
- Elemental Groups and their Representative Chemistry

*Students are expected to know how to draw Lewis dot structures and must be familiar with VSEPR theory

‡CHEM 2321 Organic Chemistry I is a prerequisite to this course.

Grading*:

Content Assessment Exam	10%
Midterm Exam	35%
Forum Participation	10%
Comprehensive Final Exam	45%

The final examination *may* include an oral component worth 20% of the exam grade.

Exam Grading

The first examination will be administered on Blackboard and consist of multiple-choice questions. All other examinations will be administered in person with the exams primarily comprised of *short answer responses*.

A short answer response should be treated as a short form essay. Short answers are typically several sentences in length and should indicate the following:

- Comprehension of the question
- Demonstration of knowledge
- Command of the subject
- Focus and conciseness

Short answer responses will be graded on the following scale:

- 100% - Excellent – The concept is clearly, concisely, and accurately explained in depth with minimal to no superfluous information
- 80% - Satisfactory – Knowledge of the concept is explained with some detail and is not accompanied by incorrect statements or information (minimal leeway may be given for minor to trivial statements that are incorrect)
- 50% - Fair – Basic concept knowledge is explained but response lacks depth or strong coherency and/or is accompanied by substantial incorrect statements or information
- 0% - Poor or Incorrect – A poor response is incoherent with minimal to no understanding of the subject and may be accompanied by incorrect or unrelated information. Alternatively, the response may be entirely incorrect.

Examples:

“Explain the general principle of the Schrodinger equation and its importance to modern chemistry.”

Excellent: The Schrodinger equation is a mathematical function which defines the wave behavior of quantum particles. The electron is a quantum particle, and the Schrodinger equation can be applied to determine the energy and wave behavior of the electron when confined to an atom. This wave function represents an electron probability density which we define as an atomic orbital. The Schrodinger equation is applied to determine the shape of the orbitals which has consequences on atomic properties such as shielding, effective nuclear charge, atomic size, and ionization energies, which effect the chemical nature of the elements. Additionally, the Schrodinger equation can be utilized to explain the combination of atomic orbitals to give molecular orbitals, forming the basis for our modern understanding of chemical bonding theory.

Satisfactory: The importance of the Schrodinger equation is a mathematical equation that can define wave behavior of any quantum particle in a given space. We apply Schrodinger's equation to a electron and it will give the wave behavior such as probability density function. Probability density function tells us the orbital representation (s,p,d,f). With this information it can predict the nature of chemistry it will produce, such as atomic size, ionization energy, shielding, etc.

Fair: Schrodinger's equation pertains to modern chemistry by providing the four different parameters known as n,l,ml and ms. These parameters are used in chemistry by helping determine where an electron will be and where it will be missing. The first quantum number known as n gives the orbital energy level of the electron and defines volume. The second quantum number l, gives the orbital shape and it defines the 3D shape of the orbital. The third quantum number ml, defines the orientation of the orbital. Lastly, the fourth known as ms will depict the "spin" of the electron. These quantum numbers provided by Schrodinger's equation are significant in modern chemistry because they are utilized to determine the volume of a singular electron as a probability density.

Poor/Incorrect: In short the Schrodinger equation is pivotal due to the additions onto it which led to the theories behind electron configurations. From a quick glance of a configuration you can see an element's paramagnetic properties, it's core electrons or valence electrons, you can even roughly gauge it's general shape and structure via the outermost shells. That is but one of many uses the equation has, even today the equation is still used in many fields and settings of QM and even QFT via adding a laplace to it, or deriving it via the Dirac Equation.

The Schrodinger equation is used to find the allowed energy levels of the quantum mechanical systems. The associated wave-function gives the probability of finding the particle at a certain position. The solution to this equation is a wave that describes the quantum aspects of a system. The equation also describes how these waves are influenced by external factors.

The following link provides helpful information on the proper structure of short answers: <https://owll.massey.ac.nz/assignment-types/shorter-responses.php>

Exam Dates:

Content Assessment Exam:

Saturday, February 5, 2022

Location: Online - Blackboard (time TBD)

Midterm Examination:

Saturday, March 26th, 2022

10:00 am – 12:45 pm

Location: CCSB G.0208

Final Examination

Friday, May 13th, 2022

10:00 am – 12:45 pm

Location: In class

Your grade in the course is based on your performance on three examinations, and your participation in online forum discussions that will be posted to Blackboard on a regular basis. Forum discussions will be available for a period of time in which you may participate for a grade. A grade cannot be received after a forum discussion closes.

No additional work will be assigned for extra credit other than that detailed below.**

*If you perform poorly on the midterm exam and receive a failing grade but successfully pass the final examination with an A or B (*prior to any curve or grade adjustments*), the midterm grade will be dropped.

**Extra Credit: There may potentially be an opportunity to earn additional credit towards your exam grades by attending specially scheduled research seminars. If so, these opportunities will be announced in advance.

Academic Integrity:

Any indications of improper academic conduct including, but not limited to, cheating or plagiarism will be reported to the UTEP Office of Student Conduct and Conflict resolution for investigation.

Class Attendance:

Attendance is not taken, but it is ill advised to voluntarily miss a lecture. If you have to miss class, please get together with a classmate to catch up on any notes or material that you may have missed. Once you have had an opportunity to review the notes, it would be my pleasure to revisit the material during office hours if you have any questions. However, if you miss a class, I will not repeat the lecture or provide a copy of the class notes.

Class lectures cannot be filmed unless I give explicit written consent in advance. Permission will only be granted in extraordinary circumstances.

Missing an Exam:

If you miss an exam, a valid and documented excuse must be provided (*e.g.*, medical emergency, school field trip or conference attendance, court appearance).

In the case that you are absent due to falling ill, a note from a licensed medical professional (*e.g.*, medical doctor, nurse practitioner, or UTEP Health Center) is required. Otherwise, you must provide compelling evidence of illness or injury, and the decision to make-up the exam will fall at my sole discretion.

If you miss an exam because of a travel issue (*e.g.* missing your flight or flight cancellation) on a non-UTEP related trip, extensive documentation must be provided demonstrating circumstances beyond your control. You must notify me immediately of your situation. I will evaluate your case and qualification for a make-up exam will be made at my discretion.

It is your responsibility to contact me at the email address listed above to schedule time for a re-take. If you do not contact me at the correct email address to make arrangements within 3 days of the original exam date, a failing grade of 0 will be automatically assigned.

Make-up exam:

The make-up exam may mirror the original exam, be slightly altered, or altogether changed in form, format and content at my discretion. In the latter two cases, best efforts will always be made to maintain the same level of difficulty, but this is not guaranteed.

Special Accommodations:

If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass. *CASS' Staff are the only individuals who can validate and if need be, authorize accommodations for students with disabilities.*

If you are designated special accommodations by CASS, it is your responsibility to coordinate these exam accommodations between CASS and me. If CASS will proctor the examination, it must be scheduled within 3 days of the exam date. Otherwise, you will not be allowed to take the exam and will receive a failing grade of 0 (unless there is a special exception as written in the "MISSING AN EXAM" section above).