



# Elementary Chemistry for Health Sciences

The University of Toledo  
College of Natural Sciences and Mathematics  
Department of Chemistry and Biochemistry  
CHEM1110-001

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<b>Instructor:</b>	Dr. Dragan Isailovic	<b>Office Phone:</b>	419-530-5523
<b>Email:</b>	Dragan.Isailovic@utoledo.edu	<b>Term:</b>	Spring 2021
<b>Office Hours:</b>	by virtual appointment	<b>Lecture Location:</b>	SYNCHRONOUS REMOTE
<b>Help Sessions:</b>	by virtual appointment	<b>Lecture Day/Time:</b>	TR 11:10 AM – 12:30 PM
	<a href="https://us.bbcollab.com/guest/ce2a41f345ed4e9d939d6e7b0ef0c63">https://us.bbcollab.com/guest/ce2a41f345ed4e9d939d6e7b0ef0c63</a>	<b>Course Website:</b>	<a href="#">Blackboard Learn</a>
<b>Office Location:</b>	BO 1086 F	<b>Class Location:</b>	<a href="#">Blackboard Learn</a>
		<b>Credit Hours:</b>	3

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## SPECIAL COURSE EXPECTATIONS DURING COVID-19

**ATTENDANCE** The University of Toledo has a missed class policy. It is important that students and instructors discuss attendance requirements for the course. Students must perform a daily health assessment, based on CDC guidelines, before coming to campus each day, which included taking their temperature. Students who are symptomatic/sick should not come to class and should contact the Main Campus Health Center at 419-530-3451. Medical and Physician Assistant Students should contact Jyothi Sri Pappula, MD via email at: Jyothi.pappula@utoledo.edu; All other clinical students should contact Dean Linda Lewandowski, College of Nursing, via email at Linda.Lewandowski@UToledo.Edu or by phone at 419-383-5835. *Absences due to COVID-19 quarantine or isolation requirements are considered excused absences. Students should notify their instructors and these absences may not require written notice.*

**FACE COVERINGS** All students must wear face coverings while on campus, except while eating, alone in an enclosed space, or outdoors practicing social distancing.

**SOCIAL DISTANCING** Students should practice social distancing inside and outside the classroom please follow signage and pay attention to the seating arrangements Please be conscious of your personal space and respectful of others.

**SPECIAL NOTES** It's important to note that based on the unpredictability of the COVID-19 virus things can change at any time so please be patience and understanding as we move through the semester. I also ask that you keep me informed of concerns you may have about class, completing course work/assignments timely and/or health concerns related to COVID.

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## COURSE/CATALOG DESCRIPTION

The study of chemistry for students that are studying nursing or other allied health related fields who have not had a previous course in chemistry or whose preparation in chemistry is not sufficient to begin Chemistry for Health Sciences (CHEM 1120).

## COURSE OVERVIEW

CHEM 1110 is the introductory chemistry course to prepare students for CHEM 1120 – Chemistry for Health Sciences. As a prerequisite to CHEM 1120 – Chemistry for Health Sciences, it is offered for students that did not meet the criteria for direct entrance into CHEM 1120. The grade of C or higher is required in CHEM 1110 to continue on to CHEM 1120. It provides a basic foundation in math and the



principles of general chemistry needed to continue on to CHEM 1120. This course is typically taken by nursing students, elementary education students, sports management students, and some science majors who do not want or need the more rigorous chemistry background that is provided by two or three years of chemistry courses. It is not appropriate for chemistry majors and may be too rigorous for non-science majors who are only interested in fulfilling their general education science core requirement. If you have any questions about course placement, please contact me as soon as possible.

### STUDENT LEARNING OUTCOMES

Upon completion of this course, the student will be able to:

1. Explain how chemical processes work in the body.
2. Apply chemical concepts to explain how chemistry is used in health care.
3. Demonstrate the ability to think critically and employ critical thinking skills.
4. Read and interpret graphs and data.
5. Demonstrate an understanding of the impact of science on society.

The specific student learning outcomes for CHEM 1110 are outlined at the end of this document.

### TEACHING METHODOLOGY

- Students entering elementary chemistry are often nervous and unsure about whether they can do well. Being successful will require time and effort. However, if you have met the pre-requisites for this course, you belong here and are in the position to learn, grow and meet the challenge: you can learn chemistry.
- Because research has shown that learning occurs when the learner is actively involved in “doing” rather than just listening or watching, asking questions and solving lots of problems will be key elements in your success. With these ideas in mind, the following are used to facilitate learning in this course.
- **Readings:** Even before watching/attending the lectures, I recommend reading the textbook. Repetition is one key to learning! While doing this, it is beneficial if you write down definitions, equations, and small notes as you go along. I will post partial outlines of my lectures that include space for this. As you read attempt to work the problems throughout the chapter. Don't get discouraged if you can't do them. After watching the lecture and practicing there, come back and try again. If you are still struggling, you can visit the Chemistry Help Center or ask me to help.
- **Lecture:** Attendance is required, please login on time. Lectures will be delivered remotely and synchronously via **Blackboard (Bb) Collaborate**. *Learning Catalytics* (LC) questions for points will be included in lecture. You are responsible for all material, experiments, and problems covered in class. You will be provided with partial lecture outlines of the course material via Blackboard (Bb). In addition, recorded/captured lectures will be posted in Bb Collaborate to ensure that every student has access to the same content presented in the classroom that day including those students who 1) use the rolling schedule, 2) require an accommodation, 3) have to self-isolate, 4) have access and/or connectivity issues or 5) reside in a different time zone. Since my live lectures will be recorded and posted for you, you can watch again at a pace appropriate for you. Feel free to **pause the recording** to write down definitions or answer questions, and then continue when you are ready to see the solutions.



- **Lecture Participation Points** Throughout the live lectures I will ask polling questions through *Learning Catalytics* (LC). LC is packaged with your online HW system, *Mastering Chemistry* (MC) (information below). You earn participation points for answering LC questions. I offer many extra (not quite double) participation points, hence, you shouldn't worry about getting them wrong. The LC questions are there to help you practice and learn. You don't learn a sport by watching others play. You go on the field, fall, and pick yourself back up to learn it. Use the LC questions as a safe place to fall.
- **Homework:** We will be using the *Modified Mastering Chemistry Homework System* (MC). It is an online, web-based learning system that is packaged with your textbook. It is part of the inclusive access package for this course. You do NOT need to purchase an access code. Problem sets will be posted in advance, feel free to work ahead. However, you must complete the assignments by the posted deadlines **because I will not re-open the online homework assignment once the deadline passes!** For each problem in MC, you have 6 attempts to answer correctly. You will not have points taken away during these 6 attempts unless it is a multiple-choice question; a small deduction is made for each wrong answer to a multiple-choice question. If you do not exhaust your options or hit give up, MC may not assign points for that section; be sure to double-check for this before the submission deadline.
- Additionally, I strongly encourage you to attempt problems from the end of each chapter in your textbook until you are very familiar with that topic. If you are having difficulties working either the *Mastering Chemistry* assignments or the questions from the end of each chapter, you should attend a virtual help session (below), work with your classmates (a post on the discussion board of our class website on Blackboard is appropriate) or contact me.
- **Help Sessions:** Virtual/online help will be available. To setup meeting with a teaching assistant, the link for the Help Center can be used <https://us.bbcollab.com/guest/ce2a41f345ed4e9d939dd6e7b0ef0c63> No appointment is necessary! Help sessions can be setup thru Bb Collaborate and recorded.
- **Final Examination:** The final examination will require proctoring. For most of you this will require installing LockDown Browser and the use of a webcam. If for any reason you cannot get these to work, we can pair you with a live proctor. Please reach out if you have difficulties during the practice in week 1.
- **WORK WEEK:** All assigned work is to be completed by 11:59 PM on the date specified in the Weekly Module on Blackboard. You are encouraged to work ahead so that if you have any difficulties with the material or your personal schedule you have enough time to meet the deadlines.

### PREREQUISITES AND COREQUISITES

One of the following: ACT math score of 20 or higher, College Algebra Test score of 10 or higher, ALEKS math score of 46 or higher, completion of MATH 1200 with a grade of C or higher, or placement into any higher level math course (1320, 1340, 1750, 1830, 1850).

### REQUIRED TEXTS AND ANCILLARY MATERIALS

- This course is part of the inclusive access program. You would have purchased your textbooks (thus access) as part of your tuition. Thus, you have already paid for access to the following items which can be accessed directly through Blackboard:
  - An electronic copy of the textbook, *General, Organic, and Biological Chemistry: The Structures of Life*, 6<sup>th</sup> edition by Timberlake
  - *Mastering Chemistry*

— *Learning Catalytics*

- A webcam. This course requires the use of a webcam for the exams. The webcam can be the type that's built into your computer or one that plugs in with a USB cable. If you have difficulty with the Webcam requirement, please contact me as soon as possible to arrange for alternate live proctoring arrangements for the final.
- LockDown Browser.
  - Watch this brief video to get a basic understanding of LockDown Browser and the webcam feature <https://www.respondus.com/products/lockdown-browser/student-movie.shtml>
  - Download and install LockDown Browser from this link: <https://download.respondus.com/lockdown/download.php?id=213815819>
- A non-programmable calculator. Only non-programmable calculators are allowed when you take exams in this course. Examples of non-programmable calculators include: TI-30XIIS, TI-30Xa, TI-30XS Multiview, TI-32, TI-34 II, TI-34 Multiview, TI-36, TI-36X Solar, Casio FX-77, Casio FX-260, Casio FX-65. Many of these can be purchased for about \$10. A calculator that has any of the following functions is not permitted for use on General Chemistry exams: solver, integration, differentiation, unit conversions, or a calculator that allows you to type an equation. If you are not sure whether your calculator is acceptable, [contact me](#) and ask.

**Optional Materials:**

- A hard copy of *General, Organic, and Biological Chemistry: The Structures of Life*, 6<sup>th</sup> ed, 2019, Timberlake, Prentice Hall (3-ring hole-punch version is available in the bookstore).

**TECHNOLOGY REQUIREMENTS, SKILLS, AND PRIVACY POLICIES:**

Please view the [technology considerations](#) for this course, including technical skills needed, general technology requirements, and technology privacy policies.

**Blackboard** (<https://blackboard.utdl.edu/webapps/login/>) (Bb) and **Modified Mastering Chemistry** (available through the Blackboard course) will be used on a regular basis in this course. Students need to have access to a properly functioning computer throughout the semester. Student computers need to be capable of running the latest versions of plug-ins, recent software and have the necessary tools to be kept free of viruses and spyware. Updated software is available from the [Online Learning Download Center](https://www.utoledo.edu/dl/main/downloads.html) (<https://www.utoledo.edu/dl/main/downloads.html>).

This class will be conducted remotely through Blackboard Collaborate Ultra. Here is a link that provides detailed navigation guides on how to access Collaborate Ultra, participate and troubleshoot common issues. <http://utlv.screensteplive.com/s/student/m/56924>

For exams, students may use an approved calculator. Any calculator that is programmable, whether graphing or non-graphing, and any calculator based on a phone or other device that can receive or transmit data, are prohibited. Exams will be administered remotely.

Students are required to have a web-enabled device (smartphone, laptop computer, iPod, or other device that connects to the internet will work) for use in all lecture classes. You will need to access both Blackboard Collaborate for the lectures plus have access for the remote polling system *Learning Catalytics*, LC.



## ACCESSIBILITY OF COURSE TECHNOLOGIES\*

Please view [Accessibility of Course Technologies](#) for information regarding the accessibility of Blackboard and other technologies used in this course.

## UNIVERSITY POLICIES

**Policy Statement on Non-Discrimination on the basis of Disability (ADA):** The University is an equal opportunity educational institution. Please read [The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance](#).

### Student Policies

Your safety and well-being as a University of Toledo Student is important to the faculty, staff, and administration; as such, please take a minute to review the comprehensive list of university policies that apply to you as a student of the University: [Student Policies](#)

Please use the following link to view a comprehensive list [Campus Health and Safety Services](#) available to you as a student.

## ACADEMIC ACCOMMODATIONS

The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the [Student Disability Services Office](#).

The University of Toledo embraces the inclusion of students with disabilities. We are committed to ensuring equal opportunity and seamless access for full participation in all courses. For students who have an accommodations memo from Student Disability Services, I invite you to correspond with me as soon as possible so that we can communicate confidentially about implementing accommodations in this course. For students who have not established affiliation with Student Disability Services and are experiencing disability access barriers or are interested in a referral to healthcare resources for a potential disability or would like information regarding eligibility for academic accommodations, please contact the [Student Disability Services Office](#) by calling 419.530.4981 or sending an email to [StudentDisability@utoledo.edu](mailto:StudentDisability@utoledo.edu).

## ACADEMIC POLICIES

All students at the University of Toledo are expected to read, understand, and follow the academic policies that govern their attendance at the University. These policies include, but are not limited to, academic dishonesty, academic forgiveness, adding and dropping a course, grades and grading, and the missed class policy. Please use the following URL to read a comprehensive list of academic policies that pertain to you in this class and throughout your academic journey: [Undergraduate Academic Policies](#).

### Copyright Notice

The materials in the course website are only for the use of students enrolled in this course for purposes associated with this course and may not be retained or further disseminated.

**Examination Policies:** *Make-up exams will not be given.* Excused absences will only be given based on conditions outlined below. If an excuse is acceptable, your missed exam score will be replaced with a score equal to the average of the other hour exams. The final exam cannot be excused. For all exams you must show a **photo ID card**. You may only use a **non-programmable calculator**. Non-permitted items



include programmable calculators, phones, other websites, other computers, notes, textbooks, etc, unless specified as permitted.

*Exam Absence Policies:* Students who will not be able to take an exam at the scheduled time due to an irresolvable conflict must provide **written** documentation to verify the conflict. This may occur for students on official university business. The exam will be given at another arranged time **before** the scheduled test date. *Approval must be obtained in advance.*

Students who unexpectedly miss an exam due to illness, car accident or similar **extreme** circumstance should inform their instructor **ASAP**. **Documentation** such as a physician's note, an accident report, etc. is required and must be attached to an **Absence Report Form** (obtained from BO 2022; email: [pamela.samples@utoledo.edu](mailto:pamela.samples@utoledo.edu), or telephone 419-530-2698). An email to the instructor and a telephone call within 24 hours is expected. In all other cases a missed exam will result in 0 on the exam.

*Absences due to COVID-19 quarantine or isolation requirements **are** considered excused absences.* Students should notify their instructors, and these absences may not require written documentation.

**Academic Dishonesty: Refer to the university's policy on Academic Dishonesty in the university catalogue. Violation of this policy can result in a course grade of F with additional university sanctions possible. You will be required to formally acknowledge the terms of our Academic Honesty Statement, by providing a statement through our Blackboard course page.**

## **COURSE EXPECTATIONS**

1. Check Blackboard and your UT email every day.
2. Attendance is required for the lecture, even remotely.
3. Read the textbook before the lecture, the schedule is listed at the end the syllabus.
4. You are responsible for all material and problems covered in class.
5. You will need your web-enabled device and a calculator for every lecture. You earn participation points for answering LC questions. Each LC question is worth 0.5 points for a correct answer and 0.1 points for an incorrect answer.
6. Mastering Chemistry online homework assignments have to be completed before the deadline.
7. At a minimum, answer the assigned Mastering Chemistry questions. There are many problems found throughout the book that should be worked if you are having difficulty with a certain concept.
8. If you need extra help, please attend the virtual help sessions/office hours. You will not be graded or judged based on the questions that you ask!
9. Copyright Notice: The materials in the course website are only for the use of students enrolled in this course for purposes associated with this course and may not be retained or further disseminated.
10. **SPECIAL NOTES:**  
It's important to note that based on the unpredictability of the COVID-19 virus, things can change at any time. Please be patient and understanding as we move through the semester. I also ask that you keep me informed of concerns you may have about class, completing course work/assignments timely and/or health concerns related to COVID.

As your instructor, I am here to help, and will do my best to respond to email within 48 hours. Students are expected to check their UT email account and blackboard frequently for important course information.



## ATTENDANCE

The University of Toledo has a missed class policy. It is important that students and instructors discuss attendance requirements for the course. Students must perform a daily health assessment, based on based on [CDC guidelines](#), before coming to campus each day, which includes taking their temperature. Students who are symptomatic/sick should not come to class and should contact the Main Campus Health Center at 419-530-3451. *Absences due to COVID-19 quarantine or isolation requirements **are** considered excused absences.* Students should notify their instructors, and these absences may not require written documentation.

## GRADING

It is a very high priority to your instructor to ensure fairness and equity in all grading aspects of the course. There is nothing about this class that requires a certain number of students to get a certain grade. **We don't use a curve**, so every one of you can achieve the grade that you are willing to earn!

**Course Points** The following is the distribution of possible points in the course:

Midterm Exams – 3 @100 points each	300 pts	46 %
Final Exam	200 pts	31 %
Mastering Chemistry (online HW)*	100 pts	15 %
Participation points*	<u>50 pts</u>	<u>8 %</u>
<b>Total:</b>	<b>650 pts</b>	

\* These categories will have *extra points* available to allow students a chance to reach the total points. However, points added to the total grade will not exceed total points for a category.

The grading scale for this class is:

	A	100-93%	A-	92-90%
B+	B	89-87%	B-	82-80%
C+	C	79-77%	C-	72-70%
D+	D	69-67%	D-	62-60%

**All course points and grades will be frequently updated on Blackboard** including a **midterm grade**. Although this is not your final grade in the course, a midterm grade should be taken seriously with respect to how well you are doing in the course approximately half-way through the semester.

Midterm grades are assigned the 8th week of class and are used to assist students with determining their academic standing. Attendance is also recorded during the 8th week to meet state and federal laws regarding financial aid disbursement. Please note, if you are not attending class it could affect your financial aid (scholarships, grants, loans or Federal Work Study). If you decide you are not going to attend this class (or any other class you have registered for), you must formally withdraw (drop) from the course. You can do this by logging onto the myUT portal, clicking on the "Student" tab, and then under "My Toolkit" click on Register/Drop/Withdraw.



***Drop, Withdrawal and Incomplete Grades Course drop and withdrawal procedures have been set by the University. Dropped courses do not appear on your transcript. The deadline for dropping is February 2. You may withdraw from the course and receive a grade of W. The deadline for withdrawal is March 26. W's do not affect your GPA.***

A course grade of **Incomplete** is given only to those who have completed all but a small percentage of course requirements for an acceptable reason. The Incomplete must be removed before you take CHEM 1120 – Chemistry for the Health Sciences.

### **COMMUNICATION GUIDELINES**

***Instructor Communication:*** This class is being taught for you so if you are having trouble understanding any of it, let me know. **I am here to help!** Although there are no regular office hours, please reach out with questions. You can email me at any time; I will do my best to respond within 48 hours. We can also set up an appointment to meet virtually through Blackboard Collaborate. I have found that you, as a student, have more time constraints than I do so feel free to send an email with a few times you are available, and I will see what fits in my schedule.

***Netiquette:*** It is important to be courteous and civil when communicating with others. Students taking online courses are subject to the [Student Code of Conduct](#). To ensure your success when communicating online, take time to familiarize yourself with the "dos" and "don'ts" of [Internet etiquette](#).

***Email:*** Students are expected to check their UT email account frequently for important course information. If you are having trouble understanding any aspect of the course, please let me know.

***Real-Time Communication:*** A link to Blackboard Collaborate Ultra, a real-time communication tool has been added to the course menu in Blackboard. We will be using this tool for delivery of lectures and for help sessions. The tool is available for you to use if and when you need it. I would be happy to arrange a time to meet with you virtually if you feel that you have questions that would best be answered in real-time. Conversely, you could also use the tool to meet with fellow students online in order to enhance your understanding of course concepts.

### **STUDENT SUPPORT SERVICES**

Please view the [Learner Support](#) page for links and descriptions of the technical, academic, and student support services available to UT students.

***Instructor Office Hours:*** Although I have no regular office hours, please reach out with questions. You can email me at any time; I will do my best to respond within 48 hours. We can also set up an appointment to meet virtually through Blackboard Collaborate. Feel free to send an email with a few times you are available, and I will see what fits in my schedule.

***Chemistry Help from Teaching Assistants:*** Virtual/online help will be available. The link for the Help Center is <https://us.bbcollab.com/guest/ce2a41f345ed4e9d939dd6e7b0ef0c63> No appointment is necessary!

***Tutoring through the Learning Enhancement Center:*** <http://www.utoledo.edu/success/lec/>

***Library:*** <http://www.utoledo.edu/library/>





**Success Coaching:** <https://www.utoledo.edu/successcoach/>

**Student Affairs:** <http://www.utoledo.edu/studentaffairs/>

**Career Services:** <http://www.utoledo.edu/success/career/>

**Course scheduling assistance:** Chemistry Department Secretary, Ms. Samples. You can find her in Room BO 2022, ; email: [pamela.samples@utoledo.edu](mailto:pamela.samples@utoledo.edu), or telephone 419-530-2698. Ms. Samples takes care of all scheduling changes.

#### **SAFETY AND HEALTH SERVICES FOR UTOLEDO STUDENTS**

Please use the following link to view a comprehensive list [Campus Health and Safety Services](#) available to you as a student.

#### **COURSE SCHEDULE**

The following table will give you a general idea of our pace throughout the course. Exams will occur on the dates indicated below. Material covered on each exam will be dependent on the pace of the class and will be specified in lecture prior to each exam. Each chapter listed is consistent with the learning outcomes included in this syllabus.



**CHEM 1110 Sec 001 – Elementary Chemistry for Health Sciences**  
 University of Toledo  
**EXPECTED Course Schedule – Spring 2021**

Week	Dates	Chapter	Notes
1	January 19-22	Introduction 1. Chemistry in Our Lives	
2	January 25-29	2. Chemistry and Measurements	
3	Feb 1 – Feb 5	3. Matter and Energy	<b>Last day to Drop is February 2</b>
4	Feb 8-12	3. Matter and Energy	
5	<b>Feb 15-19</b>	4. Atoms	<b>No class on Feb 16 (instructional break)</b>
6	Feb 22-26	4. Atoms	<b>Midterm Exam 1, Tues. Feb 22, Chapters 1-4</b>
7	March 1 – 5	6. Ionic and Molecular Compounds	
8	March 8 – 12	6. Ionic and Molecular Compounds	
9	<b>March 15 - 19</b>	7. Chemical Reactions and Quantities	<b>Midterm Exam 2, Tues. Mar 16: Ch 6 &amp; 7, and a review of Exam 1</b>
10	March 22 - 26	7. Chemical Reactions and Quantities	<b>Note: Friday 03/26 is the last day to withdraw from the class</b>
11	Mar 29 – Apr 2	7. Chemical Reactions and Quantities	
12	April 5 - 9	7. Chemical Reactions and Quantities 8. Gases	
13	April 12 - 16	8. Gases 5. Nuclear Chemistry	
14	<b>April 19 - 23</b>	5. Nuclear Chemistry	<b>Midterm Exam 3, Tues. April 20: Ch 7-8 and a review of Exams 1 and 2</b>
	April 26	Review – Last day of classes	
Finals Week	<b>May 3 – May 7</b>	The Final Exam will be comprehensive; including chapters 1-8 from your book.	<b>*****Final Exam*****</b> <b>Tuesday, 5/4 12:30 - 2:30 PM</b> <b>YOU MUST TAKE THE FINAL EXAM AT THIS TIME!</b>



## **SPECIFIC STUDENT LEARNING OUTCOMES:**

### ***Chapter 1 Chemistry in Our Lives***

- Define the term chemistry and identify substances as chemicals.
- Describe the activities of the scientific method.
- Review math concepts used in chemistry such as place values, positive and negative numbers, percentages, solving equations, interpreting graphs, and writing numbers in scientific notation.

### ***Chapter 2 Chemistry and Measurement***

- Write the names and abbreviations for metric or SI units used in measurements of length, volume, mass, temperature, and time.
- Identify a number as measured or exact.
- Determine the number of significant figures in a measured number.
- Adjust calculated answers to give the correct number of significant figures.
- Use the numerical values of prefixes to write a metric equality.
- Write a conversion factor for two units that describe the same quantity.
- Use conversion factors to change from one unit to another.
- Calculate the density or specific gravity of a substance; use the density or specific gravity to calculate the mass or volume of a substance.

### ***Chapter 3 Matter and Energy***

- Classify examples of matter as pure substances or mixtures.
- Classify examples of pure substances as elements or compounds.
- Classify examples of mixtures as homogenous or heterogeneous.
- Identify the states and the physical and chemical properties of matter.
- Given a temperature calculate a corresponding temperature on another scale.
- Identify energy as potential or kinetic; convert between units of energy.
- Use specific heat to calculate the quantity of heat lost or gained during a temperature change.
- Describe the changes of states between solids, liquids, and gases; calculate the energy involved.

### ***Chapter 4 Atoms***

- Given the name of an element, write its correct symbol; from the symbol, write the correct name.
- Use the periodic table to identify the group and the period of an element.
- Identify elements as metal, nonmetal, or metalloid.
- Describe the electrical charge and location in an atom for a proton, a neutron, and an electron.
- Given the atomic number and the mass number of an atom, state the number of protons, neutrons, and electrons.
- Give the number of protons, neutrons, and electrons in one or more of the isotopes of an element.
- Calculate the atomic mass of an element using the abundance and mass of its naturally occurring isotopes.
- Describe the energy levels, sublevels, and orbitals for the electrons in an atom.
- Draw the orbital diagram and write the electron configuration for an element.
- Use the electron configurations of elements to explain the trends in periodic properties.

### ***Chapter 5 Nuclear Chemistry***

- Describe alpha, beta, positron, and gamma radiation.
- Write a balanced nuclear equation showing mass numbers and atomic numbers for radioactive decay.
- Describe the detection and measurement of radiation.
- Given the half-life of a radioisotope, calculate the amount of radioisotope remaining after one or more half-lives.

- Describe the process of nuclear fission and fusion.

### **Chapter 6 Ionic and Molecular Compounds**

- Write the name and formula for a compound containing a polyatomic ion.
- Given the formula of a covalent compound, write its correct name; given the name of a covalent compound, write its formula.
- Draw the electron-dot formulas for covalent compounds, including multiple bonds and resonance structures.
- Use electronegativity to determine the polarity of a bond.
- Predict the three-dimensional structure of a molecule and classify it as polar or nonpolar.
- Describe the attractive forces between ions, polar molecules, and nonpolar molecules.

### **Chapter 7 Chemical Reactions and Quantities**

- Use conversion factors to change from one unit to another.
- Identify a reaction as a combination, decomposition, single replacement, double replacement, or combustion.
- Define the terms oxidation and reduction; identify the reactant that is oxidized and the reactant that is reduced along with the oxidizing agent and the reducing agent.
- Use Avogadro's number to determine the number of particles in a given amount of moles.
- Calculate the molar mass of a substance and use the molar mass to convert between grams and moles.
- Given a quantity in moles of reactant or product, use a mole-mole factor from the balanced equation to calculate the moles of another substance in the reaction.
- Given the mass in grams of a substance in a reaction, calculate the mass in grams of another substance in the reaction.
- Identify a limiting reactant when given the quantities of two or more reactants; calculate the amount of product formed from the limiting reactant.
- Calculate the percent yield of a reaction given a quantity of starting material.
- Given the heat of reaction, calculate the loss or gain of heat for an exothermic or endothermic reaction.

### **Chapters 8 Gases**

- Describe the kinetic molecular theory of gases and the properties of gases.
- Use the pressure-volume relationship (Boyle's law) to determine the new pressure or volume when the temperature and amount of gas are constant.
- Use the temperature-volume relationship (Charles's law) to determine the new temperature or volume of gas when the pressure and amount of gas are constant.
- Use the temperature-pressure relationship (Gay-Lussac's law) to determine the new temperature or pressure when the volume and amount of gas are constant.
- Use Avogadro's law to determine the amount or volume of a gas when the pressure and temperature are constant.
- Use the combined gas law to find the new pressure, volume, or temperature of a gas when changes in two of these properties are given and the amount of gas is constant.
- Use the ideal gas law equation to solve for P, V, T, or n of a gas when given three of the four values in the ideal gas law.
- Use Dalton's law of partial pressures to calculate the total pressure of a mixture of gases.