

## Course Number and Title: CHM 150 Chemical Principles I

**Campus Location:**

Georgetown, Dover, Stanton, Wilmington

**Effective Date:**

2021-51

**Prerequisite:**

ENG 090 or ENG 091, (CHM 110 or MAT 281) , (MAT 153 or MAT 180), SSC 100 or concurrent

**Co-Requisites:**

None

**Course Credits and Hours:**

5.00 credits

4.00 lecture hours/week

3.00 lab hours/week

**Course Description:**

This course is the first of a two-semester sequence designed for science and engineering majors. Topics include atomic and molecular structure, nomenclature, chemical reactions, stoichiometry, oxidation- reduction, thermochemistry, electronic structure of atoms, chemical bonding, gases, liquids and solids. Laboratory experiments are used to illustrate theory.

**Required Text(s):**

Obtain current textbook information by viewing the [campus bookstore - https://www.dtcc.edu/bookstores](https://www.dtcc.edu/bookstores) online or visit a campus bookstore. Check your course schedule for the course number and section.

**Additional Materials:**

None

**Schedule Type:**

Classroom Course

**Disclaimer:**

None

**Core Course Performance Objectives (CCPOs):**

1. Practice individual and collaborative quantitative skills necessary to solve scientific problems. (CCC 1, 2, 6; PGC 1, 7, 10).
2. Relate proper chemical terminology to nomenclature and formulas. (CCC 1, 2, 6; PGC 1, 7, 10).
3. Describe the structure and composition of matter. (CCC 1, 2, 6; PGC 1, 7, 10)
4. Explain properties of chemical substances. (CCC 1, 2, 6; PGC 1, 7, 10)
5. Express observable changes as chemical equations. (CCC 1, 2, 6; PGC 1, 7, 10)
6. Perform calculations using principles of chemistry. (CCC 1, 2, 6; PGC 1, 7, 10)
7. Safely assemble and operate routine chemistry laboratory apparatus. (CCC 2, 3, 6; PGC 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)
8. Perform laboratory activities, document them in accordance with accepted professional standards, and analyze the results. (CCC 1, 2, 3, 4, 5, 6; PGC 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

## Measurable Performance Objectives (MPOs):

Upon completion of this course, the student will:

1. Practice individual and collaborative quantitative skills necessary to solve scientific problems.
  1. Describe the scientific method.
  2. Distinguish between qualitative and quantitative observations.
  3. Interpret and apply the SI and non-SI systems of measurements.
  4. Apply dimensional analysis using both SI and non-SI units.
  5. Express numbers in scientific notation.
  6. Define *precision* and *accuracy*.
  7. Express calculated results to the correct number of significant figures to reflect measurement uncertainty.
2. Relate proper chemical terminology to nomenclature and formulas.
  1. Write the name or chemical description of various particles of matter, given the other.
  2. Compare and contrast the nomenclature of various particles of matter.
  3. Describe the organization of the periodic table.
  4. Use the periodic table to construct chemical nomenclature and formulas.
3. Describe the structure and composition of matter.
  1. Define and classify samples of matter.
  2. State the law of conservation of matter.
  3. Identify and compare the physical and chemical properties of various particles of matter.
  4. Distinguish between physical and chemical changes.
  5. Summarize the historical development of the atomic model of matter.
  6. Identify the electrical charge and mass of each of the three major subatomic particles.
  7. Compare atomic number and mass number.
  8. Differentiate between isotopes in terms of atomic structure.
  9. Define *relative atomic mass*.
  10. Calculate average atomic mass using isotopic composition.
  11. Explain quantized matter and energy.
  12. Recognize, draw, and interpret descriptions of electronic structures.
  13. Identify trends in the periodic table.
4. Explain properties of chemical substances.
  1. Describe macroscopic and atomic scale properties of elements and compounds.
  2. Compare observable behavior to theoretical behavior.
  3. Explain changes of state as dynamic equilibria.
  4. Explain solubility.
  5. Describe energy in terms of thermodynamic variables.
  6. Interpret thermodynamic data.
  7. Explain chemical bonding.
  8. Compare actual structure to theoretical structure.
5. Express observable changes as chemical equations.
  1. Describe chemical reactions using proper chemical notation.
  2. Explain oxidation-reduction in chemistry.
  3. Distinguish and predict the behavior of ionic and molecular compounds in chemical reactions.
6. Perform calculations using principles of chemistry.
  1. Set up and solve conversion problems.
  2. Analyze elemental composition.
  3. Set up and solve stoichiometry problems.
  4. Analyze yields of a reaction.
  5. Set up and solve thermodynamic problems.
  6. Set up and solve gas problems.
  7. Set up and solve solution problems.
7. Safely assemble and operate routine chemistry laboratory apparatus.
  1. Describe and apply safe laboratory practices.
  2. Demonstrate correct use of laboratory equipment, including balances, volumetric glassware, spectrometers, and micropipettes.
  3. Construct models to illustrate chemical theories.
8. Perform laboratory activities, document them in accordance with accepted professional standards, and analyze the results.
  1. Distinguish experimental results and theory.
  2. Set up and maintain a laboratory notebook.
  3. Synthesize and isolate a compound, and calculate the theoretical, actual, and percentage yields.
  4. Construct a calibration curve, and perform a quantitative analysis.
  5. Determine heat capacities and heats of reaction.
  6. Use titration to determine the concentration of a substance.
  7. Demonstrate proper sampling technique.
  8. Summarize and orally present results.

**Evaluation Criteria/Policies:**

The grade will be determined using the Delaware Tech grading system:

90	-	100	=	A
80	-	89	=	B
70	-	79	=	C
0	-	69	=	F

Students should refer to the [Student Handbook - https://www.dtcc.edu/handbook](https://www.dtcc.edu/handbook) for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

**Final Course Grade:**

Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Summative: Tests (equally weighted)	70%
Summative: Laboratory Experiments (equally weighted)	25%
Formative:	5%
TOTAL	100%

**Core Curriculum Competencies (CCCs are the competencies every graduate will develop):**

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

**Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):**

1. Apply knowledge of the theories and principles of chemistry.
2. Follow safety procedures.
3. Perform basic laboratory operations and techniques.
4. Keep a laboratory notebook following standard laboratory practices and present data in an organized written format.
5. Prepare common laboratory solutions.
6. Prepare and purify samples using common techniques.
7. Communicate in a professional manner.
8. Analyze samples by common qualitative and quantitative techniques.
9. Use and maintain common laboratory instruments and equipment.
10. Apply mathematical concepts to the solution of scientific problems.

**Disabilities Support Statement:**

The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the [disabilities services - https://www.dtcc.edu/disabilitysupport](https://www.dtcc.edu/disabilitysupport) web page or visit the campus Advising Center.