



Course Number and Title: CHM 100 Basic Chemistry

Campus Location:

Georgetown, Dover, Stanton, Wilmington

Effective Date:

2018-51

Prerequisite:

ENG 090 or ENG 091, MAT 020 or MAT 129, SSC 100 or concurrent

Co-Requisites:

None

Course Credits and Hours:

3.00 credits

2.00 lecture hours/week

2.00 lab hours/week

Course Description:

This preparatory course in the basic concepts of chemistry includes the systems of measurement, matter and energy, atomic theory, periodic table, bonding, nomenclature, equations, gases, liquids and solids, acids and bases, organic and biochemistry. 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. Record measurements with the appropriate number of significant figures using a variety of devices; then record the appropriate number of significant figures after performing various mathematical operations with the measurements. (CCC 2, 6)
2. Convert units within the metric system and between the metric system and the English system of measurement. (CCC 2, 6)
3. Describe the structure of matter and the relationship between the structure at atomic level and the physical and chemical characteristics of the material. (CCC 1, 2, 6)
4. Classify and balance chemical reactions. (CCC 2, 6)
5. Describe the properties of solids, liquids, and gases, and perform calculations related to them. (CCC 1, 2, 6)
6. Describe the properties of solutions, and perform calculations related to them. (CCC 1, 2, 6)
7. Describe the properties of acids, bases, and buffers, and perform calculations related to them. (CCC 1, 2, 6)
8. Distinguish among the various organic functional groups, and describe the function of the four basic classes of biomolecules. (CCC 1, 2, 6)
9. Perform and analyze various laboratory activities related to chemistry (CCC 1, 2, 3, 4, 5, 6)

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. Record measurements with the appropriate number of significant figures using a variety of devices; then record the appropriate number of significant figures after performing various mathematical operations with the measurements.
 1. Discuss scientific (metric) units of measurement.
 2. List the basic units of length, mass, volume, time, energy, and temperature.
 3. Write numbers in scientific notation.
 4. Discuss the use of measuring devices and their role in determining significant digits.
 5. Add, subtract, multiply, and divide numbers in normal or scientific notation, and report the answer to the correct number of significant digits.
 6. Define *density*, and calculate it.

7. Solve problems involving density.
8. Define *specific gravity*.
2. Convert units within the metric system and between the metric system and the English system of measurement.
 1. Write equality as a conversion factor, and use the factor-unit method in solving problems.
 2. Perform calculations involving metric conversions and metric-English unit conversions.
3. Describe the structure of matter and the relationship between the structure at atomic level and the physical and chemical characteristics of the material.
 1. Define *chemistry*.
 2. Define and discuss scientific models.
 3. Classify substances as an element, a compound, or a mixture.
 4. Define and distinguish between homogeneous and heterogeneous matter.
 5. Define the three physical states of matter, and discuss their macroscopic properties.
 6. Distinguish between physical and chemical properties and physical and chemical changes.
 7. Define *energy* and discuss major forms of energy.
 8. Give names and symbols for common elements.
 9. Define chemical formulas and discuss how to write them.
 10. Discuss atomic theory.
 11. Describe the basic structure of the atom and the properties of the three major subatomic particles.
 12. Define *atomic number*, *mass number*, *atomic mass*, and *isotope*.
 13. Describe the organization of the periodic table.
 14. Discuss the arrangement of electrons in an atom, and relate it to the location of the periodic table.
 15. Use Lewis dot (electron-dot) structures to symbolize valence electrons.
 16. Define a chemical bond, and state the octet rule.
 17. Name and discuss some monatomic and polyatomic ions.
 18. Name and determine formula of ionic compounds.
 19. Define and name acids.
 20. Define and describe covalent bonding, and use electron-dot structures to model covalent compounds.
 21. Describe single, double, and triple covalent bonds.
 22. Name and write formulas of some covalent compounds.
 23. Define *electronegativity*, and describe bond polarity.
 24. Use electronegativity values to classify bonds as ionic, polar covalent, or nonpolar covalent.
4. Classify and balance chemical reactions.
 1. Discuss evidence for a chemical reaction.
 2. Define a chemical equation, and discuss the format and symbols used in writing chemical equations.
 3. Recognize common types of reactions.
 4. Balance a chemical equation.
 5. Define a mole and Avogadro's number, and use them as a conversion factor.
 6. Define and calculate molar mass, and use it as a conversion factor.
5. Describe the properties of solids, liquids, and gases, and perform calculations related to them.
 1. State the kinetic molecular theory of gases.
 2. List the four variables used to describe a gas.
 3. Define *pressure*, and discuss its measurement.
 4. Use the gas laws to predict how a change in one variable will affect a second variable.
 5. Define Boyle's law and perform pressure-volume calculations.
 6. Define Dalton's law of partial pressures, and calculate partial pressures and gas percentages in a gas mixture.
 7. Define and name the phase changes, and describe heat transfer.
 8. Discuss melting point, vapor pressure, and boiling point of a substance.
 9. Compare intramolecular versus intermolecular forces.
 10. Name the intermolecular forces, and state their relative strengths.
 11. List and discuss the unique chemical and physical properties of water.
 12. Describe common properties of liquids and solids.
6. Describe the properties of solutions, and perform calculations related to them.
 1. Define *solution*, *solute*, and *solvent*.
 2. Define concentration terms, and perform calculations.
 3. Define *solubility*, and discuss the factors that affect solubility and rate of solution.
 4. Discuss the behavior of solutes in water, and classify as electrolytes and nonelectrolytes.
 5. Define and calculate molarity and percent concentrations for a solution.
 6. Compare solutions, colloids, and suspensions.
 7. Define *diffusion*, *osmosis*, and *dialysis*, and distinguish among them.
7. Describe the properties of acids, bases, and buffers, and perform calculations related to them.
 1. State the Arrhenius definition of an acid and a base, and use these to identify compounds as acids or bases.
 2. List the common physical and chemical properties of acids and bases.
 3. Differentiate among strong acids, weak acids, strong bases, and weak bases.
 4. Describe acid-base (neutralization) reactions and identify salts.
 5. Define *pH*, and discuss its significance.
 6. Given the hydrogen ion concentration of a solution, calculate the pH.
 7. Discuss determination of pH.

8. Define and describe a buffer solution, and discuss the role of buffers in pH control.
8. Distinguish among the organic various functional groups, and describe the function of the four basic families of biomolecules.
 1. Distinguish between inorganic and organic chemistry.
 2. Explain why carbon can form so many compounds.
 3. Recognize the functional group and identify structural formulas for alkanes, alkenes, alkynes, aromatics, halo alkanes, alcohols, ethers, amines, aldehydes, ketones, organic acids, esters, and amides.
 4. Define and recognize structural isomers.
 5. List and identify the four basic families of biological molecules, and describe their function.
9. Perform and analyze various laboratory activities related to chemistry.
 1. Safely and accurately follow written and oral experimental instructions to obtain valid qualitative and quantitative data.
 2. Make accurate observations of physical and chemical changes, and record those observations in written form.
 3. Accurately measure length, volume, mass, density, and temperature of common materials using standard laboratory apparatus.
 4. Perform mathematical calculations and conversions with correct application of significant figures.
 5. Recognize and report unusual or unexpected results when accurately following a written experimental procedure.
 6. Work effectively with a laboratory partner or as part of a small group.
 7. Observe and adhere to accepted good laboratory practices for working safely in a laboratory.

Evaluation Criteria/Policies:

Students must demonstrate proficiency on all CCPOs at a minimal 75 percent level to successfully complete the course. The grade will be determined using the Delaware Tech grading system:

92	-	100	=	A
83	-	91	=	B
75	-	82	=	C
0	-	74	=	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.

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):

None

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.