

**Bossier Parish Community College**  
**Master Syllabus**

**Course Prefix and Number:** CHEM 107

**Credit Hours:** 3

**Course Title:** Introductory Chemistry

**Course Prerequisites:** Math 098 or math ACT score of 19 or higher

**Textbook:** McNamara, K.; Introductory Chemistry, Kendall Hunt (publisher), 1<sup>st</sup> edition.

**Course Description:**

An introduction to measurement systems, atomic and molecular structure, ionic and covalent bonding, chemical nomenclature, chemical equations and stoichiometry, gas law relationships, quantitative problem solving, an introduction to thermodynamics and energy relationships, solutions and concentrations and fundamentals of nuclear chemistry.

**Learning Outcomes:**

At the end of this course, the student should will:

- A. utilize algebraic skills to perform unit conversion and solve problems related to chemical concepts;
- B. demonstrate the ability to recognize, construct, and characterize the two major types of chemical compounds and understand their role in both physical and chemical reactions;
- C. demonstrate the ability to apply physical concepts to the behavior of gases and aqueous solutions; and

To achieve the learning outcomes, the student will:

- 1. demonstrate the symbols and be able to interconvert the common metric system prefixes mathematically. (A)
- 2. utilize standard the metric units for length, mass, volume, temperature, and various metric units. (A)
- 3. describe uncertainty in measurements and how to express it with significant figures. (A)
- 4. report data and results using scientific notation and the proper number of significant figures. (A)
- 5. convert from decimal to scientific notation and perform mathematical operations in scientific notation. (A)
- 6. use the equalities and conversion factors that relate the English and metric systems. (A)
- 7. use dimensional analysis as a general problem solving method. (A)
- 8. use appropriate experimental quantities in problem solving. (A)
- 9. calculate the density of an object from mass and volume data and calculate the specific gravity of an object from its density. (A)
- 10. convert temperature in the three different scales in common use. (A)
- 11. convert from calories to joules. (A)
- 12. recognize the three physical states of matter. (B)

13. recognize the interrelationship of the structure of matter and its chemical and physical properties. (B,C)
14. differentiate between intensive and extensive properties. (B,C)
15. determine if a change in matter is physical or chemical. (B,C)
16. recognize and differentiate the characteristics of pure substances and mixtures. (B,C)
17. categorize mixtures as homogeneous or heterogeneous. (B,C)
18. describe the internal structure of an atom with respect to arrangement of subatomic particles (protons, neutrons, and electrons) and be able to calculate the number of and the characteristics of each. (B)
19. recognize and demonstrate the relationship between atomic number, mass number, and isotopes. (B)
20. distinguish among atoms, ions, and isotopes. (B)
21. recognize the important subdivisions of the periodic table: periods, groups (families), metals, and nonmetals. (B)
22. use the periodic table to obtain information about an element. (B)
23. describe the spatial arrangement of electrons in an atom within electron shells, subshells, and orbitals. (B)
24. describe the relationship between the electronic structure of an element and its position in the periodic table. (B)
25. use the octet rule to predict the charge of common cations and anions. (B)
26. classify compounds as having ionic, covalent, or polar covalent bonds. (B,C)
27. determine which electrons in an element are valence electrons. (B)
28. write formulas and name ionic compounds for both binary compounds and compounds containing polyatomic ions. (B)
29. write formulas and name binary molecular compounds. (B)
30. name common inorganic compounds using standard conventions and recognize the common names of frequently used substances. (B)
31. predict the differences in physical state, melting and boiling points, solid-state structure, and solution chemistry that result from differences in bonding. (B,C)
32. draw accurate Lewis structures for covalent compounds and complex inorganic ions. (B)
33. predict the geometry of molecules and ions using the octet rule and Lewis structure. (B)
34. recognize and demonstrate the relationship between the mole and Avogadro's number, and the usefulness of these quantities. (B)
35. calculate a mole equivalent in grams or atoms or convert grams or atoms of a compound to moles. (A,B)
36. determine the formula mass of a compound. (B)
37. write and balance chemical equations. (B)
38. merge the mole concept and a balanced chemical equation to perform stoichiometric calculations. (A,B)
39. determine the theoretical yield, and the percent yield, of a chemical reaction. (A,B,C)
40. describe the behavior of gases expressed by the gas laws: Boyle's law, Charles's law, Combined gas law, Avogadro's law, the Ideal gas law, and Dalton's law. (A,B,C)
41. use gas laws equations to calculate conditions and changes in conditions of gases. (A,B,C)
42. comprehend the kinetic molecular theory of matter and how it applies to the three physical states. (B,C)
43. demonstrate understanding of the changes of state. (B)
44. describe intermolecular forces in liquids and their relationship to physical properties of liquids. (C)
45. describe the processes of melting, boiling, evaporation, and condensation. (B,C)

46. describe hydrogen bonding and its relationship to boiling and melting temperatures. (B)
47. classify chemical reactions by type: combination, decomposition, single replacement, double replacement, and oxidation-reduction. (B)
48. recognize the various classes of chemical reactions: precipitation, combustion, acid-base, and oxidation-reduction. (B,C)
49. list the properties of a solution. (C)
50. describe the concepts of solubility and saturated solutions. (C)
51. learn to express the concentration of solutions in both percent concentration and molarity, and be able to convert between the two. (A,C)
52. perform dilution calculations. (A,C)
53. describe why the chemical and physical properties of water make it a truly unique solvent. (B,C)
54. correlate the terms endothermic and exothermic with heat flow between a system and its surroundings. (A,B)
55. describe the concept of reaction rate and the role of kinetics in chemical and physical changes. (B)
56. recognize and demonstrate the factors that influence reaction rates and be able to predict the effect on a particular reaction. (A,B)
57. write an equilibrium constant for a given reversible reaction. (B)
58. understand LeChatelier's principle and its relationship to equilibrium conditions. (B)
59. identify acids and bases and acid-base reactions. (B,C)
60. write equations describing acid-base dissociation and label the conjugate acid-base pairs. (B,C)
61. state the differences between the two acid-base theories. (B)
62. calculate the pH given a value of hydronium/hydroxide ion concentration. (A,B,C)
63. state the meaning of the term buffer and describe the applications of buffers to chemical and biochemical systems, particularly blood chemistry. (B,C)
64. describe the meaning and utility of neutralization reactions. (B,C)
65. provide examples of the importance of pH in chemical and biochemical systems. (B,C)

## Course Requirements

In order to receive a grade of "C" the student must earn 70% of the total possible points for the courses and achieve all of the following course requirements.

- minimum average of 70% on tests
- homework portfolio (minimum 75% complete)
- minimum 50% on comprehensive final test
- Important Notification: If you are taking this course online, take special note that the final test will be given/taken on the BPCC campus. Check under announcements in your Canvas course for dates and times. If you live outside a 100 mile radius of the campus, you MAY request to take your final at a pre-approved, proctored site but it must be a community college, college or university that you have contacted and has agreed to perform this service. You must contact your instructor within the first month of classes with the appropriate information: (1) name of community college, college or university; (2) name and contact information of the individual with whom you made the arrangements – email and phone number required. If this procedure incurs an expense, you must cover the cost. There are no exceptions. The final must be taken and a certain percentage on the final is required to pass the course.

## **Course Grading Scale:**

- A- 90% or more of total possible points with a minimum average of 70% on tests and a minimum of 75% on the homework portfolio and a minimum of 50% on the comprehensive final test
- B- 80% or more of total possible points with a minimum average of 70% on tests and a minimum of 75% on the homework portfolio and a minimum of 50% on the comprehensive final test
- C- 70% or more of total possible points with a minimum average of 70% on tests and a minimum of 75% on the homework portfolio and a minimum of 50% on the comprehensive final test
- D- 60% or more of total possible points with a minimum average of 60% on tests and a minimum of 75% on the homework portfolio and a minimum of 50% on the comprehensive final test
- F- less than 60% of total possible points or less than 60% average on tests or less than 75% on the homework portfolio or less than 50% on the comprehensive final test

**Attendance Policy:** The college attendance policy is available at <http://www.bpcc.edu/catalog/current/academicpolicies.html>

## **Nondiscrimination Statement**

Bossier Parish Community College does not discriminate on the basis of race, color, national origin, gender, age, religion, qualified disability, marital status, veteran's status, or sexual orientation in admission to its programs, services, or activities, in access to them, in treatment of individuals, or in any aspect of its operations. Bossier Parish Community College does not discriminate in its hiring or employment practices.

### COORDINATOR FOR SECTION 504 AND ADA

Angie Cao, Student and Disability Services Specialist

Disability Services, F254, 6220 East Texas Street, Bossier City, LA 71111

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[acao@bpcc.edu](mailto:acao@bpcc.edu)

Hours: 8:00 a.m.-4:30 p.m. Monday - Friday, excluding holidays and weekends.

Equity/Compliance Coordinator

Teri Bashara, Director of Human Resources

Human Resources Office, A-105

6220 East Texas Street

Bossier City, LA 71111

Phone: 318-678-6056

Hours: 8:00 a.m.-4:30 p.m. Monday - Friday, excluding holidays and weekends.

Reviewed by K. McNamara (April 2019)