
CODE: CHEM-116

TITLE: Chemistry in Life

DIVISION: Science & Health Sciences

DEPARTMENT: Chemistry

COURSE DESCRIPTION: This chemistry course for non-science majors will focus on the role chemistry plays in maintaining and improving our quality of life. Topics include environmental issues such as air pollution, acid rain and recycling; the study of energy sources including nuclear power; and health issues such as nutrition and world hunger. The accompanying lab involves the study of common items found in everyday life.

PREREQUISITES: MATH 012 or MATH 015 or passing score in computation on Basic Skills Test

CREDITS: 4

LECTURE HOURS: 3

LAB/STUDIO HOURS: 3

REQUIRED MATERIALS:

Students are not required to purchase any textbooks.

Face-to-face sections must purchase a lab coat, goggles, and bring a calculator to class

COURSE LEARNING OUTCOMES:

- Utilize critical thinking skills to learn fundamental concepts from chemistry found in everyday life
- Perform chemistry-based problem solving. Reinforcement of chemical concepts will be made as hands-on skills are developed in the laboratory program including use of common chemistry glassware, a pH meter, a Geiger counter, an infrared spectrometer, and a UV/Vis spectrophotometer
- Utilize risk assessment and understand its global importance
- Analyze the effect humans have had on the environment through studies of global warming, the ozone hole, air pollution, and water pollution.
- Categorize and distinguish the labels placed on food packaging
- Analyze the different methods of energy generation and their impact on the environment
- Research one topic from the course in depth and write a paper or present your research

Additional Time Requirements:

For information on Brookdale's policy on credit hour requirements and outside class student work refer to [Academic Credit Hour Policy](#).

GRADING STANDARD:

| | | |
|----|---|-----------|
| A | = | 92 - 100% |
| A- | = | 89 - 91% |
| B+ | = | 86 - 88% |
| B | = | 82 - 85% |
| B- | = | 79 - 81% |
| C+ | = | 76 - 78% |
| C | = | 70 - 75% |
| D | = | 65 - 69% |
| F | = | <65% |

Unit examination results will be reported as the grade assigned by the faculty calculated to the first decimal place. These grades will be weighed according to course grading policy. In calculating the course grade, 0.5 will round up to the next numerical grade and 0.4 will round down to the next lower numerical grade.

COURSE CONTENT:

Unit 1: Introduction, Air and Air Pollution, The Ozone Layer

Unit 2: Climate Change and Global Warming, Water and Water Pollution

Unit 3: Acids and Bases and Acid Rain, Nuclear Energy, Polymers and Plastics

Unit 4: Food and Nutrition, DNA and Genetically Modified Organisms

DEPARTMENT POLICIES:

1. Students in face-to-face sections must attend their regularly scheduled weekly laboratory section. Students are not allowed to attend any other lab section for any reason.
2. Students must pass (65% or better) both the lecture and the laboratory portion of the course in the same semester or they will fail the course.

COLLEGE POLICIES:

As an academic institution, Brookdale facilitates the free exchange of ideas, upholds the virtues of civil discourse, and honors diverse perspectives informed by credible sources. Our College values all students and strives for inclusion and safety regardless of a student's disability, age, sex, gender identity, sexual orientation, race, ethnicity, country of origin, immigration status, religious affiliation, political orientation, socioeconomic standing, and veteran status. For additional information, support services, and engagement opportunities, please visit www.brookdalecc.edu/support.

For information regarding:

- ◆ Brookdale's Academic Integrity Code

- ◆ Student Conduct Code
- ◆ Student Grade Appeal Process

Please refer to the [BCC STUDENT HANDBOOK AND BCC CATALOG](#).

NOTIFICATION FOR STUDENTS WITH DISABILITIES:

Brookdale Community College offers reasonable accommodations and/or services to persons with disabilities. Students with disabilities who wish to self-identify must contact the Disabilities Services Office at 732-224-2730 (voice) or 732-842-4211 (TTY) to provide appropriate documentation of the disability, and request specific accommodations or services. If a student qualifies, reasonable accommodations and/or services, which are appropriate for the college level and are recommended in the documentation, can be approved.

ADDITIONAL SUPPORT/LABS:

See the Tutoring Center for information <https://www.brookdalecc.edu/academic-tutoring/tutoring-center/>.

MENTAL HEALTH:

- Mental Health Crisis Support: From a campus phone, dial 5555 or 732-224-2329 from an external line; off-hours calls will be forwarded to BCC police (2222 from a campus phone)
- Psychological Counseling Services: 732-224-2986 (to schedule an appointment during regular hours)

Unit 1

Chapter: 0, 1, and 2

Unit Objective: Identify the regions and composition of the atmosphere and study problems regarding air pollution. Describe how the ozone layer is formed and why it's important to life on Earth.

Lab Experiments: Exp 1: Introduction to the Chemistry Laboratory and Safety
Exp 2: Measurements
Exp 3: Atmospheric Gases
Exp 4: UV Light and Sunscreen

Learning Objectives

Chapter 0: Chemistry and You

1. Describe the importance of chemistry and its impact on public policy
2. Understand the five parts of the scientific method and its importance in the advancement of science
3. Interpret different types graphs and describe how one might manipulate those graphs

Chapter 1: Air and Air Pollution

1. Describe how elements are represented using symbols and how elements are organized on the periodic table
2. Differentiate between an element, a compound, and a mixture.
3. Name and write formulas for binary covalent compounds
4. Describe a chemical reaction and balance chemical equations
5. Calculate and understand the importance of the mole
5. Understand the different regions of the atmosphere with respect to altitude
6. Describe the composition of the troposphere and any regional variances
7. Discuss the Risk Assessment

8. Analyze the importance of the Clean Air Act and its impact on air quality
9. Identify common indoor air pollutants and their effects on human health

Chapter 2: The Ozone Layer

1. Explore the structure of a neutral atom and the importance of periodicity.
2. Demonstrate the importance of the octet rule and be able to draw Lewis dot structures for simple covalent compounds
3. Examine the parts of a wave and the relationship between wavelength, frequency, and energy.
4. Describe the parts of the electromagnetic spectrum and how UV light affects chemical bonds.
5. Label the five parts of the atmosphere
6. Describe the importance of the ozone layer
7. Draw the chemical reactions involved in the Chapman cycle and understand its importance in the formation of the ozone layer
8. Identify the methods available to determine the concentration of ozone in the atmosphere
9. Detail the importance of CFCs in the past and how they have damaged the ozone layer
10. Describe how humans determined that there was problem with the ozone layer and what has been done to combat the problem.

Unit 2

Chapter: 3 and 4

Unit Objective: Analyze the impacts of human caused gas emissions on the Earth.
Predict the impact polluting water would have on the water cycle.

Lab Experiments: Exp 5: Infrared Spectroscopy
Exp 6: Density
Exp 7: Water Testing
Exp 8: Paper Chromatography

Learning Objectives

Chapter 3: Global Warming and Climate Change

1. Draw and identify the VSEPR geometries for molecules containing up to four groups on the central atom
2. Describe the concept of resonance and its importance of in the Lewis dot structures of substances
3. Analyze why some molecules vibrate and why some do not when exposed to IR and its importance in global warming.
4. Discuss the relationship between the average temperature of the inner planets and their atmospheres
5. Categorize the factors affecting Earth's energy budget. Analyze how humans have affected this budget.
6. Express a gas' impact on the enhanced greenhouse effect in relation to carbon dioxide.
7. Describe the methods scientists use to determine the climate in the past and how they are used to construct climate models
8. Summarize the effects of climate change on people and the environment. Describe what can be done to minimize its impact.

Chapter 4: Water and Water Pollution

1. Predict the charge on an atom if it was ionized using the Bohr (orbit) model of the atom. List the important polyatomic ions.
2. Write formulas from the names of simple ionic compounds.
3. Describe structure and physical properties that get water referred to as the “universal solvent”
4. Classify and describe the different parts of the water cycle. Estimate the location of water on Earth by percentage.
5. Propose how pollutants are able to contaminate different water supplies.
6. Explain the different methods of water purification. Describe the steps water treatment facilities use to treat water that comes out of a home’s tap

Unit 3

Chapter: 5, 6, and 7

Unit Objective: Analyze the impact burning fossil fuels has on the pH of rainwater and on the acidification of the ocean. Discuss pros and cons of the use of radionuclides and nuclear radiation in technology. Describe how polymers are formed and their impact on technology and the environment

Lab Experiments: Exp 9: Acids and Bases
Exp 10: Nuclear Radiation
Exp 11: Polymers

Learning Objectives

Chapter 5: Acids and Bases and Acid Rain

1. Differentiate between the properties of acids and bases
2. Classify substances as Arrhenius acids and bases and Bronsted-Lowry acids and bases
3. Label substances in a chemical equation as acid, base, conjugate acid and conjugate base
4. Use the pH scale to determine a solution's acidity/basicity and know the approximate pHs of some common substances
5. Describe why the pH of rain is 5.6 and explain how certain gaseous emissions lower the pH of rain even further.
6. Explain the effect of acid rain on the environment and on infrastructure.
7. Discuss how Americans have nearly eliminated the problem of acid rain in the United States.
8. Explain how carbon emissions have acidified the oceans. Describe the impact of ocean acidification on underwater ecosystems.

Chapter 6: Nuclear Chemistry and Nuclear Power

1. Describe and recognize the different kind of transmutation reactions including alpha, beta, and gamma decay, and nuclear fusion and fission
2. Name some units of radiation including the Becquerel and the Sievert and describe their meaning.
3. Describe how a nuclear reactor works
4. Explain why a nuclear power plant cannot explode like a nuclear bomb.
5. Differentiate between high level and low-level nuclear waste. Explain how both high level and low-level waste are disposed

Chapter 7: Polymers and Municipal Waste

1. Define and recognize the fundamental organic functional groups.
2. Name some artificial and naturally occurring polymers.
3. Show how the reaction of functional groups can form addition and condensation polymers.
4. Recognize the “big 6” polymers and list some of their uses in consumer products
5. Compare the municipal waste created by developed and developing countries and the describe trend in municipal solid waste generation over the next 30 years.
6. Describe the impact of plastic waste has on the environment and the food web.
7. Discuss the pros and cons of plastic recycling using single and dual stream processes. Name other methods of controlling the amount of plastic waste.

Unit 4

Chapter: 8 and 9

Unit Objective: Describe the classes of nutrients required to have a balanced diet. Recognize the federally recognized food labels that can appear on food packaging. Express the importance of the central dogma in the synthesis of proteins from DNA. Discuss the environmental impact modern farming has on the ecosystem.

Lab Experiments: Exp 12: Isolation of Casein and Other Milk Components
Exp 13: Alcohol Fermentation
Exp 14: Bacterial Transformation

Chapter 8: Food and Nutrition

1. Compare and contrast the structures of saturated and unsaturated fatty acids
2. Describe the importance of phospholipids in the cell membrane.
3. Describe the monomer that makes up a protein
4. Name and define the four levels of organization in proteins
5. Define, recognize, and describe the importance of the different carbohydrates in a diet including mono-, di-, and polysaccharides.
6. Define vitamins and minerals and describe the importance of the vitamins and minerals in a diet.
7. Read and understand the information of a nutrition label
8. Recognize the types of labels found food packaging including food that is certified and product dating

Chapter 9: DNA and Agriculture

1. Compare and contrast the structure of DNA vs RNA
2. Know how the DNA of eukaryotes is organized in a nucleus
3. Describe the major steps in the process of DNA recombination
4. Discuss the importance of crop rotation and the impact fertilizers have contributed to modern farming and the environment.
5. Describe the pros and cons to using pesticides on plants including their mode of action and their persistence in the environment
6. Compare and contrast plant hybridization to genetic modification

The syllabus is intended to give student guidance in what may be covered during the semester and will be followed as closely as possible. However, the faculty member reserves the right to modify, supplement, and make changes as the need arises.