

CHEM-1000: EVERYDAY CHEMISTRY

Cuyahoga Community College

Viewing: CHEM-1000 : Everyday Chemistry

Board of Trustees:

May 2019

Academic Term:

Fall 2021

Subject Code

CHEM - Chemistry

Course Number:

1000

Title:

Everyday Chemistry

Catalog Description:

Intended for non-science majors. Basic survey of chemistry as related to environment, health and nutrition, and applications that effect everyday life. Includes basic concepts and applications of chemistry including consumer chemistry, acids and bases, medicines and drugs, pollution, and conservation. To fulfill laboratory science requirement, student should enroll in related laboratory course.

Credit Hour(s):

3

Lecture Hour(s):

3

Lab Hour(s):

0

Other Hour(s):

0

Requisites

Prerequisite and Corequisite

ENG-0985 Introduction to College Literacies or appropriate score on English Placement Test.

Note: ENG-0980 Language Fundamentals I taken prior to Fall 2021 will also meet prerequisite requirements.

Outcomes

Course Outcome(s):

Apply the core principles of chemistry to everyday life.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Classify the states of matter and chemical/physical changes.
 2. Convert units of measure.
 3. Discuss oxidation and reduction as seen in batteries.
 4. Differentiate between covalent and ionic compounds based on composition and properties.
 5. Recognize and compare differences between elements, compounds, and mixtures.
 6. Describe and utilize the organizational arrangement of the periodic table of elements.
 7. Summarize the fundamental concepts of the modern atomic theory and describe its relation to chemical bonding.
 8. Identify polymers and plastics used in packaging.
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Course Outcome(s):

Apply fundamental chemical principles to the fields of medicine, nutrition, and the environment.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Civic Responsibility: Analyze the results of actions and inactions with the likely effects on the larger local and/or global communities.

Objective(s):

1. Describe the relationship between nitrogen oxides and sulfur dioxide in acid rain formation and prevention.
 2. Apply the concepts of chemical bonding to the structures of proteins, fats, carbohydrates, and nucleic acids.
 3. Identify the gases in the atmosphere, their chemical properties, and the role played in global warming.
 4. Discuss free radicals and the destruction of the ozone layer.
 5. Describe the advantages and disadvantages of nuclear power and the impact of nuclear power on the environment.
 6. Differentiate between water sources and possible pollutants.
 7. Relate the structure of a drug to biological function.
 8. Differentiate between drugs and herbal remedies.
 9. Discuss the benefits of plastics and polymers as well as the drawbacks.
 10. Apply the concepts of reduction and oxidation to potential fuel cell developments.
 11. Describe the impact of acid rain on the environment.
 12. Describe the impact of polymers and plastics on waste management and recycling.
 13. Relate acid-base chemistry to the chemistry of acid rain.
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Methods of Evaluation:

1. Unit examinations and/or quizzes
2. Written library research reports
3. Individual class presentations
4. Cooperative class projects
5. Assignments
6. Student/faculty contractual agreements
7. Computer assignments/games/simulations
8. Field trip activities/assignments
9. Other or some combination of the above

Course Content Outline:

1. Chemistry and matter
 - a. Physical and chemical properties
 - b. Physical and chemical changes
 - c. Classification of matter
 - i. Compounds
 - ii. Elements and allotropes
 - iii. Mixtures
2. Measurements in chemistry
 - a. SI measurements
 - b. Units
 - c. Temperature, density, specific gravity
 - d. Conversion of units
3. Atomic structure and the periodic table
 - a. Subatomic particles
 - i. proton
 - ii. electron
 - iii. neutron
 - b. Atomic number and valence electrons
 - c. Isotopes
 - d. Metals, non-metals, and metalloids
 - e. Groups and periods
 - f. Periodic trends
4. Bonding and structures

- a. Ionic bonding
 - i. Anions
 - ii. Cations
 - iii. Crystal lattice
 - iv. Nomenclature
 - b. Covalent bonding
 - i. Polar bonds
 - ii. Non-polar bonds
 - iii. Nomenclature
 - iv. Octet Rule
 - v. Isomers
 - vi. Three-dimensional shapes of molecules
 - c. Lewis structures
5. Solution chemistry
- a. Solutes
 - b. Solvents
 - c. Concentrations
 - i. Percent
 - ii. Parts per million
 - iii. Parts per billion
 - iv. Molarity
6. Chemical reactions, stoichiometry, and mole concept
- a. Balancing equations and stoichiometry
 - i. reactants
 - ii. products
 - b. Mole concept
 - i. Avogadro's number
 - ii. Formula weight
 - iii. Molar concentration
7. Acids and bases
- a. Properties of acids and bases
 - b. pH scale
 - c. Acid-base buffers
 - d. Neutralization
 - i. Products
 - ii. Chemistry of antacids
8. Oxidation-reduction reactions
- a. Oxidation, reduction, and half-reactions
 - b. Galvanic and electrolytic cells
 - c. Anodes and cathodes
 - d. Applications
 - i. Electrolysis
 - ii. Electroplating
 - iii. Fuel cells
 - iv. Batteries
 - v. Photovoltaics
9. Chemistry of carbon and carbon compounds
- a. Hydrocarbons
 - i. Saturated, unsaturated, and aromatic
 - ii. Combustion of hydrocarbons
 - iii. Petroleum distillation and cracking
 - b. Organic chemicals
 - i. Functional groups
 - ii. Organic synthesis
 - iii. Chiral compounds
 - iv. Racemic mixtures
10. Light and the properties of light
- a. Wavelength and wavenumber
 - b. Frequency

- c. Electromagnetic spectrum
 - i. Visible light, ultraviolet light, and infrared light
 - ii. Effects of ultraviolet light and infrared light on molecules
 - d. Photons
 - e. Ultraviolet index
 - f. Ultraviolet light and biological systems
11. Thermodynamics
- a. Energy
 - i. Potential and kinetic energy
 - ii. Heat and temperature
 - iii. Calories
 - b. Laws of thermodynamics
 - c. Entropy and enthalpy
 - d. Exothermic and endothermic
 - e. Bond energies
 - f. Activation energy
12. Nutritional chemistry
- a. Essential chemicals
 - i. Carbohydrates
 - ii. Proteins
 - iii. Fats
 - iv. Enzymes, vitamins, and minerals
 - b. Nutrition
 - i. Recommended dietary allowance
 - ii. Diet and disease
 - c. Food additives and food preservation
13. Polymer chemistry
- a. Polymers and monomers
 - b. Thermoplastics
 - i. Polyethylene (low density and high density)
 - ii. Polyethylene terephthalate
 - iii. Polystyrene
 - iv. Polyvinylchloride
 - v. Polypropylene
 - c. Plasticizers
 - d. Condensation polymerization
 - e. Polyamides
 - f. Recycling plastics
14. Medicinal chemistry
- a. Medicines
 - i. Antibiotics
 - ii. Analgesics
 - iii. Antiseptics and disinfectants
 - iv. Nanomedicines
 - v. Herbal remedies
 - vi. Drugs of abuse
 - b. Hormones, steroids, and enzymes
 - c. Drug design
 - i. Substrate
 - ii. Pharmacophore
 - iii. Combinatorial chemistry
 - iv. Natural products
 - d. Food and drug administration approvals
15. Chemistry of genetics and proteins
- a. Deoxyribonucleic acid (DNA) and ribonucleic acid (RNA)
 - b. Nucleotides and nucleosides
 - c. Chargaff's rules
 - d. DNA

- i. Replication
 - ii. Structure
 - iii. Transcription and translation
 - iv. Codons
 - e. Protein structure
 - f. Cloning and transgenic species
 - g. Stem cells
16. Chemistry of air
- a. Regions of the atmosphere
 - b. Pollutant types
 - i. Sources
 - ii. Effects
 - c. Abatement procedures and policies
 - i. Sequestration
 - ii. Kyoto protocol
 - d. Greenhouse effect/global warming
 - i. Greenhouse gases
 - ii. Ultraviolet light in greenhouse effect
 - iii. Carbon cycle
 - e. Ozone layer
 - i. Causes of ozone depletion
 - ii. Chlorofluorocarbons
 - iii. Alternatives to chlorofluorocarbons
 - iv. Free radical reactions in ozone
17. Water chemistry
- a. Structure of water
 - b. Hydrogen bonding of water
 - c. Water purification
 - i. Softening of hard water
 - ii. Treatment of municipal water
 - iii. Distillation and osmosis
 - iv. Rural water problems
 - v. Water sources
 - 1. Aquifers
 - 2. Surface water
 - 3. Ground water
 - d. Sewage treatment
 - i. Primary
 - ii. Secondary
 - iii. Tertiary
 - e. Polluted water and rain
 - i. Sources of water pollutants
 - ii. Impact of hazardous wastes
 - iii. Causes of acid rain
 - 1. Acid anhydrides
 - 2. Sulfur dioxide
 - 3. Nitrogen oxides
 - 4. Nitrogen cycle
18. Nuclear chemistry
- a. Fission and fusion
 - b. Radioactivity
 - i. Alpha particle
 - ii. Beta particle
 - iii. Gamma ray
 - c. Chain reactions and critical mass
 - d. Control rods, breeder reactors, and coolants
 - e. Background radiation
 - f. Units of radiation

- i. Curie
- ii. Radiation absorbed dose
- iii. Roentgen equivalent man
- iv. Sievert
- g. High- and low-level nuclear waste
- h. Advantages and disadvantages of nuclear energy
- i. Nuclear weapons

Resources

Fahlman, B.D., Purvis-Roberts, K.L., Kirk, J.S., Bentley, A.K., Daubenmire, P.L., Ellis, J.P., Mury, M.T. *Chemistry in Context: Applying Chemistry to Society*. 9th ed. New York, NY: McGraw-Hill Higher Education, 2018.

Suchocki, J. *Conceptual Chemistry*. 5th ed. Upper Saddle River, NJ: Pearson Education, Inc., 2013.

Tro, Nivaldo. *Chemistry in Focus: A Molecular View of Our World*. 7th. Belmont, CA: Brooks/Cole Cengage Learning, 2018.

Joesten, Melvin, Hogg, John L. *CHEM in Your World*. 2nd. Belmont, CA: Brooks/Cole Cengage Learning, 2015.

Manufacturing Chemists Association. "Chemecology" Washington, DC,

"Journal of Chemical Education"

"Journal of Nutrition Education"

"Science News"

Resources Other

1. Audio-visual materials: slides, videos, audio tapes, and computer programs.
2. Faculty developed instructional materials.
3. Library reference materials including journals

Instructional Services

OAN Number:

Ohio Transfer 36 TMNS

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