CHEM-1010: INTRODUCTION TO INORGANIC CHEMISTRY

Cuyahoga Community College

Viewing: CHEM-1010 : Introduction to Inorganic Chemistry

Board of Trustees:
2016-03-31

Academic Term:
Fall 2022

Subject Code
CHEM - Chemistry

Course Number:
1010

Title:
Introduction to Inorganic Chemistry

Catalog Description:
Introduction to atomic structure and bonding as basis for understanding valence, formulas, compounds and chemical reactions. Measurement, stoichiometry, states of matter, solutions, ionization, equilibria, acids, bases and pH, and health careers, scientific studies, and applications in daily life.

Credit Hour(s):
4

Lecture Hour(s):
3

Lab Hour(s):
3

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
Eligibility for College-level math.

Outcomes

Course Outcome(s):
Apply the core principles of chemistry to the health careers, other scientific studies, and/or applicationsin daily 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. Describe the fundamental principles of atomic theory and the atomic structure of the elements including principle energy levels, sub-energy levels, orbitals, and electronic configurations.
2. Classify and describe the states of matter and chemical and physical changes.
3. Differentiate between covalent and ionic compounds based on composition and chemical and physical properties.
4. Name ionic and covalent compounds and determine the chemical formulas.
5. Describe acid and base chemistry including pH and buffer solutions
6. Define chemical equilibrium and equilibrium constants.
7. Explain the principles of nuclear chemistry including nuclear decay reactions, fission, fusion, measurement of radiation, and half-life.
8. Discuss the properties of liquids including vapor pressure, viscosity, and surface tension.
9. Describe energy changes in endothermic and exothermic reactions, energy diagrams, and bond dissociation energies.

Course Outcome(s):

Apply problem solving skills in a career in the health sciences, advanced scientific studies, and/or applications in daily 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. Calculate density and specific gravity.
2. Convert between International System of Units (SI)/Metric system and English units and standard and scientific notation.
3. Solve problems by balancing chemical equations and using Avogadro's number, mole concept, stoichiometry, theoretical yield, and percent yield.
4. Examine the relationship between pressure, temperature, volume, and moles as defined by the gas laws.
5. Determine the concentrations of solutions and predict effect of temperature and pressure on solubility.
6. Construct Lewis structures and valence shell electron pair repulsion (VSEPR) models.

Course Outcome(s):

Apply fundamental knowledge of chemistry to analyze reactions and properties and develop critical thinking skills such as deducing, predicting, and determining the causes of physical observations and various chemical reactions.

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. Explain atomic size, structure, physical properties, chemical properties, and the bonding of elements using periodic trends.
2. Deduce the effects of concentration, temperature, and catalysts on reaction rates.
3. Apply LeChatlier's Principle to predict responses to stresses in equilibrium.
4. Determine the intermolecular forces for compounds and the effect of the forces on the melting point, boiling point, and solubility.

Course Outcome(s):

Apply laboratory safety and fundamental laboratory skills to health careers and other scientific studies.

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. Demonstrate laboratory safety and proper laboratory techniques.
2. Perform experiments in a cooperative group environment.
3. Analyze experimental results by applying the concepts of chemistry.
4. Report experimental outcome and conclusions in an oral form.

Course Outcome(s):

Apply fundamental knowledge of chemistry to communicate scientific information in written formats

Essential Learning Outcome Mapping:

Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Report experimental results and conclusions in a written form
2. Use information resources in chemistry, including the primary literature and report/summarize in a written format.

Methods of Evaluation:

1. Exams (including laboratory and a final examination)
2. Lab reports
3. Evaluation of laboratory skills
4. Participation

5. Quizzes
6. Homework assignments

Course Content Outline:

1. Matter
   a. States of matter
   b. Changes of state
   c. Physical and chemical changes and properties
   d. Classification of matter as chemical compounds, elements, and mixtures
2. Measurement
   a. Physical quantities including mass, length, and volume
   b. Significant figures
   c. Scientific notation
   d. Conversion of units
   e. Density and specific gravity
3. Atomic structure and the periodic table
   a. Atomic theory and structure
   b. Elements, symbols, and isotopes
   c. Electronic structure including shells, subshell, and orbitals
   d. Electronic configurations and electron-dot symbols
   e. Periodic trends
   f. Ionization energy, electron affinity, and electronegativity
4. Ionic compounds
   a. Ion formation based on periodic trends
   b. Ionic bonding and octet rule
   c. Nomenclature and properties of ionic compounds
5. Covalent compounds
   a. Covalent bonds and periodic trends
   b. Lewis structures and VSEPR models
   c. Nomenclature and properties of covalent compounds
6. Chemical reactions and energy
   a. Chemical equations and reactions
   b. Avogadro's number and mole concept
   c. Limiting reagent and percent yield
   d. Acid-base reactions
   e. Precipitation reactions and solubility
   f. Reduction-oxidation reactions
7. Thermodynamics
   a. Enthalphy, endothermic, and exothermic reactions
   b. Entropy and Gibb's free energy
   c. Effects of temperature, concentration, and catalysts on reaction rates
   d. Heat of fusion and heat of vaporization
8. Chemical equilibrium
   a. Equilibrium constant and equations
   b. LeChâtelier's principle
   c. Effect of temperature, pressure, and concentration on equilibrium
9. Gas Laws
   a. Kinetic-molecular theory and ideal gases
   b. Relationships between volume, temperature, pressure, and molar amount
   c. Ideal gas law
   d. Partial pressure and Dalton's law
   e. Intermolecular forces
10. Solutions and liquids
    a. Solubility and dependence of temperature and pressure
    b. Calculations of concentrations and dilutions
    c. Vapor pressure, surface tension, and boiling points
    d. Colligative properties

   e. Osmosis and dialysis
   f. Colloids
11. Solids
   a. Properties of solids
   b. Amorphous and crystalline solids
   c. Solid hydrates and hygroscopic solids
12. Acids, bases and pH
   a. Bronsted-Lowry acid and bases and conjugates
   b. Dissociation constants
   c. Calculations of pH and Henderson-Hasselbach equation
   d. Buffers in body fluids
13. Nuclear chemistry
   a. Radioactivity and radioisotopes
   b. Nuclear decay and half-life
   c. Nuclear fission and fusion
   d. Detection and measurement of radiation
14. Chemistry in daily life
   a. Ionic compounds, biologically important ions, and electrolyte concentrations
   b. Covalent compounds in polymers, medicine, and the environment
   c. Measurements
   d. Chemical reactions in batteries, the environment, and the body
   e. Minerals in nutrition
   f. Acid base chemistry in the body and the environment
   g. Radioactivity in food irradiation and body imaging
15. Laboratory work
   a. Perform experiments in a cooperative group environment
   b. Record experimental results
   c. Perform calculations using data acquired
   d. Interpret experimental outcomes and report in written form

Resources

Bettelheim, Frederick A., and Joseph M. Landesberg. *Laboratory Experiments for Introduction to General, Organic, and Biochemistry.* 8th ed. Belmont: Brooks/Cole, 2012.

McMurry, John, Mary Castellion, David S. Ballantine, Carl A. Hoeger, and Virginia E. Peterson. *Fundamentals of General, Organic and Biological Chemistry.* 6th ed. Upper Saddle River, NJ: Prentice-Hall, 2010.

Denniston, K. J., Joseph Topping and Robert L. Caret. *General, Organic, and Biochemistry.* 6th ed. New York: McGraw-Hill, 2008.

Henrickson, Charles H., Larry C. Byrd, and Norman W. Hunter. *A Laboratory Manual for General, Organic, and Biochemistry.* 6th ed. New York: McGraw-Hill, 2008.

Smith, Janice G. *General, Organic, and Biological Chemistry.* 1st ed. New York: McGraw-Hill, 2010.

Bettelheim, Frederick A., William H. Brown, Mary K. Campbell, and Shawn O. Farrell. *Introduction to General, Organic, and Biochemistry.* 10th ed. Belmont: Brooks/Cole, 2012.

Stoker, Stephen H. *General, Organic, and Biological chemistry.* 5th ed. Belmont: Brooks/Cole, 2010.

Carlson, Lynn G. *Laboratory Manual for Stoker's General, Organic, and Biological Chemistry.* 5th ed. Belmont: Brooks/Cole, 2010.

Instructional Services

OAN Number:
Ohio Transfer 36 TMNS

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