



**COWLEY COLLEGE  
& Area Vocational Technical School**

COURSE PROCEDURE FOR

**GENERAL CHEMISTRY  
CHM4211 5 Hours**

**Student Level:**

This course is open to students on the college level in the freshman or sophomore year.

**Catalog Description of the Course:**

**CHM4211 - GENERAL CHEMISTRY (N) (5 hrs)**

**[KRSN CHM 1030/1031/1032]**

An introduction to chemistry which includes the study of matter, atoms, molecules, chemical arithmetic, chemical reactions, gas laws, acids and bases, organic chemistry, and laboratory experimentation.

**Prerequisite:**

MTH4411 Intermediate Algebra with Review or a higher level Math course with a grade of "C" or better completion within the past 5 years, or a Math ACT score of 18 or better or an equivalent assessment score.

**Controlling Purpose:**

This chemistry course is the beginning or preparatory chemistry which is offered to students who have a limited science background. It gives the student a knowledge of the basic concepts of chemistry which are needed to enter a major chemistry course or other advanced science course.

**Learner Outcomes:** Upon completion of this course the student will read about, understand and successfully apply the basic concepts of chemistry: atoms, elements, molecules, compounds, chemical reactions, chemical composition and quantities, modern atomic theory, chemical bonding and introductory organic and biochemistry. In addition the student will become proficient in application of chemical mathematics and laboratory procedures and techniques.

**Units Outcomes and Criterion Based Evaluation Key for Core Content:**

The following defines the minimum core content not including the final examination period. Instructors may add other content as time allows.

Evaluation Key:

- A = All major and minor goals have been achieved and the achievement level is considerably above the minimum required for doing more advanced work in the same field.
- B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.

- C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.
- D = A few of the major goals have been achieved, but the student's achievement is so limited that he is not well prepared to work at a more advanced level in the same field.
- F = Failing, will be computed in GPA and hours attempted.
- N = No instruction or training in this area.

### UNIT 1: INTRODUCTION TO CHEMISTRY, MATTER AND ENERGY

Outcomes: Upon completion of this unit, the student will be able to understand the importance of learning chemistry, the process of scientific thinking, how to express measurements in appropriate units, the basic nature of matter and energy.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Describe the scientific method
						Express numbers in scientific notation and ordinary decimal notation.
						Know metric prefixes.
						Express numbers derived from a calculation to the correct number of significant figures.
						Calculate the density of a solid or a liquid.
						Know chemistry lab safety rules.
						Solve various types of problems using the dimensional analysis technique.
						Convert from one temperature scale to another.
						Distinguish between physical/chemical properties and changes.
						Distinguish between elements, compounds and mixtures.
						Know techniques used to physically separate components of a mixture.
						Calculate the specific heat capacity of materials.

**UNIT 2: ELEMENTS, ATOMS, IONS AND NOMENCLATURE**

Outcomes: Upon completion of this unit, the student will understand the difference between an element and a compound, the basic structure of the atom, and the system for naming inorganic compounds.

A	B	C	D	F	N	Specific Competencies
						Demonstrate to ability to:
						Define and appropriately use the following terms: atoms, elements, molecules, compounds, cation and anion.
						Identify common properties of ionic compounds.
						List the 5 points of Dalton's Atomic Theory.
						Know how to write atomic symbols and be able to calculate the number of protons, neutrons and electrons contained in an atom by reading the atomic symbol.
						Name chemical compounds from chemical formulas.
						Write chemical formulas from chemical names.

**UNIT 3: INTRODUCTION TO CHEMICAL REACTIONS**

Outcomes: Upon completion of this unit, the student will understand how to recognize, write, balance and classify common types of chemical reactions.

A	B	C	D	F	N	Specific Competencies
						Demonstrate to ability to:
						Know how to recognize that a chemical reaction has occurred.
						Write and balance a chemical equation from a word problem.
						Classify chemical reactions according to types.
						Define a driving force and name the four driving forces of chemical reactions.
						Use solubility rules to predict the products in a chemical reaction. (identify products)
						Provide examples of common acids and bases.
						Write and balance acid-base reactions.
						Write and balance combustion reactions.
						Balance redox reactions by inspection.

**UNIT 3: INTRODUCTION TO CHEMICAL REACTIONS**

Outcomes: Upon completion of this unit, the student will understand how to recognize, write, balance and classify common types of chemical reactions.

A	B	C	D	F	N	Specific Competencies
						Demonstrate to ability to:
						Write complete ionic and net ionic equations for precipitation reactions and acid-base reactions.
						Understand the pH scale and how pH is measured.
						Understand the use of indicators to estimate the pH of a solution.

**UNIT 4: CHEMICAL COMPOSITION AND CHEMICAL QUANTITIES**

Outcomes: Upon completion of this unit, the students will understand this definition of a mole and how it is used, along with balanced chemical equations, to calculate chemical quantities.

A	B	C	D	F	N	Specific Competencies
						Demonstrate to ability to:
						Calculate molar mass.
						Calculate grams of a sample if given the mols.
						Calculate the mols in a sample if given the grams.
						Determine the empirical formula and molecular formula of a compound.
						Determine the amount of reactant needed for or amount of product produced in a chemical reaction.
						Determine limiting reactant.
						Calculate percent yield.

**UNIT 5: MODERN ATOMIC THEORY AND CHEMICAL BONDING**

Outcomes: Upon completion of this unit, the student will understand the modern concept of atomic structure and how the modern periodic table is constructed. Based on these principles, the student will understand the nature of various types of chemical bonds and how to represent the bonds between atoms in molecule using Lewis structures.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Write electron configurations for elements.
						Identify <u>valence</u> electrons.
						Explain <u>why</u> valence electrons are <u>important</u> .
						Rank selected bonds in order of increasing polarity.
						Write Lewis structures for simple molecules and ions.
						Predict structures using VSEPR theory for simple molecules and ions.

**UNIT 6: INTRODUCTION TO ORGANIC CHEMISTRY AND BIOCHEMISTRY**

Outcomes: Upon completion of this unit, the student will understand the nature and scope of organic and biochemistry.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Identify organic compounds.
						Identify functional groups.
						Give examples of biopolymers and synthetic polymers.
						Relate the importance of the development of polymers to our society.
						Understand basic structure and fundamental properties of proteins, carbohydrates, DNA, RNA and lipids.

## UNIT 7: THE GASEOUS STATE

Outcomes: Upon completion of the unit the student will be able to relate the gas law problems involving partial pressure, volume, temperature, pressure and moles.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Relate liquid height in a barometer or manometer, density of the liquid, and pressure.
						Arrange the gas law to solve for the unknown variable.
						Explain Dalton's law of partial pressure and calculate partial pressure in a mixture of gas.

### **Projects Required:**

The student will participate in classroom laboratory activities and prepare reports appropriate to these activities.

### **Textbook:**

Contact bookstore for current text.

### **Materials/Equipment Required:**

Metric balance, volumetric glassware, pH meter, buret, bunsen burner, spectrum tubes, spectroscope  
Scientific calculator

### **Attendance Policy:**

Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

### **Late Daily Work:**

May be accepted per instructors discretion.

### **Grading Policy:**

The grading policy will be outlined by the instructor in the course syllabus.

### **Maximum class size:**

Based on classroom occupancy

**Course Timeframe:**

The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time. The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

**Refer to the following policies:**

[402.00 Academic Code of Conduct](#)

[263.00 Student Appeal of Course Grades](#)

[403.00 Student Code of Conduct](#)

**Disability Services Program:**

Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability which may impact work in this class which requires accommodations, contact the Disability Services Coordinator.