COWLEY COLLEGE
& Area Vocational Technical School

COURSE PROCEDURE FOR

CHEMISTRY I
CHM 4220 5 Credit Hour

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

Catalog Description of the Course:
CHM4220 - CHEMISTRY I (N) (5 hrs)
[KRSN CHM 1010/1011/1012]
An introduction to inorganic chemistry with emphasis on atomic structure, molecular bonding and structure, the periodic table, kinetic theory, changes of state, solutions and concentrations, chemical reactions and oxidation-reduction, and fundamental organic chemistry. This course includes laboratory experimentation.

Prerequisite:
CHM 4211 General Chemistry or high school Chemistry with a grade of "C" or better within the past five years, **and** successful completion of College Algebra MTH4420 or MTH4421 or a Math ACT score of 21 or better within the past five years or concurrent enrollment in MTH4420 College Algebra.

Controlling Purpose:
This course in inorganic chemistry is offered to students who have had a previous experience in chemistry. The course gives students a functional knowledge of the principles and concepts of chemistry which are needed for advanced study in chemistry or other areas of science. This course can be taken as a one semester course in chemistry or as the first course in a two semester sequence of study in inorganic chemistry.

Learner Outcomes:
Upon completion of this course, students will be able to read technical information in the field of chemistry and apply mathematics to chemical principles and concepts. The students will be able to use laboratory equipment to gather data and interpret data to write laboratory reports.

The learning outcomes and competencies detailed in this course meet, or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Project for this course, as sanctioned by the Kansas Board of regents.

Core Outcomes:
The learning outcomes and competencies detailed in this course outline or syllabus meet or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Groups project for this course as approved by the Kansas Board of Regents.

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 I:						**CHEMISTRY AND MEASUREMENT** Outcomes: The student will be able to solve problems using factor conversion and express answers using the correct significant figures.
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Calculate the mass of a substance in a chemical reaction using the law of conservation of mass.
						Report an answer to the correct number of significant figures and round it properly.
						Convert a given temperature reading from one scale to another.
						Rearrange the density equation to solve for mass, volume and density.
						Convert a measurement expressed in one unit to a new unit using the dimensional analysis.

UNIT II: ATOMS, MOLECULES, AND ONS Outcomes: The student will be able to write chemical formulas and balance chemical equations.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Write the nuclide symbol for a given element.
						Determine the atomic weight from isotopic masses and fractional abundances.
						Write the name of a compound from its formula or given its name, write its formula.
						Distinguish between ionic and molecular compounds.
						Examine simple equations and obtain the coefficients needed to balance it.

UNIT III: CHEMICAL REACTIONS Outcomes: Upon completion of this unit the student will be able to classify and write chemical equations and given the reactants, predict the products.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to use:
						Classify chemical equations as to the type of reaction.
						Identify acids and bases as being strong or weak.
						Generate the net ionic equation from a given molecular equation.
						Decide on the basis of the solubility rules, whether two soluble ionic compounds will react to form a precipitate.
						Write the molecular and net ionic equation for a neutralization reaction.
						Determine oxidation states and assign oxidation numbers.
						Balance redox reactions and determine the oxidizing and reducing agents.

UNIT IV:						**CALCULATIONS WITH CHEMICAL FORMULAS AND EQUATIONS** Outcomes: Upon completion of this unit the student will be able to use stoichiometry to compute the unknown amount of substance in a chemical reaction.
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to use:
						Determine the formula weight from a given formula.
						Apply Avogadro=s number to molar mass, atoms, and molecules.
						Convert the mass of a substance to moles or the moles to mass.
						Compute the mass percentage of elements in a formula given mass, moles, or by combustion.
						Determine the empirical formula from masses or percentage composition, and obtain its molecular formula given molecular weight.
						Identify the limiting reactant in a given chemical equation and calculate theoretical yields from stoichiometric data.
						Rearrange the molarity equation to solve for mass, volume, or molarity.
						Modify a given molarity to make a solution with a different molarity.
						Describe the preparation of a solution of a known molarity or percent composition.
						Solve titration problem involving a known molarity of a solution with an unknown molarity of a solution.

UNIT V:						**THE GASEOUS STATE** Outcomes: Upon completion of the unit the student will be able to relate the gas laws problems involving partial pressure, volume, temperature, pressure and moles.
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to use:
						Relate liquid height in a barometer or manometer, density of the liquid, and pressure.
						Solve problems using the empirical gas laws.
						Describe how gasses differ from liquids and solids in terms of physical properties and intermolecular forces.
						Arrange the ideal gas law to solve for the unknown variable.
						Solve stoichiometry problems involving gas volumes.
						Explain Dalton=s law of partial pressure and calculate partial pressure in a mixture of gas.
						Determine the amount of dry gas given the volume, pressure and temperature of the gas collected over water.
						Describe and apply Kinetic Molecular Theory.

UNIT VI:						**QUANTUM THEORY OF THE ATOM** Outcomes: Upon completion of this unit the student will be able to use the quantum theory to assign quantum numbers to an electron in an atom.
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to use:
						Relate wavelength and frequency in calculations.
						Perform calculations involving photon energy, frequency, and wavelength.
						Determine the wavelength, frequency or light emitted for an electron transition in the hydrogen atom.
						Predict whether a given set of quantum numbers is permissible for an electron.
						Select the correct element to match a given set of quantum numbers.

UNIT VII: ELECTRON CONFIGURATIONS AND PERIODICITY Outcomes: Upon completion of this unit the student will be able to predict electron configuration given the location on the periodic table.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to use:
						Decide whether a given orbital diagram or electron configuration is possible according to the Pauli exclusion principle.
						Determine the configuration of an atom using the building-up principle.
						Predict the electron configuration given the period and group numbers.
						Apply Hund=s rule write the electron configuration for the ground state of an atom and the orbital diagram.
						Arrange a series of elements in order by atomic radius or ionization energy using the known trends and the periodic table.

UNIT VIII: IONIC AND COVALENT BONDING Outcomes: Upon completion of this unit the student will be able to apply the principles of bonding to determine bond order, bond length and heat of reaction.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to use:
						Construct Lewis symbols for a given ion, element, formula or compound.
						Arrange a series of ions in order of increasing ionic radius.
						Arrange a series of bonds in order by polarity using electronegativities.
						Write resonance formulas for simple molecules with delocalized bonding.
						Relate bond order to bond length.
						Estimate the heat of reaction from the bond energies given.

UNIT IX: MOLECULAR GEOMETRY AND CHEMICAL BONDING Outcomes: Upon completion of this unit the student will use the concepts of molecular geometry to predict the type of bonding in a molecule.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to use:
						Predict the molecular geometry of a simple molecule using the VSEPR model.
						Relate dipole moment and molecular geometry.
						Describe the bonding of simple molecules using the valence bond theory.
						Relate molecular orbital concepts to various properties of molecules.
						Determine whether a molecular substance is diamagnetic or paramagnetic.

UNIT X: THERMOCHEMISTRY Outcomes: The student will understand and apply fundamental thermodynamic properties to chemical reactions and systems of energy transfer.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Write a thermochemical equation, given the states of substances and quantity of heat evolved.
						Calculate the heat of reaction of a given mass of reactant or product.
						Relate heat and specific heat using the quantities q, s, m, and delta t.
						Calculate the heat of reaction from calorimetric data.
						Apply Hess's law to calculate the heat of reaction.,
						Interpret a table of standard enthalpies and use the information to calculate the heat of phase transition.
						Determine the standard enthalpy of formation from any enthalpy of reaction.
						Describe the relationship between phase changes and energy changes.

Projects Required:
Laboratory notebook.

Textbook:
Contact Bookstore for current textbook.

Materials/Equipment Required:
composition notebook, calculator

Major Pieces of Equipment:
pH meters
electronic balances
analytical balances
spectrophotometers
PC computers

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

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

Maximum class size:
Based on classroom occupancy

Course Time Frame:
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.