North Central
Michigan College

NCMC MASTER COURSE SYLLABUS

Last Date Revised __3/5/2012_____

INSTRUCTIONAL AREA: Liberal Arts **DEPARTMENT: Science**

ASSOCIATE DEAN: Samantha McLin **ORIGINATOR: Ralph Christensen**

DEAN OF INSTRUCTION: Christine Hammond, Ph.D.

COURSE ALPHA/NUMBER: CEM 101

COURSE TITLE: Fundamentals of Chemistry

HOURS OF INSTRUCTION:

Credit hours: 4
Lecture: 3
Lab: 3
Clinical:
Variable Hours:
Total Hours of Instruction: 6
Total Contact Hours: 105.6
(Total Contact Hours Formula: (lecture hours + lab hours + clinical hours) x 17.6

CATALOG DESCRIPTION: A course for students with limited or no chemistry background wishing to enter an allied health program or prepare for enrolling in Principles of Chemistry, CEM 121. Topics include: states of matter, atomic structure, chemical bonding, stiochiometry, gas laws, solutions, equilibrium, acids and bases, and nuclear chemistry.

PREREQUISITE(S): MATH 110

COREQUISITE(S):

GENERAL EDUCATION DISTRIBUTION AREA:

___Communications, Writing
___Communications, Communications
___Humanities Group A
___Humanities Group B
___Mathematics
___Natural Science Group A
___Natural Science Group B
___Social Science Group A
___Social Science Group B
___Non Applicable

GENERAL EDUCATION OUTCOMES:

___Write and Speak Effectively

___Think Critically & Analytically

_X_Write & Speak Effectively and Think Critically & Analytically

___Non Applicable

COURSE OBJECTIVES AND OUTCOMES:

Describe the characteristics of elements, compounds, and mixtures.
Name the units of the metric system and convert them into the units of other systems.
Describe the relationship between uncertainty and significant figures.
Use scientific notation in expressing numbers and doing calculations.
Use the unit conversion method in solving problems.
Define mass, volume, density, temperature, and heat, and describe how they are measured.
Use Dalton's atomic theory to explain the constant composition of matter and the conservation of mass in chemical reactions.
Define atomic mass.
Describe the structure of the atom in terms of its principal subatomic particles.
Identify main group and transition elements, metals, nonmetals and metalloids.
Correlate the arrangement of the periodic table with the electron configurations of the valence shells of the elements.
Describe the octet rule.
Describe the difference between ionic and covalent bonds.
Describe the relation between the octet rule and the formation of ions.
Predict the formulas of ionic compounds.
Construct the names of ionic compounds.
Construct the names of covalent compounds.
Create Lewis structures.
Describe the difference between polar and nonpolar covalent bonds.
Use VSEPR, valence shell electron pair repulsion, theory to predict molecular shape.
Calculate the formula mass of a compound.
Define the mole.
Use the mole as a unit conversion factor for converting mass into moles and moles into mass.
State the magnitude of Avogadro's number and what it implies about the size of atoms and molecules and the numbers of them in a weighable sample.
Calculate the empirical and molecular formulas of a compound.
Write a chemical reaction as an equation.
Balance a chemical equation.
Use a balanced chemical equation to predict the masses of compounds produced and used up in chemical processes.
Define gas pressure and its units, and describe how it is measured.
Summarize the gas laws' quantitative descriptions of the physical behavior of gases.
Apply the appropriate gas laws to particular experimental conditions.
Describe the properties of mixtures of gases.
Use the gas laws to determine formula mass.
Determine the amount of gas dissolved in a liquid.
Use molecular concepts to explain the properties of the three states of matter and transitions between them.
Describe secondary forces and correlate chemical structure with types of secondary forces.
Correlate physical properties such as vapor pressure, normal boiling point, melting point, and surface tension with types of secondary forces.
Understand the molecular characteristics necessary for solution formation.
Define dynamic equilibrium.
Describe how the formation of a solution depends on the molecular properties of the solute and solvent.
Give the quantitative definitions of concentration and use them as conversion factors in calculations.
Specify reasons and methods for preparing dilute solutions from concentrated solutions.
Describe diffusion and the characteristics of semipermeable membranes from a molecular point of view.
Describe the origin of osmotic pressure and how it is measured and used in calculations.
Describe the properties of macromolecules and colloidal solutions.
Describe how the rates of chemical reactions are affected by the concentrations of reactants, the temperature and the presence of catalysts.
Describe how chemical reactions are the result of collisions that lead to the formation and decay of an activated complex.

Explain how a chemical system reaches a state of dynamic equilibrium.
Describe LeChatelier's principle.
Describe how an equilibrium constant provides a quantitative description of chemical equilibrium
Describe the central role of water in acid base chemistry.
Explain the difference between strong and weak acids and strong and weak bases.
Use the ion product of water to calculate hydronium ion and hydroxide ion concentrations.
Define pH and describe its use as a measure of acidity.
Describe the behavior of weak acids and bases in terms of chemical equilibria.
Use the Bronsted theory to explain the properties of salts of weak acids and bases and of buffers.
Describe how the concentrations of acids and bases are determined by titration.
Define radioactivity and describe the principal kinds of nuclear emissions.
Use nuclear equations to explain transmutation.
Describe radioactive decay and the half life concept.
Describe the chemical effects of high energy radiation.
Describe the characteristics of radioisotopes used in diagnosis and in therapy.
Explain how CAT scans, PET scans, and MRI are used in diagnosis.
Describe the origin of nuclear energy and its effect on the biosphere.

METHODS OF INSTRUCTION: Lecture, lab, discussion

METHODS OF EVALUATION: Quizzes, test, homework, lab, projects.

REQUIRED TEXT AT TIME OF COURSE ADOPTION/REVISION:

TEXTS: Chemistry for Changing Times by Hill and Kolb

OPTIONAL SUPPLEMENTARY MATERIALS:

Reasonable accommodations can be provided for students with documented disabilities. Please contact Learning Support Services for assistance: (231)348-6817.

SUGGESTED TIME ALLOWANCE AND SEQUENCE OF INSTRUCTION:
(List general content description of what is being covered each week)

(If you need more than one line for a week, hit enter at the end of row; second line will begin)

WEEK 1	Chemistry
WEEK 2	Atoms
WEEK 3	Atomic Structure
WEEK 4	Nuclear Chemistry
WEEK 5	Chemical Bonds
WEEK 6	Chemical Accounting
WEEK 7	Acids and Bases
WEEK 8	Oxidation and Reduction
WEEK 9	Organic Chemistry
WEEK 10	Student Choice #1
WEEK 11	Student Choice #2
WEEK 12	Student Choice #3

WEEK 13	Student Choice #4
WEEK 14	Oral Presentations
WEEK 15	Oral Presentations
WEEK 16	Final

APPROVED FOR ADOPTION/REVISION BY THE CRD/AP COMMITTEE ON ___03/21/12_____