Douglas College

CURRICULUM GUIDELINES

A:	Division:	**Instructional**	Date:		**24 May 2000**
B:	Department/ Program Area:	**Science and Technology**	New Course [ ]	Revision [X]	
			If Revision, Section(s) Revised:		**P,L**
			Date Last Revised:		**20 March 2000**

C: **CHEM 110**	D: **The Structure of Matter**	E: **5**
Subject & Course No.	Descriptive Title	Semester Credits

F: Calendar Description: This course offers a brief review of stoichiometry, gases and the treatment of experimental data, and then focuses on the modern view of atomic structure, theories of bonding and molecular structure, organic chemistry, and the properties and reactions of the major functional groups.

G: Allocation of Contact Hours to Types of Instruction/Learning Settings:

Primary Methods of Instructional Delivery and/or Learning Settings:

Lecture/Laboratory

Number of Contact Hours: (per week / semester for each descriptor)

Lecture: 4 hours/week
Laboratory: 3 hours/week

Number of Weeks per Semester:
14

H: Course Prerequisites: CHEM 108 (or CHEM 105) (C or better) or Chem 12 (C+ or better) AND MATH 101 or MATH 11 (B or better)

I. Course Corequisites:

J. Course for which this Course is a Prerequisite: CHEM 210

K. Maximum Class Size: 36

L: PLEASE INDICATE:

- [ ] Non-Credit
- [ ] College Credit Non-Transfer
- [X] College Credit Transfer: Requested [ ] Granted [X]

SEE BC TRANSFER GUIDE FOR TRANSFER DETAILS (www.bccat.bc.ca)

UBC.	121+122 (with CHEM 210) or 111/112 (with CHEM 108+205)
SFU	Chem 102 and 115
U.Vic	Chem 101

M: Course Objectives/Learning Outcomes: The student will be able to:

1. carry out measurements using the correct number of significant figures, and express the precision using absolute or relative uncertainties.
2. given a set of experimental data, calculate the average value, the average deviation, and the standard deviation.
3. solve stoichiometry problems of the following types: percentage composition/emperical formula, gram-gram or gram-volume (of a gas), solution stoichiometry, limiting reactant, problems involving two simultaneous or two sequential reactions.
4. solve problems using the ideal gas equation
5. explain the kinetic molecular theory of gases
6. calculate the properties of a real gas using the van der Waals equation
7. give the three fundamental atomic particles and describe the experiments by which they were discovered
8. explain the Bohr theory of atomic structure
9. give the electronic configuration of any of the common elements in the periodic table
10. given a periodic table, explain the relative sizes, ionization energies, and electron affinities of the elements
11. explain and be able to apply the following concepts to covalent bonds: dipole moment, electronegativity, percent ionic character
12. draw Lewis electron dot structures for a given molecule. The molecule may exhibit resonance, or expanded valence shells
13. use the VSEPR theory to predict the geometry of any polyatomic molecule
14. given the formula of a polyatomic molecule, use the Valence Bond Theory to describe the types of bonds, the type of hybridization of the central atom, and draw a diagram showing orbital overlap and geometry.
15. use the Molecular Orbital Theory of bonding to describe the bonding in any diatomic molecule involving atoms from the first two rows of the periodic table.
16. given the formulas of two compounds, list the types of intermolecular forces which apply to each molecule, and predict which will have the higher boiling point, or heat of vaporization.
17. given the formula of an organic compound, give the IUPAC name, or the common name, if one exists.
18. given the formula of an organic compound, draw diagrams of all possible isomers, and describe each type of isomer.
19. given the formulas of the reactants in an organic reaction, predict the predominant product of the reaction. The reactant molecules may be any of the following types: alkanes, alkenes, alkynes, aromatics, alcohols, aldehydes, ketones, or carboxylic acids.

N: Course Content

1. **Introduction and Review**
   Scientific measurements, significant figures, uncertainties and standard deviation; the mole, formulas, stoichiometry; gas laws, kinetic molecular theory of gases, real gases.
2. **Atomic Structure**
   Historical development of atomic structure; fundamental particles; quantum theory of radiation; the quantum mechanical model of the atom;: Planck, Heisenberg, orbital shapes, sizes and energies, electronic configurations; periodic properties: ionization energy, atomic size, electron affinity.
3. **Bonding and Molecular Structure**
   Ionic bonding; covalent bonding: Lewis structures, electronegativity, polarity, resonance, shapes of molecules; Valence Bond Theory: hybridization, orbital diagrams; Molecular Orbital Theory: shapes and energies of molecular orbitals, bond order; intermolecular forces, and hydrogen bonding.
4. **Coordination Compounds**
   Bonding and structure; isomerism.
5. **Organic Chemistry**
   Nomenclature; bonding; reactions of alkanes, alkenes, alkynes, aromatics, alcohols and phenols, aldehydes, ketones, carboxylic acids and esters; polymerization.
6. **Nuclear Chemistry** (Optional topic)
   Nucleons, nuclear stability, nuclear reactions, radioactivity, fission, radioactive decay series, fusion, applications and issues.

Laboratory Content

The following laboratory experiments will be performed during the lab period:

1. Volumetric Techniques; A review of Titration
2. An Introduction to Statistics
3. Recycling Aluminium
4. Back Titration: Analysis of an Insoluble Base
5. Atomic Spectra
6. Gravimetric Analysis of Nickel
7. Synthesis of Aspirin
8. Separation and Identification of Drugs by Thin Layer Chromatography
9. Geometric Isomers
10. Preparation and Analysis of Potassium Hydrogen Maleate
11. Qualitative Organic Analysis

O: Methods of Instruction

The course will be presented using lectures, problem sessions and class discussion. Films and other audio-visual aids as well as programmed material will be used where appropriate. Problems will be assigned on a regular basis, to be handed in and evaluated. The laboratory course will be used to illustrate the practical aspects of the course material. Close coordination will be maintained between laboratory and classroom work whenever possible. This will be accomplished by discussing laboratory experiments in class and, when necessary, by using the lab period for problem solving.

P: Textbooks and Materials to be Purchased by Students

Petrucci, R.H. and Harwood, W.S., *General Chemistry, Principles and Modern Applications*; 7th Edition, Maxwell Macmillan Canada, Toronto, 1997.

Douglas College, *Chemistry 110 Laboratory Manual*

Q: Means of Assessment
The final grade assigned for the course will be based upon the following components:

1. **Lecture Material (70%)**
   a) Two or three-in class tests will be given during the semester (30%)
   b) A final exam covering the entire semester's work will be given during the final examination period (30%)
   c) Any or all of the following evaluations, at the discretion of the instructor: problem assignments, quizzes, class participation [5% maximum] (10% in total)

2. **Laboratory (30%)**
   a) Written reports for each experiment will be handed in and graded. These reports will either be complete reports, to be handed in in the laboratory notebook, or short reports, to be handed in on report sheets (27%). In addition, some written quizzes based on laboratory material will be evaluated.
   b) Qualitative results of experiments performed on unknown samples will be graded (3%).

R: Prior Learning Assessment and Recognition: specify whether course is open for PLAR

NO

William Reed
Course Designer(s)

Education Council/Curriculum Committee Representative

Desmond Wilson
Dean/Director

R. H. [illegible]
Registrar