CHEM 100-12 GENERAL CEMISTRY

Course Synopsis: The fundamental principles of chemistry, including atomic and molecular structure, bonding, elementary thermochemistry and thermodynamics, oxidation-reduction reactions, kinetics and equilibrium reactions with particular reference to the behaviour of solutions, and an introduction to organic chemistry. This course emphasizes the application of chemical principles in areas of interest to students in the life sciences.

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Office Hours:

Monday:	11:15 a.m. - 12:15 p.m.
Tuesday:	3:15 p.m. - 5:15 p.m.
Wednesday:	4:15 p.m. - 5:15 p.m.

(If you want to see me outside these times please make an appointment)

Lectures: F BLOCK

Monday:	1:15 p.m. - 2:05 p.m., NH 261
Wednesday:	12:15 p.m. - 1:05 p.m., NH 261
Friday:	11:15 a.m. - 12:05 p.m., NH 261

Labs (L)/ Tutorials (T):

Tuesday (12A):	**L**-8:15 a.m.- 11:05 a.m., PSC 2045
	T-9:15 a.m.- 11:05 a.m., PSC 1072
Wednesday (12B):	**L**-2:15 p.m.- 5:05 p.m., PSC 2045
	T-2:15 p.m.- 4.05 p.m., PSC 1072

Text: *Chemistry - The Central; Science (13th Ed.) by T.L. Brown, H.E. Lemay, and B.E Bursten, C.J. Murphy, P.M. Woodward, and M.W. Stoltzfus,Prentice Hall – 2014.*
The text is required and can be purchased at the StFX Bookstore. The syllabus for the course will essentially follow that of the text (as laid out in the course content). Practice problems and assignment questions will be given from the text and online resources.

Labs: Please see the associated links on the Course Basics Moodle page.

Assignments: The assignments are online, called Mastering Chemistry. This resource will enable you to practice and hone your problem solving skills. The link to the website and the **course name** and **course ID** are given on the Course Basics Moodle page

Quizzes: There will be a quiz at the end of every tutorial. The weeks that a tutorial is not scheduled there will be a pop quiz given.

Academic Integrity:
All members of St. Francis Xavier University are expected to conduct themselves in an ethical manner in their academic work. It is the policy of the university that academic dishonesty in any form is not acceptable. Academic dishonesty is defined as any act, practice or behavior that gives a student an unearned academic advantage over another or that counteracts or undermines the integrity of academic or scholarly endeavor at St. Francis Xavier University.

For further details: http://www.stfx.ca/services/registrar/academic-integrity-document.pdf

Grading Scheme:

	Mastering Chemistry	Quizzes	Lab (+Lab Exam)	Midterm test	Final Exam	Marks
Fall 2015	**2.5**	**2.5**	**7.5**	**10**	**20**	**45 %**
Winter 2016	**2.5**	**2.5**	**7.5 (+ 5)**	**10**	**30**	**55%**
	5	**5**	**20**	**20**	**50**	**100%**

PLEASE NOTE:

The lecture component (80%) and the lab component (20%) **must each be passed separately in order to receive a passing grade for the course.** **The passing grade for the lab component is 70%**. If a student fails to complete **more than 3 labs (for whatever reason)**, a failing grade will be assigned for the course. A complete lab means carrying out the designated procedure and submitting a completed lab module for that procedure. Lab pre-labs and write-ups will account for 15% and a lab exam for the remaining 5% of the course lab mark. The lab exam will take place at the end of March.

There will be no make up Mastering Chemistry Assignments or Tutorial/in-class quizzes

If you know ahead of time you are going to miss any component of the class please contact me as soon as possible.

Class assignments are due a week after they are assigned. (Late assignments will not be accepted)

No programmable calculators or electronic devices of any kind, with the exception of a basic calculator is allowed on your person during any in-class quizzes, midterms or finals.

Important dates for class:

MIDTERM FALL TEST (45 mins):	**16th OCT 2015**
FINAL FALL EXAM (2 hrs):	**8th – 19th DEC 2015 (TBD)**
MIDTERM WINTER TEST (45 mins):	**24th FEB 2016**
LAB EXAM (1 hr):	**TBA, MAR 2016**
FINAL WINTER EXAM (3 hrs):	**8th – 20th APR 2016 (TBD)**

Important dates for course:

Last day to drop full-year courses :	**11th JAN 2016**

Topics Outline

The following outline is based on the assigned course text. Those topics designated **"READ"** are part of the course material, but, with a few exceptions, will not be covered in detail during lectures.

Chapter 1. ***INTRODUCTION: SOME BASIC CONCEPTS***

- 1.1. The Study of Chemistry ..... **READ**
- 1.2. Classifications of Matter ..... **READ**
- 1.3. Properties of Matter ..... **READ**
- 1.4. Units of Measurement ..... **READ**
- 1.5. Uncertainty in Measurement
- 1.6. Dimensional Analysis

Chapter 2. ***ATOMS, MOLECULES, AND IONS***

- 2.1. The Atomic Theory of Matter ..... **READ**
- 2.2. The Discovery of Atomic Structure ..... **READ**
- 2.3. The Modern View of Atomic Structure
- 2.4. Atomic Weights
- 2.5. The Periodic Table
- 2.6 Molecules and Molecular Compounds
- 2.7. Ions and Ionic Compounds
- 2.8. Naming Inorganic Compounds
- 2.9. Some Simple Organic Compounds

Chapter 3. ***STOICHIOMETRY: CALCULATIONS WITH CHEMICAL FORMULAS AND EQUATIONS***

- 3.1. Chemical Equations

3.2. Some Patterns of Chemical Reactivity
3.3. Formula Weights
3.4. Avogadro's Number and the Mole
3.5. Empirical Formulas from Analyses
3.6. Quantitative Information from Balanced Equations
3.7. Limiting Reactants

Chapter 4. ***AQUEOUS REACTIONS AND SOLUTION STOICHIOMETRY***
4.1. General Properties of Aqueous solutions
4.2. Precipitation Reactions
4.3. Acid-Base Reactions
4.5. Concentrations of Solutions
4.6. Solution Stoichiometry and Chemical Analyses

Chapter 4/20 ***OXIDATION REDUCTION REACTION***
4.4 Oxidation Reduction Reactions
20.1 Oxidation States
20.2 Balancing Oxidation-Reduction Equations

Chapter 5 ***THERMOCHEMISTRY***
5.3. Enthalpy
5.4. Enthalpies of Reaction
5.6. Hess's Law

Chapter 10 ***GASES***
10.1. Characteristics of Gases
10.2. Pressure
10.3. The Gas Laws
10.4. The Ideal-Gas Equation
10.5. Further Applications of the Ideal Gas Equation
10.6. Gas Mixtures and Partial Pressures
10.7. Kinetic-Molecular Theory
10.8. Molecular Effusion and Diffusion
10.9. Real Gases: Deviations from Ideal Behavior

Chapter 15 ***CHEMICAL EQUILIBRIUM***
15.1. The Concept of Equilibrium
15.2 The Equilibrium Constant
15.3. Interpreting and Working with Equilibrium Constants
15.4. Heterogeneous Equilibria
15.5. Calculating Equilibrium Constants
15.6. Applications of Equilibrium Constants
15.7. Le Châtelier's Principle

Chapter 16 ***ACID-BASE EQUILIBRIA***
16.1. Acids and Bases – A Brief Review

16.2. Brønsted-Lowry Acids and Bases
16.3. The Autoionization of Water
16.4. The pH Scale
16.5. Strong Acids and Bases
16.6. Weak Acids
16.7. Weak Bases
16.8. Relation Between K_a and K_b
16.9. Acid-Base Properties of Salt Solutions
16.10. Acid-Base Behavior and Chemical Structure .....**READ**
16.11. Lewis Acids and Bases .....**READ**

Chapter 17 ***ADDITIONAL ASPECTS OF AQUEOUS EQUILIBRIA***
17.1. The Common-Ion Effect
17.2 Buffered Solutions
17.3 Acid-Base Titrations
17.4. Solubility Equilibria
17.5. Factors that Affect Solubility
17.6. Precipitation and Separation of Ions
17.7. Qualitative Analyses for Metallic Elements .....**READ**

Chapter 14 ***CHEMICAL KINETICS***
14.1. Factors that Affect Reaction Rates
14.2. Reaction Rates
14.3. Concentration and Rate
14.4. Change of Concentration with Time
14.5. Temperature and Rate
14.6. Reaction Mechanisms .....**READ**
14.7. Catalysis

Chapter 5 ***ENERGY RELATIONSHIPS IN CHEMISTRY: THERMOCHEMISTRY***
5.1. The Nature of Energy
5.2. The First Law of Thermodynamics
5.4. Enthalpies of Reaction
5.5. Calorimetry
5.7. Enthalpies of Formation
5.8. Foods and Fuels

Chapter 19 ***CHEMICAL THERMODYNAMICS***
19.1. Spontaneous Processes
19.2. Entropy and the Second Law of Thermodynamics
19.3. A Molecular Interpretation of Entropy
19.4. Entropy Changes in Chemical Reactions
19.5. Gibbs Free Energy

19.6. Free Energy and Temperature
19.7. Free Energy and the Equilibrium Constant

Chapter 6 ***ELECTRONIC STRUCTURE OF ATOMS***
6.1. The Wave Nature of Light .....**READ**
6.2. Quantized Energy and Photons.....**READ**
6.3. Line Spectra and the Bohr Model .....**READ**
6.4. The Wave Behaviour of Matter .....**READ**
6.5. Quantum Mechanics and Atomic Orbitals.....**READ**
6.6. Representations of Orbitals
6.7. Many-Electron Atoms
6.8. Electron Configurations
6.9. Electron Configurations and the Periodic Table

Chapter 7 ***PERIODIC PROPERTIES OF THE ELEMENTS***
7.1. Development of the Periodic Table .....**READ**
7.2. Effective Nuclear Charge
7.3. Sizes of Atoms and Ions
7.4. Ionization Energy
7.5. Electron Affinities
7.6. Metals, Nonmetals, and Metalloids

Chapter 8 ***BASIC CONCEPTS OF CHEMICAL BONDING***
8.1. Chemical Bonds, Lewis Symbols, and the Octet Rule
8.2. Ionic Bonding
8.3. Covalent Bonding
8.4. Bond Polarities and Electronegativity
8.5. Drawing Lewis Structures
8.6. Resonance Structures
8.7. Exceptions to the Octet Rule
8.8. Strengths of Covalent Bonds

Chapter 9 ***MOLECULAR GEOMETRY AND BONDING THEORIES***
9.1. Molecular Shapes
9.2. The VSEPR Model
9.3. Molecular Shape and Molecular Polarity
9.4. Covalent Bonding and Orbital Overlap
9.5. Hybrid Orbitals
9.6. Multiple Bonds

Chapter 24 **ORGANIC CHEMISTRY**
24.1 General Characteristics of Organic Molecule
24.2 Introduction to Hydrocarbons
24.3 Alkenes, Alkynes, and Aromatic Hydrocarbons
24.4 Organic Functional Groups
24.5 Chirality in Organic Chemistry
