



SEP. 10 2002

**DEPARTMENT OF SCIENCE & TECHNOLOGY**

**CHEMISTRY 1030 (Fall 2002)**

<b>INSTRUCTOR:</b>	Dr. Som K. Pillay (Office: J210; Tel: 539-2985)
<b>PREREQUISITE:</b>	CHEM 30 or equivalent and MATH 30 & 31 or equivalent (ENGINEERING STUDENTS ONLY)
<b>COREQUISITE:</b>	MATH 1000 or equivalent
<b>TRANSFER CREDITS:</b>	U. of Alberta: CHEM 103, 4.3 Credits U. of Calgary: ENGG 201, 3 Credits
<b>LECTURES:</b>	Mondays & Wednesdays 8:30 - 9:50 A.M. (J 229)
<b>SEMINARS:</b>	Thursdays 1:00 - 1:50 P.M. (J 204)
<b>LABORATORY:</b>	Fridays 10:00 - 12:50 P.M. (J 119)
<b>TEXT BOOKS:</b>	Steven S. Zumdahl, <i>Chemical Principles</i> , Fourth Edition, D. C. Heath and Company, 2001.  R. S. Boikess and C. H. Sorum, <i>How to Solve General Chemistry Problems</i> , 7th Ed., Prentice-Hall Inc., 1987 (Optional).
<b>LABORATORY ITEMS:</b>	<i>Chemistry 103, Laboratory Experiments</i> , University of Alberta, 2002.  A Hard-Covered Laboratory Notebook, Lab Coats and Safety Glasses.

*e-mail:*  
*Web Pages:*

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## ***COURSE EVALUATION***

### **THEORY:**

<i>Assignments:</i>	<i>5.0 %</i>
<i>Quizzes:</i>	<i>10.0 %</i>
<i>Mid-term Examination (Week of October 7):</i>	<i>15.0 %</i>
<i>Mid-term Examination (Week of November 11):</i>	<i>17.0 %</i>
<i>Final Examination (Week of December 10):</i>	<i><u>38.0 %</u></i>
	<i>85.0 %</i>

**Note:** *Students must obtain a minimum of 50 % in the theory Component to pass the course. There will be no supplemental or re-examination.*

### **LABORATORY:**

<i>General Competence in the Laboratory, Experimental Results, Lab Reports, and Lab Quizzes:</i>	<i>9.0 %</i>
<i>Lab Exam:</i>	<i><u>6.0 %</u></i>
	<i>15.0 %</i>

**Note:** *Students must obtain a minimum of 50 % in the laboratory component to pass the course.*

<b><i>Grade</i></b>	<b><i>Marks (%)</i></b>	<b><i>Grade</i></b>	<b><i>Marks (%)</i></b>
<i>9</i>	<i>90-100</i>	<i>5</i>	<i>56-63</i>
<i>8</i>	<i>80-89</i>	<i>4</i>	<i>50-55</i>
<i>7</i>	<i>74-79</i>	<i>3</i>	<i>45-49</i>
<i>6</i>	<i>66-73</i>	<i>2</i>	<i>36-44</i>



## **COURSE OUTLINE**

### **EMPHASIS IS PLACED ON UNDERSTANDING OF PRINCIPLES AND THE ABILITY TO USE PRINCIPLES TO SOLVE PROBLEMS.**

#### **1. REVIEW**

*Approximately two weeks of lectures and two weeks of seminars. The following chapters are relevant, and the material should be known from Chem 30.*

- Chapters:*
- 2. Atoms, Molecules, and Ions*
  - 3. Stoichiometry*
  - 4. Types of Chemical Reactions and Solution Stoichiometry*
- Appendix*
- 1. Mathematical Procedures*
  - 2. Units of Measurement*

*Problem Sets: 1 & 2*

#### **2. QUANTUM THEORY AND ATOMIC STRUCTURE**

*Electromagnetic Radiation, Black Body Radiation, Photoelectric Effect, Bohr Model, Hydrogen Spectrum, The de Broglie Hypothesis, The Heisenberg Uncertainty Principle, The Schrodinger Wave Equation, Orbitals and Quantum Numbers, The Pauli Exclusion Principle, Hund's Rule, Electron Configuration, Periodic Properties.*

*Chapter: 12*

*Problem Sets: 3 & 4*

#### **3. CHEMICAL BONDING AND MOLECULAR STRUCTURE**

*Ionic Bonds, Energetics of Ionic Crystals, Covalent Bonds, Electronegativity, Dipole Moments, Molecular Orbitals, Hybridization, Resonance, Lewis Structures, Molecular Geometry, Intermolecular Forces.*

*Chapters: 13 & 14*

*Problem Sets: 5 & 6*



4. **APPLICATIONS OF EQUILIBRIUM**

A. **GENERAL**: *Gas Phase Equilibria, Heterogeneous Equilibria, Le Chatelier's Principle*

Chapter: 6

Problem Set: 7

B. **ACID-BASE EQUILIBRIA**: *Review of Fundamentals, Bronsted-Lowry Acid-Base Theory, The Lewis Theory, Dissociation Constant, Levelling Effect, pH of Simple and Complex Acids and Bases in Water, Indicators, Titration Curves, Buffer Solutions, Hydrolysis, Polyprotic Acids*

Chapters: 7 & 8

Problem Sets: 8 & 9

C. **IONIC EQUILIBRIA**: *Solubility of Ionic Compounds,  $K_{sp}$ , Common-Ion Effect, The Effect of Complexing Ligands, The Effect of pH on Solubility Equilibria, Selective Precipitation of Ions, Extraction and Separation*

Chapter: 8

Problem Set: 10



## LECTURE SESSION

Regular attendance of lectures/seminars is essential to achieve a good understanding of the course material. You are encouraged to ask questions and to participate in class discussions. Help is also available outside the classroom. **NO APPOINTMENTS ARE NEEDED.**

### TENTATIVE LECTURE SCHEDULE

<i>WEEK OF</i>	<i>MONDAY</i>	<i>WEDNESDAY</i>	<i>THURSDAY (Tutorial)</i>
<i>Sept. 2</i>	-	<i>Introduction</i>	-
<i>9</i>	<i>Stoichiometry</i>	<i>Stoichiometry</i>	<i>Stoichiometry</i>
<i>16</i>	"	"	"
<i>23</i>	<i>Atomic Structure</i>	<i>Atomic Structure</i>	<i>Atomic Structure</i>
<i>30</i>	"	"	"
<i>Oct. 7</i>	<i>Bonding &amp; Structure</i>	<i>Bonding &amp; Structure</i>	<b>EXAM I</b>
<i>14</i>	<i>No Classes</i>	"	<i>Bonding &amp; Structure</i>
<i>21</i>	"	"	"
<i>28</i>	"	<i>Equilibria</i>	"
<i>Nov. 4</i>	<i>Equilibria</i>	"	<i>Equilibria</i>
<i>11</i>	<i>No Classes</i>	<i>Acids &amp; Bases</i>	<b>EXAM II</b>
<i>18</i>	"	"	<i>Acids &amp; Bases</i>
<i>25</i>	"	"	"
<i>Dec. 2</i>	<i>Ionic Equilibria</i>	<i>Ionic Equilibria</i>	<i>Ionic Equilibria</i>
<i>9</i>	*	<b>FINAL EXAM</b>	*



## READING AND PROBLEM ASSIGNMENTS

*Problem solving is an essential part of this course. It will guide your study in the right direction and also will help you to monitor your performance in the course.*

*Approximately ten questions will be assigned as homework every week. However, you are encouraged to solve as many additional problems as you can. It is important that you work out these problems independently. Seek help with the ones you cannot solve yourself. Unless instructed otherwise, assignments are due on Fridays at 10:00 AM. **NO LATE ASSIGNMENTS ARE ACCEPTED. DON'T ASK!***

PROBLEM SET #	CHAPTER*	PROBLEMS
1	3	Questions 1-13, Pages 1-2, Stoichiometry
2	3	Questions 14-25, Pages 2-3, Stoichiometry
3	12	Questions 1 - 12, Pages 1-2, Atomic Structure and Bonding.
4	12	Questions 13 - 25, Pages 3-4, Atomic Structure and Bonding.
5	12 & 13	Questions 26 - 37, Pages 4-5, Atomic Structure and Bonding
6	13 & 14	Question 38, Page 6, Atomic Structure and Bonding
7	6	Questions 1-18, Pages 1-2, Equilibrium
8	7	Questions 1-12, Page 1, Acids & Bases
9	8	Questions 13-26, Pages 1-2, Acids & Bases
10	8	Questions 1-17, Pages 1-2, Ionic Equilibrium

\*TEXT: Steven S. Zumdahl, *Chemical Principles, Fourth Edition*, D. C. Heath and Company, 2001.



## **LABORATORY SESSION**

Laboratory sessions start at 10:00 A.M. sharp. All students are expected to come to the laboratory well prepared for the experiment that is to be performed and on time. At the start of each lab period you will be given a 15-minute quiz.

Students are expected to attend all laboratory periods. Absences due to illness must be substantiated by presenting suitable evidence to the Instructor/Lab Technician within one week of missing the lab. An opportunity to make up a lab will be given only for **excused absences**.

The laboratory experiments are designed to allow a well-prepared student to finish all the work within the allotted time. **IT IS YOUR RESPONSIBILITY TO COMPLETE THE LAB ON TIME.**

Students are responsible for keeping the lab tidy. Failure to keep the workbench and common areas tidy will result in demerits up to 5 marks each lab period.

### **LABORATORY REPORT**

You must record everything you do and observe as you carry out your experiment. Use a hardcover laboratory notebook for this purpose. Do not copy the procedure from the laboratory manual. Keep your notebook neat. Your notebook will be checked periodically.

Formal lab reports should be written using the format given in your laboratory manual. The lab reports are due on Wednesdays at 8:30 A.M. **NO LATE LAB REPORTS ARE ACCEPTED.**

### **TENTATIVE LABORATORY SCHEDULE**

<b>Date</b>	<b>EXPERIMENT*</b>
Sept. 13	A. Check-In: Lab and Safety Orientation
Sept. 27	B. Compounds of Cu
Oct. 11	E. Atoms and Line Spectra
Oct. 25	F. Analysis of Vitamin C
Nov. 8	I. Titration Curves
Nov. 22	L. Lab Exam and Check-Out

\*TEXT: Chemistry 103, Laboratory Experiments, University of Alberta, 2002.

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Send mail to [pillay@gprc.ab.ca](mailto:pillay@gprc.ab.ca) with questions or comments about this web site.

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Last modified: August 28, 2002

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