Registrar

GRANDE PRAIRIE REGIONAL COLLEGE

DEPARTMENT OF SCIENCE

CHEMISTRY 202 (1991-92)

INSTRUCTOR:	Dr. Som K. Pillay (Office: J 210; Tel: 539-2985)
PREREQUISITE:	CHEM 30 or equivalent and MATH 30 or equivalent
COREQUISITE:	MATH 202 or MATH 203 or equivalent
TRANSFER CREDIT:	U. of Alberta: CHEM 104, 6 Credits U. of Calgary: CHEM 234, 6 Credits
LECTURES:	MONDAYS, WEDNESDAYS & FRIDAYS 13.00 - 13.50 (J 201)
SEMINAR:	THURSDAYS 9.30 - 10.50 (E 305) 11.00 - 12.20 (E 305)
LABORATORY:	WEDNESDAYS & THURSDAYS 15.00 - 17.50 (J 116)
TEXT BOOKS AND LABORATORY ITEMS:	David W. Oxtoby and Norman H. Nachtrieb, Principles of Modern Chemistry, 2nd Ed., Sanders College Publishing, 1990. R. S. Boikess and C. H. Sorum, How to Solve General Chemistry Problems, 7th Ed., Prentice-Hall Inc., 1987 (Optional). Chemistry 202, Laboratory Experiments, University of Alberta, 1991 Lab Coats and Safety Glasses

COURSE EVALUATION

First Mid-term Examination (Oct. 24)	10 %
First Term Final Exam. (Week of Dec. 12)	20 %
Second Mid-term Examination (Feb. 20)	10 %
Final Examination (Week of April 20)	30 %
Assignments/Quizzes	10 %
Lab Reports/Lab Quizzes	20 %

Note: A pass Grade is essential for the Laboratory Component.

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
1. Stoichiometry and the Atomic Theory of Matter
2. Chemical Periodicity and Inorganic Reactions
4. Stoichiometry of Reactions in Solution, Section 4.2 & 4.3
8. Thermochemistry, Section 8.4

Problem Sets: 1 & 2

2. PROPERTIES OF GASES

Equation of State for Ideal Gases, Dalton's Law of Partial Pressures, Kinetic Theory of Gases, Effusion and Diffusion, Molecular Speeds, Van der Waals Equation of State, Critical Phenomena

Chapter: 3
Problem Sets: 3 & 4

3. 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

Chapters: 13 & 14
Problem Sets: 5 & 6

4. **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: 2, 14 & 15
Problem Sets: 7 & 8

5. **APPLICATIONS OF EQUILIBRIUM:**

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

Chapters: 4 & 5
Problem Set: 9

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

Chapter: 6
Problem Sets: 10 & 11

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: 7
Problem Set: 12

6. **THERMODYNAMIC PROCESSES AND THERMOCHEMISTRY:**

Reversible and Irreversible Processes, Internal Energy, PV Work, The First Law of Thermodynamics, Heat capacity, Enthalpy, Processes Involving Ideal Gases, Thermochemistry Spontaneous Processes, Entropy, The Second and Third Laws of Thermodynamics, Free Energy and Chemical Equilibrium, Temperature Dependence of K

Chapters: 8 & 9
Problem Sets: 13, 14, 15 & 16

7. **ELECTROCHEMISTRY:**

Review of Redox Reactions, Chemistry of Electrolytic and Galvanic Cells, Faraday's Laws, Electrode Potentials, emf, Free Energy and emf, Concentration Effects, The Nernst Equation, Commercial Cells, Fuel Cells, Corrosion

Chapter: 10
Problem Sets: 17, 18 & 19

8. **CHEMICAL KINETICS:**

Rate Laws, Order of Reactions, Differential and Integrated Rate Equations for Zero, First and Simple Second Order Reactions, Half-life, Reaction Mechanisms, Arrhenius Law, Catalysis

Chapter: 11
Problem Sets: 20 & 21

9. **NUCLEAR CHEMISTRY (OPTIONAL):**

The Nucleus, Nuclear Stability, Nuclear Decay Processes, Kinetics of Radioactive Decay, Radioactive Dating, Radioactive Disintegration Series, Nuclear Reactions, Nuclear Fission and Fusion

Chapter: 12
Problem Set: 22

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 class room. **NO APPOINTMENTS ARE NEEDED.**

TENTATIVE LECTURE SCHEDULE

FALL SEMESTER

WEEK OF	MONDAY	WEDNESDAY	THURSDAY (Tutorial)	FRIDAY
Sept. 2				Intro-duction
9	Stoich.	Stoich.	Study Skills	Stoich.
16	"	"	Stoich.	"
23	"	Gases	"	Gases
30	Gases	"	Gases	"
Oct. 7	"	"	"	Atomic Structure
14	**NO LECTURE**	Atomic Structure	Atomic Structure	"
21	Atomic Structure	"	**MID-TERM**	"
28	Bonding	Bonding	Bonding	Bonding
Nov. 4	"	"	"	"
11	**NO LECTURE**	Molecular Structure	Molecular structure	Molecular Structure
18	Molecular Structure	"	"	"
25	Equilibria	Equilibria	Equilibria	Equilibria
Dec. 2	Equilibria	**REVIEW**	**REVIEW**	**REVIEW**
9	**REVIEW**	**FINAL**	**EXAM**	-

TENTATIVE LECTURE SCHEDULE

WINTER SEMESTER

WEEK OF	MONDAY	WEDNESDAY	THURSDAY (Tutorial)	FRIDAY
Jan. 6	Acids & Bases	Acids & Bases	Acids & Bases	Acids & Bases
13	,,	,,	,,	,,
20	,,	,,	,,	,,
27	Ionic Equilibria	Ionic Equilibria	Ionic Equilibria	Ionic Equilibria
Feb. 3	Thermo-dynamics	Thermo-dynamics	Thermo-dynamics	Thermo-dynamics
10	,,	,,	,,	,,
17	NO LECTURE	,,	MID-TERM	,,
24	-	WINTER	BREAK	-
Mar. 2	Thermo-dynamics	Thermo-dynamics	Thermo-dynamics	Thermo-dynamics
9	Electro-chemistry	Electro-chemistry	Electro-chemistry	Electro-chemistry
16	,,	,,	,,	,,
23	,,	Kinetics	Kinetics	Kinetics
30	Kinetics	,,	,,	,,
Apr. 6	,,	,,	,,	REVIEW
13	REVIEW	REVIEW	REVIEW	NO LECTURE
20	-	FINAL	EXAM	-

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 home work 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 1.00 PM. **NO LATE ASSIGNMENTS ARE ACCEPTED. DON'T ASK!**

FALL SEMESTER

PROBLEM SET #	CHAPTER*	PROBLEMS
1	1	Questions 1-14, Pages 12-13
2	1	63, 68 & Questions 15-25, Pages 13-14
3	3	5, 60, 65, 66 & Questions 1-8, Pages 15-16
4	3	67, 73, 38 a, 53 Questions 9-17, Pages 16-17
5	13	34, 45 & Questions 1-9, Pages 18-19
6	14	57 & Questions 10-19, Pages 19-20
7	14	Questions 20-25, Page 20 & Questions 1-3, Page 21
8	14	Question 1, Page 22
9	4 5	5 12, 18, 20, 22, 26, 38, 47, 64, 67 69, 77 & Questions 1-3, Page 23
10	6	32, 73 & Questions 1-13, Pages 24-25

***TEXT: David W. Oxtoby and Norman H. Nachtrieb, Principles of Modern Chemistry, 2nd Ed., Sanders College Publishing 1990.**

WINTER SEMESTER

PROBLEM SET #	CHAPTER*	PROBLEMS
11	6	40, 61, *85 & Questions 14-26, Pages 25-26
12	7	26, 28, 32, 34, 40, 44, 50, 58, 65, 70 & Questions 1-5, Page 26
13	8	10, 22, 62 & Questions 1-10, Pages 27-28
14	8	68, 71 & Questions 11-21, Pages 28-30
15	9	6, 8, 10, 28 & Questions 1-7, Pages 31-32
16	9	45, 48, 50, 69, 70 & Questions 8-15, Pages 32-34
17	10	See Page 35
18	10	24, 26, 40, 64, 71, 73, 74, 89 & Questions 1-4, Page 36
19	10	50, 68, 69, 80-83, 87 & Questions 5-9, Pages 37-38
20	11	8, 10, 12, 16, 20, 38, 42, 59 & Questions 1-5, Pages 39-40
21	11	24, 28, 30, 32, 49, 52, 55, 61, 62 & Questions 6-9, Pages 41-42

*TEXT: David W. Oxtoby and Norman H. Nachtrieb, Principles of Modern Chemistry, 2nd Ed., Sanders College Publishing, 1990.

LABORATORY SESSION

Laboratory sessions start at 3.00 PM sharp. All students are expected to come to the laboratory well prepared in the experiment that is to be performed and on time.

Students are expected to attend all laboratory periods. Absences due to illness must be substantiated by presenting suitable evidence to the Instructor/Lab Technician. 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.**

LABORATORY REPORT:

You must record everything you do and observe as you carry out your experiment. Use a hard-cover laboratory note book for this purpose. Do not copy the procedure from the laboratory manual. Keep your note book 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 Mondays at 4.30 PM. **NO LATE LAB REPORTS ARE ACCEPTED.**

TENTATIVE LABORATORY SCHEDULE

WEEK OF	EXPERIMENT*	
Sept. 16	*	Check-In *
23	A	Reactions of Copper
30	A	,,
Oct. 7	B	Hydrates
14	C	Ideal Gas Constant
21	*	**MID-TERM EXAM** *
28	Q	Complex Nickel Compounds
Nov. 4	Q	,,
11	R	The Oxidation States of Vanadium
18	X	Molecular Models
25	G	Equilibrium Constant
Jan. 13	F	Chemical Equilibrium
20	H	Titration Curves
27	I	Buffers
Feb. 3	K	Qualitative Analysis
10	K	,,
17	*	**MID-TERM** *
24	*	**WINTER BREAK** *
Mar. 2	D	Enthalpy of Reaction
9	L	Electrolysis
16	S	The Rate of Chemical Reaction
23	T	Activation Energy
30	*	Check-Out *

***TEXT: Chemistry 202, Laboratory Experiments, University of Alberta, 1991.**