



Grande Prairie
Regional College

DEPARTMENT OF SCIENCE

CHEMISTRY 1050 (Winter 1995)

- INSTRUCTOR:** Dr. Som K. Pillay
(Office: E. 309; Tel: 539-2985)
- PREREQUISITE:** CHEM 1030 or equivalent and
MATH 1000 or equivalent
(ENGINEERING STUDENTS ONLY)
- COREQUISITE:** MATH 1010 or equivalent
- TRANSFER CREDITS:** U. of Alberta: CHEM 105, 3.8 Credits
U. of Calgary: CHEM 209, 3 Credits
- LECTURES:** MONDAYS, WEDNESDAYS & FRIDAYS
9:00 - 9:50 A. M. (J 201)
- SEMINARS:** TUESDAYS
1:30 - 2:50 P. M. (J 201)
- LABORATORY:** TUESDAYS
3:00 - 5:50 P. M. (J 119)
- TEXT BOOKS AND LABORATORY ITEMS:**
- Chemical Principles, Steven S. Zumdahl, D. C. Heath and Company, 1992.
- How to Solve General Chemistry Problems, Seventh Ed., R. S. Boikess and C. H. Sorum, Prentice-Hall Inc., 1987 (Optional).
- Chemistry 105, Laboratory Experiments, University of Alberta, 1994.
- A Hard-Covered Laboratory Notebook, Lab Coats and Safety Glasses.*

COURSE EVALUATION

| | |
|------------------------------|---------------|
| <i>Assignments/Quizzes</i> | <i>12.5%</i> |
| <i>Lab Work/Lab Quizzes</i> | <i>12.5%</i> |
| <i>Mid-Term Examinations</i> | <i>30.0%</i> |
| <i>Final Examination</i> | <i>45.0%</i> |
| | <i>100.0%</i> |

| <u><i>Grade</i></u> | <u><i>Marks (%)</i></u> | <u><i>Grade</i></u> | <u><i>Marks (%)</i></u> |
|---------------------|-------------------------|---------------------|-------------------------|
| 9 | 90-100 | 5 | 56-65 |
| 8 | 80-89 | 4 | 50-55 (Pass) |
| 7 | 74-79 | 3 | 45-49 |
| 6 | 66-73 | 2 | 36-44 |

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. SPONTANEOUS CHANGE AND EQUILIBRIUM:

Spontaneous Processes, Entropy, The Second and Third Laws of Thermodynamics, Free Energy and Chemical Equilibrium, Temperature Dependence of K.

Chapter: 10

Problem Sets: 1 & 2

2. 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.

Chapters: 4 & 11

Problem Sets: 3, 4 & 5

3. 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: 15

Problem Sets: 6 & 7

4. 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: 8 & 9

5. **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: 10 & 11

6. **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: 21

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

| <i>WEEK OF</i> | <i>MONDAY</i> | <i>WEDNESDAY</i> | <i>FRIDAY</i> | <i>TUE/THU. (Tutorial)</i> |
|----------------|----------------------------|----------------------------|----------------------------|--------------------------------|
| <i>Jan. 2</i> | | <i>Introduction</i> | <i>Thermodynamics</i> | <i>Study Skills</i> |
| <i>9</i> | <i>Thermodynamics</i> | <i>Thermodynamics</i> | <i>Thermodynamics</i> | <i>Thermodynamics</i> |
| <i>16</i> | <i>Thermodynamics</i> | <i>Thermodynamics</i> | <i>Thermodynamics</i> | <i>Thermodynamics</i> |
| <i>23</i> | <i>Electrochemistry</i> | <i>Electrochemistry</i> | <i>Electrochemistry</i> | <i>Electrochemistry</i> |
| <i>30</i> | <i>Electrochemistry</i> | <i>Electrochemistry</i> | <i>Electrochemistry</i> | <i>Electrochemistry</i> |
| <i>Feb. 6</i> | <i>Kinetics</i> | <i>Kinetics</i> | <i>Kinetics</i> | EXAM I |
| <i>13</i> | <i>Kinetics</i> | <i>Kinetics</i> | <i>Kinetics</i> | <i>Kinetics</i> |
| <i>20</i> | <i>Canada</i> | <i>Winter</i> | <i>Games</i> | -- |
| <i>27</i> | <i>Canada</i> | <i>Winter</i> | <i>Games</i> | -- |
| <i>Mar. 6</i> | <i>Atomic Structure</i> | <i>Atomic Structure</i> | <i>Atomic Structure</i> | <i>Atomic Structure</i> |
| <i>13</i> | <i>Atomic Structure</i> | <i>Atomic Structure</i> | <i>Atomic Structure</i> | <i>Atomic Structure</i> |
| <i>20</i> | <i>Bonding</i> | <i>Bonding</i> | <i>Bonding</i> | <i>Bonding</i> |
| <i>27</i> | <i>Bonding</i> | <i>Bonding</i> | <i>Bonding</i> | EXAM II |
| <i>Apr. 3</i> | <i>Molecular structure</i> | <i>Molecular structure</i> | <i>Molecular Structure</i> | <i>Molecular structure</i> |
| <i>10</i> | <i>Molecular structure</i> | <i>Molecular structure</i> | <i>No Classes</i> | <i>Molecular structure</i> |
| <i>17</i> | <i>Review</i> | <i>Review</i> | <i>No Classes</i> | <i>Review</i> |
| <i>24</i> | - | 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 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 A.M. **NO LATE ASSIGNMENTS ARE ACCEPTED. DON'T ASK!***

| PROBLEM SET # | CHAPTER | PROBLEMS |
|----------------------|----------------|---|
| 1 | 10 | 68, 76, 78, 93, 94 & Questions 1-6, Pages 8 -9 |
| 2 | 10 | 41, 73, 81, 92 & Questions 7-14, Pages 9 - 11 |
| 3 | 4 | See Page 12 |
| 4 | 11 | 50, 52, 56, 58, 59, & Questions 1-5, Pages 13 - 14 |
| 5 | 11 | 18, 25, 32, 35, 41, 42, 75, 78, 79 & Question 6, Page 15 |
| 6 | 15 | 55, 59, 68, 70, 72 & Questions 1-6, Pages 16 - 18 |
| 7 | 15 | 37, 38, 43, 44, 60, 62, 64, 79, 82, 84, 85 & Questions 7-9, Pages 18 - 19 |
| 8 | 12 | 5, 13, 15 & Questions 1-10, Pages 20 - 21 |
| 9 | 12 | 50, 60-62, 81, 90, 105 & Questions 11-16, Pages 21 - 22 |
| 10 | 12 & 13 | Questions 17-25, Page 22 & Questions 1-3, Page 23 |
| 11 | 13 & 14 | Question 1, Page 24 |

***TEXT:** Chemical Principles, Steven S. Zumdahl, D. C. Heath and Company, 1992.

LABORATORY SESSION

Laboratory sessions start at 3:00 P.M. sharp. All students are expected to come to the laboratory well prepared for 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 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 Fridays at 10:00 A.M. **NO LATE LAB REPORTS ARE ACCEPTED.**

TENTATIVE LABORATORY SCHEDULE

| WEEK OF | EXPERIMENT |
|-------------------|--------------------------|
| Jan. 10 & 17 | N. Separation of Cations |
| Jan. 24 & Feb. 31 | O. Electrolysis |
| Feb. 7 & 14 | X. Redox Titration |
| Mar. 7 & 14 | U. Vanadium |
| Mar. 21 & 28 | W. Chemical Kinetics |
| Apr. 4 & 11 | ** Check-out ** |

*TEXT: Chemistry 105, Laboratory Experiments, University of Alberta, 1993.