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GRANDE PRAIRIE REGIONAL COLLEGE  
DEPARTMENT OF SCIENCE  
TWENTY-EIGHTH SESSION 1993/94

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CHEMISTRY 1040: Introductory University Chemistry, SECTION A23

PREREQUISITE: Chemistry 30 or equivalent

PRE/COREQUISITE: Math 1130 or Math 1140

INSTRUCTOR: Les Rawluk, Office #J210  
Telephone 539-2738 (Office)

TRANSFER CREDIT: U of Alberta: Chem 104, 6 credits  
U of Calgary: Chem 201 and Chem 203, 6 credits  
U of Lethbridge: Chem 1000 and Chem 2000, 6 credits

LECTURES: Monday, Wednesday, Friday 11:00 - 11:50 in J201

TEXT BOOK: *CHEMICAL PRINCIPLES*  
Steven S. Zumdahl  
D.C. Heath and Company, Toronto  
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LABORATORY: Chemistry 100/104 Experiments, University of Alberta, 1993/94  
A hard cover Laboratory Notebook used to record all observations and notes.

**Lab coats and safety glasses are compulsory**, and are available at the Bookstore.

A Laboratory Breakage Deposit of \$30 per Chemistry course must be paid to the Cashier (Room C315), and the receipt must be shown to the Laboratory Technician (Mrs. Omana Pillay) during the first Laboratory class.

SEMINAR: Seminars consist of problem solving, discussion of weekly problem sets, and a brief introduction to the upcoming Laboratory experiment.

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### COURSE EVALUATION

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First Midterm .....	12.5%
Christmas Exam .....	20.0%
Second Midterm .....	12.5%
Final Exam .....	25.0%
Assignments .....	10.0%
Lab reports .....	20.0%
Total .....	100.0%

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Assignments will be distributed on a weekly basis. Completion of assignments is essential to successfully understanding the course.

Attendance to all lectures and seminars is strongly recommended. Laboratory attendance is compulsory; a passing grade in the laboratory component is required to pass the course.

Students are required to maintain an overall average of 50% or better to pass the course.

## FALL SEMESTER COURSE CONTENT

- A: Chemical Foundations** Chapter 1 Pages 1-13
- A.1 The Scientific Method
  - A.2 Units of Measurement
  - A.3 Uncertainty in Measurement
  - A.4 Significant Figures and Calculations
  - A.5 Dimensional Analysis
- B: Atom, Molecules, and Ions** Chapter 2 Pages 19-49
- B.1 Early Atomic Experiments
  - B.2 Modern Atomic Structure
  - B.3 Molecules and Ions
  - B.4 Periodic Table
  - B.5 Naming Simple Compounds
- C: Stoichiometry** Chapter 3 Pages 51-84
- C.1 Atomic Masses; the Mole
  - C.2 Molar Mass/Molecular Weight
  - C.3 Percent Composition of Compounds
  - C.4 Determining the Formula of a Compound
  - C.5 Stoichiometric Calculations using a Balanced Chemical Equation
  - C.6 Calculations involving a Limiting Reagent
- D: Types of Reactions and Solution Stoichiometry** Chapter 4 Pages 85-130
- D.1 The Nature of Aqueous Solutions
  - D.2 Molarity
  - D.3 Precipitation Reactions and Limiting Reagents
  - D.4 Acid-Base Reactions
  - D.5 Oxidation-Reduction Reactions
- E: Gases** Chapter 5 Pages 131-177
- E.1 Gas Laws of Boyle, Charles, and Avogadro
  - E.2 Ideal Gas Law
  - E.3 Gas Stoichiometry
  - E.4 Partial Pressures
  - E.5 Kinetic Molecular Theory
  - E.6 Effusion and Diffusion
  - E.7 Intermolecular Collisions
  - E.8 Real Gases

<b>F: Atomic Theory</b>	<b>Chapter 12</b>	<b>Pages 469–535</b>
F.1 Electromagnetic Radiation		
F.2 The Nature of Matter		
F.3 Atomic Spectrum of Hydrogen		
F.4 Bohr Model		
F.5 Quantum Mechanics and the Atom		
F.6 Particle in a Box		
F.7 Hydrogen Wave Function and a Physical Interpretation		
F.8 Hydrogen Orbitals		
F.9 Pauli Principle		
F.10 The Aufbau Principle and the Periodic Table		
F.11 Trends in Atomic Properties		
<b>G: Structure and Bonding</b>	<b>Chapter 13</b>	<b>Pages 537–597</b>
G.1 Types of Chemical Bonds		
G.2 Electronegativity		
G.3 Bond Polarity and Dipole Moments		
G.4 Ions		
G.5 Binary Ionic Compounds		
G.6 Covalent Bonds		
G.7 Localized Electron Model		
G.8 Lewis Structures		
G.9 Exceptions to the Octet Rule		
G.10 Resonance		
G.11 VSEPR Model		
<b>H: Transition Metals and Coordination Chemistry</b>	<b>Chapter 20</b>	<b>Pages 847–892</b>
H.1 A Survey of the Transition Metals		
H.2 First-row Transition Metals		
H.3 Coordination Compounds		
H.4 Isomerism		

## WINTER SEMESTER COURSE CONTENT

- I: Chemical Equilibrium** Chapter 6 Pages 179–210
- I.1 The Equilibrium Condition and Equilibrium Constant
  - I.2 Equilibrium Expression Involving Pressures
  - I.3 Activity
  - I.4 Heterogeneous Equilibria
  - I.5 Applications of the Equilibrium Constant
  - I.6 Le Châtelier's Principle
- J: Acids and Bases** Chapter 7 Pages 211–257
- J.1 The Nature of Acids and Bases
  - J.2 Acid Strength and the pH Scale
  - J.3 Calculating the pH of Strong/Weak Acids
  - J.4 Bases
  - J.5 Polyprotic Acids
  - J.6 Salts
  - J.7 Contributions to  $[H^+]$  from Water
- K: Applications of Aqueous Equilibria** Chapter 8 Pages 259–323
- K.1 Common Ion Effect
  - K.2 Buffers
  - K.3 Titrations
  - K.4 Solubility Equilibria and the Solubility Product
  - K.5 Complex Ion Equilibria
- L: Thermochemistry** Chapter 9 Pages 325–370
- L.1 Types of Energy; Work and Heat
  - L.2 Enthalpy and Thermodynamics of Ideal Gases
  - L.3 Calorimetry
  - L.4 Hess's Law
  - L.5 Standard Enthalpy of Formation
- M: Thermodynamics: Entropy and Free Energy** Chapter 10 Pages 371–423
- M.1 Spontaneous Processes and Entropy
  - M.2 Isothermal Expansion and Compression of an Ideal Gas
  - M.3 Entropy: Physical Changes and the Second Law
  - M.4 Effect of Temperature on Spontaneity
  - M.5 Free Energy
  - M.6 Entropy and Free Energy in Chemical Reactions
  - M.7 Pressure Dependence of Free Energy
  - M.8 Free Energy and Equilibrium
  - M.9 Free Energy and Work

**N: Electrochemistry**

Chapter 11 Pages 425-467

N.1 Galvanic Cells

N.2 Standard Reduction Potentials

N.3 Cell Potential, Electrical Work, and Free Energy

N.4 Cell Potential Dependence on Concentration

N.5 Electrolysis

**O: Chemical Kinetics**

Chapter 15 Pages 637-691

O.1 Reaction Rates

O.2 Introduction to Rate Laws

O.3 Determining Rate Law Form

O.4 Integrated Rate Law

O.5 Reaction Mechanisms

O.6 Steady State Approximation

O.7 Catalysis