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**GRANDE PRAIRIE REGIONAL COLLEGE  
DEPARTMENT OF SCIENCE AND TECHNOLOGY  
1998/99**

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CHEMISTRY 2710: Chemical Thermodynamics — Energetics of Chemical Reactions

PREREQUISITE: CHEM 1020 or equivalent and  
MATH 1130 or equivalent

INSTRUCTOR: Les Rawluk Office J214 539-2738

TEXT BOOK: Physical Chemistry, 6<sup>th</sup> Edition,  
by P.W. Atkins

LABORATORY ITEMS: Chemistry 271 Laboratory Manual  
University of Alberta, 1998  
Lab coats and safety glasses  
Hard cover Physics Laboratory Note Book

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**COURSE EVALUATION**

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First Midterm Exam .....	15%
Second Midterm Exam .....	15%
Final Exam .....	35%
Assignments .....	10%
Lab reports and exam .....	25%

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## CH2710 COURSE OUTLINE

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### I. Gases

- Equations of state, Ideal Gas Law, Dalton's Law of Partial Pressures
- Temperature and the Zeroth Law of Thermodynamics
- Kinetic Molecular Theory and the its Basis for the Ideal Gas Law
- Nonideal Gases, the Van der Waals Gas

### II. The First Law of Thermodynamics

- Work, Heat, Energy, State Functions and Exact Differentials
- Stating the First Law
- Enthalpy, Heat Capacity, Thermochemistry, Calorimetry
- Bond Enthalpies, Born-Haber Cycle, Solubilities of Ionic Salts
- Temperature dependence of Enthalpy
- Work, Heat, Energy changes in Processes Involving Gases

### III. The Second and Third Laws of Thermodynamics

- Entropy and the Direction of Spontaneous Change, Interconversion of Heat and Work
- Stating the Second Law
- Entropy Changes in Reversible and Irreversible Processes
- Conditions for Equilibrium
- Standard Entropies and the Third Law of Thermodynamics
- Gibbs Energy, Helmholtz Energy, Chemical Potential, Maxwell Relations

### IV. Chemical Equilibrium

- Equilibria Involving Ideal and Nonideal Gases, Gas Fugacity, Activity and the Chemical Potential
- Solution Equilibria, Solute and Solvent Activities
- Heterogeneous Equilibria, Activities of Solids and Liquids
- Temperature and Pressure Dependence of Equilibrium Constants

### V. Phase Equilibria

- Pure Substances: Gas-Liquid, Gas-Solid, Liquid-Solid Equilibria
- Ideal Solutions of Non-electrolytes, Enthalpy and Entropy of Mixing, Raoult's Law, Henry's Law, Boiling Point Elevation, Freezing Point Depression
- Phase Diagrams for One and Two Component Systems