

CHEMISTRY 221

WINTER 2005

COURSE SUMMARY

Instructor: N.J. Meanwell
Office: F348B. Telephone: 370-3448
E-mail: meanwen@camosun.bc.ca

Texts: *The Elements of Physical Chemistry, Third Edition, by Peter Atkins*, is the recommended text. There is also a laboratory manual/study guide which all students must have. Both the text and the manual can be obtained from the bookstore.

There are also approximately ten texts kept in the library on reserve which can be signed out at the front desk.

A. COURSE CONTENT

1. Kinetics (12 lectures)

Topics to include:

- Factors influencing the rate
- Methods of following fast reactions
- Differential rate laws
- Methods of determining the form of the rate law
- Integrated rate laws
- Theories of reaction rates (collision theory and activated complex theory)
- Reaction mechanisms, slowest step approximation, steady state approximation
- Lindemann mechanism for unimolecular reactions
- Catalysis
- Enzyme catalysed reactions and the Michaelis-Menten mechanism
- Chain reactions and explosions.
- Photochemical reactions
- Reactions in solution

2. Thermodynamics (9 lectures)

Topics to include:

- First Law
- Internal energy, work and heat
- Heat capacity (constant pressure and constant volume)
- Calorimetry
- Enthalpy concept
- Enthalpy changes for physical and chemical processes
- Variation of enthalpy with temperature
- Second Law
- Entropy and entropy changes for typical processes
- Heat engines, refrigerators, and heat pumps
- Spontaneity of chemical reactions
- Free energy
- Free energy and maximum useful work
- Gibbs energy and equilibrium
- Clausius-Clapeyron equation

3. Electrochemistry (6 lectures)

Topics to include:

- Ionic conductivity and Kohlrausch's law
- Electrochemical cells
- Galvanic cells and electrolytic cells
- Half-reactions and electrodes
- Varieties of electrodes
- Cell potential, Nernst equation, cell potential and equilibrium
- Junction potentials
- Concentration cells
- Ion selective electrodes, the pH electrode
- Thermodynamic functions from cell measurements

4. Solutions and Colligative Properties (6 lectures)

Topics will include:

- Partial molar quantities
- Chemical potential
- Arrhenius theory of dissociation
- Debye-Huckel theory, ionic strength and activity
- Ideal and non-ideal solutions
- Raoult's law and Henry's law
- Elevation of the boiling point
- Depression of the freezing point
- Osmotic pressure

5. Phase Equilibria (6 lectures)

The topics will include:

- Phase diagrams for one- and two-component systems
- The lever rule
- The Gibbs phase rule
- Azeotropes and eutectic mixtures

B. SCHEDULE

1. Three lectures per week.
2. Assignments. Not marked but answers posted periodically.
3. Weekly laboratory work.
4. Review test of Chemistry 121 principles (week 5).
5. Midterm on Kinetics and Thermodynamics (week 9).
6. Final examination (three hours) after the end of the course. The final exam covers **ALL** the course material.

C. METHOD OF EVALUATION

The course mark is obtained using the following formula:

a. Laboratory reports:	25%
b. Review test:	15%
c. Midterm :	20%
d. Final examination:	40%

Note: You must pass both the lecture and laboratory portions of the course independently in order to pass overall.

D. GRADING

The following is the official grading scale:

>95	A+	80-84	B+	65-69	C+	50-59	D	0-49	F
90-94	A	75-79	B	60-64	C				
85-89	A-	70-74	B-						

The above is only a guideline and the exact equivalency will be determined by the instructor when all the marks are available.