Grande Prairie Regional College

Department: Academic Upgrading

Credit/Contact Hours:

CH 0130 is a 5-credit course with 5 hours/week lecture and 1.5 hr/week lab component.

COURSE OUTLINE – FALL and WINTER 2008/09

CH0130 5(5-0-1.5) Chemistry Grade 12 Equivalent

Instructor:	Dr. Devinder S Sekhon PhD	**Phone:**	539-2991
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Office Hours:	M, W, R, 9:00 – 9:50 or by appointment		

Prerequisite(s)/corequisite(s): CH0120 or equivalent, and MA0110 or equivalent

Required Text: Nelson Chemistry (Alberta 20 -30)

Course Description:

The major concepts to be covered in this course include Thermochemical Changes; Chemical Equilibrium as applied to Acids and Bases; Electrochemical Changes; and Chemical Changes of Organic Compounds. Problem solving is emphasized

Attendance and Classroom Decorum:

Regular attendance is expected of all students which is crucial to good performance in the course**. Any interruption due to lateness or use of cell phones or otherwise will not be permitted. You may be debarred from the final exam if your absences exceed 15% (10 days) of class days.**

Tests and Exams: All tests and exams **MUST** be written at the scheduled times unless **PRIOR** arrangements have been made with the instructor. A missed test (exam) will result in a score of **ZERO** on that test (exam).

Labs:

Attendance is compulsory in all labs. A missed lab will result in a score of **ZERO** in that lab. Make-up labs **CANNOT** be guaranteed. Labs reports must be handed in by the deadlines announced. Late lab reports will result in penalties. Labs handed in after two days will not be graded unless PRIOR approval of the Instructor has been secured.

Evaluation:

The final grade in the course will be based on the following components. Normally, evaluation will be grading norm referenced.

4 Tests	=	36%
Midterm Exam	=	24%
Labs	=	15%
Final Exam	=	25%

Grades will be assigned on the Letter Grading System.

Academic Upgrading Department

Grading Conversion Chart

Alpha Grade	4-point Equivalent	Percentage Guidelines	Designation
A^+	**4**	**90 – 100**	**EXCELLENT**
A	**4**	**85 – 89**	
A^-	**3.7**	**80 – 84**	**FIRST CLASS STANDING**
B^+	**3.3**	**76 – 79**	
B	**3**	**73 – 75**	**GOOD**
B^-	**2.7**	**70 – 72**	
C^+	**2.3**	**67 – 69**	**SATISFACTORY**
C	**2**	**64 – 66**	
C^-	**1.7**	**60 – 63**	
D^+	**1.3**	**55 – 59**	**MINIMAL PASS**
D	**1**	**50 – 54**	
F	**0**	**0 – 49**	**FAIL**

COURSE OBJECTIVES

UNIT 1 THERMOCHEMICAL CHANGES

Upon completing this unit, the student shall be able to

a. Define and explain the terms: System, and the Surroundings
b. State and explain the First law of thermodynamics giving examples
c. Explain the following terms: The internal energy, E, of a system, the enthalpy, H, of a system, and the changes in internal energy, ΔE and in enthalpy ΔH. State the difference between the two - E and H
d. Explain the sources of internal energy (or enthalpy) in systems, and explain how the bond energies in hydrocarbons originate from the sun
e. Explain endothermic and exothermic changes, and also the corresponding changes in enthalpy.
f. Write chemical equations to include enthalpy changes
g. Define specific heat capacity, c, of a substance, and state its units
h. Explain the principles and the working of bomb calorimeter, and how it can be used to determine ΔH. Use the equation: $\Delta H = mc \Delta T$ to solve related problems
i. Define and explain the terms: Heat (enthalpy) of reaction, ΔH; Heat (enthalpy) of formation, ΔH_f. Standard conditions.
j. Calculate the heat (enthalpy) of a reaction if heats (enthalpies) of formation of all the reactants and the products are given.
k. Calculate the heat (enthalpy) of formation of a reactant or a product if the heat (enthalpy) of the reaction, and the heats (enthalpies) of formation of all other species are given
l. Define heat (enthalpy) of combustion, ΔH_c, of a hydrocarbon, and explain how it can be determined using bomb calorimeter. Solve related problems
m. State Hess' law, and demonstrate how the enthalpy of a reaction can be calculated if enthalpies of related reactions are given. Solve related problems
n. Name the reactants in photosynthesis, and the products in cellular respiration. Also name the products in hydrocarbon combustion
o. Identify ways to use energy, particularly the fossil fuel energy, more efficiently
p. Identify and explain selection of different fuels used by communities in urban, rural and remote areas, and compare the selection to the fuels used by the early inhabitants of a particular area of Alberta
q. Evaluate the impact of the combustion of various energy sources, including fossil fuels and biomass, on personal health and the environment. Describe the technologies used by the early peoples to mitigate the harmful effects of combustion

WRITE TEST 1

UNIT 2 CHEMICAL EQUILIBRIUM: ACIDS AND BASES

Upon completing this unit, the student should be able to

a. Define rate of reaction and state its units
b. State the factors that affect rate
c. Express the rate of reaction in terms of the concentration of the reactants
d. Define the rate constant, and state factors that affect it
e. Discuss the transition state theory for chemical reactions and expolain energy of activation
f. Define irreversible and reversible reactions
g. Define equilibrium, and state conditions of equilibrium
h. Define equilibrium constant, and write mathematical expression for equilibrium constant for a given reaction
i. Explain the significance of the equilibrium constant and discuss the factors that affect it
j. Solve related mathematical problems
k. State Le Chatelier's principle, and apply it to predict changes to systems at equilibrium
l. Apply equilibrium theories and principles to analyze a variety of phenomena, e.g. escape of CO_2 from a carbonated beverage; role of oceans in the carbon cycle; solubility of O_2 in lake water, and so on
m. Define and explain Bronsted and Lowry concept of acids and bases
n. Identify acids and bases in a acid-base reaction
o. Define and identify conjugate acid-base pairs in acid-base reactions
p. Define strength of acids and bases, and state factors that affect their strengths
q. Name the common strong acids and bases
r. Define ionization of acids and bases in water as the solvent, and write down the expressions for the ionization constants, K_a and K_b, for acids and bases
s. Define pH and pOH, and state the relationship between them
t. Calculate the pH and pOH of a given acid or a base
u. Define and explain buffers, and discuss their role in living systems
v. Define indicators and discuss their use in titrations of acids and bases

WRITE TEST 2

WRITE MIDTERM EXAM

UNIT 3 ELECTROCHEMICAL CHANGES

Upon completing this unit, the student should be able to

a. Define and explain with examples oxidation, and reduction; and oxidizing and reducing agents
b. Split a given redox reaction into two half-reactions
c. Balance a given skeletal redox reaction in acidic and basic media using half-reactions method
d. Define and explain the concept of oxidation numbers (O.N.) and determine the oxidation number (O.N.) of an element in a given compound or ion using the rules for O.N.
e. Define spontaneous and non-spontaneous reactions
f. Explain how to construct an electrochemical (also Voltaic or Galvanic) cell using a spontaneous redox reaction
g. List all the parts of an electrochemical cell and identify the two electrodes – the anode and the cathode
h. Define reduction potential, E and standard reduction potential, E^0
i. Calculate the standard potential difference, E^0 for a cell when the standard reduction potentials of the two half-reactions making up the cell are known
j. Design a cell which uses a given redox reaction (or two half-reactions). Write the complete cell reaction, and calculate E^0 for the cell. Draw diagram for the cell listing all the parts and showing the direction of movement of all the charges
k. Discuss the construction and electrode reactions of common batteries
l. Define and explain electrolysis and electrolytic cell. Discuss the electrode reactions for the electrolysis of select molten and aqueous solutions. Discuss electroplating
m. State Faraday's laws of electrolysis, and discuss quantitative aspects of electrolysis relating charge, Q, (amount of electricity) to the current and the time
n. Solve problems based on electrolysis
o. Discuss corrosion, and describe methods to prevent corrosion
p. Describe how the process of trial and error was used by early people to extract metals from ores
q. Analyze redox reactions used in industry and commerce, such as pulp and paper, textiles, water treatment and food processing

WRITE TEST 3

UNIT 4 CHEMICAL CHANGES OF ORGANIC COMPOUNDS

Upon completing this unit, the student should be able to

a. Define organic compounds and organic chemistry.
b. Make distinction between organic compounds, and inorganic compounds containing carbon; e.g. carbonates, cyanides, CO_2 and carbides etc.
c. Describe organic compounds of significance in everyday life explaining their origins and applications
d. Name common organic compounds using IUPAC system. Give formulas of common organic compounds and draw their structural, condensed structural, and line diagrams
e. Name saturated and unsaturated aliphatic (including cyclic) and aromatic compounds containing up to ten carbon atoms in the parent chain
f. Define isomers and recognize the differences in the properties of isomers
g. Given the molecular formula of a hydrocarbon – saturated or unsaturated - be able to write all the possible isomers
h. Define functional groups and identify common organic compounds based on their functional groups
i. Compare, both within a homologous series and among compounds with different functional groups, the boiling points and solubilities of aliphatics, aromatics, alcohols, and carboxylic acids
j. Describe tests to identify alcohols, aldehydes, sugars and acids
k. Describe the physical, chemical, and technological processes (fractional distillation and solvent extraction) used to separate organic compounds from natural mixtures or solutions
l. Explain how science and technology are developed to meet societal needs; for example hydrogenation of oils to produce margarine, and the use of esters as flavouring agents
m. Describe Aboriginal use of organic substances for waterproofing, tanning, dyeing, medicines, and insect repellents
n. Explain the application of technology to produce organic compounds of vital importance to society; for example plastics, medicines, paints, pesticides, and so on

WRITE TEST 4

WRITE THE FINAL EXAM