DEPARTMENT OF ACADEMIC UPGRADING

COURSE OUTLINE CH0130 A3/B3 W13
CH0130 - Chemistry Grade 12 Equivalent- Winter 2013

INSTRUCTOR: Sheryl Heikel **PHONE:** Office: 780–539–2059
OFFICE: C417 **E-MAIL:** sheikel@gprc.ab.ca

OFFICE HOURS: 1:00pm - 2:00 pm Tuesdays, Thursdays or by appointment

PREREQUISITE(S)/COREQUISITE:
CH0120 (Chemistry 20),
and MA0122 (Math 20-2), or MA0120 (Math 20-1) or MA0130 placement**.**

REQUIRED TEXT/RESOURCE MATERIALS:

Nelson Chemistry (Alberta 20 -30)
Chemistry Data Booklet
Scientific calculator (if you need to purchase, a TI-30X IIS is recommended)
Lab Coat
3-ring binder
graph paper (fine lined *10 lines/cm* - may be printed from Moodle)

NOTE: There are approximately 300 pages of recommended printing for this course.

CALENDAR DESCRIPTION:
CH 0130 - Chemistry Grade 12 Equivalent 5 (5-0-1.5) HS
Course concepts include thermochemical changes; electrochemical changes; chemical equilibrium focusing on acid-base systems; and chemical reactions of select classes of organic compounds. Energy changes and safety are emphasized.

CREDIT/CONTACT HOURS: 5 credits; 6.5 contact hours per week
DELIVERY MODE(S): Classroom instruction and lab. Use of Moodle required.

TRANSFERABILITY:
Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability.

Important Dates: **Last day to** Withdraw with refund **January 21**
Withdraw with permission **March 11**

GRADING CRITERIA:

GRANDE PRAIRIE REGIONAL COLLEGE			
GRADING CONVERSION CHART			
Alpha Grade	*4-point Equivalent*	*Percentage Guidelines*	*Designation*
A^+	*4.0*	*90 – 100*	*EXCELLENT*
A	*4.0*	*85 – 89*	
A^-	*3.7*	*80 – 84*	*FIRST CLASS STANDING*
B^+	*3.3*	*77 – 79*	
B	*3.0*	*73 – 76*	*GOOD*
B^-	*2.7*	*70 – 72*	
C^+	*2.3*	*67 – 69*	*SATISFACTORY*
C	*2.0*	*63 – 66*	
C^-	*1.7*	*60 – 62*	
D^+	*1.3*	*55 – 59*	*MINIMAL PASS*
D	*1.0*	*50 – 54*	
F	*0.0*	*0 – 49*	*FAIL*
WF	*0.0*	*0*	*FAIL, withdrawal after the deadline*

EXAMINATIONS:

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). Only in very specific cases may student be given an opportunity to make up a missed exam (student will be presented with a different version of the exam). Doctor, lawyer or police documentation will be required. The final exam is 3 hours long and is scheduled by the registrars' office during GPRC Exam weeks.

STUDENT RESPONSIBILITIES:

Attendance: Regular attendance is expected of all students and is crucial to good performance in the course. Class interruption due to lateness will **NOT** be permitted. You may be debarred from the final exam if your absences exceed 15% of class days (10 lecture classes).

AUD Student Classroom Deportment Guidelines The Academic Upgrading Department is an adult education environment. Students are expected to show respect for each other as well as faculty and staff. They are expected to participate fully in achieving their educational goals.

Certain activities are disruptive and not conducive to an atmosphere of learning. In addition to the *Student Rights and Responsibilities* as set out in the College calendar, the following guidelines will maintain an effective learning environment for everyone. We ask the cooperation of all students in the following areas of classroom deportment.

1. Students are expected to turn off cell phones during class time or in labs. **NO texting in class.**
   No unspecified electronic devices will be allowed in exams.
2. Refrain from disruptive talking or socializing during class time.
3. Be respectful of others regarding food or beverages in the classroom.
   Clean up your eating area and dispose of garbage.
4. Recycle paper, bottles and cans in the appropriate containers.
5. Students are expected to **arrive on time and to remain for the duration of scheduled class**.
6. Children are not permitted in the classrooms.
7. Students are expected to notify his/her instructor of any extenuating circumstances.

STATEMENT ON PLAGIARISM AND CHEATING: Refer to the Student Conduct section of the College Admission Guide at http://www.gprc.ab.ca/programs/calendar/ or the College Policy on Student Misconduct: Plagiarism and Cheating at www.gprc.ab.ca/about/administration/policies/ **

**Note: all Academic and Administrative policies are available on the same page.

COURSE SCHEDULE/TENTATIVE TIMELINE:

Chemistry 0130 consists of four units (approx. 3 weeks each) **Tentative** Exam dates

A. Thermochemical Changes (ch 11,12)	January 25
B. Electrochemical Changes (ch 13,14)	March 1
Midterm Exam (20%)	March 5
C. Chemical Equilibrium - Acid-Base Systems (ch 15,16)	March 22
D. Chemical Changes of Organic Compounds (ch 9,10)	April 12

EVALUATION:

Course final grade will be based on the following components.

Unit Tests (4)	35%
Labs, Assignments, Quizzes (7-12)	15%
Midterm Exam	20%
Final Exam	30%
	100%

The final exam is 3 hours long and is scheduled by the registrars' office during Exam weeks. Final Grades will be assigned on the Letter Grading System.

Labs:

- Attendance is compulsory in all labs.
- Missed labs result in a score of zero. **There are NO make-up labs.**
- If you are late and have missed the lab safety discussion, you will be excluded from participating in the lab and will receive a mark of zero.
- Late lab reports will result in a penalty of 20% per day. Labs over two days late will not be graded without PRIOR approval.
- Download the lab sheets and complete the Pre-lab assignment before the lab period, data tables are completed during the lab and analysis and questions after the lab.

Lab Schedule				
	Tuesdays	L1	9:30 – 11:20 am	J119
		L2	11:30 am – 1:20 pm	J119
	Thursdays	L3	12:00 noon – 1:50pm	J119

Date	Lab	Room	Title
Jan 15/17	Check in-Safety	**J119**	
Jan 22/24	Lab 1 (unit A)	**J119**	Enthalpy (Hess's Law)
Jan 29/31	Lab 2 (Unit A)	**J119**	Rate of Reaction
Feb 5/7	**no class no lab**		
Feb 12/14	Lab 3 (Unit B)	**J119**	Redox reactions
Feb 19/21	**Fall break**		
Feb 24/26	Lab 4 (unit B)	**J119**	Electrochemical cells
Mar 5	**MIDTERM**	TBA	9:30am – 11:30am or 11:00am – 1:00pm
Mar 12/14	Lab 5 (Unit C)	**J119**	Chemical equilibrium
Mar 18/20	Lab 6 (Unit C)	**J119**	Equilibrium constants
Mar 26/28	**no class no lab**		
April 2/4	**Lecture**	**H211**	**A3 April 2** 10:00–11:20am **April 4** 10:00–10:50 am **B3 April 2** 11:30 – 12:50pm **April 4** 11:00-11:50 **April 4** 12:00-12:50
Apr 9/11	Lab 7-Checkout	**J119**	Condensation Polymers, Esters, and Nylon
Apr 16	**no class no lab**		

In this course your lab reports will not be required to follow formal formatting.

This page is included for your information. You may, for some future chemistry course be required to complete a formal lab write-up.

Formal Format for Lab Reports

*Labs must be in **ink** and **hand written** with the exception that diagrams, data tables, graphs, vector diagrams and example calculations may be in pencil. Data tables must be ready for the input of data BEFORE lab begins.*

Title - Center page, top. Each lab begins on a right hand page

Date - Top right corner

Your name - Top RIGHT corner
Lab partners names, if any - top LEFT corner

Objective - a short explanation of what it is you wish to test, study or determine in the lab. Include your experimental design (manipulated, controlled and responding variables) and/or hypothesis (an educated guess as to what will happen) if applicable.

Apparatus or Materials - list of those materials required to duplicate the lab. This may include a diagram if it helps to explain how the equipment is set up.

Theory - This includes balanced chemical formulae and any chemistry you must know in order to be able to understand the lab.

Procedure - Sufficient explanation that would enable someone else, not in the lab, to duplicate or repeat the experiment and verify your results. A diagram may be included here if it helps explain how to use or what to do with the equipment.

Observations or Data Collection - includes both written observations and data tables. In Data Tables units are found only at column heads and not within the data columns. A diagram may be included here if it helps to explain something you observed or saw happening in the lab.

Analysis - the **MEAT** of the lab - includes any, some, or all of the following:
Results
Example calculations - **one** of each type or formula you used. Include units.
Graphs - these are a tool to analyze data.
(These must be taped or glued in flat with no flip edges.)
Discussion of sources of error - this is unavoidable error, not poor technique
% error calculations
Answers to any questions asked in the lab

Conclusion - Evaluate your objective and your hypothesis. State the values you determined, discovered or verified. Were you correct in your hypothesis?

CH0310 Detailed Course Outline

Unit A. Thermochemical Changes

Key Concepts:

- enthalpy of formation
- enthalpy of reaction
- ΔH notation
- Hess' law
- molar enthalpy
- energy diagrams
- activation energy
- catalysts
- calorimetry

General Outcomes

1. determine and interpret energy changes in chemical reactions

- recall the application of $Q = mc\Delta t$ to the analysis of heat transfer
- explain, in a general way, how stored energy in the chemical bonds of hydrocarbons originated from the sun
- define enthalpy and molar enthalpy for chemical reactions
- write balanced equations for chemical reactions that include energy changes
- use and interpret ΔH notation to communicate and calculate energy changes in chemical reactions
- predict the enthalpy change for chemical equations using standard enthalpies of formation
- explain and use Hess' law to calculate energy changes for a net reaction from a series of reactions
- use calorimetry data to determine the enthalpy changes in chemical reactions
- classify chemical reactions as endothermic or exothermic (including those for the processes of photosynthesis, cellular respiration and hydrocarbon combustion)

2. explain and communicate energy changes in chemical reactions.

- define activation energy as the energy barrier that must be overcome for a chemical reaction to occur
- explain the energy changes that occur during chemical reactions, referring to bonds
- breaking and forming and changes in potential and kinetic energy
- analyze and label energy diagrams of a chemical reaction, including reactants, products, enthalpy change and activation energy
- explain that catalysts increase reaction rates by providing alternate pathways for changes, without affecting the net amount of energy involved; e.g., enzymes in living systems.

Unit B. Electrochemical Changes

Key Concepts:

- reduction
- oxidation
- oxidizing agent
- reducing agent
- oxidation-reduction (redox) reaction
- oxidation number
- half-reaction
- disproportionation
- spontaneity
- standard reduction potential
- voltaic cell
- electrolytic cell
- electrolysis
- standard cell potential
- Faraday's law
- corrosion

General Outcomes

1. explain the nature of oxidation-reduction reactions

- define oxidation and reduction operationally and theoretically
- define oxidizing agent, reducing agent, oxidation number, half-reaction, disproportionation
- differentiate between redox reactions and other reactions, using half-reactions and/or oxidation numbers
- identify electron transfer, oxidizing agents and reducing agents in redox reactions that occur in everyday life, in both living systems (*e.g., cellular respiration, photosynthesis*) and nonliving systems; i.e., corrosion
- compare the relative strengths of oxidizing and reducing agents, using empirical data
- predict the spontaneity of a redox reaction, based on standard reduction potentials, and compare their predictions to experimental results
- write and balance equations for redox reactions in acidic and neutral solutions by

-using half-reaction equations obtained from a standard reduction potential table
-developing simple half-reaction equations from information provided about redox changes
-assigning oxidation numbers, where appropriate, to the species undergoing chemical change

- perform calculations to determine quantities of substances involved in redox titrations

2. apply the principles of oxidation-reduction to electrochemical cells.

- define anode, cathode, anion, cation, salt bridge/porous cup, electrolyte, external circuit, power supply, voltaic cell and electrolytic cell
- identify the similarities and differences between the operation of a voltaic cell and that of
- an electrolytic cell
- predict and write the half-reaction equation that occurs at each electrode in an electrochemical cell
- recognize that predicted reactions do not always occur; *e.g., the production of chlorine gas from the electrolysis of brine*
- explain that the values of standard reduction potential are all relative to 0 volts, as set for the hydrogen electrode at standard conditions
- calculate the standard cell potential for electrochemical cells
- predict the spontaneity or nonspontaneity of redox reactions, based on standard cell potential, and the relative positions of half-reaction equations on a standard reduction potential table
- calculate mass, amounts, current and time in single voltaic and electrolytic cells by applying Faraday's law and stoichiometry.

Unit C. Chemical Equilibrium Focusing on Acid-Base Systems

Key Concepts:

- chemical equilibrium systems
- Brønsted–Lowry acids and bases
- reversibility of reactions
- Le Chatelier's principle
- titration curves
- conjugate pairs of acids and bases
- equilibrium law expression
- amphiprotic substances
- equilibrium constants Kc , Kw , Ka , Kb
- buffers
- acid-base equilibrium
- indicators

General Outcomes

1. explain that there is a balance of opposing reactions in chemical equilibrium systems

- define equilibrium and state the criteria that apply to a chemical system in equilibrium;
  i.e., closed system, constancy of properties, equal rates of forward and reverse reactions
- identify, write and interpret chemical equations for systems at equilibrium
- predict, qualitatively, using Le Chatelier's principle, shifts in equilibrium caused by changes in temperature, pressure, volume, concentration or the addition of a catalyst and describe how these changes affect the equilibrium constant
- define K_c to predict the extent of the reaction and write equilibrium-law expressions for given chemical equations, using lowest whole-number coefficients
- describe Brønsted–Lowry acids as proton donors and bases as proton acceptors
- write Brønsted–Lowry equations, including indicators, and predict whether reactants or products are favoured for acid-base equilibrium reactions for monoprotic and acids and bases
- identify conjugate pairs and amphiprotic substances
- define a buffer as relatively large amounts of a weak acid or base and its conjugate in equilibrium that maintain a relatively constant pH when small amounts of acid or base are added.

2. determine quantitative relationships in simple equilibrium systems.

- recall the concepts of pH and hydronium ion concentration and pOH and hydroxide ion concentration, in relation to acids and bases
- define K_w , K_a , K_b and use these to determine pH, pOH, $[H_3O^+]$ and $[OH^-]$ of acidic and basic solutions
- calculate equilibrium constants and concentrations for homogeneous systems and Brønsted–Lowry acids and bases (excluding buffers) when
- concentrations at equilibrium are known
- initial concentrations and one equilibrium concentration are known (ICE table)
- the equilibrium constant and one equilibrium concentration are known.

Unit D: **Chemical Changes of Organic Compounds**

Key Concepts:
- organic compounds
- naming organic compounds
- structural formulas
- structural isomers
- monomers
- polymers

General Outcomes

1. explore organic compounds as a common form of matter
   - define organic compounds as compounds containing carbon, recognizing inorganic exceptions such as carbonates, cyanides, carbides and oxides of carbon
   - dentify and describe significant organic compounds in daily life, demonstrating generalized knowledge of their origins and applications; e.g., methane, methanol, ethane, ethanol, ethanoic acid, propane, benzene, octane, glucose, polyethylene
   - name and draw structural, condensed structural and line diagrams and formulas, using International Union of Pure and Applied Chemistry (IUPAC) nomenclature guidelines, for saturated and unsaturated aliphatic (including cyclic) and aromatic carbon compounds - containing up to 10 carbon atoms in the parent chain (e.g., pentane; 3-ethyl-2,4- dimethylpentane) or cyclic structure (e.g., cyclopentane) - containing only one type of a functional group (with multiple bonds categorized as a functional group; e.g., pent-2-ene), including simple halogenated hydrocarbons (e.g., 2- chloropentane), alcohols (e.g., pentan-2-ol), carboxylic acids (e.g., pentanoic acid) and esters (e.g., methyl pentanoate), and with multiple occurrences of the functional group limited to halogens (e.g., 2-bromo-1-chloropentane) and alcohols (e.g., pentane-2,3- diol)
   - identify types of compounds from the hydroxyl, carboxyl, ester linkage and halogen functional groups, given the structural formula
   - define structural isomerism as compounds having the same empirical formulas, but with different structural formulas, and relate the structures to variations in the properties of the isomers
   - compare, both within a homologous series and among compounds with different functional groups, the boiling points and solubility of examples of aliphatics, aromatics, alcohols and carboxylic acids (general trends only)

2. describe chemical reactions of organic compounds.

   - define and identify simple addition, elimination, substitution, esterification and combustion reactions
   - predict products and write and interpret balanced equations for the above reactions
   - define, illustrate and provide examples of monomers (e.g., ethylene), polymers (e.g., polyethylene) and polymerization in living systems (e.g., carbohydrates, proteins) and nonliving systems (e.g., nylon, polyester, plastics) (addition and condensation polymers)
   - relate the reactions described above to major reactions that produce thermal energy and economically important compounds from fossil fuels.