GRANDE PRAIRIE REGIONAL COLLEGE
DEPARTMENT OF ACADEMIC UPGRADING

SEP. 16 2001

CHEMISTRY 0130
COURSE OUTLINE

INSTRUCTOR: DEVINDER S. SEKHON PhD

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TEXT BOOK: Introductory Chemistry by Sevenair and Burkett

COURSE GOALS: To provide an understanding of gases, thermochemistry, chemical kinetics, acids and bases, and electrochemistry. It is also hoped that the students will leave this course with an appreciation for chemistry, science, and nature.

PREREQUISITES: CH 0120 or equivalent, and MA 0120 or equivalent .
Students are also **REQUIRED** to know the names of all the common inorganic compounds.

ATTENDANCE AND LATENESS: Regular attendance is expected of all students, and is crucial to passing the course. Students who miss classes will soon find themselves falling behind and failing. Lateness will NOT be permitted as it interrupts the class.

TESTS AND EXAMS: All tests and exams MUST be written at scheduled times unless PRIOR arrangements have been made with the instructor. A missed test (exam) will result in a score of zero.

LABS: Attendance is compulsory for all labs. A missed lab will result in a mark of zero for that lab. Make-up labs CANNOT be guaranteed, and are up to the discretion of the instructor and the lab tech.- that too only for a reasonable cause to miss the lab.
All lab reports must be handed in by the deadlines announced. A one-day lateness will result in a penalty of 20% in the mark, and a two-day lateness in a penalty of 30%. Labs will NOT be graded if they are handed late by more than two days. To avoid penalty for lateness, prior arrangements must be made with the instructor.

EVALUATION: The final grade will be awarded based on the following components

4 Tests	= 32 %	(Tests 1 and 3: 10% each, and 2 and 4: 6% each)
Midterm	= 20 %	
Final	= 25%	
Lab	= 23 %	

NOTE: Records of lab and exam (test) scores will be kept for six months after the last day of classes. After that they will be destroyed.

COURSE CONTENT: The following topics will be covered over the semester. The numbers in the parentheses indicate the corresponding chapter(s) of the text. Please do as many questions as possible at the end of each chapter.

1. **REVIEW:** (7, 8 and 9) Upon completion of the review, you should be able to:

   a) Name most of the inorganic compounds if their formulas are given.
   b) Write formulas of inorganic compounds for which names are given.
   c) Given the reactants and the products, be able to write a balanced chemical equation.
   d) Interpret a given chemical equation in terms of masses and moles of all the reactants and the products.
   e) Given the mass (or moles) of one or more of the reactants or products, be able to calculate the mass or the number of moles of the rest of the reactants or products of a given chemical equation.
   f) State the relation between the mole and the volume of a gas at S.T.P. and use it in problem solving.
   g) Solve stoichiometric problems when a reactant is present in limiting amounts.

2. **GASES:** (11) Upon completion of this topic, you should be able to:

   a) State the physical characteristics of gases.
   b) State and explain gas laws of Boyle, Charles, Avagadro, the combined gas law, and the ideal gas law. State the units of R for different units of pressure.
   c) State the postulates of the Kinetic Molecular Theory.
   d) State and explain Dalton's and Graham's laws.
   e) Solve problems based on all the above laws.
   f) Explain the difference between ideal and non-ideal behavior of gases. State the conditions under which real gases approach ideal behavior.
   g) Explain intermolecular forces including Van der Waal's forces, and how such forces cause deviation from ideal behavior in gases.

WRITE TEST 1

3. **ENERGY CHANGES IN CHEMICAL REACTIONS:** (4) Upon completion of this topic, you should be able to:

a) Define and explain a system and surroundings.
b) Explain enthalpy, changes in enthalpy, exothermic and endothermic reactions.
c) Determine ΔH using the bomb calorimeter.
d) State and explain the following terms clearly: heat of reaction, heat of formation, heat of combustion, heat of neutralization. State the relationship between the heat of formation and heat of reaction. Solve related problems.
e) State and explain Hess' law of constant heat summation and apply it to calculate heats of reactions.
f) Solve other related problems.

NOTE: This topic is NOT covered well in the text.

WRITE TEST 2. WRITE MIDTERM FINAL

4. **CHEMICAL KINETICS:** (14) Upon completion of this topic, you should be able to:

a) Define the rate of a chemical reaction and state the factors that affect the rate. Also be able to draw a rate-time diagram.
b) State and explain the following terms clearly: rate law, rate constant, and the factors that affect it.
c) Express the rate of a reaction in terms of the rate constant and the molar concentrations of the reactants. Discuss implications and applications of rate law.
d) Explain the following terms in detail: transition state theory, activated complex, energy of activation and reaction coordinate. Be able to draw diagram showing all these quantities.
e) Explain the effect of temperature and catalyst on the rate of a reaction using transition state theory.

5. **CHEMICAL EQUILIBRIUM:** (14) Upon completion of this topic, you should be able to:

a) State and explain the following terms clearly: reversible reactions, law of mass action, chemical equilibrium.
b) State and explain equilibrium constant and the factors on which it depends. Write mathematical expression for equilibrium constant for a given reaction.
c) Given the equilibrium concentrations of the reactants and the products, be able to calculate the equilibrium constant. Conversely, given the value of the equilibrium constant and the concentrations of some of the reactants and the products, be able to calculate the concentrations of the rest of the species in a reaction at equilibrium.
d) State the factors that affect chemical equilibrium.
e) State and explain LeChatelier's principle and apply it to predict shifts in chemical equilibrium.
f) Explain heterogeneous equilibria and write the expression for the equilibrium constant for heterogeneous equilibria.
g) Solve related problems.

6. **ACIDS AND BASES:** (15) Upon completion of this topic, you should be able to:

a) Define acids and bases in terms of both, the Arrhenius, and the Bronsted-Lowry concepts.
b) Define and identify the conjugate base of a given acid and vice versa.
c) Define the strength of an acid and a base; and be able to list factors that affect the strength of an acid or a base.
d) Explain dissociation, and dissociation constant of an acid and a base. Write equations for both. Be able to list strong acids and bases.
e) Explain ion product of water. Define the pH of a solution and be able to compute pH from a knowledge of hydrogen ion concentration and vice versa. Explain pOH and state the relation between pH and pOH.
f) Compute the pH and pOH of strong acid and base solutions.
g) Compute the dissociation constants of weak acids and bases if pH or pOH values are given.
h) Compute the pH or pOH of weak acid or base solutions if the related dissociation constants are given.
i) Solve other related problems involving acids and bases.

WRITE TEST 3

7. **ELECTROCHEMISTRY:** (16) Upon completion of this topic, you should be able to:

a) Explain the following terms in detail: oxidation; reduction; oxidant; reductant; oxidation number; redox reactions.
b) Identify the oxidant, the reductant, the oxidized and the reduced species in a redox reaction.
c) Balance a redox equation using half reactions.
d) Explain the principle and working of a Galvanic Cell. Be able to draw a diagram for such a cell, labelling all parts and showing the direction of the electron flow and the migration of ions.
e) Explain the following terms in detail: standard reduction (or oxidation) potential for a reaction (or a half reaction); EMF of a cell.
f) Design a cell by combining two half reactions and be able to calculate its EMF if electrode potentials are known.
g) Explain standard hydrogen electrode.
h) Explain electrolysis, and Coulomb and Faraday units of charge.
i) Solve problems based on electrolysis.
j) Write the overall and net reactions for the electrolysis of common electrolytes.
k) List the parts of the following batteries and write the electrode half reactions and the overall reactions for them: lead storage battery; nickel-cadmium battery; common dry battery; and the alkaline battery.

WRITE TEST 4

WRITE FINAL EXAM