Registrar

W.92

GRANDE PRAIRIE REGIONAL COLLEGE
CHEMISTRY 130
COURSE OUTLINE

INSTRUCTOR: Nancy Fraser

OFFICE: J216

PHONE: 539-2980

OFFICE HOURS: T.B.A. (will be posted on my office door)
- other times can be arranged

TEXTBOOK & SUPPLIES: Chemistry: The Study of Matter, Dorin, Demmin, Gabel
Prentice Hall Publisher

- Lab coat
- Lab notebook
- Scientific calculator

COURSE GOALS: To provide an understanding of gases, energy changes in chemical reactions, chemical kinetics, chemical equilibrium, acids & bases, and electrochemistry. If time remains we will discuss bonding.

ATTENDANCE: Regular attendance is expected. Students who miss 20% or more of classes may be BARRED from writing the final.

LABS: There are 10 labs in the course. Students MUST pass the lab component of the course in order to pass the course.

TESTS & EXAMS: There will be 5 or 6 chapter tests, 1 midterm, and 1 final exam. The mid-term will probably be at the end of Chemical Kinetics. Absence from a test or exam will result in a mark of 0 unless previous arrangement is made with the instructor.

EVALUATION:

Labs	25%
Tests	25%
Mid-term	10%
Final	40%
	100%

CHEMISTRY 130

COURSE OBJECTIVES

The following is a brief list of objectives for various topics of the course. The list is by no means complete. Learn as much more as you can beyond these objectives.

1. REVIEW: On completing this topic, 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: On completing this topic, you should be able to,
   a) State the physical characteristics of gases.
   b) State and explain gas laws of Boyle, Charles, Gay-Lussac, Avagadro and the combined gas law. Also the ideal gas law. State the units of R.
   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 real gases and the conditions under which real gases approach ideal behavior.
g) Explain van der Waal's forces.

3. ENERGY CHANGES IN CHEMICAL REACTIONS: On completing this topic, you should be able to,
   a) Explain Enthalpy; Exothermic and Endothermic reactions.
   b) State and explain the following terms clearly: Heat of Reaction; Heat of Formation; Heat of Conbustion; Heat of Neutralization. State the relationship between the Heat of Formation and Heat of Reaction.
   c) State and explain Hess' Law of constant heat Summation and apply it to calculate heats of reactions.
   d) Solve other related problems.

4. CHEMICAL KINETICS: On completing this unit, the student should be able to,
   a) Define the rate of a chemical reaction and state the factors that affect the rate. Also be able to make a rate-time diagram.
   b) State and explain the following terms clearly: Molar concentration, Rate constant.
   c) Express the rate of a reaction in terms of the rate constant and the molar concentrations of the reactants.
   d) Explain the following terms in detail: Transition State Theory, Activated complex, Energy of activation and Reaction Coordinate. Be able to draw a diagram showing all these quantities.
   e) Explain the effect of temp. and catalyst on the rate of a reaction using transition state theory.

5. CHEMICAL EQUILIBRIUM: On completing 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 equilibrium 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 Le Chatelier's principle and apply it to predict shifts in chemical equilibrium.
   f) Explain common-ion effect.
   g) Explain heterogeneous equilibria and write the expression for the equilibrium constant for hetrogeneous equilibria.
   h) Explain solubility product.
   i) Solve related problems.

6. ACIDS AND BASES: Having completed this unit, the student 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 or 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 or a base. Write equations for both and be able to list strong acids and bases.
   e) Explain Ionic 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) Work out the numerical problems involving the use of concentration of various species, dissociation constant, pH and pOH.

7. ELECTROCHEMISTRY: On completing this unit, you should be able to,

a) Explain the following terms in detail:
Oxidation; Reduction; Oxidant; Reductant and 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 oxidation numbers and also using half reactions. (in acidic media only)

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 molten NaCl, aq. NaCl and aq. H_2SO_4.

k) Explain the working with electrode reactions of the following:
Dry Battery; Lead Storage Battery.

8. BONDING: On completing this topic, you should be able to,
   a) Give Lewis Symbols for elements.
   b) Explain with examples the formation of Ionic, covalent and the coordinate covalent bond, and be able to identify them in a compound or ion, the Lewis symbol for which is given.
   c) Explain polarity of bonds; Hydrogen bond and its significance
   d) Explain Hybridization of orbitals and formation of multiple bonds.
   e) Explain the difference between a sigma and a pi bond and be able to identify them in a given compound or an ion.
   f) Discuss the shape of a molecule or an ion based on the bonding of its atoms.