Inver Hills Community College

CHEM 1062: Principles of Chemistry II

A. COURSE DESCRIPTION

Credits: 5

Lecture Hours/Week: 4

Lab Hours/Week: 3

OJT Hours/Week: *.*

Prerequisites:
This course requires the following prerequisite
CHEM 1061 - Principles of Chemistry I

Corequisites: None

MnTC Goals: Goal 02 - Critical Thinking, Goal 03 - Natural Science

Continues CHEM 1061 with emphasis on properties of liquids and solids, properties of aqueous solutions, principles of kinetics, acid-base concepts, solution chemistry applied to chemical equilibria of weak electrolytes, electrochemistry, basic concepts of thermodynamics and nuclear chemistry. The lab component of this course provides the student with the opportunity to apply chemical concepts through observation, data collection, quantitative measurement, problem analysis and mathematical applications to chemistry. Approved safety goggles and a lab apron are required.

B. COURSE EFFECTIVE DATES: 01/01/1998 - Present

C. OUTLINE OF MAJOR CONTENT AREAS

1. Liquids and solids including phase diagrams and intermolecular forces 8%
2. Solution chemistry including solubility theory, concentration units and colligative properties 10%
3. Acid-base concepts including strength, pH/concentration calculations, titration curves and buffers 20%
4. Chemical kinetics including reaction orders, integrated rate laws, mechanisms and activation energy 18%
5. Chemical equilibrium including equilibrium calculations and Le Chatelier's principle 16%
6. Solubility equilibria and its application to precipitation analysis 5%
7. Electrochemistry foundations including balancing redox reactions and Nernst equation 8%
8. Thermodynamics indcluding laws, entropy, Gibb's free energy, spontaneity and relation to equilibria 10%
9. Nuclear chemistry foundations 5%

D. LEARNING OUTCOMES (General)

1. State the characteristics of liquids and solids, including phase change/diagrams, and identify intermolecular interactions and predict trends in physical properties.
2. Calculate solution concentrations and perform conversions between different units and calculate colligative properties.
3. Determine the rate of a reaction and its dependence on concentration, time, temperature and catalyst.
4. Determine the rate law from a reaction mechanism.
5. Write equilibrium constant expressions for different chemical equations and solve for equilibrium constant or equilibrium concentrations.
6. Apply Le Chatelier's Principle to predict the effects of concentration, pressure/volume, and temperature changes on the equilibrium mixtures.
7. Define acids and bases using three definitions, relate strength of an acid and its conjugate base to its molecular structure and analyze and solve acid/base equilibria problems and calculate pH of acids, bases, buffers and interpret titration curve.
8. Calculate solubility product constant Ksp and describe the factors that affect solubility including common ion effects and formation of complex ions.
9. Analyze and perform calculations with thermodynamic functions, enthalpy, entropy and Gibb¿s free energy and its relation to equilibria.
10. Balance redox reactions and calculate standard and nonstandard cell potentials and relate to standard free energy.
11. Balance and identify different types of nuclear reactions.
12. Use basic laboratory equipment properly and recognize characteristics of hazardous wastes, handle and dispose chemicals appropriately.

E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

Goal 02 - Critical Thinking

1. Gather factual information and apply it to a given problem in a manner that is relevant, clear, comprehensive, and conscious of possible bias in the information selected.
2. Imagine and seek out a variety of possible goals, assumptions, interpretations, or perspectives which can give alternative meanings or solutions to given situations or problems.
3. Analyze the logical connections among the facts, goals, and implicit assumptions relevant to a problem or claim; generate and evaluate implications that follow from them.

Goal 03 - Natural Science

1. Demonstrate understanding of scientific theories.
2. Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, students' laboratory experience in the collection of data, its statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.
3. Communicate their experimental findings, analyses, and interpretations both orally and in writing.
4. Evaluate societal issues from a natural science perspective, ask questions about the evidence presented, and make informed judgments about science-related topics and policies.

F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

G. SPECIAL INFORMATION

None noted