

SYLLABUS

CHEM& 163 General Chemistry w/Lab III

Russ Jones

I. COURSE DESCRIPTION AND PREREQUISITES

CHEM& 163 General Chemistry w/Lab III, 6 credits

Prerequisite: A grade of "C-" or better in CHEM& 162.

A continuation of general chemistry including thermodynamics, electrochemistry, descriptive chemistry of the elements, nuclear chemistry, and fundamentals of organic and biochemistry. Laboratory work includes qualitative analysis. 4 lecture hours; 4 lab hours. Satisfies specified elective requirements for the AA degree.

II. AIMS AND OBJECTIVES

CHEM& 163 supports the five Desired Student Abilities:

A. Competency in the Disciplines (rating: 4)

This course is the third of a three quarter sequence of courses, structured primarily for students majoring in the physical and biological sciences and for pre-professional students in engineering and health sciences. The primary focus is on the major topics of general chemistry. Students who successfully complete these courses will have a thorough understanding of the vocabulary and fundamental theories of modern chemistry. They will recognize the quantitative nature of chemistry and the correlation of experimental observations with the development of these theories. The laboratory portions of these courses reinforce this correlation by stressing the importance of laboratory technique and of accuracy in measurement and calculations in obtaining experimental data. Students who successfully complete these courses will be able to succeed in higher-level chemistry courses, both at Grays Harbor College and at transfer institutions.

B. Literacy (rating: 4)

Students must have college-level reading, writing, and quantitative skills to succeed in these courses. Appropriate methods for solving algebraic equations, including logarithmic equations, are reviewed throughout the sequence of courses.

C. Critical Thinking (rating: 3)

Students learn how to explain chemical and physical phenomena using the theories of chemistry, as well as successful strategies for interpreting and solving problems. They also learn to analyze and interpret information obtained from tables and graphs.

D. Social and Personal Responsibility (rating: 1)

These courses encourage personal responsibility by promoting appropriate classroom behavior and good work habits. They also encourage group activity, especially in the laboratory where students usually work in pairs.

E. Using Resources (rating: 2)

Students are encouraged to use computers for data analysis, graphing, and word processing. The course includes an exercise on obtaining information from The Handbook of Chemistry and Physics.

III. TEXTBOOKS

General Chemistry, Fourth Edition, John W. Hill, Ralph H. Petrucci, Terry W. McCreary, and Scott S. Perry. Pearson Prentice Hall, 2005.

Laboratory Manual for Principles of General Chemistry, Eighth Edition, by J. A. Beran. John Wiley and Sons, 2009

IV. OTHER INSTRUCTIONAL MATERIALS

Solutions for exercises in the text are on reserve in the library.

Sample examinations from a previous quarter are provided to the students. Answers are on reserve in the college library and are posted in the laboratory.

Review sheets containing objectives for each topic are provided before a new section of material is covered.

A Macintosh computer is available in the laboratory for student use.

V. TECHNIQUE OF INSTRUCTION

CHEM& 163 meet for four one-hour lecture and two two-hour laboratory sessions per week. The lecture and laboratory sessions allow ample time for students to ask questions.

Laboratory assignments, examination dates, and grading policy are provided at the beginning of each quarter. Three midterm examinations and a comprehensive final examination are given in each course. A standardized examination provided by the American Chemical Society, covering all of general chemistry, is also given.

Before each section of material students receive a review sheet, containing important terms and objectives, and an optional notebook assignment. The notebook assignment includes the definitions of terms and the answers to relevant problems from the text. For some chapters, additional problems and exercises are included in the assignment. Students must show their work for the assigned problems where appropriate.

VI. ORGANIZATION OF COURSE CONTENT

The titles in parentheses identify laboratory experiments that are relevant to specific course content.

1. Solubility and Complex Ion Equilibria

- Solubility product
- Common ion effect (Molar Solubility, Common-Ion Effect)
- Complex ion equilibria

2. Thermodynamics

- Laws of thermodynamics
- Enthalpy and entropy (Ice Calorimetry)
- Free energy and spontaneity
- Thermodynamics and equilibrium (The Thermodynamics of the Dissolution of Borax)

3. Electrochemistry

- Voltaic cells and reduction potentials
- Spontaneity of electrochemical reactions
- Nernst equation (Galvanic Cells, the Nernst Equation)
- Electrolytic cells (Electrolytic Cells, Avogadro's Number)
- Applications of electrochemistry

4. Nuclear Chemistry

- Radioactive decay and rates of decay (Detection and Properties of Radiation)
- Nuclear energy — fission and fusion
- Analytical and medical applications

5. Properties of the Metals and Coordination Chemistry

- Metallurgy
- Periodic trends in metallic behavior; physical and chemical properties
- Complex ions and coordination compounds (Transition Metal Chemistry)
- Isomerism and optical activity of complex ions; crystal field theory

5. Properties of the Nonmetals and Metalloids

- Molecular structures of the nonmetals and metalloids
- Physical and chemical properties of nonmetals and their compounds

6. Organic and Biochemistry

- Fundamentals of organic chemistry (Aspirin Synthesis and Analysis)
- Biological polymers

In addition to the laboratory experiments directly related to course content, other experiments Paper Chromatography, Synthesis of an Alum, and Qualitative Analysis.

VII. METHODS OF EVALUATION

A student's final grade is determined by his or her work in both lecture and laboratory. 75% of the grade is based on examinations and the notebook assignment (60 – 75% on examinations, 0 – 15% on the notebook) and 25% on laboratory reports. The contribution of examination and notebook scores to the final grade is based on a sliding scale. The more of the notebook assignment a student does, the less examination scores will contribute to the final grade. If a student does all of the assignment correctly (for the maximum 15%), examinations contribute 60%. If a student does two-thirds of the assignment (10%), examinations

contribute 65%. If a student does one-third of the assignment (5%), examinations contribute 70%, and so forth.

The grading scale is:

	87-89%	B+	77-79%	C+	67-69%	D+	
93-100%	A	83-86%	B	73-76%	C	60-66%	D
90-92%	A-	80-82%	B-	70-72%	C-	0-59%	F

VIII. ATTENDANCE POLICY

Attendance at lectures is strongly recommended. Attendance at laboratory sessions and at examinations is mandatory. Students are accountable for the proceedings of the class whether they attend or not.

IX. DISABILITIES STATEMENT

Students who have documented disabilities that require accommodation in compliance with the Americans with Disabilities Act should contact the Disability Support Services coordinator as well as the instructor of the course in order to ensure that together we create an optimal environment for educational achievement.