

COURSE PROFICIENCY OUTLINE

CHEMISTRY – 371

Honors 5 Credits

Purpose

Chemistry - 371 is offered to sophomores and juniors following the completion of a high level biology course. Strong mathematics and problem-solving abilities are expected. Previously learned scientific principles, skills, and ideas will be utilized in the course. The outcomes of the course will include the development of the students' knowledge of chemical principles, of high-level problem-solving skills, and of an understanding of the applications of chemistry to natural phenomena.

I. Student Outcomes 5.1, 5.2, 5.3, 5.4, 5.6, 5.7, 5.10

- A. Students will demonstrate an understanding of the terminology, facts, concepts, and applications of chemistry.
- B. Students will demonstrate the ability to utilize chemistry learning in simplified and in complex chemical-mathematics problem-solving situations.
- C. Students will demonstrate an understanding of chemistry and technology as related to daily life and the interrelationships of humankind, resources, energy and the environment.
- D. Students will utilize already attained competencies in science critical thinking skills, study and learning skills, reading, writing, listening and organizing skills, high level problem-solving skills, and laboratory manipulative and investigative skills and further these college preparatory skills.

II. Content 5.1, 5.2, 5.3, 5.4, 5.6, 5.7, 5.10

- A. Introduction - Chemistry, a process
 - 1. Chemistry as a human endeavor
 - 2. Science career ideas, related information and concepts
 - 3. Chemical measurement and calculations - dimensional analysis (factor-label math) and concept formulas
 - 4. Classification and changes undergone by matter
- B. Mole concept in chemistry
 - 1. Chemical shorthand - elements, compounds, reactions, formulas and equations, naming compounds
 - 2. Matter and energy relationships in chemical systems
 - 3. Mole concept and quantitative chemical problems; stoichiometry
 - 4. Formulas and percentage composition
 - 5. Heat measurements and calculations
- C. Atomic model in chemistry
 - 1. Historical development of models of the atom
 - 2. Scientific laws
 - 3. Simple atomic models

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4. Electron structure models of the atom; wave-particle duality
 5. Periodicity and structure
 6. Radioactivity and isotopes
 7. Nuclear reactions; applications
- D. Chemical bonding
1. Types of chemical bonds
 2. Factors which affect bonding - ionization energy, electron affinity, electronegativity, polarity, etc.
 3. Relationship between bonding and structure, hybridization, molecular orbitals
 4. Inorganic and organic compounds - applications of bonding, isomers, reactions, etc.
 5. Structure and properties of molecules
- E. Kinetic theory of matter
1. Particle motion
 2. Solids; crystal structure
 3. Liquids - vapor pressure, phase changes, properties
 4. Gas laws - combination problems
 5. The mole and gas law relationships
- F. Energy in chemical reactions
1. Enthalpy, entropy and free energy
 2. Applied calculations
- G. Solution chemistry
1. Basic solution chemistry and calculations, molarity, etc.
 2. Colligative properties
 3. Reaction rate and mechanisms, chemical equilibrium and calculations
 4. Acid-base chemistry; titrations
 5. Le Chatelier's principle with applications
 6. Law of mass action, problem-solving
 7. Acid-base equilibria, pH, pOH, logs and calculations, hydrolysis, buffers, ionic equilibria, solubility product
- H. Redox chemistry
1. Basic models
 2. Electrochemistry and electrolysis; applications

III. Activities and Materials

A. Text - Zumdahl - Introductory Chemistry: A Foundation

B. Classwork

1. Lectures, note-taking, discussions, demonstrations, problem-solving development, formula and equation writing, audio-visual materials and regular tests and quizzes will be utilized.
2. College preparatory skills such as reading, writing, listening and note-taking, problem-solving, information processing, reporting and interpreting, and science learning skills will be utilized.

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- C. Laboratory activities - developing an attitude toward safety
 1. Use of chemistry laboratory apparatus such as balances, volumetric apparatus, glassware set-ups, and computer assisted experiments.
 2. Studies developing quantitative relationships in chemistry, problem-solving skills and quantitative and qualitative concepts.
 3. Studies developing scientific skills and science critical thinking skills.
 4. Studies of scientific principles and their applications related to the course content.
- D. Assignments - to be checked and reviewed by the teacher and students utilizing college preparatory reading, writing, chemical shorthand, organizational and process thinking skills and problem-solving techniques and skills.
 1. Readings - text and other sources, outlining and the organization of information
 2. Written answers to questions
 3. Formula writing, equation writing and problem-solving practice
 4. Laboratory and other reports utilizing various techniques and methods
 5. Science study-learning assignments

II. Evaluation

- A. Students will be expected to complete classwork and homework learning assignments, laboratory work and reports, and make up work missed whenever it is practical to do so.
- B. Students will be expected to demonstrate a high level of proficiency in all of the goals and objectives of the course within the previously defined content and process areas.
- C. The evaluation of student deficiencies shall consist of tests and quizzes, written assignments and reports, lab reports, and the teacher's regular observations of students' proficiencies, involvement and learnings in classroom environment and laboratory activities.
- D. Students will take a comprehensive final examination. This exam will count as 20% of the final grade.
- E. The final grade represents the teacher's professional judgment of the student's performance and all of the aforementioned activities and/or requirements are included in the evaluative process.

