

Curriculum Outline



Campbell High School

Character – Courage – Respect – Responsibility

Course & Level: Honors Chemistry

Department: Science

Teacher: Michael O'Keefe

Grade level: Juniors & Seniors

Description of Course:

Honors Chemistry is designed for college bound students who are interested in pursuing a major in the sciences and as such is only suitable for students who exhibit high levels of motivation, commitment, academic maturity and who are self-directed. Throughout this course, you will encounter scientific concepts and physical relationships expressed mathematically. Honors Chemistry presents a rigorous treatment of the following concepts: the nature of matter; The Quantum Model; The Kinetic Molecular Theory; bonding; the gas laws; chemical kinetics; chemical equilibrium; thermodynamics; acids and bases; oxidation-reduction; and an introduction to Organic and Nuclear Chemistry. Laboratory experiments will be used to reinforce the concepts covered. All enrolled students are expected to pick up a textbook and summer assignments before leaving in June. An exam will be given the first week in September on the assigned summer assignments. Students will use the web and other sources to research, analyze, and evaluate scientific advances, discoveries, current issues, or other topics of interest and in formal research reports will describe the impact they have had in the past or may have in the future.

School – Wide Expectations:

Academic:

1. Read, write and speak effectively
2. Exhibit critical thinking and problem solving skills
3. Use resources to obtain information and facilitate learning

The school-wide expectations are incorporated into all courses at Campbell High School. Underlined words in the following text illustrate this alignment between the school-wide expectations and the course

Civic/Social:

1. Work cooperatively in an atmosphere of mutual respect
2. Exhibit personal responsibility

Core Competencies and State Standards:

Scientific Knowledge I (Semester 1): Students will demonstrate their knowledge both orally and in writing. They will also demonstrate their understanding of the subject matter by exhibiting critical thinking and problem solving skills. The nature of matter; The Scientific Method; The Kinetic Molecular Theory; the atom and electron configurations; The Quantum Model; The Periodic Law and trends; the concept of the mole; chemical bonding; chemical formulas; chemical compounds; and chemical equations.

PS 1 All living and nonliving things are composed of matter having characteristics properties that distinguish one substance from another.

PS 2 Energy is necessary for change to occur in matter. Energy can be stored, transferred and transformed, but cannot be destroyed.

PS4 The growth of scientific knowledge in Physical Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

Scientific Knowledge II (Semester 2): Students will demonstrate their knowledge both orally and in writing. They will also demonstrate their understanding of the subject matter by exhibiting critical thinking and problem solving skills. Stoichiometry; the gas laws; solids/liquids and intermolecular forces; solutions; acids and bases; thermodynamics; chemical kinetics; and oxidation-reduction reactions.

PS 1 All living and nonliving things are composed of matter having characteristics properties that distinguish one substance from another.

PS 2 Energy is necessary for change to occur in matter. Energy can be stored, transferred and transformed, but cannot be destroyed.

PS4 The growth of scientific knowledge in Physical Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

Skill Competencies - Both Semesters

Scientific Investigation:

SPS1 – Scientific Inquiry and Critical Thinking Skills (INQ) **SPS2** – Unifying Concepts of Science **SPS3** – Personal, Social, and Technological Perspectives **SPS4** – Students will continue to develop the ability to analyze a problem and use the Scientific Method to find a solution. Students will perform standard laboratory experiments cooperatively and will also design their own experiments to reproduce the work of scientists who have made significant contributions to the field of chemistry. Students will explain the purpose for and the results of their work in formal laboratory reports. *Science Skills for Information, Communication and Media Literacy*

Scientific Research: Students will use the web and other sources to research, analyze, and evaluate scientific advances, discoveries, current issues, or other topics of interest and in formal research reports will describe the impact they have had in the past or may have in the future.

SPS1 – Scientific Inquiry and Critical Thinking Skills (INQ) **SPS2** – Unifying Concepts of Science **SPS3** – Personal, Social, and Technological Perspectives **SPS4** – Science Skills for Information, Communication and Media Literacy

Suggested Texts and Media (Software, AV, etc.):

1. Textbook and ancillary materials (concept development sheets, labs, etc): *Modern Chemistry* by Raymond E. Davis, PH.D., H. Clark Metcalfe, John E. Williams, & Joseph E. Castka
2. Video/DVDs: *World of Chemistry* series
3. PASCO *Datastudio* software

The science curriculum at Campbell High School is a dynamic document, reflecting the nature of the subject. It addresses ever-changing areas of study, such as genetics and quantum physics, as well as the fundamentals, such as the Periodic table and Newton's Laws of Motion. Scientific Research is an important component for each course at Campbell. The analysis and interpretation of recent scientific information and articles will vary appropriately with grade level and course difficulty. We utilize a variety of instructional resources beyond the identified textbooks and materials throughout the school year to enhance your student's educational experience. Parents/Guardians are welcome to review the available resources throughout the school year by contacting their student's teacher. Due to religious or moral objections, alternative assignments may be available upon request. Please contact the classroom teacher for further details.

Suggested Instructional Strategies:

1. **Laboratory Investigations** – Inquiry-based labs are used whenever feasible. In these, the students determine what question will be answered in the lab, research the topic, propose a hypothesis, plan the step-by-step procedure and determine what materials will be needed. Upon completion of the lab they write a formal lab report in which they are expected to graphically display and analyze their results and provide a detailed explanation of the reasoning that allowed them to reach a conclusion. For example, at the beginning of the year, students are asked to think of a question about a candle's chemical properties then design a lab to answer that question. Questions can range from, "What effect does wick length have on how long a candle burns?" to "How much oxygen does a candle use to burn?" to "Which type of candle burns hotter, paraffin or beeswax?" Each team must have a unique question and their lab must produce data that can be analyzed and graphed. They are provided with a lab report format as a guide.
2. **Lecture and Discussion** – Chemical concepts are presented, usually with the help of a PowerPoint presentation. A physical model or demonstration is employed whenever possible and practical applications are emphasized. Discussion is encouraged and often prompted by questioning of students during or following the presentation.
3. **Practice Time** – Lecture is frequently followed by an opportunity for students to practice or apply the concepts or calculations, usually via a worksheet or activity. This helps students convert the material from something they hear about to something they can use and manipulate.
4. **Activities, Explorations and Demonstrations** – In addition to formal labs, students are provided with a large variety of hands-on experiences to help illuminate chemistry concepts and calculations. These can be as brief as the Penny Activity, in which students see how many drops of water they can get on a penny before the surface tension breaks, to full-length labs that are not conducive to inquiry, so are guided by ready-made instructions and thought-provoking questions, such as the "Formula Weight of a Gas".
5. **Chemistry Research Project** – everything has a chemistry story behind it and this project lets students pick topics of interest to them and report back on the chemistry behind it. Popular topics are 'depression and neurotransmitters', 'the effect of steroids on the body', 'sun-tanning salons and the effects on the skin', 'gemstones', and 'the chemistry of fire.'
6. **Teamwork** – Students are expected to work cooperatively with a partner on their labs and are also encouraged to work together in class to compare strategies and offer mutual aid and insight.

Suggested Assessment Strategies:

1. **Tests and Quizzes** – Most chapter tests are a combination of multiple choice and problems. The types of problems depend upon the material in the chapter. They include questions like the correct use of math equations, writing ionic compounds given two ions, balancing reactions, solving stoichiometric questions, etc.
2. **Handout Completion** – Students can show their proficiency in a chapter by correct completion of the various handouts. These would include worksheets as well as activity/lab handouts.
3. **Lab write-ups** – Lab reports are an important tool in assessing student understanding of the concepts underlying the lab, as well as the ability to manipulate calculations appropriately and the student's lab skills.
4. **Class participation and groupwork** – This informal assessment tool often provides a unique insight into student understanding – or misunderstanding - displayed as students go about their work or labs. This has the added benefit of potentially being reinforced or corrected on the spot.
5. **Project Rubric**