Curriculum Outline

Campbell High School
Character – Courage – Respect – Responsibility

Course & Level: **Chemistry**

Department: **Science**

Teacher: **Michael O'Keefe**

Grade level: **Juniors & Seniors**

Description of Course:

This course is designed to provide students with a strong background in the fundamental concepts of chemistry. Topics covered will include the structure and properties of matter, chemical bonding, nomenclature, mole concept, solution chemistry, and the gas laws. Laboratory investigations will be used to reinforce content material. This course is intended for students applying to college. Students will analyze and evaluate scientific literature for contributions to, or for the impact they have had or may have on, the community, the environment, and/or the economy. Students will present their findings in the form of projects or papers.

School – Wide Expectations:

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 curriculum.

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

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 and properties of matter; The Scientific Method; The Kinetic Molecular Theory; the atom and electron configurations; The Periodic Law; and chemical bonding.

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. Chemical formulas; chemical equations; the gas laws; solids/liquids and intermolecular forces; acids and bases; and oxidation-reduction.

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 Competency - Both Semesters

Inquiry and Analysis - Students will continue to develop the ability to analyze a problem and use the Scientific Method to find a solution. Students will perform laboratory experiments cooperatively and in individual formal laboratory reports will explain: the purpose of the experiment; the hypothesis to be tested; the experimental approach used; data collected; and conclusions formed.

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*

Communication and Literacy Connections - Students will analyze and evaluate scientific literature for contributions to, or for the impact they have had or may have on, the community, the environment, and/or the economy. Students will present their research in the form of projects or papers.

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, A/V, 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**