Course: Chemistry 11

Teacher Name: Sheloah Klausen and Nicholas Ottenbreit

Contact Information: sklausen@sd44.ca, nottenbreit@sd44.ca

Course Description:

Chemistry 11 is an introduction into the field of applied chemistry that focuses primarily on the nature of matter. Throughout the course, students will learn the fundamental skills related to the gravimetric analysis of chemical reactions, atomic theory, solution chemistry, and the mole. Much of the course material is laboratory and problem based, with a significant mathematical component, therefore a sound working knowledge of the chemistry topics covered in science 10 as well as a strong standing in mathematics 10 will be essential to success. The goal of this course is to provide students with the knowledge of chemistry by giving them the skills they need to conceptualize rather than memorize chemistry.

Summer Learning Beliefs:

Summer Learning provides an engaging learning environment where all students can challenge themselves and fulfill their learning goals. To ensure this, students will:

- abide by the student Code of Conduct
- adhere to the Academic Honesty Policy
- adhere to the Summer Learning Student Engagement policy
- respect themselves and others
- attend every class and be punctual
- inquire, think, and engage to the best of their ability
- access technology in class when instructed to do so and for learning purposes only
- challenge themselves and have fun learning

All Summer Learning policies can be accessed at:
https://www.sd44.ca/school/summer/policies/Pages/default.aspx#/=

Course Plan:

Unit	Essential Questions	Content	Curricular Competencies	Assessment Task
The Mathematical Toolkit	How does mathematics inform our practice as chemists, and allow us to justify process decisions? How would you estimate the uncertainty in a measurement, and how does using significant figures communicate uncertainty?	**Dimensional analysis:** factor-label method (unit-analysis method), calculation of mass and molar quantities (using significant figures).	Use appropriate SI units and appropriate equipment, including digital technologies, to systematically and accurately collect and record data. Apply the concepts of accuracy and precision to experimental procedures and data, including significant figures, uncertainty and scientific notation. Evaluate methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions.	This is not a stand-alone unit, it will be evaluated throughout the course.
The Nature of Matter	How does the quantum mechanical model extend our understanding of the atom?	**Electron configuration** molecular geometry, valence shell electron pair repulsion (VSEPR) theory. **Chemical bonding** Lewis structures of compounds, polarity, covalent and hydrogen bonding, intra- and intermolecular forces, impact on properties.	Use knowledge of scientific concepts to draw conclusions that are consistent with evidence. Construct, analyze, and interpret graphs of electronegativity, atomic radii, and ionic radii. Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative).	Laboratory activities, solo and collaborative work, summative assessments.

The Mole	How has the mole as a quantity made chemical analysis more elegant, and attainable?	**The mole** as the fundamental unit of reaction analysis.	Analyze cause-and-effect relationships. Formulate physical or mental theoretical models to describe a phenomenon. Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative). Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative)	Summative, laboratory and formative assessments. The mole is a fundamental concept and you will see it throughout the course.
Chemical Reactions	How would you measure negative and positive impacts of chemical reactions on human health, society or the environment in your local community? Why do some materials dissolve in water or other liquids, but others do not?	**Reactions** predicting products, reactants and energy changes (ΔH) **Chemical processes** First Peoples traditional practices (e.g., tanning hides; preparation of food, soap, and natural bleach), smelting, pulp and paper production, food chemistry, photosynthesis and cellular respiration, development of petrochemical smog. **Green chemistry** development of sustainable processes and technologies that reduce negative impacts	Formulate physical or mental theoretical models to describe a phenomenon. Use knowledge of scientific concepts to draw conclusions that are consistent with evidence. Analyze cause-and-effect relationships. Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data	Laboratory activities, solo and POGIL collaborative work, formative and summative assessments. Project exploring place-based chemistry in BC and how it contributes positively, and negatively to the province including economically, environmentally and socioculturally.

		on the environment (e.g., reducing toxicity, designing benign solvents, increasing energy efficiency). **Solubility:** dissociation of ions, dissociation equations.	(qualitative and quantitative).	
Stoichiometry	What variables affect solubility, concentration (molarity), and conductivity? How could you use solution chemistry analysis techniques to investigate local water or soil samples?	**Stoichiometric calculations** using significant figures, mass, number of molecules, gas volumes, molar quantities, excess and limiting reactants. **Stoichiometric calculations in aqueous solutions:** Molarity, dilution effect, concentration of ions in solution when two, solutions are mixed. **Analysis techniques:** e.g., dissolved oxygen, pH, nitrates, phosphorus.	Formulate physical or mental theoretical models to describe a phenomenon. Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies.	Laboratory activities, solo and collaborative work, formative and summative assessments.
Organic Chemistry	How do organic compounds differ in structure and properties? How do the structure and geometry of organic compounds contribute to their usefulness in medicine, and other applications?	**Organic compounds** names, structures, geometry. **Applications of organic chemistry** First Peoples traditional practices (e.g., medicines), pharmaceuticals, petrochemicals, polymers, cosmetics, metabolism, agriculture, food, biotechnology.	Demonstrate an awareness of assumptions, question information given, and identify bias in their own work and in primary and secondary sources. Consider social, ethical, and environmental implications of the findings from their own and others' investigations.	Laboratory activities, solo and collaborative work, formative and summative assessments.

	Using knowledge shared by First Peoples, explore the uses of traditional medicines. What medicines have been used? Which particular health conditions are/were they used for?		Use knowledge of scientific concepts to draw conclusions that are consistent with evidence.	

Grade Descriptors:

"A" quality evidence of learning….
Produces high-quality, frequently innovative work. Communicates scientific ideas to connect and synthesize concepts and skills learned over time. Consistently demonstrates sophisticated critical and creative thinking. Collects, presents, and correctly transforms experimental data. Interprets, analyzes and critiques scientific findings and experimental data. Frequently transfers and extends knowledge and skills and uses concepts to solve non-routine, real-world problems, displaying initiative and expertise in their approach. Virtually no support is needed. Mistakes made are not reflective of gaps or deficiencies in mastery.

"B" quality evidence of learning….
Sometimes produces high-quality, innovative work. Communicates scientific ideas to compare and critique concepts and skills learned over time. Consistently demonstrates a degree of critical and creative thinking. Collects and presents scientific data in an appropriate manner. Assesses, interprets, and revises scientific findings and experimental data. Transfers knowledge and skills and uses concepts to consistently solve routine, real-world problems correctly with minimal guidance and occasional periods of greater support, with some mistakes sometimes indicative of gaps in mastery.

"C" quality evidence of learning….
Produces work of an acceptable, and inconsistent quality. Communicates a basic understanding of scientific concepts and operates superficially within a scientific contextual framework. Displays an emergent level of application when it comes to critical thinking skills. Collects scientific data in an appropriate manner. Is inflexible in the use of knowledge and skills, requiring moderate to high levels of support even in familiar classroom situations. Makes attempts to use knowledge, skills and scientific concepts to solve routine, real-world problems, with frequent mistakes indicative of gaps in mastery.

Resources:

Hebden Chemistry 11: A Workbook For Students

We would like to thank the Coast Salish people, specifically the Skwxwú7mesh Nation and Tsleil-Waututh Nation, on whose unceded traditional territory the North Vancouver School District resides. We value the opportunity to learn, share and grow on this traditional territory.