Information for Course Syllabus

Name of Course: Chemistry Honors

Grade Level: 10-12

School: ORHS

Major Assignments: None

Field Trips: None

How can parents access instructional materials? Canvas

Chemistry Honors
2021-2022

Term 1

Matter and Energy	**CHEM1.PS3.1** Contrast the concepts of temperature and heat flow in macroscopic and microscopic terms. Understand that heat is a form of energy and temperature is a measure of the average kinetic energy of a molecule.
	CHEM1.PS3.2 Draw and interpret heating and cooling curves and phase diagrams. Analyze the energy involved in calorimetry by using the Law of Conservation of Energy quantitatively (use $q=mc\Delta t$) and qualitatively.
	CHEM1.PS3.3 Distinguish between endothermic and exothermic reactions by constructing potential energy diagrams and explain the differences between the two using chemical terms (i.e. activation energy). Recognize when energy is absorbed or given off depending on the bonds formed and bonds broken.
	CHEM1.PS3.4 Analyze energy changes to explain and defend the Law of Conservation of energy.

Atoms and the Periodic Table	**CHEM1.PS1.11** Develop and compare historical models of the atom (from Democritus to quantum mechanical model) and construct arguments to show how scientific knowledge evolves over time, based on experimental evidence, critique, and alternative interpretation.
	CHEM1.PS1.12 Explain the origin and organization of the Periodic Table. Predict chemical and physical properties of main group elements (reactivity, number of subatomic particles, ion charge, ionization energy, atomic radius, and electronegativity) based on location on the periodic table. Construct an argument to describe how the quantum mechanical model of the atom (e.g., patterns of valence and inner electrons) defines periodic properties. Use the periodic table to draw Lewis dot structures and show understanding of orbital notations through drawing and interpreting graphical representations (i.e., arrows representing electrons in an orbital).

Naming Compounds	**CHEM1.PS1.13** Use the periodic table and electronegativity differences of elements to predict the types of bonds that are formed between atoms during chemical reactions and write the names of chemical compounds, including polyatomic ions using the IUPAC criteria.

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Term 1

The Mole	**CHEM1.PS1.1** Understand and be prepared to use values specific to chemical processes: the mole, molar mass, and percent composition.

Chemical Reactions	**CHEM1.PS1.2** Demonstrate that atoms, and therefore mass, are conserved during a chemical reaction by balancing chemical equations.
	CHEM1.PS1.4 Use the reactants in a chemical reaction to predict the products and identify reaction classes (synthesis, decomposition, combustion, single replacement, and double replacement).

Stoichiometry	**CHEM1.PS1.3** Perform stoichiometric calculations involving the following relationships: mole-mole, mass-mass, mole-mass, mole-particle, and mass-particle. Show a qualitative understanding of the phenomenon of percent yield, limiting and excess reagents in a chemical reaction through pictorial and conceptual examples (states of matter liquid and solid; excluding volume of gases).

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Term 2

Light and Modern Atomic Theory	**CHEM1.PS4.1** Using a model, explain why elements emit and absorb characteristic frequencies of light and how this information is used.
	CHEM1.PS1.11 Develop and compare historical models of the atom (from Democritus to quantum mechanical model) and construct arguments to show how scientific knowledge evolves over time, based on experimental evidence, critique, and alternative interpretation.
	CHEM1.PS1.12 Explain the origin and organization of the Periodic Table. Predict chemical and physical properties of main group elements (reactivity, number of subatomic particles, ion charge, ionization energy, atomic radius, and electronegativity) based on location on the periodic table. Construct an argument to describe how the quantum mechanical model of the atom (e.g., patterns of valence and inner electrons) defines periodic properties. Use the periodic table to draw Lewis dot structures and show understanding of orbital notations through drawing and interpreting graphical representations (i.e., arrows representing electrons in an orbital).

Chemical Bonding	**CHEM1.PS1.12** Explain the origin and organization of the Periodic Table. Predict chemical and physical properties of main group elements (reactivity, number of subatomic particles, ion charge, ionization energy, atomic radius, and electronegativity) based on location on the periodic table. Construct an argument to describe how the quantum mechanical model of the atom (e.g., patterns of valence and inner electrons) defines periodic properties. Use the periodic table to draw Lewis dot structures and show understanding of orbital notations through drawing and interpreting graphical representations (i.e., arrows representing electrons in an orbital).
	CHEM1.PS1.13 Use the periodic table and electronegativity differences of elements to predict the types of bonds that are formed between atoms during chemical reactions and write the names of chemical compounds, including polyatomic ions using the IUPAC criteria.
	CHEM1.PS1.14 Use Lewis dot structures and electronegativity differences to predict the polarities of simple molecules (linear, bent, trigonal planar, trigonal pyramidal, tetrahedral). Construct an argument to explain how electronegativity affects the polarity of basic chemical molecules.

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Gas Laws	**CHEM1.PS1.5** Conduct investigations to explore and characterize the behavior of gases (pressure, volume, and temperature), develop models to represent this behavior, and construct arguments to explain this behavior. Evaluate the relationship (qualitatively and quantitatively) at STP between pressure and volume (Boyle's Law), temperature and volume (Charles's Law), temperature and pressure (Gay-Lussac Law), and moles and volume (Avogadro's Law), and evaluate and explain the relationships with respect to kinetic-molecular theory. Be able to understand, establish, and predict the relationships between volume, temperature, and pressure using the combined gas law both qualitatively and quantitatively.
	CHEM1.PS1.6 Use the ideal gas law, PV=nRT, to algebraically evaluate the relationship among the number of moles, volume, pressure, and temperature for ideal gases.
	CHEM1.PS2.2 Understand the intermolecular forces created by the unequal distribution of charge result in varying degrees of attraction between molecules. Compare and contrast the intermolecular forces (hydrogen bonding, dipole-dipole bonding, and London dispersion forces) within different types of simple substances (only those following the octet rule) and predict and explain their effect on chemical and physical properties of those substances using models or graphical representations.

Solutions	**CHEM1.PS1.7** Analyze solutions to identify solutes and solvents, quantitatively analyze concentrations (molarity, percent composition, and ppm), and perform separation methods, such as, evaporation, distillation, and/or chromatography and show conceptual understanding of distillation. Construct arguments to justify the use of certain separation methods under different conditions.
	CHEM1.PS1.15: Investigate, describe, and mathematically determine the effect of solute concentration on vapor pressure using the solute's van't Hoff factor on freezing point depression and boiling point elevation.
	CHEM1.PS2.3: Construct a model to explain the process by which solutes dissolve in solvents and develop an argument to describe how intermolecular forces affect the solubility of different chemical compounds.
	CHEM1.PS2.4: Conduct and investigation to determine how temperature, surface area, and stirring affect the rate of solubility. Construct an argument to explain the relationships observed in experimental data using collision theory.

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Acids and Bases	**CHEM1.PS1.8** Identify acids and bases as a special class of compounds with a specific set of properties.

Nuclear Chemistry	**CHEM1.PS1.9** Draw models (qualitative models such as pictures or diagrams) to demonstrate an understanding of radioactive stability and decay. Understand and differentiate between fission and fusion reactions. Use models such as pictures (graphs or table) to explain the concept of half-life and its use in determining age of materials (such as radiometric dating).
	CHEM1.PS1.10 Compare alpha, beta, and gamma radiation in terms of mass, charge, and penetrating power. Identify examples of applications of different radiation types in everyday life (such as its applications to cancer treatment).