Information for Course Syllabus

On March 29th, 2016, Public Chapter 660 was signed into law. This statute requires a syllabus be made publicly available for all grades six (6) through twelve (12) social studies, science, math, and English language arts courses beginning with the 2016-17 school year. The syllabus for each course must include a course calendar that outlines the standards, objectives, and topics covered in the course; major assignments and field trips; and procedures for parental access to instructional materials.

We are going to help with providing this information on our Website; therefore, please complete the following form in your collaborative team and provide requested material. We need one completed form per course per grade level. This information is due by **September 1**. Thank you!

Name of Course: Chemistry, CP

Grade Level: 10, 11, 12

School: ORHS

Please list any major assignments and/or projects that will be completed during the course. Major assignments are defined as assignments that integrate multiple standards and/or are worth significant points towards the final course grade and/or span multiple days to complete.

Major Assignments: Click or tap here to enter text.

Field Trips: Click or tap here to enter text.

How can parents access instructional materials? Canvas

Please attach a pacing guide for your course if you teach middle school science or social studies or high school math, English, social studies or science. Please make sure that your pacing guide includes standards, topics and timeframe at a minimum.

Chemistry, CP Syllabus

Term 1

Unit 1: Lab Safety

Prior Knowledge: N/A

Mastery

- **Lab Materials:** Identify and correctly use laboratory equipment used in the chemistry classroom.
- **Lab Safety:** Perform laboratory investigations in a safe manner.

Extension: N/A

Unit 2: Measurement

Prior Knowledge: N/A

- **Metric Units:** Correctly include appropriate metric units on all measurements. (2.5)

Mastery

- **Scientific Notation:** Write numbers in both standard and scientific notation. (2.2)
- **Significant Figures:** Express answers with the correct number of significant figures. (2.3)

Extension

- **Ext. Significant Figures:** Determine the number of significant figures through calculations (2.4)

Unit 3: Matter and Energy

Prior Knowledge

- **Matter:** Define matter. (3.1)
- **Phases/States of Matter:** Describe the properties of solids, liquids, and gases in terms of molecular motion, molecular spacing, definite/indefinite shape and volume. (3.2)
- **Classification of Matter:** Compare and contrast elements, mixtures, and compounds. (3.3)

Mastery

- **Physical and Chemical Changes**: Compare and contrast physical and chemical properties/changes. (3.5, 3.6)
- **Separation Methods**: Perform separation methods such as evaporation, distillation, and chromatography, and analyze chemical and physical properties of a substance to construct an argument to justify the use of separation methods under different circumstances. (3.6)
- **Conservation of Mass:** Explain the law of conservation of mass. (3.7)
- **Energy:** Define energy and convert between energy units using dimensional analysis. (3.8)
- **Endothermic vs. Exothermic:** Compare and contrast endothermic and exothermic reactions in terms of an investigation, explanation, and energy diagrams of a chemical reaction. (3.9)
- **Heat and Temperature:** Compare and contrast heat and temperature. (3.10)
- **Calorimetry:** Analyze and explain the energy changes involved in calorimetry using the law of conservation of energy. (3.12)

Extension: N/A

Unit 4: Atoms and Elements

Prior Knowledge

- **Subatomic Particles:** Compare and contrast protons, neutrons, and electrons in terms of mass, charge, and location in the atom. (4.4)

Mastery

- **Models of the Atom:** Compare and contrast the historical models of the atom and use this as evidence to construct an argument to show how scientific knowledge evolves over time. (4.2, 4.3)
- **Periodic Table:** Use the periodic table to determine the make-up of an atom and describe trends in atomic radius. (4.5)
- **Periodic Law:** Use the periodic table to predict the chemical and physical properties of main group elements. (4.6)
- **Lewis-Dot Structures:** Draw Lewis-Dot Structures of the main group elements. (4.7)

- **Ion Formation:** Determine the ion charge from the number of protons and electrons and determine the number of protons and electrons in an ion. (4.7)
- **Isotopes:** Define isotope and determine the atomic number, mass number, and isotope symbol (4.8)

Extension

- **Ext. Atomic Mass:** Calculate atomic mass from percent natural abundance and isotopic masses. (4.9)

Unit 5: Molecules and Compounds

Prior Knowledge: N/A

Mastery

- **Nature of Elements and Compounds:** Compare and contrast atomic elements, molecular elements (identify the seven diatomic elements), molecular compounds, and ionic compounds. (5.4)
- **Nomenclature:** Write the names and formulas of compounds and molecules using IUPAC criteria. (5.5, 5.6, 5.7, 5.8)
- **Molecular Mass:** Calculate the molecular mass.

Extension

- **Ext. Types of Formulas:** Compare and contrast empirical, molecular, and structural formulas. (5.3)
- **Ext. Naming Acids:** Name and write formulas for binary and oxyacids. (5.9)

Term 2

Unit 6: Chemical Composition

Prior Knowledge: N/A

Mastery

- **Conversions:** Interconvert between moles and particles, atoms, molecules, and formula units. (6.3, 6.4, 6.5)
- **Mass Percent:** Determine the mass percent composition from a chemical formula. (6.7)

Extension

- **Ext. Empirical Formulas:** Determine and calculate the empirical formula from experimental and reaction data. (6.8)
- **Ext. Molecular Formulas:** Calculate a molecular formula from an empirical formula and molar mass. (6.9)

Unit 7: Chemical Reactions

Prior Knowledge: N/A

Mastery

- **Evidence:** Identify evidence of a chemical reaction in an investigation. (7.2)
- **Balancing Equations:** Balance a chemical equation and use the equation as evidence in an argument to defend the law of conservation of mass. (7.3, 7.4)
- **Types of Reactions:** Classify chemical reactions as synthesis, decomposition, single displacement, or double displacement. (7.10)

Extension

- **Solubility:** Determine whether a compound in soluble (7.5)
- **Precipitation Reactions:** Predict and write equations for precipitation reactions. (7.6)
- **Net Ionic Equations:** Write molecular, complete ionic, and net ionic equations. (7.7)
- **Other Equations:** Write equations for acid-base and gas evolution reactions. (7.8)
- **Redox:** Write equations for oxidation-reduction reactions. (7.9)

Unit 8: Quantities in Chemical Reactions

Prior Knowledge: N/A

Mastery

- **Stoichiometry:** Predict the amount (moles, mass, particles) or products produced when given the amount of reactants through mathematical modeling. (8.3, 8.4)
- **Limiting Reactant:** Demonstrate the phenomenon of percent yield, theoretical yield, limiting and excess reagents through pictorial and conceptual examples. (8.5)

Extension

- **Ext. Limiting Reactant:** Mathematically determine the limiting and excess reactant as well as percent yield. (8.6)
- **Ext. Enthalpy:** Calculate the amount of thermal energy emitted or absorbed by a chemical reaction. (8.7)

Term 3

Unit 9: Electrons in Atoms and the Periodic Table

Prior Knowledge: N/A

Mastery

- **Emission:** Using a model, explain why elements emit and absorb characteristic frequencies of light and how this information is used. (9.4)
- **Orbital Diagrams:** Illustrate the location of electrons in the quantum mechanical model through orbital diagrams. (9.6)
- **Electron Configuration:** Represent the location of electrons in the quantum mechanical model through the element's electron configuration. (9.6)
- **Quantum Mechanical:** Construct an argument to describe how the quantum mechanical model of the atom defines periodic properties. (9.5, 9.8)
- **Periodic Trends:** Use the periodic table to predict the chemical and physical properties of the main group elements and how this relates to reactivity, Lewis-dot structures, ion charge, ionization energy, and electronegativity. (9.9)

Extension

- **Ext. Electron Configuration:** Write electron configuration for elements based on their positons in the periodic table. (9.7)

Unit 17: Radioactivity and Nuclear Chemistry

Prior Knowledge: N/A

Mastery

- **Radioactivity:** Create models to demonstrate the concept of radioactive stability and decay using neutrons nuclear strong force as a means of explanation.
- **Types of Decay:** Compare and contrast alpha, beta, and gamma radiation in terms of mass, charge, and penetrating pattern as well as describe the change in the nucleus of the parent atom. (17.3)
- **Half-Life:** Use models such as graphs and tables to explain the concept of half-life and its use in radiometric dating. (17.5, 17.6)
- **Fission and Fusion:** Compare and contrast fission and fusion reactions. (17.7, 17.9)
- **Applications of Radiation:** Identify examples of applications of radiation. (17.10, 17.11)

Extension: N/A

Unit 10: Chemical Bonding

Prior Knowledge: N/A

Mastery

- **Lewis-Dot of Bonds:** Illustrate bonds using Lewis-dot structures. (10.3, 10.4, 10.5)
- **Molecular Geometry:** Predict the shapes of molecules. (10.7)
- **Types of Bonds:** Use the periodic table and electronegativity differences of elements to predict the type of chemical bond that will form between.
- **Polarity:** Determine whether a molecule is polar. (10.8)

Extension

- **Ext. Resonance:** Identify and illustrate resonance structures.

Term 4

Unit 11: Gases

Prior Knowledge: N/A

Mastery

- **Gas Behavior:** Use the kinetic molecular theory to conceptually explain the relationship of pressure, temperature, and volume in gases as well as volume and number of moles. (11.2, 11.3)
- **Gas Laws:** Use the gas law equations (mathematical models) to predict the quantitative relationship among pressure, temperature, and volume, as well as volume and number of moles. (11.4, 11.5, 11.6, 11.7)
- **Ideal Gas Law:** Use the ideal gas law equation (mathematical model) to predict the quantitative relationship among number of moles, volume, pressure, and temperature for ideal gases. (11.8)

Extension

- **Dalton's Law:** Restate and apply Dalton's law of partial pressures. (11.9)
- **Stoichiometry of Gases:** Apply the principles of stoichiometry to chemical reactions involving gases. (11.10)

Unit 12: Liquids, Solids, and Intermolecular Forces

Prior Knowledge: N/A

Mastery

- **Heating Curves:** Draw and interpret heating and cooling curves. (12.4, 12.5)
- **Heating Curve Calculations:** Use mathematical models to calculate the heat absorbed or released during phase changes. (12.4, 12.5)
- **Intermolecular Forces:** Define, compare, and contrast the intermolecular forces (hydrogen bonding, dipole-dipole bonding, London dispersion forces) within different substances and predict and explain the effect of intermolecular forces on substances using models and graphical representations. (12.6)
- **Phase Diagrams:** Draw and interpret phase diagrams.

Extension: N/A

Unit 13: Solutions

Prior Knowledge: N/A

Mastery

- **Solutions:** Use a model to explain the process by which solutes dissolve in solvents. (13.2, 13.3)
- **Rate of Solution:** Conduct an investigation to determine how temperature, surface area, and stirring affect the rate of solubility.
- **Solutions and Intermolecular Forces:** Develop an argument to describe how intermolecular forces affect the solubility of different chemical compounds. (13.3)
- **Concentration of Solutions:** Analyze solutions to describe their properties as well as mathematically analyze their concentrations in terms of molarity, molality, percent composition, and parts per million. (13.5, 13.6)
- **Colligative Properties:** Use the van't Hoff factor to mathematically determine freezing point depression and boiling point elevation. (13.9)

Extension

- **Solutions of Gases:** Relate the solubility of gases and liquids to temperature and pressure. (13.4)
- **Dilutions:** Use dilution calculations to create solutions of desired concentrations from stock solutions. (13.7)
- **Solution Stoichiometry:** Use the volume and concentration to calculate the number of moles of reactants or products and then use stoichiometric coefficients to convert to other quantities in a reaction. (13.8)

Unit 14: Acids and Bases

Prior Knowledge: N/A

Mastery

- **Properties of Acids and Bases:** Analyze the properties of a substance to determine if it can be categorized as an acid or a base. (14.2, 14.3, 14.5, 14.9)
- **Strength:** Discuss the solubility of acids and bases in terms of qualitative strength of acids and bases. (14.7)

Extension

- **Ext. Acids/Bases on a Molecular Level:** Identify Arrhenius acids and bases as well as Bronsten-Lowry acids and bases and their conjugates. (14.4)
- **Ext. Titration:** Use acid-base titration to determine the concentration of an unknown solution (14.6)
- **Ext. pH:** Use pH and pOH to calculate concentrations of $[H_3O^+]$ and $[OH^-]$. (14.9)
- **Ext. Buffers:** Describe how buffers resist pH change. (14.10)