

Wallenpaupack Area School District Planned Course Curriculum Guide

HIGH SCHOOL SCIENCE

Honors Chemistry II

Course Description:

Chemistry II is a continuation of Chemistry I with a strong emphasis on laboratory experiences. The concepts of stoichiometry, gas laws, intermolecular forces, solutions, thermochemistry, organic chemistry, and nuclear chemistry (time-permitting) are presented. The course requires knowledge in algebra to perform basic calculations.

Initial Creation Date and Revision Dates:

This curriculum was initially completed in the Fall of 2025 by Toni Ann Snyder.

Completion Date: October 2025

Textbook Resource:

Davis, R. E. (2009). *Modern Chemistry*. Holt, Rinehart and Winston.

Unit Breakdown (90 Days of 84 Minute Blocks):

1. Review of Chemistry I Topics
2. Stoichiometry
3. Properties of Gases and Gas Laws
4. Liquids and Solids
5. Solutions
6. Thermochemistry
7. Organic Chemistry
8. Nuclear Chemistry*

* This unit may be omitted based on lack of time due to snow/other interruptions

Wallenpaupack Area School District Curriculum	
COURSE: Honors Chemistry II	GRADE/S: 10-12
UNIT 0: Review of Chemistry I	TIMEFRAME: Approximately 2 weeks

PA STANDARDS/STEELS:

3.2.9-12.A: Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

3.2.9-12.C: Construct and revise an explanation for the outcome of a sample chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

UNIT OBJECTIVES:

1. Students will understand significant figures and be able to adhere to significant figure rules in calculations and while measuring.
2. Students will understand moles and be able to convert the mass of a substance to particles of a substance and vice versa.
3. Students will understand the defining characteristics of the three types of bonds.
4. Students will understand how to draw Lewis Dot Structures for basic chemical compounds and be able to determine the shape and polarity of molecules.
5. Students will be able to name and write formulas for compounds.
6. Students will be able to balance chemical equations.
7. Students will be able to identify the five basic types of chemical equations and predict the products of those reactions.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

1. Content delivered via YouTube videos; students are asked to watch videos for homework and take notes in teacher developed note packet
2. Modeling and scaffolding problems as direct class instruction
3. Demonstrations
4. Online simulations
5. POGIL activities
6. Worksheets to be graded on either completion or accuracy
7. Lab Activities

ASSESSMENTS:

1. Formative assessment from teacher observation and assignment checks
2. Summative assessment at the conclusion of the unit
3. Lab Activities

DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):

1. Bonus, multi-faceted questions provided on various concepts.
2. As a final project, students will research a topic of their choice related to chemistry and write a 10-page paper and present their findings to the class. This allows students with strengths and interest in a particular area to expand upon that knowledge.

RESOURCES (Technology Based Resources, Text Resources, etc.):

1. Davis, R. E. (2009). *Modern Chemistry*. Holt, Rinehart and Winston.
2. Ebbing, D. D., & Gammon, S. D. (2005). *General chemistry*. Houghton Mifflin.
3. Zumdahl, S. S., Zumdahl, S. A., & DeCoste, D. J. (2017). *Chemistry*. Cengage.
4. CollegeBoard; AP Chemistry
5. General Lab Equipment

KEY VOCABULARY:

chemistry, chemical, atom, molecule, compound, significant figure, density, proton, neutron, electron, mole, electron configuration, alkali metal, alkaline earth metal, transition metal, halogen, noble gas, Lewis dot structure, VSEPR theory, polarity, electronegativity, ionic, covalent, metallic, diatomic, synthesis, decomposition, single replacement, double replacement, combustion

Wallenpaupack Area School District Curriculum	
COURSE: Honors Chemistry II	GRADE/S: 10-12
UNIT 10: Stoichiometry	TIMEFRAME: Approximately 2 weeks

PA STEELS:

3.2.9-12.G: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

UNIT OBJECTIVES:

1. Students will understand mole ratios and be able to predict the mass of a product from the mass of a given reactant and vice versa.
2. Students will be able to identify the limiting reagent in a chemical reaction and calculate the mass of unreacted excess.
3. Students will be able to calculate percent yield by comparing theoretical yield to actual yield in reactions.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

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2. Modeling and scaffolding problems as direct class instruction
3. Demonstrations
4. Online simulations
5. POGIL activities
6. Worksheets to be graded on either completion or accuracy
7. Lab Activities

ASSESSMENTS:

1. Formative assessment from teacher observation and assignment checks
2. Summative assessment at the conclusion of the unit
3. Lab Activities

DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):

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6. POGIL Activities for High School Chemistry
7. PhET Interactive Simulations

KEY VOCABULARY:

stoichiometry, mole ratio, limiting reagent, excess reagent, percent yield

Wallenpaupack Area School District Curriculum	
COURSE: Honors Chemistry II	GRADE/S: 10-12
UNIT 11: Properties of Gases and Gas Laws	TIMEFRAME: Approximately 3 weeks

PA STEELS:

3.2.9-12.E: Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which the reaction occurs.

3.2.9-12.G: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

3.2.9.12.P: Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

UNIT OBJECTIVES:

1. Students will understand the five postulates of the kinetic molecular theory, and know the conditions at which an ideal gas behaves more like a real gas.
2. Students will understand and identify Boyle's Law, Charles' Law, Gay-Lussac's Law, the Combined Gas Law, Dalton's Law of Partial Pressures, the Ideal Gas Law, and Graham's Law of Effusion and be able to correctly solve problems using each.
3. Students will understand Avogadro's Law.
4. Students will be able to solve stoichiometric problems with gases at standard and non-standard conditions.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

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2. Modeling and scaffolding problems as direct class instruction
3. Demonstrations
4. Online simulations
5. POGIL activities
6. Worksheets to be graded on either completion or accuracy
7. Lab Activities

ASSESSMENTS:

1. Formative assessment from teacher observation and assignment checks
2. Summative assessment at the conclusion of the unit
3. Lab Activities

DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):

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KEY VOCABULARY:

kinetic molecular theory, elastic collision, kinetic energy, ideal gas, real gas, pressure, STP, Boyle's law, Charles' law, Gay-Lussac's law, combined gas law, partial pressure, Dalton's Law of partial pressures, water displacement, eudiometer, Avogadro's law, standard molar volume of a gas, ideal gas law, ideal gas law constant, Graham's law of effusion

Wallenpaupack Area School District Curriculum	
COURSE: Honors Chemistry II	GRADE/S: 10-12
UNIT 12: Liquids and Solids	TIMEFRAME: Approximately 3 weeks

PA STEELS:

3.2.9-12.B: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

3.2.9-12.N: Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

UNIT OBJECTIVES:

1. Students will understand the structure of and know the properties of the four types of solids.
2. Students will be able to differentiate between the five types of intermolecular forces.
3. Students will be able to qualitatively rank substances in order of increasing boiling or melting point by identifying both intramolecular and intermolecular forces present.
4. Students will understand vapor pressure.
5. Students will understand the phrase “like dissolves like” and be able to determine which substances will dissolve or mix with others.
6. Students will be able to interpret phase diagrams.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

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3. Demonstrations
4. Online simulations
5. POGIL activities
6. Worksheets to be graded on either completion or accuracy
7. Lab Activities

ASSESSMENTS:

1. Formative assessment from teacher observation and assignment checks
2. Summative assessment at the conclusion of the unit
3. Lab Activities

DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):

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KEY VOCABULARY:

ionic solid, covalent network solid, metallic solid, molecular solid, intermolecular forces, formula unit, electrostatic attractions, ductile, malleable, intramolecular forces, intermolecular forces, London dispersion, dipole-dipole, hydrogen bonding, ion-dipole, dipole-induced-dipole, polarizable electron

cloud, vapor pressure, volatile, phase diagram, triple point, normal boiling/freezing/melting point, critical point, supercritical fluid

Wallenpaupack Area School District Curriculum	
COURSE: Honors Chemistry II	GRADE/S: 10-12
UNIT 13: Solutions	TIMEFRAME: Approximately 3 weeks

PA STEELS:

3.2.9-12.C: Construct and revise an explanation for the outcome of a sample chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

3.2.9-12.E: Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which the reaction occurs.

3.2.9-12.G: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

3.2.9-12.R: Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

UNIT OBJECTIVES:

1. Students will be able to read a solubility chart and be able to differentiate between saturated, unsaturated, and supersaturated solutions.
2. Students will be able to differentiate between the solute and the solvent in a solution and be able to calculate the molarity and molality of a solution, as well as how to perform dilutions.
3. Students will understand colligative properties and be able to calculate vapor pressure lowering, freezing point depression, and boiling point elevation for solutions.
4. Students will be able to differentiate between electrolytes and non-electrolytes and be able to mathematically relate them to colligative properties.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

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3. Demonstrations
4. Online simulations
5. POGIL activities
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7. Lab Activities

ASSESSMENTS:

1. Formative assessment from teacher observation and assignment checks
2. Summative assessment at the conclusion of the unit
3. Lab Activities

DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):

1. Bonus, multi-faceted questions provided on various concepts.
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4. CollegeBoard; AP Chemistry

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KEY VOCABULARY:

solution, solute, solvent, electrolyte, non-electrolyte, dissociation, solubility, solution equilibrium, saturated solution, unsaturated solution, supersaturated solution, concentration, dilute, concentrated, molarity, dilution, molality, colligative properties, vapor pressure lowering, mole fraction, Raoult's law, freezing point depression, boiling point elevation

Wallenpaupack Area School District Curriculum	
COURSE: Honors Chemistry II	GRADE/S: 10-12
UNIT 13: Thermochemistry	TIMEFRAME: Approximately 2 weeks

PA STEELS:

3.2.9-12.D: Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

3.2.9-12.R: Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

3.2.9.12.P: Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

3.2.9-12.Q: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

UNIT OBJECTIVES:

1. Students will understand specific heat capacity, heat (enthalpy) of fusion, heat (enthalpy) of vaporization, and be able to calculate the heat energy absorbed or released for substances to undergo temperature and/or phase changes.
2. Students will be able to determine the properties of a chemical species by interpreting its heating or cooling curve.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

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3. Demonstrations
4. Online simulations
5. POGIL activities
6. Worksheets to be graded on either completion or accuracy
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ASSESSMENTS:

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2. Summative assessment at the conclusion of the unit
3. Lab Activities

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KEY VOCABULARY:

thermochemistry, temperature, heat, joule, exothermic, endothermic, enthalpy, calorimetry, specific heat capacity, thermal equilibrium, sublimation, deposition, condensation, vaporization, melting, freezing, enthalpy of fusion, enthalpy of vaporization, heating/cooling curve

Wallenpaupack Area School District Curriculum	
COURSE: Honors Chemistry II	GRADE/S: 10-12
UNIT 14: Organic Chemistry	TIMEFRAME: Approximately 2 weeks

PA STEELS:

3.1.9-12.F: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

3.2.9-12.G: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

UNIT OBJECTIVES:

1. Students will be able to identify the hybridization of carbon atoms in organic structures.
2. Students will be able to identify, draw, and name alkanes, cycloalkanes, alkenes, alkynes, and basic aromatics.
3. Students will be able to identify, draw, and name structural and geometric isomers.
4. Students will be able to identify, draw, and name organic compounds with functional groups.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

1. Content delivered via YouTube videos; students are asked to watch videos for homework and take notes in teacher developed note packet
2. Modeling and scaffolding problems as direct class instruction
3. Demonstrations
4. Online simulations
5. POGIL activities
6. Worksheets to be graded on either completion or accuracy
7. Lab Activities

ASSESSMENTS:

1. Formative assessment from teacher observation and assignment checks
2. Summative assessment at the conclusion of the unit
3. Lab Activities

DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):

1. Bonus, multi-faceted questions provided on various concepts.
2. As a final project, students will research a topic of their choice related to chemistry and write a 10-page paper and present their findings to the class. This allows students with strengths and interest in a particular area to expand upon that knowledge.

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KEY VOCABULARY:

organic chemistry, hybridization, alkane, saturated hydrocarbon, branching, cycloalkane, unsaturated hydrocarbon, alkene, alkyne, aromatic hydrocarbon, benzene, isomer, structural isomer, geometric isomer, cis/trans, functional groups, alcohol, alkyl halide, ether, aldehyde, ketone, carboxylic acid, ester, amine, amide, primary, secondary, tertiary

Wallenpaupack Area School District Curriculum	
COURSE: Honors Chemistry II	GRADE/S: 10-12
UNIT 15: Nuclear Chemistry	TIMEFRAME: Approximately 2 weeks

PA STEELS:

3.2.9-12.H: Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

3.2.9-12.G: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

UNIT OBJECTIVES:

1. Students will understand mass defect and be able to calculate the mass defect for a nuclide.
2. Students will be able to differentiate between nuclear fission and nuclear fusion.
3. Students will be able to identify, balance, and predict the products of the six different types of nuclear reactions.
4. Students will understand half-life and be able to calculate the amount of material remaining after a given amount of time.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

1. Content delivered via YouTube videos; students are asked to watch videos for homework and take notes in teacher developed note packet
2. Modeling and scaffolding problems as direct class instruction
3. Demonstrations
4. Online simulations
5. POGIL activities
6. Worksheets to be graded on either completion or accuracy
7. Lab Activities

ASSESSMENTS:

1. Formative assessment from teacher observation and assignment checks
2. Summative assessment at the conclusion of the unit
3. Lab Activities

DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):

1. Bonus, multi-faceted questions provided on various concepts.
2. As a final project, students will research a topic of their choice related to chemistry and write a 10-page paper and present their findings to the class. This allows students with strengths and interest in a particular area to expand upon that knowledge.

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KEY VOCABULARY:

nuclear chemistry, nucleus, nuclides, mass number, atomic number, proton, neutron, electron, radioactivity, nuclear reactions, alpha particle, beta particle, positron, gamma ray, alpha emission, beta emission, gamma emission, positron emission, electron capture, spontaneous fission, decay, band of stability, decay series, parent nuclide, daughter nuclide, half-life, mass defect, nuclear binding energy, nuclear fusion, nuclear fission, chain reaction, nuclear reactor, artificial transmutation