Board Approved
August 2009

Wilson Area School District
Planned Course Guide

Title of planned course: Honors Chemistry

Subject Area: Chemistry

Grade Level: 10

Course Description: The Honors Chemistry course, designed for college bound students, is intended to develop the students understanding of the materials that compose our universe. The content, ranging from measurement to electrochemistry, is studied using a variety of methods including extensive laboratory work.

Time/Credit for this Course: 7 period/week. 1.2 credits.

Curriculum Writing Committee: P. Stewart, C. Evans, S. Tozzoli

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Wilson Area School District
Planned Course Materials

Course Title: Honors Chemistry

Textbook: Modern Chemistry
Holt
Go.hrw.com

Supplemental Books: Teacher Discretion - Possibilites include:
Umland and Bellama
Zumdahl

Teacher Resources: Internet Lessons
Laboratory Manuals
SAT II Prep Materials
Laboratory Equipment and Chemicals

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Curriculum Map*

August: Mathematics and Measurement
Unit conversions and common physical definitions such as mole, molarity, and density

September: Nature of matter (Historical and Present)
Atomic Theory
Mole concept – stoiciometry including limiting reactant calculations
Empirical and molecular formation calculations
Subatomic particles (Discovery and nature)
Modern atomic structure including electron structure and quantum theory

October: Periodicity of atomic properties (physical and chemical)
Fundamentals of bonding and molecule formation
Orbital Hybrdization and VSEPR theory and applications to molecular shape and polarity

November: Intra/Inter molecular bonding and application to states of matter
Phase changes, cooling/heating curves, and phase diagrams
Gas Laws and distinction between real and ideal gases

December: Solutions – colligative properties and solubility
Molality
Raoult's and Henry's Law
Molar mass determinations

January: Equilibrium Concepts and Calculations
Acids and Bases
pH, titrations and buffers.

February: Thermodynamics
Governing principles behind reaction spontaneity
Entropy, Enthalpy, and Free Energy
Calorimetry
Hess's Law
Relations between equilibrium and thermodynamics.

March: Electrochemistry and Kinetics
Principles of oxidation and reduction
Galvanic and electrolytic cells
Reaction rates and factors that influence them.

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April:	Nuclear and Organic Chemistry Mass defect and relation of mass and energy Fundamentals of organic chemistry including functional group study, isomers, and hydrocarbon structure and nomenclature.
May:	Consolidation.
June:	Exams

* This map represents a model for the mapping of presentation of new concepts. All concepts must be integrated and used throughout the year for significant retention.

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 1: Applied Mathematics

Time frame: 2 Weeks

State Standards: 3.1.12.B,3.1.12.D

Anchor(s) or adopted anchor: S11.4.2.1.1

Essential content/objectives: At end of the unit, students will be able to:

- Describe the importance of scientific notation and use it in calculations
- Use rounding and simplification to perform mathematics without calculators
- Make use of units and conversion factors to perform scientific calculations. (Mole, Molarity, Density, etc.)
- Describe the difference between direct and inverse relationships and be able to represent them graphically and mathematically
- Describe the concept of a "constant" and how they are determined
- Determine the specificity of a measurement and its instrument
- Describe why a calculated value cannot contain less error than the measurements
- Perform % error calculations
- Compare precision and accuracy

Core Activities: Students will complete/participate in the following:

- Making Measurements
- Determining Density
- Preparing a solution
- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 2: Atomic Theory

Time frame: 1.5 Weeks

State Standards: 3.1.12.B, 3.1.12.E

Anchor(s) or adopted anchor: S11 C.1.1.1, S11 A.1.1.1

Essential content/objectives: At end of the unit, students will be able to:

- Describe how atomic theory has changed over the last 3 thousand years
- Describe three critical discoveries that supported the atomic concept
- Describe how Dalton's laws contributed to the ongoing atomic construct
- Describe how atomic masses and formulas were determined using Dalton's and Avogadro's experiments
- Distinguish between elements and compounds/pure substances and mixture
- Calculate empirical and molecular formulas and compare the two
- Determine and work with % compositions by mass
- Balance Chemical Equations and work quantitatively with them using stoichiometry (Limiting Reactants, % Yields, etc.)

Core Activities: Students will complete/participate in the following:

- Preparing a solution
- Determining an empirical formula
- Preparation of compound
- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 3: Modern Atomic Theory (Inside the Atom)

Time frame: 2 Weeks

State Standards: 3.1.12.B, 3.1.12.E, 3.4.12.B

Anchor(s) or adopted anchor: S11.A.1.1.1, S11.A.1.1.5, S11.A.3.3.3

Essential content/objectives: At end of the unit, students will be able to:

- Describe the experiments and results that led scientists to believe in sub-atomic particles
- Describe isotopes and their contributions to the average atomic mass of an element
- Describe how a mass spectrometer works and interpret basic spectra
- Compare the Rutherford, Bohr, and Quantum Models of the atom and supporting and contrary evidence for each
- Utilize both a qualitative and quantitative understanding of waves to describe the interaction of light with matter
- Describe how the discovery of spectral lines supported first the Bohr, then the quantum model of the atom
- Interpret basic IR, Visible, and UV spectra
- Understand relative positioning of frequencies in the EM spectrum.
- Utilize quantum theory (quantum numbers) to determine electron and orbital configurations for all elements
- Understand the importance of valence electrons and determine the likely number for most elements

Core Activities: Students will complete/participate in the following:

- Determining the electron transition using spectral lines
- Creating an absorption spectrum and standard curve
- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 4: Organization of Elements and Critical Properties

Time frame: 2 Weeks

State Standards: 3.1.12.C, 3.1.12.E, 3.4.12.C

Anchor(s) or adopted anchor: S11.A.3.3.1, S11.A.3.3.2, S11.C.1.1.2, S11.C.1.1.4

Essential content/objectives: At end of the unit, students will be able to:

- Describe both historical and modern methods for organizing elements
- Explain how our modern periodic table supports modern quantum theory
- Utilize modern nomenclature to identify elemental groups
- Describe the importance of atomic structure in comparing elemental properties such as atomic/ionic radii, electronegativity, ionization energy, electron affinity, metallic character, density, etc

Core Activities: Students will complete/participate in the following:

- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 5: Interactions Between Atoms

Time frame: 2 Weeks

State Standards: 3.1.12.E, 3.4.12.A

Anchor(s) or adopted anchor: S11.A.1.1.1, S11.C.1.1.3

Essential content/objectives: At end of the unit, students will be able to:

- Explain why atoms form bonds
- Determine the likely character (ionic vs. covalent) of a bond between atoms
- Deduce relative bond strengths
- Deduce formulas of compounds
- Provide the correct IUPAC name for both ionic and molecular compounds
- Describe why hybridization theory was necessary to explain observed bonding behavior
- Write plausible lewis structures for molecular compounds
- Use VSEPR theory to determine molecular shape, bond angles, and polarity
- Qualitatively describe why molecular orbital theory has replaced VSEPR and the localized electron model
- Describe the characteristics of the four principal bonding structures (metallic, ionic, covalent network, covalent molecular)
- Compare intra and inter molecular forces
- Determine relative strengths of attractive forces of substances and use this to predict relative boiling/melting points

Core Activities: Students will complete/participate in the following:

- Calculating lattice energies
- Paper Chromatography
- Rates of evaporation and inter-molecular forces
- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 6: States of Matter

Time frame: 2 Weeks

State Standards: 3.4.12.A

Anchor(s) or adopted anchor: S11.C.1.1.5

Essential content/objectives: At end of the unit, students will be able to:

- Describe the changes that occur during a phase change
- Describe the difference between an endothermic and exothermic process and how this affects the surroundings
- Accurately describe the changes that occur throughout a heating/cooling process
- Describe the roles of pressure, temperature, and internal bonding in determining phase
- Compare and contrast all phases of matter
- Utilize and understand a phase diagram for conventional materials as well as water
- Define pressure and the units used to measure it
- Describe the function of a barometer and manometer
- Describe vapor pressure, the factors that influence it, and it's relation to boiling
- Describe kinetic molecular theory and use it to explain the relationships between temperature, pressure, volume, and moles of a gas
- Quantitatively determine various characteristics of gases (volume, pressure, temperature, moles, density, molar mass, relative speed, mole fraction, etc.)
- Explain the difference between a real and ideal gas

Core Activities: Students will complete/participate in the following:

- Calculate Absolute Zero
- Determine molar mass of gas
- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 7: Solutions

Time frame: 2 Weeks

State Standards: 3.5.12.A

Anchor(s) or adopted anchor: S11.A.1.3.2, S11.A.2.1.2, S11.A.2.1.3

Essential content/objectives: At end of the unit, students will be able to:

- Determine the relative solubility of materials
- Write net-ionic equations
- Utilize a solubility chart
- Describe the factors that influence solubility including temperature, nature of materials, and pressure
- Determine heats of solution
- Describe how the addition of solute influences colligative properties such as vapor pressure, boiling point, freezing point, and osmotic pressure
- Determine Van Hoft factor for solutes
- Quantitatively determine solutions boiling point, freezing point, vapor pressure, osmotic pressure, and molar mass of solute

Core Activities: Students will complete/participate in the following:

- Determine boiling point of solution
- Preparation of precipitate
- Calculate heat of solution
- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 8: Equilibrium

Time frame: 2 Weeks

State Standards: 3.5.12.A

Anchor(s) or adopted anchor: S11.A.3.1.1, S11.A.1.3.1, S11.A.1.3.2, S11.A.3.1.2

Essential content/objectives: At end of the unit, students will be able to:

- Describe the equilibrium condition
- Describe the relation between energetics and equilibrium
- Write equilibrium expressions and understand the significance of the equilibrium constant
- Quantitatively determine equilibrium concentrations, the equilibrium constant, and Q
- Predict direction of reaction shift using Q and/or le-chatelier's principle

Core Activities: Students will complete/participate in the following:

- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 9: Acids/Bases

Time frame: 2 Weeks

State Standards: 3.1.12.D, 3.4.12.A

Anchor(s) or adopted anchor: S11A.1.3.1, S11.A.3.2.1

Essential content/objectives: At end of the unit, students will be able to:

- Define bronsted and lewis acids/bases
- Recognize and predict behavior of acids and bases
- Determine relative strengths of acids and bases
- Determine pH and pOH of solutions
- Apply equilibrium concepts to acid/base solutions
- Use titrations to quantitatively determine properties of solutions including concentrations or pH
- Understand the importance of buffer solutions and how to create one

Core Activities: Students will complete/participate in the following:

- Calculate pH of various solutions
- Titration
- Preparation of Buffer
- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 10: Thermodynamics

Time frame: 2 Weeks

State Standards: 3.1.12.A, 3.4.12.B

Anchor(s) or adopted anchor: S11.C.2.1.2, S11.C.2.1.3

Essential content/objectives: At end of the unit, students will be able to:

- Describe what factors influence the degree to which a reaction will be spontaneous
- Determine enthalpy change of a process using calorimetry, heats of formation, Hess's law, and bond energies
- Determine entropy change of a reaction
- Use gibb's free energy equation to predict spontaneity of reaction
- Express three laws of thermodynamics and how this relates to spontaneity
- Quantitatively describe the relation between the equilibrium constant and the change in free energy

Core Activities: Students will complete/participate in the following:

- Determine specific heat of metal
- Calculate enthalpy of reaction
- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 11: Kinetics

Time frame: 2 Weeks

State Standards: 3.1.12.A

Anchor(s) or adopted anchor: S11.C.1.1.6

Essential content/objectives: At end of the unit, students will be able to:

- Describe the factors that influence the speed of a reaction
- Determine the relative affect of reactant concentration of speed of reaction
- Describe how catalysts influence the speed of reaction

Core Activities: Students will complete/participate in the following:

- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 12: Electrochemistry

Time frame: 2 Weeks

State Standards: 3.1.12.A, 3.4.12.B

Anchor(s) or adopted anchor: S11.A.3.1.3, S11.A.3.2.(1-3)

Essential content/objectives: At end of the unit, students will be able to:

- Describe the difference between oxidation and reduction
- Predict the ability of a material to behave as an oxidizing or reducing agent
- Identify the parts of a galvanic cell and calculate it's voltage
- Quantitatively determine the relationship between equilibrium, free energy, and the voltage of an electrochemical process
- Balance Redox reactions
- Describe electrolysis and its importance

Core Activities: Students will complete/participate in the following:

- Series of Metals
- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 13: Nuclear Chemistry

Time frame: 2 Weeks

State Standards: 3.1.12.A, 3.4.12.A, 3.5.12.A

Anchor(s) or adopted anchor: S11.C.1.1.1

Essential content/objectives: At end of the unit, students will be able to:

- Describe the factors that influence the stability of atomic nuclei
- Describe various types of nuclear changes
- Understand the relationship between mass and energy and how this applies to fusion and fission
- Relate kinetics to radioactive decay (Half-Life/radioactive dating)
- Balance nuclear reactions

Core Activities: Students will complete/participate in the following:

- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Technology

Assessments:

- Quizzes
- Graded student work
- Examinations
- Participation

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Curriculum Scope & Sequence

Title of Planned Course: Honors Chemistry

Unit 14: Organic Chemistry

Time frame: 2 Weeks

State Standards: 3.2.12.A-D

Anchor(s) or adopted anchor: S11.A.3.1.3

Essential content/objectives: At end of the unit, students will be able to:

- Compare alkanes, alkenes, and alkynes
- Describe isomers
- Recognize key functional groups and their properties
- Name and write formulas for basic organic compounds

Core Activities: Students will complete/participate in the following:

- Independent practice
- Guided instruction

Instructional Methods:

- Socratic method
- Cooperative learning
- Differentiated instruction
- Individual student work

Materials & Resources:

- Teacher materials
- Text
- 3rd party materials (ACS)
- Lab manuals
- Technology

Assessments:

- Quzzes
- Graded student work
- Examinations
- Participation