Wilson Area School District
Planned Course Guide

Title of planned course: Chemistry

Subject Area: Science

Level: 10

Course Description: Chemistry is the study of matter and the changes it undergoes. Students studying chemistry will investigate the physical and chemical properties and changes of matter including elements, compounds, and mixtures. Students will learn about the evolution of the model of the atom - the building blocks of all materials. In addition, the course will examine how the structure of the atom influences the function and behavior of matter with regard to the changes it can undergo along with the application of its usage in real life applications. Although math is critical to the study of chemistry, its usage in this class will be limited to essential applications. Where possible and appropriate, students will engage in laboratory experiments to supplement their understanding.

Time/Credit for this Course: One Full Academic Year / 1.0 credit

Curriculum Writing Committee: Michael Cavanaugh, Madison Pope, Paul Stewart

Wilson Area School District
Planned Course Materials

Title of Planned Course: Chemistry

Textbook: Modern Chemistry
Holt McDougal: Copyright 2012

Resources: Teacher guide for textbook including ancillary materials and a CD with PowerPoint presentations, guided notes, worksheets, laboratory assignments.
The following web sites may be helpful:

- myhrw.com
- ck12.org
- https://phet.colorado.edu/en/simulations/category/chemistry
- www.fordhamprep.org/gcurran/sho/sho/index.htm
- www.chemtutor.com/
- antoine.frostburg.edu/chem/senese/101/tutorials/
- www.learnchem.net/tutorials/
- www.chemicalheritage.org
- www.americanchemistry.org
- www.amnh.org/science/divisions/physsci/
- www.nasa.gov/audience/forstudents/9-12/index.html
- http://genesismission.jpl.nasa.gov/index.html
- www.acs.org/content

Demonstrations: Chemical Demonstrations, Shakashiri
http://www.flinnsci.com/

Curriculum Map

August: **Introductory Calculations**
International System of Measurement
Dimensional Analysis

September: **Measurement and Data**
Lab Safety
Reliability and Precision of Measurement
Properties and Classification of Matter
Methods of Separations

October: **Atomic Theory**
Historical Development of the Atomic Model
Nuclear Chemistry and Subatomic Particles

November: **Periodic Table and Atomic Trends**
Properties of Groups and Periods
Electron Configurations

December: **Bonding**
Ionic Bonding and Compounds
Covalent Bonding and Molecular Compounds
Intra vs Intermolecular forces
Nomenclature and formula writing

January: **States of Matter**
Kinetic Molecular Theory and States of Matter
Phase Changes
Gas Laws

February: **Chemical Reactions**
Empirical and Molecular Formulas
Chemical Reactions
Stoichiometry

March: **Solution Chemistry**
Concentration
Acid/Base Reactions
Precipitation Reactions

April: **Chemical Equilibrium and Kinetics**
Reaction Rates and Kinetic Theory
Equilibrium
Le Chatelier's Principle

May/June: **Energy Changes in Reactions**
Thermodynamics
Heat Capacity
Energy Transfer
Electrochemistry
Galvanic Cells
Final Exams

Curriculum Scope & Sequence

Title of Planned Course: Chemistry

Unit: Introduction Calculations

Time frame: 2 - 3 Weeks

State Standards: 3.1.10.C; 3.1.10.D; 3.7.10.B

Anchor(s) or adopted anchor: S11.A.1.1.5; S11.A.2.2.1

Essential content/objectives: At end of the unit, students will be able to:
- Perform basic algebraic operations
- Use the SI system
- Use dimensional analysis to perform unit conversions within the metric system including metric conversions and mole conversions
- Draw and interpret line graphs using scientific data

Core Activities: Students will complete/participate in the following:
- Guided Notes for Calculations Unit
- Teacher prepared handouts
- Calculations for each topic
- Videos on Google Classroom

Extensions:
- Apply real life issues to chemistry using data obtained from reliable sources
- Read and analyze current scientific research
- Prepare questions and answers on a topic of interest that relate to the unit
- Prepare instructional video for school video library

Remediation:
- Teacher directed based on formative assessment
- Completion of additional guided practice / independent practice

Instructional Methods:
- Direct instruction
- PowerPoint presentations/ notes
- Guided practice
- Videos

Materials & Resources:
- Guided Notes
- Google Classroom Videos
- Textbook

Assessments:

- Quizizz
- Test
- Lab Analysis
- Homework
- Warm-ups / ticket out
- Individual participation / consultation
- Other individualized assessment strategies as necessary

Curriculum Scope & Sequence

Title of Planned Course: Chemistry

Unit: Measurement and Data

Time frame: 3 - 4 Weeks

State Standards: 3.1.10.C; 3.1.10.D; 3.7.10.B

Anchor(s) or adopted anchor: S11.A.1.1.5; S11.A.2.2.1

Essential content/objectives: At end of the unit, students will be able to:
- Evaluating precision in measurements
- Perform safely in the lab
- Identify and use common lab equipment properly
- Compare experimental values to actual values and discuss possible sources of error

Core Activities: Students will complete/participate in the following:
- Guided Notes for Measurement Unit
- Teacher prepared handouts
- Labs
    - Measurement and Laboratory Techniques
    - Density of a Metal
    - Separating Mixtures
- Videos on Google Classroom

Extensions:
- Apply real life issues to chemistry using data obtained from reliable sources
- Read and analyze current scientific research
- Prepare questions and answers on a topic of interest that relate to the unit
- Prepare instructional video for Google Classroom

Remediation:
- Teacher directed based on formative assessment
- Completion of additional guided practice / independent practice

Instructional Methods:
- Direct instruction
- PowerPoint presentations/ notes
- Guided practice
- Videos

Materials & Resources:
- Textbook
- Guided notes and problem sets

Assessments:

- Quizizz
- Test
- Lab Analysis
- Homework
- Warm-ups / ticket out
- Individual participation / consultation
- Other individualized assessment strategies as necessary

Curriculum Scope & Sequence

Title of Planned Course: Chemistry

Unit: Atomic Structure

Time frame: 2 - 3 weeks

State Standards: 3.1.10E; 3.2.10.A; 3.4.10.A

Anchor(s) or adopted anchor: S11.A.1.1.5; S11.C.1.1.1

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

- Define atom
- Identify the properties of atoms (atomic mass, atomic number, mass number)
- Describe the smaller particles of an atom (electrons, protons, neutrons, quarks, etc.)
- Discuss the main components of the scientific method
- Discuss the development of atomic theory with respect to the use of the scientific method and improvements in technology
- Describe the contributions of Aristotle, Democritus, Lavoisier, Proust, Dalton, J.J. Thomson, Rutherford, Bohr
- Define isotope. Compare and contrast isotopes of the same element
- Understand that the atomic mass is a weighted average of various isotopes and reflects their natural abundances
- Identify nuclear reactions as alpha, beta, or gamma reactions
- Describe how radioactive isotopes that are subject to decay can be used to estimate the age of materials
- Apply the predictability of nuclear decay to estimate the age of materials that contain radioactive isotopes

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

- Guided notes for Atomic Theory
- Teacher prepared handouts
- Lab: Conservation of Mass
- Videos on Google Classroom

Extensions:

- Is nuclear power a viable alternative to the energy crisis?
- Read and report on an article on nuclear power in France
- Write an article on nuclear power for the school newspaper / announcements
- Prepare questions and answers on a topic of interest that relate to the unit
- Prepare instructional video for school video library

Remediation:

- Teacher directed based on formative assessment
- Completion of additional guided practice / independent practice

Instructional Methods:

- Videos on Google Classroom
- Vocabulary
- Direct instruction with PowerPoint presentations / notes
- Demonstrations
- Guided practice
- Labs

Materials & Resources:

- Guided Notes
- Problem Sets
- Lab manuals
- Videos

Assessments:

- Quizizz
- Test
- Lab Analysis
- Homework
- Warm-ups / ticket out
- Individual participation / consultation
- Other individualized assessment strategies as necessary

Curriculum Scope & Sequence

Title of Planned Course: Chemistry

Unit: Periodic Table and Atomic Trends

Time frame: 2 - 3 Weeks

State Standards: 3.1.10.E; 3.2.10.B; 3.2.10.C; 3.4.10A

Anchor(s) or adopted anchor: S11.A.1.1.1; S11.A.1.1.2; S11.A.1.1.3; S11.A.1.1.5; S11.C.1.1.1; S11.A.1.3.3; S11.A.2.1.1; S11A.2.1.3

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

- Identify elements as metals, nonmetals, or metalloids and locate these elements on the periodic table
- Discuss the historical development of the periodic table, citing the work of Mendeleev and Moseley
- Identify the regions of the periodic table
- Describe the arrangement of the periodic table: periods, families, metals, nonmetals, metalloids
- Discuss the correlation between electron configuration and placement of an element on the periodic table
- State the octet rule
- Predict the properties of elements based on the valence electrons and the position on the periodic table
- Identify physical and chemical properties of elements based off their location on the periodic table
- Determine atomic trends for properties such as atomic radius and electronegativity
- Compare the reactivity of elements

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

- Guided Notes for Unit
- Teacher prepared handouts
- Labs/Activities
    - Properties of Matter
    - Design your own periodic table
- Videos on Google Classroom

Extensions:

- Read and write a response to National Geographic articles
- Prepare questions and answers on a topic of interest that relate to the unit
- Prepare instructional video for school video library

Remediation:

- Teacher directed based on formative assessment
- Completion of additional guided practice / independent practice

Instructional Methods:

- Videos on Google Classroom
- Vocabulary
- Direct instruction with PowerPoint presentations / notes
- Demonstrations
- Guided practice
- Labs

Materials & Resources:

- Lab manuals
- Videos

Assessments:

- Quizizz
- Test
- Lab Analysis
- Homework
- Warm-ups / ticket out
- Individual participation / consultation
- Other individualized assessment strategies as necessary

Curriculum Scope & Sequence

Title of Planned Course: Chemistry

Unit: Nomenclature and Bonding

Time frame: 4 - 5 weeks

State Standards: 3.1.10.C; 3.2.10.A; 3.2.10.B; 3.4.10.A

Anchor(s) or adopted anchor: S11.A.3.3.1; S11.A.3.2.3; S11.A.3.3.3; S11.C.1.1.3

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

- Define the terms covalent bond, single bond, double bond, triple bond, polar bond, nonpolar bond, bond dissociation energy, bond length, resonance structure
- Name and write formulas for molecular compounds and acids
- Name and write formulas for simple hydrocarbons
- Describe the formation of single, double, and triple covalent bonds
- Relate the strength of covalent bond to bond length and bond dissociation energy
- Draw Lewis structures for molecular compounds
- Identify resonance structures and exceptions to the octet rule
- Use VSEPR theory to identify the shape of a molecule when given the possibilities
- Describe the role of electronegativity in the type of bonding of atoms
- Determine the polarity of a molecule and the effect on the properties of a compound
- Compare and contrast polar and nonpolar bonds and polar and nonpolar molecules
- Discuss the bonding in carbon and provide reasons for the multitude of carbon compounds
- Predict the types of bonding in a substance using data such as melting point, boiling point, electrical conductivity, and solubility
- Define ionic bonds
- Discover how to name ionic compounds with and without transition metals
- Write the formulas given the name of an ionic compound
- Systematically determine the difference between an ionic and molecular compound
- Recognize and describe the distinctions between intra and intermolecular forces and how this relates to applications in real -life scenarios

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

- Guided Notes for Nomenclature
- Vocabulary
- Labs/Activities
    - Wild Ion
    - Properties of Ionic Compounds
    - Making an Ionic Compound
- Contribution to Blog
- Ionic Behavior Online Activity
    - https://pbslm-contrib.s3.amazonaws.com/WGBH/arct15/SimBucket/Simulations/chemthink-ionicbonding/content/index.html

Extensions:

- Research and report on gems
- Research and present information an ionic compound for its properties and uses
- Prepare questions and answers on a topic of interest that relate to the unit

Remediation:

- Teacher directed based on formative assessment
- Completion of additional guided practice / independent practice

Instructional Methods:

- Vocabulary
- Direct instruction with PowerPoint presentations / notes
- Demonstrations
- Activities
- Cooperative learning structures
- Labs

Curriculum Scope & Sequence

Title of Planned Course: Chemistry

Unit: Chemical Reactions

Time frame: 5 - 6 weeks

State Standards: 3.1.10.A; 3.1.10.C; 3.1.10.E; 3.2.10.C; 3.2.10.D; 3.4.10.A; 3.4.10.B; 4.8.10.A

Anchor(s) or adopted anchor: S11.A.1.1.2; S11.A.1.1.4; S11.A.1.1.5; S11.A.1.3.1; S11.A.2.2.1; S11.A.2.2.2; S11.A.3.1.3; S11.C.2.1.2

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

- Identify the reactants and products in a chemical reaction
- Interpret and balance a chemical equation in accordance with the Law of Conservation of Mass
- Classify chemical reactions as synthesis, decomposition, single replacement, double replacement or combustion AND as either oxidation/reduction, precipitation, or acid/base.
- Predict the products of the aforementioned chemical reactions
- Determine the reactants needed for a chemical reaction when given the type of reaction and desired products
- Describe energy changes in chemical reactions
- Calculate the molar mass and percent composition of a compound
- Determine the empirical formula of a compound given the mass or percent of each element in the compound
- Determine the molecular formula of a compound given the empirical formula and molar mass
- Describe a hydrate and calculate the percent of water in a hydrate
- Define limiting reactant, excess reactant
- Discuss factors which will result in the completion of a reaction (equilibrium or until a limiting reactant is exhausted)
- Apply the mole concept in stoichiometric calculations, including those involving limiting reactants and percent yield

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

- Study Guides for Chapters 8 and 9 of what?
- Vocabulary
- Questions from textbook
- Labs
    - Determination of the empirical formula of a compound
    - Percent of oxygen in potassium chlorate
    - Percent of carbon dioxide in copper (II) carbonate
- Inquiry Lab: How do you make that?

Extensions:

- Research and present information on common chemical reactions
- Kahoot/Plickers/Edulastic Activities

Remediation:

- Teacher directed based on formative assessment
- Completion of additional guided practice / independent practice

Instructional Methods:

- Independent reading in textbook (chapters 8 and 9)
- Vocabulary
- Direct instruction with PowerPoint presentations / notes
- Demonstrations
- Cooperative learning structures
- Labs

Materials & Resources:

- Guided Notes
- Problem Sets

Assessments:

- Lab report
- Quizizz
- Test
- Individual participation / consultation
- Other individualized assessment strategies as necessary

Curriculum Scope & Sequence

Title of Planned Course: Chemistry

Unit: Solutions

Time frame: 2 - 3 weeks

State Standards: 3.1.10.A; 3.2.10.A; 3.1.10.A; 3.1.10.C; 3.1.10.E; 3.2.10.B; 3.2.10.D; 3.4.10.A; 3.4.12.A

Anchor(s) or adopted anchor: S11.A.1.1.3; S11.A.1.1.4; S11.A.1.3.1; S11.A.2.1.1; S11.A.2.1.3; S11.A.2.1.4; S11.A.3.1.3; S11.A.3.2.1; S11.A.3.2.2; S11.C.1.1.5

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

- Describe the characteristics of solutions and identify the various types.
- Relate the intermolecular and intramolecular forces and the process of solvation.
- Define solubility and identify factors affecting it.
- State the concentrations of solutions in different ways.
- Calculate the concentrations of solutions using molarity and ppm.
- Identify the physical and chemical properties of acids and bases.
- Analyze titration curves

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

- Laboratory Experiments involving precipitation reactions and/or acids and bases
- Laboratory Experiments on preparing and diluting solutions
- Application of concentrations to the environment such as sea water, dissolved oxygen, etc.

Remediation

- Teacher directed based on formative assessment
- Completion of additional guided practice / independent practice

Instructional Methods

- Vocabulary
- Direct instruction with PowerPoint presentations / notes
- Demonstrations
- Cooperative learning structures
- Labs

Materials & Resources

- Guided notes
- Problem Sets
- Lab manuals
- World of Chemistry videos

Assessment

- Lab report
- Quizizz
- Test
- Individual participation / consultation
- Other individualized assessment strategies as necessary

Curriculum Scope & Sequence

Title of Planned Course: Chemistry

Unit: Chemical Equilibrium and Kinetics

Time frame: 2 - 3 weeks

State Standards: 3.1.10.A; 3.2.10.A; 3.2.10.C; 3.2.10.D; 3.4.10.A

Anchor(s) or adopted anchor: S11.A.1.1.1; S11.A.1.1.2; S11.C.1.1.3

Essential content/objectives: At end of the unit, students will be able to:
- Classify what factors contribute to the rate of a chemical reaction
- Define equilibrium and write equilibrium expressions
- Develop rate laws based off experimental data for chemical reactions
- Discuss factors which will result in the completion of a reaction (equilibrium or until a limiting reactant is exhausted)

Core Activities: Students will complete/participate in the following:
- Guided Notes
- Vocabulary
- Labs
- Inquiry Lab: Percent of water in a hydrate

Extensions:
- Research and present common hydrates
- Prepare an announcement for the school
- Prepare questions and answers on a topic of interest that relate to the unit

Remediation:
- Teacher directed based on formative assessment
- Completion of additional guided practice / independent practice

Instructional Methods:
- Guided notes
- Problem sets
- Vocabulary
- Direct instruction with PowerPoint presentations / notes
- Demonstrations
- Cooperative learning structures
- Labs

Materials & Resources:
- Lab manuals
- Solving Problems: A Chemistry Handbook

Assessments:

- Lab report
- Quizizz
- Test
- Individual participation / consultation
- Other individualized assessment strategies as necessary

Curriculum Scope & Sequence

Title of Planned Course: Chemistry

Unit: Gasses

Time frame: 2 - 3 weeks

State Standards: 3.1.10.A; 3.2.10.A; 3.1.10.A; 3.1.10.C; 3.1.10.E; 3.2.10.B; 3.2.10.D; 3.4.10.A; 4.3.10.C

Anchor(s) or adopted anchor: S11.A.1.1.3; S11.A.1.1.4; S11.A.1.3.1; S11.A.2.1.1; S11.A.2.1.3; S11.A.2.1.4; S11.A.3.1.3; S11.A.3.2.1; S11.A.3.2.2; S11.C.1.1.

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

- Qualitatively predict the changes in temperature, pressure, and volume using Boyle's Law, Charles' Law and Gay-Lussac's Law
- State and apply Dalton's Law of Partial Pressures
- Define and describe the derivation of absolute temperature
- Apply gas laws to problems involving pressure, temperature, volume, and amount of gas

Core Activities: Students will complete/participate in the following

- Study Guides Chapter 11
- Vocabulary
- Questions in textbook for Chapter 11
- Labs:
    - Boyle's Law
    - Charles' Law
    - Gay-Lussac's Law
    - Calculation of the Ideal Gas Constant, R

Remediation:

- Teacher directed based on formative assessment
- Completion of additional guided practice / independent practice

Instructional Methods:

- Vocabulary
- Direct instruction with PowerPoint presentations / notes
- Demonstrations
- Cooperative learning structures
- Labs

Materials & Resources:

- Guided notes
- Problem sets
- Lab manuals
- Solving Problems: A Chemistry Handbook
- World of Chemistry video: Our Atmosphere
- United Streaming videos

Assessments:

- Lab report
- Quizizz
- Test
- Individual participation / consultation
- Other individualized assessment strategies as necessary

Curriculum Scope & Sequence

Title of Planned Course: Chemistry

Unit: Advanced Topics in Chemistry

Time frame: 2-3 weeks

State Standards: 3.1.10.A; 3.1.10.B; 3.1.10.C; 3.1.10.E; 3.2.10.B; 3.2.10.D; 3.4.10.A; 4.1.10.B; 4.3.10.C; 4.6.10.A; 4.8.10.A;

Anchor(s) or adopted anchor: S11.A.1.1.3; S11.A.1.3.1; S11.A.1.3.2; S11.A.1.3.4; S11.A.2.1.2; S11.A.2.1.3; S11.A.2.1.4; S11A.3.1.1; S11.A.3.1.2; S11.A.3.2.1; S11.B.3.1.5; S11.B.3.3; S11.C.1.1.6

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

- Define how heat and energy are related and how they are transferred
- Generate a definition of heat capacity
- Quantitatively examine how heat is transferred within an isolated system
- Outline the fundamentals of a galvanic cell
- Express how electricity is generated within a cell
- Diagram a simple galvanic cell
- Propose chemical half-reactions that explain the process of oxidation and reduction
- Interpret how different functional groups in organic compounds contribute to their chemical and physical properties
- Name simple organic compounds (alkanes, alkenes, alkynes, alcohols)

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

- Guided Notes
- Problem Sets
- Vocabulary

Extensions:

- Prepare an announcement for school
- Prepare questions and answers on a topic of interest that relate to the unit
- Kahoot/Plickers/Edulastic Activities

Remediation:

- Teacher directed based on formative assessment
- Completion of additional guided practice / independent practice

Instructional Methods:

- Vocabulary
- Direct instruction with PowerPoint presentations / notes
- Demonstrations
- Cooperative learning structures
- Lab: Synthesis of aspirin

Materials & Resources:

- Guided notes
- Problem sets
- Lab manuals
- United Streaming videos

Assessments:

- Lab report
- Quizizz
- Test
- Individual participation / consultation
- Other individualized assessment strategies as necessary