Wolcott Public Schools

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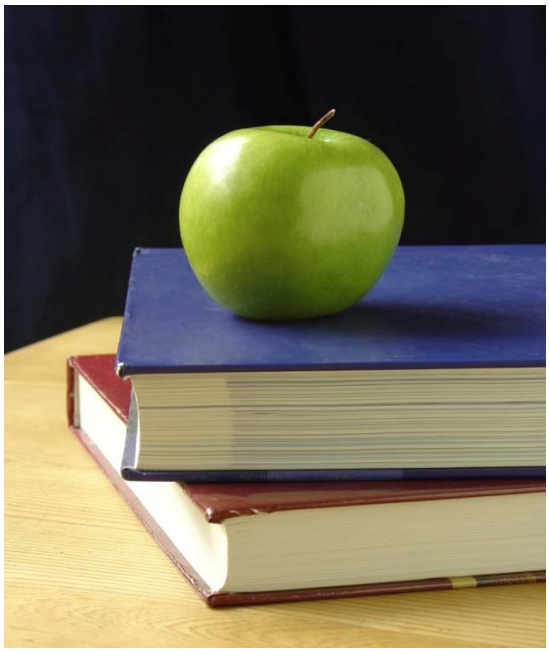
High School Curriculum
Grades 11 & 12
Chemistry in the Community



Children are our Future…

Acknowledgements

Curriculum Writers:
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We acknowledge and celebrate the professionalism, expertise, and diverse perspectives of these teachers. Their contributions to this curriculum enrich the educational experiences of all Wolcott students.

Dr. Gail A. Gilmore
Assistant Superintendent

Date of Presentation to the Board of Education: _____

(Name of Curriculum)

Chemistry in the Community

Mission Statement:
The mission of the Wolcott Public Schools is to develop in each student the knowledge, skills, and attitudes necessary to become a productive member of the community and a contributing member to society.

Departmental Philosophy:
To develop an interest in global issues and the ability to collect, analyze and use data to explore and explain related science concepts.

Course Description:
This course is designed to help students understand chemical concepts and how these concepts relate to their lives. Through laboratory experiments and activities, students will develop problem-solving techniques and critical thinking skills which can be applied to chemical principles and to many other life skills.

Chemistry in the Community

Unit I: Scientific Numeracy

Content Standard—Scientific Inquiry, Literacy and Numeracy – How is scientific knowledge created and communicated?

Performance Standards	*Sample Activities*	*Assessment Strategies*	*Resources*
National Science Education Standards: Abilities Necessary to do Scientific Inquiry • Identify questions and concepts that guide scientific investigations. • Design and conduct scientific investigations. • Use technology and mathematics to improve investigations and communications. • Formulate and revise scientific explanations and models using logic and evidence. • Recognize and analyze alternative explanations and models. • Communicate and defend a scientific argument.	1. **Laboratory Activity**: Making quantitative measurements 2. **Laboratory Activity**: Finding the density of regularly and irregularly shaped solids. 3. **Laboratory Activity:** Determination of the metal of which a pre-1983 and post-1983 penny is composed.	**Any combination of the following based on school wide and course specific rubrics:** **Pre-Assessment** -KWL charts -pretests -checklists -observations -self evaluation & questions **Formative Assessments** -questioning student -conferencing -peer evaluation -observation -performance tasks -exit cards -portfolio check -quizzes -journal entries -self evaluation **Summative Assessments** -lab/science journal entries -performance tasks -portfolio review -unit tests -semester exams -product/exhibits/displays -demonstrations	• Metric ruler • Triple beam balance • Wooden block • Graduated cylinders of varying volumes • Metric ruler • Electronic balance • Regularly shaped solids • Irregularly shaped solids • Electronic balance • Graduated cylinder • Pre-1983 pennies • Post-1983 pennies • Graph paper • Excel software

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Unit II: Water
Content Standards—The Changing Earth, Properties of Matter, Atomic and Molecular Structure, and Solutions

Performance Standards	*Sample Activities*	*Assessment Strategies*	*Resources*
• Explain how elements on Earth exist in essentially fixed amounts and are located in various chemical reservoirs. • Describe the general structure of the atom, and explain how the properties of the first ten elements in the Periodic Table are related to their atomic structure.	1. **Laboratory Activity**: Foul water 2. **Student Activity**: "Uses of water" 3. **Student Activity**: Modeling Matter: Pictures in the mind 4. **Laboratory Activity**: Water testing	**Any combination of the following based on school wide and course specific rubrics:** **Pre-Assessment** -KWL charts -pretests -checklists -observations -self evaluation & questions **Formative Assessments** -questioning student -conferencing -peer evaluation -observation -performance tasks -exit cards -portfolio check -quizzes -journal entries -self evaluation **Summative Assessments** -lab/science journal entries -performance tasks -portfolio review -unit tests -semester exams -product/exhibits/displays -demonstrations	• **Copy of Activity**: "Foul water lab" • Glass funnel • Clay triangle • Metal pinch clamp • Metal ring • Rubber tube • Styrofoam cup • Gravel • Sand • Filter paper • "Dirty" water • **Copy of Activity**: "Uses of water" • **Copy of Activity**: "Modeling Matter: Pictures in the mind" • **Copy of Activity**: "Water testing" • Calcium Chloride • Ammonium Carbonate • Iron (III) Nitrate • Ammonium Thiocyanate • Silver Nitrate • Sodium Sulfate • Barium Nitrate

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• Define solute and solvent.	5. **Laboratory Activity**: Types of solutions	**Any combination of the following based on school wide and course specific rubrics:** **Pre-Assessment** -KWL charts -pretests -checklists -observations -self evaluation & questions **Formative Assessments** -questioning student -conferencing -peer evaluation -observation -performance tasks -exit cards -portfolio check -quizzes -journal entries -self evaluation **Summative Assessments** -lab/science journal entries -performance tasks -portfolio review -unit tests -semester exams -product/exhibits/displays -demonstrations	• **Copy of Activity**: "Types of solutions" • Sodium Acetate Trihydrate • Assorted glassware • Hot plate
	6. **Graphing Activity**: Solubility curves		• **Copy of Activity**: "Solubility curves" • Graph paper • Ruler
	7. **Laboratory Activity**: Construction of a solubility curve		• **Copy of Activity**: "Construction of a solubility curve" • Potassium Nitrate • Bunsen Burner • Thermometer • Assorted glassware
• Explain the effect temperature, pressure, and surface area have on the rate of solution.	8. **Laboratory Activity**: Rate of solution		• **Copy of Activity**: "Rate of solution" • Copper (II) Sulfate Pentahydrate • Sodium Chloride • Mortar and Pestle • Hot plate • Assorted glassware • Forceps

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• Explain how the accumulation of mercury, phosphates and nitrates affects the quality of water and the organisms that live in rivers, lakes and oceans. • Apply the pH scale to characterize acid and base solutions.	9. **Student Activity**: Determining the cause of the fish kill 10. **Student Project**: Fish kill—Finding a solution	**Any combination of the following based on school wide and course specific rubrics:** **Pre-Assessment** -KWL charts -pretests -checklists -observations -self evaluation & questions **Formative Assessments** -questioning student -conferencing -peer evaluation -observation -performance tasks -exit cards -portfolio check -quizzes -journal entries -self evaluation **Summative Assessments** -lab/science journal entries -performance tasks -portfolio review -unit tests -semester exams -product/exhibits/displays -demonstrations	• **Copy of Activity**: "Determining the cause of the fish kill" • Sample data • Graph paper • Ruler • **Copy of Activity**: "Fish kill—Finding a solution"

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Unit III: Materials—Structure and Uses
Content Standards—Properties of Matter, Periodic Law, The Changing Earth, Conservation of Matter and Stoichiometry

Performance Standards	*Sample Activities*	*Assessment Strategies*	*Resources*
• Use the periodic table to identify metals, semimetals, nonmetals, and halogens. • Explain the relationship between the position of an element in the periodic table to its atomic number and atomic mass. • Use the periodic table to identify alkali metals, alkaline earth metals and transition metals, trends in ionization energy, electro negativity, and the relative sizes of ions and atoms. • Explain how elements on Earth exist in essentially fixed amounts and are located in various chemical reservoirs.	1. **Laboratory Activity**: Metal or Nonmetal? 2. **Graphing Activity**: Periodic variation in properties 3. **Laboratory Activity**: Relative reactivity's of metals 4. **Laboratory Activity**: Converting copper	**Any combination of the following based on school wide and course specific rubrics:** **Pre-Assessment** -KWL charts -pretests -checklists -observations -self evaluation & questions **Formative Assessments** -questioning student -conferencing -peer evaluation -observation -performance tasks -exit cards -portfolio check -quizzes -journal entries -self evaluation **Summative Assessments** -lab/science journal entries -performance tasks -portfolio review -unit tests -semester exams -product/exhibits/displays -demonstrations	• **Copy of Activity**: "Metal or Nonmetal? • Assorted metallic elements • Assorted nonmetallic elements • Assorted glassware • Battery • **Copy of Activity**: "Periodic variation in properties" • Periodic table • Graph paper • Ruler • **Copy of Activity**: "Relative Reactivity's of Metals" • Copper • Magnesium • Zinc • Copper (II) Nitrate • Magnesium Nitrate • Zinc Nitrate • **Copy of Activity**: "Converting copper" • Copper powder • Crucible • Clay triangle • Bunsen Burner • Assorted glassware

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Materials—Structures and Uses Cont. • Explain that the conservation of atoms in chemical reactions leads to the principle of conservation of matter.	5. **Laboratory Activity**: Retrieving copper 6. **Laboratory Activity**: Striking it rich 7. **Laboratory Activity**: Copper plating 8. **Student Activity**: Accounting for atoms 9. **Student Activity**: Writing chemical equations	**Any combination of the following based on school wide and course specific rubrics:** **Pre-Assessment** -KWL charts -pretests -checklists -observations -self evaluation & questions **Formative Assessments** -questioning student -conferencing -peer evaluation -observation -performance tasks -exit cards -portfolio check -quizzes -journal entries -self evaluation **Summative Assessments** -lab/science journal entries -performance tasks -portfolio review -unit tests -semester exams -product/exhibits/displays -demonstrations	• **Copy of Activity**: "Retrieving copper" • Copper (II) Oxide • Hydrochloric Acid • Zinc • Assorted glassware • **Copy of Activity**: "Striking it rich" • Penny • Zinc • Zinc Chloride • Bunsen Burner • Assorted glassware • **Copy of Activity**: "Copper plating" • Beaker • Tygon tubing • Copper plating solution • Iron nail • Copper metal strips • 9-V battery • Wire leads • **Copy of Activity**: "Accounting for atoms" • **Copy of Activity**: "Writing chemical equations"

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Unit IV: Petroleum—Breaking Bonds and Making Bonds
Content Standards—Properties of Matter, Chemical Bonding, Organic Chemistry, Chemical Thermodynamics, Global Interdependence

Performance Standards	*Sample Activities*	*Assessment Strategies*	*Resources*
• Describe the general structure of the atom, and explain how the properties of the first ten elements in the Periodic Table are related to their atomic structure. • Explain how the structure of the carbon atom affects the type of bonds it forms in organic and inorganic molecules.	1. **Laboratory Activity**: Separation by distillation 2. **Graphing Activity**: Hydrocarbon boiling points 3. **Laboratory Activity**: Modeling alkanes 4. **Laboratory Activity**: alkanes revisited 5. **Graphing Activity**: Boiling points of alkane isomers	**Any combination of the following based on school wide and course specific rubrics:** **Pre-Assessment** -KWL charts -pretests -checklists -observations -self evaluation & questions **Formative Assessments** -questioning student -conferencing -peer evaluation -observation -performance tasks -exit cards -portfolio check -quizzes -journal entries -self evaluation **Summative Assessments** -lab/science journal entries -performance tasks -portfolio review -unit tests -semester exams	• **Copy of Activity**: "Separation by distillation" • 2-Propanol • Acetone • Water • Methanol • Condenser • Hot Plate • Assorted glassware • **Copy of Activity**: "Hydrocarbon boiling points" • Graph paper • Sample data • Ruler • **Copy of Activity**: "Modeling alkanes" • Atomic modeling kits • **Copy of Activity**: "Alkanes revisited" • Atomic modeling kits • **Copy of Activity**: "Boiling points of alkane isomers" • Graph paper • Sample data • Ruler

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Petroleum—Breaking and Making Bonds Cont. • Describe combustion reactions of hydrocarbons and their resulting byproducts. • Explain how simple chemical monomers can be combined to create linear, branched and/or cross-linked polymers. • Describe the availability, current uses and environmental issues related to the use of hydrogen fuel cells, wind and solar energy to produce electricity.	6. **Laboratory Activity**: Combustion 7. **Laboratory Activity**: The Builders 8. **Student Activity**: The fuel sources over the years 9. **Internet Activity**: Alternative fuel sources	-product/exhibits/displays -demonstrations **Any combination of the following based on school wide and course specific rubrics:** **Pre-Assessment** -KWL charts -pretests -checklists -observations -self evaluation & questions **Formative Assessments** -questioning student -conferencing -peer evaluation -observation -performance tasks -exit cards -portfolio check -quizzes -journal entries -self evaluation **Summative Assessments** -lab/science journal entries -performance tasks -portfolio review -unit tests -semester exams -product/exhibits/displays -demonstrations	• **Copy of Activity**: "Combustion" • Glass rod • Empty soda container • Candle • Ring stand • Thermometer • **Copy of Activity**: "The Builders" • Atomic modeling kits • **Copy of Activity**: "The fuel sources over the years" • **Copy of Activity**: "Alternative fuel sources" • Computer for each student

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Unit V: Air—Chemistry and the Atmosphere
Content Standards—Gas Laws, Acids and Bases, Chemical Thermodynamics, Global Interdependence

Performance Standards	*Sample Activities*	*Assessment Strategies*	*Resources*
• Explain that the random motion of molecules and their collisions with a surface create the observable pressure on that surface. • Apply the gas laws to relations between the pressure, temperature and volume of any amount of an ideal gas or any mixture of ideal gases.	1. **Lab Activity**: Exploring properties of gases 2. **Graphing Activity**: Atmospheric data 3. **Student Activity**: Gas law calculations 4. **Student Activity**: Solar Radiation	**Any combination of the following based on school wide and course specific rubrics:** **Pre-Assessment** -KWL charts -pretests -checklists -observations -self evaluation & questions **Formative Assessments** -questioning student -conferencing -peer evaluation -observation -performance tasks -exit cards -portfolio check -quizzes -journal entries -self evaluation **Summative Assessments** -lab/science journal entries -performance tasks -portfolio review -unit tests -semester exams -product/exhibits/displays -demonstrations	• **Copy of Activity**: "Exploring properties of gases" • Balloon • Electronic balance • Pin • Drinking glass • Large metal container • Soft-drink bottle • Plastic • Test tube • Aluminum can • Hot plate • Tongs • Syringe • **Copy of Activity**: "Exploring properties of gases" • Graph paper • Ruler • **Copy of Activity**: "Gas law calculations" • Calculator

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Air—Chemistry and the Atmosphere Cont. • Explain how the accumulation of carbon dioxide (CO_2) in the atmosphere increases Earth's "greenhouse" effect and may cause climate changes.	5. **Laboratory Activity**: Specific Heat Capacity	**Any combination of the following based on school wide and course specific rubrics:** **Pre-Assessment** -KWL charts -pretests -checklists -observations -self evaluation & questions **Formative Assessments** -questioning student -conferencing -peer evaluation -observation -performance tasks -exit cards -portfolio check -quizzes -journal entries -self evaluation **Summative Assessments** -lab/science journal entries -performance tasks -portfolio review -unit tests -semester exams -product/exhibits/displays -demonstrations	• **Copy of Activity**: "Solar Radiation"
	6. **Laboratory Activity**: Carbon Dioxide Levels		• **Copy of Activity**: "Specific Heat Capacity" • Styrofoam cups • Corrugated cardboard • Thermometer • Hot plate • Assorted metal
▪ Explain how water, carbon and nitrogen cycle between abiotic resources and organic matter in the ecosystem and oxygen cycles through photosynthesis and respiration.	7. **Student Activity**: Trends in CO_2 Levels		• **Copy of Activity**: "Carbon Dioxide Levels" • Assorted glassware • Bromthymol blue • Sodium Hydroxide • Aspirator • Funnel • Candle • **Copy of Activity**: "Trends in CO_2 levels"
• Explain how the release of sulfur dioxide (SO_2) into the atmosphere can form acid rain, and how acid rain affects water sources, organisms and human-made structures.	8. **Laboratory Activity**: Making Acid Rain		• **Copy of Activity**: "Making Acid Rain" • Sodium Sulfite • Zip-seal bag • Hydrochloric Acid • Pipet

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Air—Chemistry and the Atmosphere Cont. • Explain how land development, transportation options and consumption of resources may affect the environment.	9. **Laboratory Activity**: Cleansing air	**Any combination of the following based on school wide and course specific rubrics:** **Pre-Assessment** -KWL charts -pretests -checklists -observations -self evaluation & questions **Formative Assessments** -questioning student -conferencing -peer evaluation -observation -performance tasks -exit cards -portfolio check -quizzes -journal entries -self evaluation **Summative Assessments** -lab/science journal entries -performance tasks -portfolio review -unit tests -semester exams -product/exhibits/displays -demonstrations	**Copy of Activity**: "Cleansing air"

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Pacing Guide

September: Scientific Numeracy
- ➔ Lab Activity: “Making Quantitative Measurements”
- ➔ Lab Activity: “Finding the Density of Regularly and Irregularly Shaped Solids”
- ➔ Lab Activity: “Composition of a Penny”

October: Begin: Water (Textbook Pages 2-42)
- ➔ Lab Activity: “Foul Water”
- ➔ Student Activity: “Uses of Water”
- ➔ Student Activity: “Modeling Matter: Pictures in the Mind”
- ➔ Lab Activity: “Water Testing”
- ➔ Lab Activity: “Types of Solutions”

November: Finish: Water (Textbook Pages 45-84)
- ➔ Graphing Activity: “Solubility Curves”
- ➔ Lab Activity: “Construction of a Solubility Curve”
- ➔ Lab Activity: “Rate of Solution”
- ➔ Student Project: “Fish Kill—Finding a Solution”

December: Begin: Materials—Structure and Uses (Textbook Pages 90-126)
- ➔ Lab Activity: “Metal or Nonmetal”
- ➔ Graphing Activity: “Periodic Variation in Properties”
- ➔ Lab Activity: Relative Reactivity’s of Metals”
- ➔ Lab Activity: “Converting Copper”

January: Finish: Materials—Structure and Uses (Textbook Pages 128-164)
- ➔ Lab Activity: “Retrieving Copper”
- ➔ Lab Activity: “Striking it Rich”
- ➔ Lab Activity: Copper Plating

February: Begin: Petroleum—Breaking and Making Bonds (Textbook Pages 172-213)
- ➔ Lab Activity: “Separation by Distillation”
- ➔ Graphing Activity: “Hydrocarbon Boiling Points”
- ➔ Lab Activity: “Modeling Alkanes”
- ➔ Lab Activity: “Alkanes Revisited”

March: Continue: Petroleum—Breaking and Making Bonds (Textbook Pages 216-232)
- ➔ Graphing Activity: “Boiling Points of Alkane Isomers”
- ➔ Lab Activity: “Combustion”
- ➔ Lab Activity: “The Builders”

April: Finish: Petroleum—Breaking and Making Bonds (Textbook Pages 234-243)
- ➔ Student Activity: “The Fuel Sources Over the Years”
- ➔ Internet Activity: “Alternative Fuel Sources”

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May: Begin: Air—Chemistry and the Atmosphere (Textbook Pages 248-295)

- ➔ Lab Activity: “Exploring Properties of Gases”
- ➔ Graphing Activity: “Atmospheric Data”
- ➔ Student Activity: “Gas Law Calculations”
- ➔ Student Activity: “Solar Radiation”
- ➔ Lab Activity: “Specific Heat Capacity”

June: Finish: Air—Chemistry and the Atmosphere (Textbook Pages 297-329)

- ➔ Lab Activity: “Carbon Dioxide Levels”
- ➔ Student Activity: “Trends in CO_2 Levels”
- ➔ Lab Activity: “Making Acid Rain”

Chemistry in the Community

Essential Questions

1. What are the methods used to collect and analyze quantitative data describing matter?
2. What qualitative properties are used to classify matter and its changes?
3. What are the basic parts of an atom and how does atomic structure determine properties of the atom?
4. What is the empirical basis for how combinations of atoms are formed and represented?
5. How does the Periodic Law enable the properties of matter to be predicted?
6. How do the accumulations of mercury, phosphates and nitrates affect the quality of water and the organisms that live in rivers, lakes and oceans?
7. How does the structure of the carbon atom affect the type of bonds it forms in organic and inorganic molecules?
8. What are the byproducts of combustion reactions?
9. What are the current uses and environmental issues related to the use of hydrogen fuel cells, wind and solar energy to produce electricity?
10. How does kinetic theory explain the behaviors of gases?
11. How does the release of sulfur dioxide (SO_2) into the atmosphere form acid rain, and how does acid rain affect water sources, organisms and human-made structures?
12. How does the accumulation of carbon dioxide (CO_2) in the atmosphere increase Earth's "greenhouse" effect and may cause changes in the climate?

Chemistry in the Community

Skills Objectives

1. Construct and label data tables appropriately to include all measurements.
2. Take measurements to the correct precision of the instrument.
3. Use dimensional analysis to make metric conversions.
4. Identify substances by their physical and chemical properties.
5. Apply a method to separate matter based on physical properties.
6. Differentiate between physical and chemical changes.
7. Theoretically predict the formula of a compound based on the rules of nomenclature.
8. Write and balance formula equations for chemical reactions.
9. Distinguish between unsaturated, saturated, and supersaturated solutions.
10. Identify the main characteristics of matter in the gaseous phase.

Chemistry in the Community

Assessments

[That are aligned to the curriculum – this will be done through the data teams throughout the year – no need to do them now, I just wanted to let you know where they will go in the curriculum, as we complete them. Thank you.]