**Purpose of Science Curriculum Maps**

This map is meant to help teachers and their support providers (e.g., coaches, leaders) on their path to effective, college and career ready (CCR) aligned instruction and our pursuit of Destination 2025.  It is a resource for organizing instruction around the TN State Standards, which define what to teach and what students need to learn at each grade level. The map is designed to reinforce the grade/course-specific standards and content—the major work of the grade (scope)—and provides *suggested* sequencing, pacing, time frames, and aligned resources. Our hope is that by curating and organizing a variety of standards-aligned resources, teachers will be able to spend less time wondering what to teach and searching for quality materials (though they may both select from and/or supplement those included here) and have more time to plan, teach, assess, and reflect with colleagues to continuously improve practice and best meet the needs of their students.

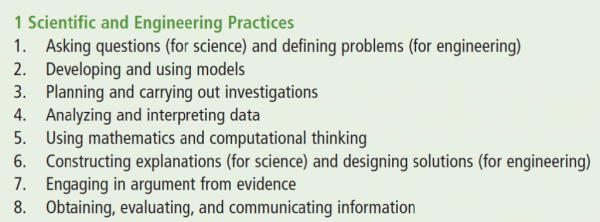
 The map is meant to support effective planning and instruction to rigorous standards. It is *not* meant to replace teacher planning, prescribe pacing or instructional practice.  In fact, our goal is not to merely “cover the curriculum,” but rather to “uncover” it by developing students’ deep understanding of the content and mastery of the standards.  Teachers who are knowledgeable about and intentionally align the learning target (standards and objectives), topic, text(s), task, and needs (and assessment) of the learners are best-positioned to make decisions about how to support student learning toward such mastery. Teachers are therefore expected--with the support of their colleagues, coaches, leaders, and other support providers--to exercise their professional judgment aligned to our shared vision of effective instruction, the Teacher Effectiveness Measure (TEM) and related best practices.  However, while the framework allows for flexibility and encourages each teacher/teacher team to make it their own, our expectations for student learning are non-negotiable.  We must ensure all of our children have access to rigor—high-quality teaching and learning to grade level specific standards, including purposeful support of literacy and language learning across the content areas.

**Introduction**

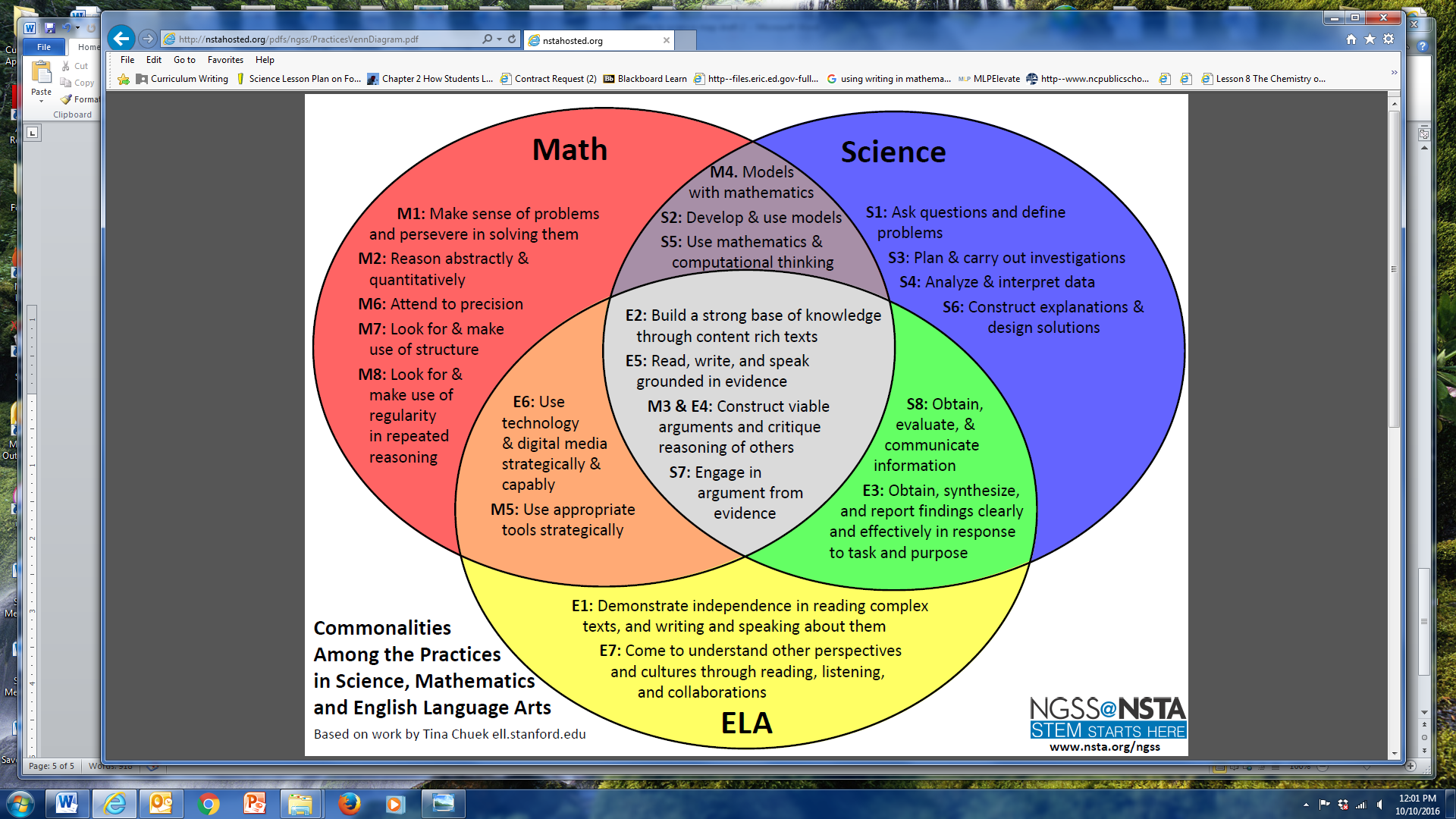
In 2014, the Shelby County Schools Board of Education adopted a set of ambitious, yet attainable goals for school and student performance. The District is committed to these goals, as further described in our strategic plan, Destination 2025. In order to achieve these ambitious goals, we must collectively work to provide our students with high quality, College and Career Ready standards-aligned instruction. The Tennessee State Standards provide a common set of expectations for what students will know and be able to do at the end of a grade. College and Career Ready Standards are rooted in the knowledge and skills students need to succeed in post-secondary study or careers. While the academic standards establish desired learning outcomes, the curriculum provides instructional planning designed to help students reach these outcomes. **The curriculum maps contain components to ensure that instruction focuses students toward college and career readiness.**  Educators will use this guide and the standards as a roadmap for curriculum and instruction. The sequence of learning is strategically positioned so that necessary foundational skills are spiraled in order to facilitate student mastery of the standards.

Our collective goal is to ensure our students graduate ready for college and career. The standards for science practice describe varieties of expertise that science educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in science education. The Science Framework emphasizes process standards of which include planning investigations, using models, asking questions and communicating information**. The science maps contain components to ensure that instruction focuses students toward college and career readiness. The maps are centered around four basic components: the state standards and framework (Tennessee Curriculum Center), components of the 5E instructional model (performance tasks), scientific investigations (real world experiences), and informational text (specific writing activities).**

*The Science Framework for K-12 Science Education* provides the blueprint for developing the effective science practices*.* The *Framework* expresses a vision in science education that requires students to operate at the nexus of three dimensions of learning: Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas. The *Framework* identified a small number of disciplinary core ideas that all students should learn with increasing depth and sophistication, from Kindergarten through grade twelve. Key to the vision expressed in the *Framework* is for students to learn these disciplinary core ideas in the context of science and engineering practices.

To develop the skills and dispositions to use scientific and engineering practices needed to further their learning and to solve problems, students need to experience instruction in which they use multiple practices in developing a particular core idea and apply each practice in the context of multiple core ideas. We use the term “practices” instead of a term such as “skills” to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. Students in grades K-12 should engage in all eight practicesover each grade band**.** This guide provides specific goals for science learning in the form of grade level expectations*,* statements about what students should know and be able to do at each grade level.

Science is not taught in isolation. There are commonalities among the practices of science (science and engineering), mathematics (practices), and English Language Arts (student portraits). There is an early focus on informative writing in ELA and science. There’s a common core in all of the standards documents (ELA, Math, and Science). At the core is: reasoning with evidence; building arguments and critiquing the arguments of others; and participating in reasoning-oriented practices with others. The standards in science, math, and ELA provide opportunities for students to make sense of the content through solving problems in science and mathematics by reading, speaking, listening, and writing. Early writing in science can focus on topic specific details as well use of domain specific vocabulary. Scaffold up as students begin writing arguments using evidence during middle school. In the early grades, science and mathematics aligns as students are learning to use measurements as well as representing and gathering data. As students’ progress into middle school, their use of variables and relationships between variables will be reinforced consistently in science class. Elements of the commonalities between science, mathematics and ELA are embedded in the standards, outcomes, content, and connections sections of the curriculum maps.



An instructional model or learning cycle, such as the 5E model is a sequence of stages teachers may go through to help students develop a full understanding of a lesson concept. Instructional models are a form of scaffolding, a technique a teacher uses that enables a student to go beyond what he or she could do independently. Some instructional models are based on the constructivist approach to learning, which says that learners build or construct new ideas on top of their old ideas. Engage captures the students’ attention. Gets the students focused on a situation, event, demonstration, of problem that involves the content and abilities that are the goals of instruction. In the explore phase, students participate in activities that provide the time and an opportunity to conducts activities, predicts, and forms hypotheses or makes generalizations. The explain phase connects students’ prior knowledge and background to new discoveries. Students explain their observations and findings in their own words. Elaborate, in this phase the students are involved in learning experience that expand and enrich the concepts and abilities developed in the prior phases. Evaluate, in this phase, teachers and students receive feedback on the adequacy of their explanations and abilities. The components of instructional models are found in the content and connection columns of the curriculum maps.



**Science Curriculum Maps Overview**

**The science maps contain components to ensure that instruction focuses students toward college and career readiness. The maps are centered around four basic components: the state standards and framework (Tennessee Curriculum Center), components of the 5E instructional model (performance tasks), scientific investigations (real world experiences), informational text (specific writing activities), and NGSS (science practices).**

At the end of the elementary science experience, students can observe and measure phenomena using appropriate tools. They are able to organize objects and ideas into broad concepts first by single properties and later by multiple properties. They can create and interpret graphs and models that explain phenomena. Students can keep notebooks to record sequential observations and identify simple patterns. They are able to design and conduct investigations, analyze results, and communicate the results to others. Students will carry their curiosity, interest and enjoyment of the scientific world view, scientific inquiry, and the scientific enterprise into middle school.

At the end of the middle school science experience, students can discover relationships by making observations and by the systematic gathering of data. They can identify relevant evidence and valid arguments. Their focus has shifted from the general to the specific and from the simple to the complex. They use scientific information to make wise decision related to conservation of the natural world. They recognize that there are both negative and positive implications to new technologies.

As an SCS graduate, former students should be literate in science, understand key science ideas, aware that science and technology are interdependent human enterprises with strengths and limitations, familiar with the natural world and recognizes both its diversity and unity, and able to apply scientific knowledge and ways of thinking for individual and social purposes.

**How to Use the Science Curriculum Maps**

**Tennessee State Standards**

The TN State Standards are located in the first three columns. Each content standard is identified as the following: grade level expectations, embedded standards, and outcomes of the grade/subject. Embedded standards are standards that allow students to apply science practices. Therefore, you will see embedded standards that support all science content. It is the teachers' responsibility to examine the standards and skills needed in order to ensure student mastery of the indicated standard.

**Content**

The performance tasks blend content, practices, and concepts in science with mathematics and literacy. Performance tasks should be included in your plans. These can be found under the column content and/or connections. Best practices tell us that making objectives measureable increases student mastery.

**Connections**

District and web-based resources have been provided in the Instructional Support and Resources column. The additional resources provided are supplementary and should be used as needed for content support and differentiation.

(More Academic Vocabulary support can be found at the following link: <http://www.berkeleyschools.net/wp-content/uploads/2013/05/BUSD_Academic_Vocabulary.pdf>)

Following the vocabulary development work of Beck, McKeown and Kucan, the CCSS references three tiers of words that are vital to academic achievement:

* Tier One words are the words of everyday speech usually learned in the early grades… Tier Two words (what the Standards refer to as general academic words) are far more likely to appear in written texts than in speech. They appear in all sorts of texts: informational texts (words such as relative, vary, formulate, specificity, and accumulate), technical texts (calibrate, itemize, periphery), and literary texts (dignified, faltered).
* Tier Two words often represent subtle or precise ways to say relatively simple things—saunter instead of walk, for example. Because Tier Two words are found across many types of texts, they are highly generalizable.
* Tier Three words (what the Standards refer to as domain-specific words) are specific to a domain or field of study (lava, legislature, circumference, aorta) and key to understanding a new concept within a text… Recognized as new and “hard” words for most readers (particularly student readers), they are often explicitly defined by the author of a text, repeatedly used, and otherwise heavily scaffolded (e.g., made a part of a glossary).

It is important to target specific instruction on Tier 2 and Tier 3 vocabulary words to help students develop deep understanding that cannot be acquired through independent reading. Since Tier 3 words are typically targeted in content specific instruction, it's particularly important and challenging to identify and target Tier 2 words, since they appear across all disciplines.

Basic Guidelines for effective structured language practice strategies:

* Make the target language rigorous, and mandatory.
* Never use structured language practice strategies with language that hasn’t been explicitly taught first.
* Post the graphic organizers or word banks and sentence frames that you’ve taught. Require students to use them during the activity and continuously remind them to focus on their use of the language.
* Use a timer, chime, or other signal to mark the beginning, transitions, and ending of the activity. Keep it moving! Don’t adjust your pace to allow all students to finish. If you use these strategies regularly, students will increase their speed to match your snappy pace.
* Circulate to monitor for participation as well as accuracy. Provide targeted support as needed.
* Take it to writing. A brief written product (sentence(s) in a journal, language log, note sheet, poster, post-it, exit ticket…) helps hold all students accountable.

Strategies include

* Classroom Instructional Strategy - <https://drive.google.com/drive/folders/0B_iyFfHv_OU6Z1FHOWN2TFFpdDQ>
* Word Webs - <https://drive.google.com/drive/folders/0B_iyFfHv_OU6Z1FHOWN2TFFpdDQ>
* Academic Vocabulary Log - <https://drive.google.com/drive/folders/0B_iyFfHv_OU6Z1FHOWN2TFFpdDQ>

| **State Standards** | **Embedded Standards** | | **Outcomes** | | **Content** | | **Connections** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Standard 2 – Matter and Energy – Properties of Matter - 3 Weeks** | | | | | | | |
| CLE 3221.2.1 Investigate the characteristic properties of matter  CLE3221.2.2 Explore the interactions between matter and energy.  Scaffolded (Unpacked) Ideas  1.A compound is a substance composed of two or more elements chemically combined.  2. Matter can be either pure substances (compounds or elements) or mixtures which can be homogeneous or heterogeneous.  3. Homogeneous mixtures can be characterized by solute concentration.  4. Solute concentration can affect the physical properties of a homogeneous mixture.  5. Solute concentration can be expressed quantitatively using a number of different units such as molarity, molality and parts per million (ppm).  6. Pressure and temperature determine the state of the substance whether it is a solid, liquid or gas.  7. Particle spacing and motion is different in solids, liquids and gases as described by the Kinetic-Molecular Theory.  7. The change in temperature, pressure, volume and the number of particles of gases can be predicted by the gas laws. | | CLE3221.Inq.2 Design and conduct scientific investigations to explore new phenomena, verify previous results, test how well a theory predicts, and compare opposing theories.  CLE3221.Inq.3 Use appropriate tools and technology to collect precise and accurate data.  CLE3221.Math.1 Understand the mathematical principles associated with the science of chemistry.  CLE3221.Math.2 Utilize appropriate mathematical equations and processes to solve chemistry problems | | Identify a material as an element, compound or mixture, identify a mixture as homogeneous or heterogeneous; and/or identify a mixture as a solution, colloid or suspension.  Express the concentration of a solution in units of molarity and molality.  Express the concentration of a solution in units of ppm, ppb, molarity, molality, and percent composition.  Describe how to prepare solutions of given concentrations expressed in units of ppm, ppb, molarity, molality, and percent composition.  Investigate factors that affect the rate of solution  Describe how to prepare a specific dilution from a solution of known molarity  Use and interpret a solubility graph, composition of a solution and temperature to determine if a solution is saturated, unsaturated, or supersaturated  Classify a solution as saturated, unsaturated, or supersaturated based upon its composition and temperature and a solubility graph.  Identify properties of a solution: solute and solvent in a solid, liquid or gaseous solution.  Identify colloids and suspensions. | **Glencoe Chemistry – Mixtures and Solution – Chapter 14**  14.1 Types of Mixtures  14.2 Solution Concentration  14.3 Factors Affecting  Solvation  14.4 Colligative Properties of  Solutions  Launch Lab – How does energy change when solutions form? – Students will investigate whether the dissolution of two different solids in water is an exothermic or endothermic process. p. 475  Quick Demo - The Tyndall Effect – Student will determine if the **effect** of light scattering in colloidal dispersion, while showing no light in a true solution. p. 477  Data Analysis – Design an Experiment – How can you measure turbidity? p. 478  Practice Problems p. 481, 482, 483, 484, 486, 487, 488, 497, 503,  Mini Lab – Examine Freezing Point Depression – Students will measure freezing point depression. - p. 502  CHEMLAB – Investigate Factors Affecting Solubility – Students will test factors that may affect the rate of solution. - p. 508  **Holt Chemistry – Solutions - Chapter 12**  12.1 Types of Mixtures  12.2 The Solution Process  12.3 Concentration of Solutions  Quick Lab – Observing Solutions, Suspensions, and Colloids p. 405  Demonstration – Add enough sugar to a glass of iced tea so that an excess settles to the bottom of the glass. Students should observe whether any sugar on the bottom dissolves after you stir the tea thoroughly. Ask students to describe the relationship between a saturated solution and a solution equilibrium. Ask students to predict what will happen to the solution equilibrium if the solution is heated or cooled  Sample Problem C and Practice Problems p. 421  Sample Problem E and Practice Problem p. 424  Chapter Lab – Separation of Pen Inks by Paper Chromatography- pp. 432 – 433  Test Prep p. 435 | | **Academic Vocabulary** Suspension, colloid, Brownian motion, Tyndall effect, soluble, miscible, insoluble, immiscible, concentration, molarity, molality, mole fraction, solvation, heat of solution, unsaturated solution, saturated solution, supersaturated solution, Henry’s Law, colligative property, vapor pressure lowering, boiling point elevation, freezing point depression, osmosis, osmotic pressure  **Performance Tasks**  **Concentration**  Students will construct a graphic organizer to help organize information about the concentration of solutions.  **Knowledge** – Have students write an explanation of the general rule “like dissolves like” in their own words, citing example form their own experiences.  **Chemistry Project – Sport Drinks** – Have students research sport drinks and compare the nutritional information and the ingredients of different brands. Is there a benefit of drinking a sports drink if you are an athlete or have just completed a strenuous workout? Is a sport drink significantly different from other noncarbonated, flavored beverages? Have students compare the cost of various sport drinks to other flavored noncarbonated beverages.  **Electrolytes**  Have students research the role of electrolytes in the body. Research should include the role of electrolysis in nerve and muscle function. Students should also include information on the issues that arise when electrolytes are imbalanced in the body.  **Ocean Sequestration**  Read the article” In the Field” on p. 505. Brainstorm a list of questions that must be addressed through research before deep ocean sequestration is attempted. Visit **www. glencoe.com** for more information on CO2 sequestration.  **Nitrites and Nitrates**  Sodium nitrites and sodium nitrate are used as preservatives in meat to prevent bacterial growth. However, large doses can be unhealthy. Students are to explain in a brief report shy meat that is boiled contains fewer nitrites and nitrates |
| **Standard 3: Interactions of Matter -** -**2 Weeks** | | | | | | | |
| CLE 3221.3.3 Explore the mathematics of chemical formulas and equations. | | CLE3221.Inq.2 Design and conduct scientific investigations to explore new phenomena, verify previous results, test how well a theory predicts, and compare opposing theories.  CLE3221.Inq.3 Use appropriate tools and technology to collect precise and accurate data.  CLE3221.Math.1 Understand the mathematical principles associated with the science of chemistry.  CLE3221.Math.2 Utilize appropriate mathematical equations and processes to solve chemistry problems | | Identify a substance as an acid or base according to its formula.  Investigate the acidity/basicity of substances with various indicators.  Identify the physical and chemical properties of acids and bases.  Predict the products of a neutralization reaction involving inorganic acids and bases.  Classify solutions as acidic, basic, or neutral based upon how they react with litmus paper and phenolphthalein indicator.  Identify substances using the pH number on the pH scale of 0-14.  Know the names and chemical formulas of 3 of the strong acids. HCl, NNO3, H2SO4.  Recognize that many bases will include OH, such as NaOH.  pH & pOH = 14  Know the titration curve of a strong acid and a strong base with the location of the endpoint | **Glencoe Chemistry - Acids and Bases -Chapter18**  18.1 Introduction to Acids and  Bases  18.2 Strength of Acids and Bases  18.3 Hydrogen Ions and pH  18.4 Neutralization  Launch Lab – What is in your cupboards? P. 633  Practice Problems pp. 638, 640, 647, 649, 651, 653,  Mini Lab – Compare Acid Strength p. 648, 654, 655, 656, 657, 664, 665  Demonstration Using a Buffer p. 666  Problem –Solving Lab – Apply Scientific Explanations p. 668  **Holt Chemistry – Acids and Bases - Chapter 14**  14.1 Properties of Acids and Bases  14.2 Acid-Base Theories  14.3 Acid-Base Reactions  Demonstration – Color Change of Phenolphthalein p. 468  Quick Lab – Household Acids and Bases p. 472  Chapter Lab – Is It an Acid or a Base? Pp. 496-497  [www.scilinks.org](http://www.scilinks.org) (Sign in)  Acids  Household Acids and Bases  Acid Water  Salts  **Holt Chemistry –Acid-Base Titration and pH – Chapter 15** 15.1 Aqueous Solutions and the Concept of pH  15.2 Determining pH and Titration  Practice Problems p. 503, 505, 506, 507, 508, 520, 521,  Quick Lab – Testing the pH of Rainwater p. 514  Chapter Lab How Much Calcium Carbonate Is in an Eggshell? pp. 528-529  [www.scilinks.org](http://www.scilinks.org)  pH  Acid Rain  Titration/Indicators | **Academic Vocabulary**  Acidic solution, basic solution, Arrhenius model, Bronsted-Lowry model, conjugate acid, conjugate base, conjugate acid-base pair, amphoteric, Lewis model, strong acid, weak acid, acid ionization constant, strong base, weak base, base ionization constant, ion product constant for water, pH, pOH, neutralization reaction, salt, titration, titrant, equivalence point, acid-base indicator, end point, salt hydrolysis, buffer, buffer capacity  **Performance Tasks**  **Acids and Bases –**Students will make a graphic organizer to compare the main models of acids and bases.  **pH and Skin –** Have students research the pH of skin and how various products-particularly basic soaps-can interact with substances that protect the skin. Students will write a report on their findings.  **Analyze –**Read the article “Acid- Base Reactions on the Rise” – p. 669. If a recipe calls for flour, salt, sugars, bran cereal, milk, an egg, and shortening or vegetable oil, would you use baking soda or baking powder? Writing a report explaining your answer. For more information about acids and bases in cooking, visit **glencoe.com.**  **Cross- Disciplinary Connection – p. 477 –** Read the article and group students into groups of four and have them select a question to discuss in their groups. Let them report out.  **Alternative Assessment –** Have students research the various devices presently available to improve the quality of water in homes. Students’ findings will be presented in the form of a written report or a poster showing pictures and diagrams of available equipment and how it functions.  **Acid Rain –** Acid rain is an environmental issue that crosses state and national boundaries. Students will do research on this topic and write a brief report. Students should include a description of the areas in the United States affected by acid rain, and the geographical source of the sulfur and nitrogen oxides that are responsible for acid rain in each region.  C:\Users\moorerf\Desktop\Dropbox\Screenshots\Screenshot 2016-10-28 11.30.10.png (Sign-in)  **Play Soccer, Eat Well**  In the readings, a claim is made that carbon-based molecules are life's building blocks. Create an argument to support this claim. Give reasons and evidence from the texts. Also tell what you may already know about organic molecules | |
| **Standard 2 weeks** | | | | | | | |
| CLE 3221.3.2 Analyze chemical and nuclear reactions.  CLE 3221.3.4 Explain the law of conservation of mass/energy  Scaffolded (Unpacked) Items  1. Chemical changes result from the interaction of two or more elements or compounds in a chemical reaction.  2. Elements or compounds that interact in a chemical reaction are the reactants and the resulting substances are the products.  3. Products of a chemical reaction have physical and chemical properties that are different from the interacting substances.  4. The chemical make-up of the reactants and reaction conditions will determine the type of chemical reaction that will occur.  5. Nuclear reactions differ from chemical reactions in that they cause a change in the nucleus of atoms.  6. Chemical reactions occur without the loss of mass or a change in the number or type of atoms.  7. Unlike chemical reactions, nuclear reactions generate new atoms, isotopes and/or sub-atomic particles according to the Law of Conservation of Mass and Energy.  8. In a chemical reaction, substances interact in a specific (stoichiometric) mole ratio.  9. For a given chemical reaction, the quantitative relationship or stoichiometry between reactants and products determines the amount of products and reactants that result from the reaction. | | CLE3221. Inq.2 Design and conduct scientific investigations to explore new phenomena, verify previous results, test how well a theory predicts, and compare opposing theories.  CLE3221. Inq.3 Use appropriate tools and technology to collect precise and accurate data.  CLE3221.Math.1 Understand the mathematical principles associated with the science of chemistry.  CLE3221.Math.2 Utilize appropriate mathematical equations and processes to solve chemistry problems | | Write the nuclear equation involving alpha or beta particles based on the mass number of the parent isotope and complete symbols for alpha or beta emissions.  Determine the half-life of an isotope by examining a graph or with an appropriate equation.  Write a balanced nuclear equation to compare nuclear fission and fusion.  Describe the benefits of nuclear energy.  Describe radioactivity through a balanced nuclear equation.  Solve half-life problems involving radioactive decay, including alpha and beta decay.  Differentiate between fission and fusion | **Glencoe Chemistry – Nuclear Chemistry Chapter 24**  24.1 Nuclear Radiation  24.1 Radioactive Decay  24.3 Nuclear Reactions  24.4 Applications and Effects of Nuclear Reactions  Launch Lab – How do chain reactions occur?  P. 859  Practice Problems p.869, 872, 876  Mini Lab – Model Radioactive Decay p. 873  Problem-Solving Lab –Interpret Graphs p. 890  CHEMLAB – Investigating Radiation Dosage – p.892  **Holt Chemistry**  **Nuclear Chemistry – Chapter 21**  21.1 The Nucleus  21.2 Radioactive Decay  21.3 Nuclear Radiation  21.4 Nuclear Fission and Nuclear Fusion  Practice Problems - pp. 684, 89  Demonstration  Detecting and Measuring Beta Radiation p. 693  [www.scilinks.org](http://www.scilinks.org)  Radioactive Decay  Half-Life  Radioisotopes  Fission  Fusion  Enrico Fermi | **Academic Vocabulary**  Radioactive, X-ray, penetrating power, transmutation, nucleon, strong nuclear force, band of stability, position emission, position, electron capture, radioactive decay series, half-life, radiochemical dating, induced transmutation, trans-uranium element, mass defect, breeder reactor, nuclear fusion, thermonuclear reaction, ionizing radiation, radiotracer, nuclear fission  **Performance Tasks**  **Serendipitous Moments** – Have student research the word serendipity and relate it to works of such scientists as Henri Becquerel, Alexander Fleming, Charles Goodyear, Louis Pasteur, and Roy Plunkett in a written report.  **Radiotracers – Below Level –** Student can better understand the concept of radiotracers if they make a one-page poster describing them. Have students work in pair to design the posters. Posters should include a definition of a radiotracer in their own words. They should also include a brief description of how radiotracers work and some examples of how they are used in medicine.  **In the Field- Career: Archaeologist –Neutron Activation Analysis**  Read the article on p. 891 do the Writing in Chemistry at the end of the article.  **Skill Builder**  Have students read silently the different types of radioactive decay on pages 685-687. Then group the students in pairs, and have them use **Table 1** to explain and summarize the characteristics of each. Encourage students to use the text they read as a resource to find additional characteristics of the types of nuclear radiation.  **Historical Chemistry** – An Unexpected Finding – Have students read the article of pp. 700-701 and identify researchers who were affected by discrimination or national politics. Students will describe how history plays an important role in scientific research | |

| **TOOLBOX** | |
| --- | --- |
| Unit 4.1 Solutions  **Plans and Background Information for Teachers** | The Chemistry of Solutions (lesson plan) <http://water.me.vccs.edu/courses/ENV211/lesson8.htm>  The Chemistry of Solutions Concentration (informational text) <http://water.me.vccs.edu/courses/ENV211/lesson8_3.htm>  Introduction to Solutions (lesson plans, PowerPoint, and more) [http://www.sharemylesson.com/taxonomysearchresults.aspx?parametrics=90013,90043,91037|91038|91039|91040&tab=grade&mode=browse](http://www.sharemylesson.com/taxonomysearchresults.aspx?parametrics=90013%2C90043%2C91037%7C91038%7C91039%7C91040&amp;tab=grade&amp;mode=browse)  Messing with Mixtures (student activity) <http://sciencespot.net/Media/messingmixtures.pdf>  Solutions (slide share) <http://www.hschemsolutions.com/files/Download/6.6%20Colligative%20Lecture.pdf>  Solutions Worksheet <http://www.hschemsolutions.com/files/Download/6.6%20Colligative%20%28WS%29.pdf> |
| Unit 4.1 Solutions  **Student Activities** | Messing with Mixtures (Student’ activity) <http://sciencespot.net/Media/messingmixtures.pdf>  Solutions (handout) <http://www.hschemsolutions.com/files/Download/6.6%20Colligative%20%28SLN%29.pdf>  Solutions Worksheet <http://www.hschemsolutions.com/files/Download/6.6%20Colligative%20%28WS%29.pdf> |
| Unit 4.2  Acids and Bases  **Plans** and **Background for Teachers** | Acids and Bases (experiment) <http://www.discoveryeducation.com/teachers/free-lesson-plans/elements-of-chemistry-acids-and-bases.cfm>  Acid and Base Indicator (informational text) <http://chemistry.about.com/od/acidsbases/a/Acid-Base-Indicators.htm>  pHun with Acids and Bases (lesson plan) <http://alex.state.al.us/lesson_view.php?id=23984>  Acids and Bases Problem Set 1 <http://betterlesson.com/community/document/6327/acids-bases-prob-set-1> |
|  | Acids and Bases (lesson plan / experiment) <http://www.middleschoolchemistry.com/lessonplans/chapter6/lesson9>  The Arrhenius Definition of Acids and Bases (video) <http://education-portal.com/academy/lesson/the-arrhenius-definition-of-acids-and-bases.html#lesson>  Chemistry Daily Lesson Plan [http://www.metu.edu.tr/~kduygu/566/exper/lesson\_plan\_10.pdf](http://www.metu.edu.tr/%7Ekduygu/566/exper/lesson_plan_10.pdf)  Elements of Chemistry: Acids and Bases (lesson plan) <http://school.discoveryeducation.com/teachersguides/pdf/physicalscience/ds/ec_acidsandbases.pdf>  Acids and Bases (links for slide presentations) <http://www.unit5.org/Page/4037> |
| Unit 4.2  Acids and Bases  Student **Activities** | Identifying Acids and Bases <http://betterlesson.com/community/document/6336/acids-and-bases-problems-sheets-id>  Acids and Bases Problem Set 1 <http://betterlesson.com/community/document/6327/acids-bases-prob-set-1> |
| Unit 4.1  Nuclear Chemistry  **Plans**  and **Background for Teachers** | Nuclear Chemistry (lesson plan) <http://www.uscupstate.edu/academics/education/aam/lessons/alan_knight/lessonplan/nuclear_chem_lp.htm>  Researching Nuclear Chemistry (project) <http://www.readwritethink.org/files/resources/lesson-docs/Researching_Nuclear_Chemistry.pdf>  Researching Nuclear Chemistry Rubric <http://www.readwritethink.org/files/resources/lesson-docs/Nuclear_Chemistry_Rubric.pdf>  Nuclear Chemistry Research Project <https://docs.google.com/document/d/1WvEzo2U3OBXWMS-q30dLQTMEdrAe31g8w5-zglX796E/edit?usp=sharing>  Half-life: Calculating Radioactive Decay and Interpreting Decay Graphs (video) [http://education-portal.com/academy/lesson/half-life-calculating-radioactive-decay-and-](http://education-portal.com/academy/lesson/half-life-calculating-radioactive-decay-and-interpreting-decay-graphs.html#lesson) [interpreting-decay-graphs.html#lesson](http://education-portal.com/academy/lesson/half-life-calculating-radioactive-decay-and-interpreting-decay-graphs.html#lesson)  Nuclear Reactor/Energy Generation (lesson plan) <http://www.nrc.gov/reading-rm/basic-ref/teachers/unit3.html>  Half- life (worksheet) <http://chem.lapeer.org/Chem1Docs/HalflifeWorksheet.html>  Radiation Vocabulary (informational text) <http://www.epa.gov/radtown/docs/vocabulary-materials.pdf>  Nuclear chemistry (activities and experiments) ( <http://www.nclark.net/NuclearChem> |
| Unit 4.2  Nuclear Chemistry  **Student Activities**  **Chemistry**  **Careers** | Researching Nuclear Chemistry (project) <http://www.readwritethink.org/files/resources/lessondocs/Researching_Nuclear_Chemistry.pdf>  Researching Nuclear Chemistry Rubric <http://www.readwritethink.org/files/resources/lesson-docs/Nuclear_Chemistry_Rubric.pdf> Half-Life (worksheet) <http://chem.lapeer.org/Chem1Docs/HalflifeWorksheet.html>  ACS Chemistry for Life (Chemistry Careers and Descriptions) <http://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/research-development.html>  About Education: Chemistry Careers (informational text) <http://chemistry.about.com/cs/5/f/blcareers.htm> |