**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.

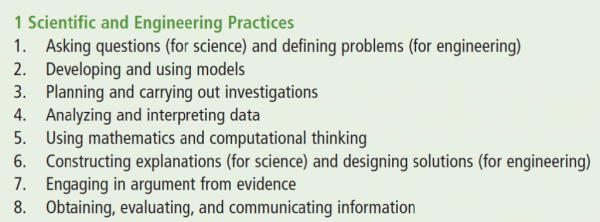
**Introduction**

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. The importance of combining science and engineering practices and disciplinary core ideas is stated in the Framework as follows:

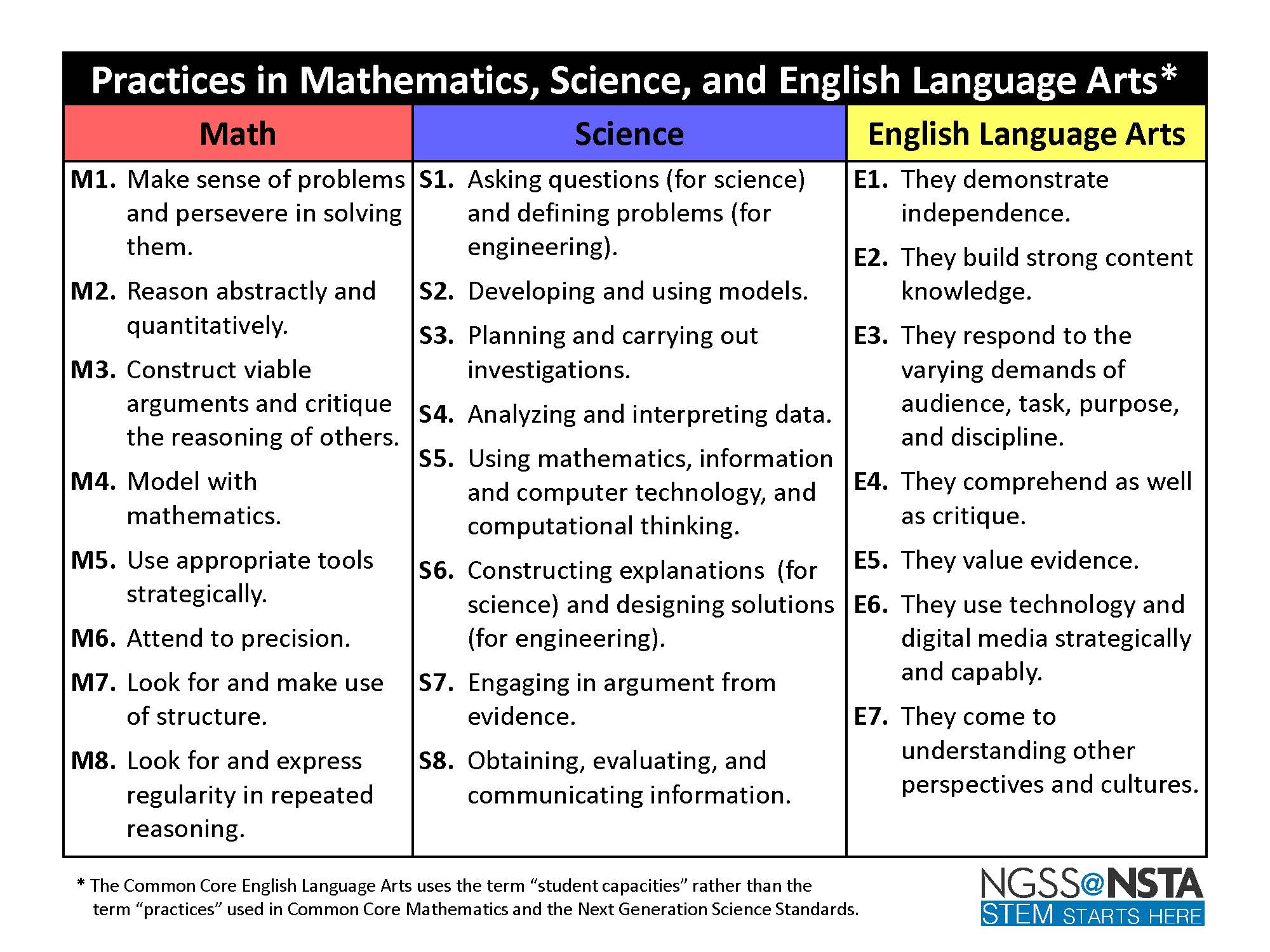
Standards and performance expectations that are aligned to the framework must take into account that students cannot fully understand scientific and engineering ideas without engaging in the practices of inquiry and the discourses by which such ideas are developed and refined. At the same time, they cannot learn or show competence in practices except in the context of specific content. (NRC *Framework*, 2012, p. 218)

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.

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 opportunities 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 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.



**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.

| State Standards | Embedded Standards | Outcomes | Resources | | CLIP Connections | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Standard 1- Mechanics - 3 weeks** | | | | | | | |
| **CLE 3231.1.2** Analyze and apply Newton’s three laws of motion.  Scaffolded (Unpacked) Ideas  1. Newton defined force as a change in momentum.  2. Momentum is the product of an object or systems mass multiplied by the object or systems velocity.  3. The momentum of a system is always conserved.  4. Physicists have organized Newton’s views into 3 laws of motion.  The 1st law requires that net force must be acting on the particle or system to change its state of motion.  The 2nd law requires that the net force acting on an object or system will be equal to the product of the mass of an object and its acceleration.  The 3rd law asserts that when 2 or more objects are in direct or indirect contact, the forces exerted on each object are exactly the same.  5. Forces and momenta are vector quantities.  6. A vector is a mathematical concept where numerical magnitude and direction of the measured attribute are equally important.  7. Numerical quantities where the direction is not relevant are called scalars, and include temperature, density, and time.  8. Forces and momentum for rotating systems involve torque and angular momentum.  9. Mass in these systems entails moments of inertia.  10. Moments of inertia refer to how the object’s mass is distributed about the axis of rotation.  11. The concept of impulse relates forces to changes in momentum.  12. Different forces can cause the same changes to an object momentum depending upon how long the forces were acting on an object. | **CLE 3231.Inq.2** Design and conduct scientific investigations to explore new phenomena, verify previous results, test how well a theory predicts, and compare opposing theories.  **CLE 3231. Inq.5** Compare experimental evidence and conclusions with those drawn by others about the same testable question.  **CLE3231.Inq.6** Communicate and defend scientific findings.  **CLE3231**.Math.4 Investigate trigonometric connections to physics. | Given Newton’s laws of motion, analyze scenarios related to inertia, force, and action-reaction.  Given various examples of quantities, categorize them as scalar or vector quantities.  Given the static and kinetic friction coefficients (μs and μk); select the appropriate coefficient of friction and calculate the force necessary to move the object.  Select the correct vector diagram to illustrate all forces on an object affected by gravity, friction and an applied force.  Given an inclined plane, the required coefficient of friction and an object of a specific mass, select the appropriate trigonometry functions to determine whether the object will slide down the plane or not.  Explain the relationship between the motion of an object and the net external force acting on the object.  Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.  Use mathematical representations of Newton’s Law of Gravitation and Coulomb’s Law to describe and predict the gravitational and electrostatic forces between objects. | **Holt Physics, Chapter 4 – Forces and the Laws of Motion**  4.1 Changes in Motion  4.2 Newton’s First Law  4.3 Newton’s Second and Third Law  4.4 Everyday Forces  Quick Lab – Force and Changes in Motion P. 122  Sample Problem A – pp. 123 – 124  Sample Problem B – pp. 127-128  Sample Problem C - pp. 131-132  Sample Problem D- p. 139  Sample Problem E – pp. 140-141  Quick Lab – Inertia – p. 126  **Why it Matters Conceptual Challenge p. 132**  **Skills Practice Lab – Force and Acceleration pp. 152-155**  **Graphing Calculator Practices –p. 149**  **SciLinks: (**[**www.scilinks.org**](http://www.scilinks.org)**)**  Forces  Newton’s Laws  Friction | | **Academic Vocabulary**  **Force, inertia, net force, equilibrium, weight, normal force, static force, kinetic friction, coefficient of friction**  **Performance Tasks**  **Seat Belts**  **Students will read the article p. 128 – Seat Belts and write a paragraph on why the rod turn (clockwise or counterclockwise) if the car comes to an abrupt stop? (clockwise)**  **(Practice 6/Literacy**  **Driving and Friction**  **Students will read the article - Driving and Friction p. 142. Students will explain the relationship between the coefficient of friction between the ground and the tires of a car. Discuss dry, raining and snowing conditions.**  **Special Instruments in an Airplane**  **Imagine an airplane with a series of special instruments anchored to its walls: a pendulum, a 200 kg mass on a spring balance. And a sealed half-full aquarium. What will happened to each instrument when the plane takes off, makes turns, slow down, lands, etc. If possible, test your predictions by simulating airplane motion in elevators, car rides, and other situations. Use instruments similar to those described above, and also observe your body sensations. Write a report comparing your predictions with your experiences.**  With fuel prices for combustible engine automobiles increasing, researchers and manufacturers have given more attention to the concept of an ultralight car. Using carbon composites, lighter steels and plastics, a fuel-efficient car can be manufactured at 540 kg. How much less does an ultralight car weigh compared to a 1450-kg Honda Accord (2016)? | | |
| **Standard 1 - Mechanics - 3 weeks** | | | | | | | |
| **CLE 3231.1.2** Analyze and apply Newton’s three laws of motion.  **CLE 3231.1.3** Understand work, energy, and power.  Scaffolded (Unpacked) Ideas  1. Energy is a scalar concept.  2. Energy due to the motion of an object is called kinetic energy.  3. Kinetic energy can exist as translational, vibrational, and rotational.  4. Energies due to configuration are called potential.  5. Energies due to oscillations such as a vibrating string are termed vibrational energy.  6. The energy of an object may change when work is done on the object.  7. Work on an object may include changes in the object’s velocity, position or both.  8. The rate that work is done on or by a system is the definition of power. | **CLE 3231.Inq.2** Design and conduct scientific investigations to explore new phenomena, verify previous results, test how well a theory predicts, and compare opposing theories.  **CLE 3231. Inq.5** Compare experimental evidence and conclusions with those drawn by others about the same testable question.  **CLE3231.Inq.6** Communicate and defend scientific findings.  **CLE3231**.Math.4 Investigate trigonometric connections to physics. | Given the mass, velocity and time it takes to stop an object in an inelastic collision, determine the momentum and impulse of the collision.  Analyze and solve problems related to elastic and inelastic collisions related to change in momentum.  Relate the variables of work, power, kinetic energy, and potential energy to mechanical situations and solve for these variables.  Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.  Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.  Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.  Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.  Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields. | | **Holt Physics, Chapter 5 – Work and Energy**  5.1 – Work  5.2 – Energy  5.3 – Conservation of Energy  5.4 – Power  Sample Problem A - pp. 161-162  Sample Problem B – pp. 165 – 166  Sample Problem C – pp. 167-168  Sample Problem D – pp. 171 -172  Sample Problem E – pp. 176-177  Sample Problem F – pp. 180-181  Quick Lab – Mechanical Energy – p. 175  Conceptual Challenge p. 179  Graphing Calculator Practice p. 188  Skills Practice Lab – Conservation of Mechanical Energy pp. 192- 195  **Chapter 6 –Momentum and Collisions**  6.1 – Momentum and Impulse  6.2 – Conservation of Momentum  6.3 – Elastic and Inelastic Conditions  Practice A – p. 199  Practice B – 9. 201  Conceptual Challenge p. 206  Quick Lab – Elastic and Inelastic Collisions p. 217  Potential Energy on Shelves  Roller Coaster Physics  Inclined Plane – Sliding Objects  **SciLinks:(**[**www.scilinks.org**](http://www.scilinks.org)**)**  Work  Potential & Kinetic Energy  Conservation of Energy  Momentum  Rocketry  Collisions | | | **Academic Vocabulary**  Work, kinetic energy, work-kinetic energy theorem, potential energy, gravitational potential energy, elastic potentials energy, spring constant, mechanical energy, power, momentum, impulse, perfectly inelastic collision, elastic collision  **Performance Tasks**  **The Energy in Food**  Students will read the article – The Energy in Food and explain why the chemical energy in food is referred to a form of potential energy. P. 168  **Roller Coaster Design**  Read the article – Roller Coaster p. 182. Design and use this link to design a roller coaster <http://www.learner.org/interactives>  [**http://www.learner.org/interactives/**](http://www.learner.org/interactives/)  **?page=1&per\_page=20&query**  **=design+a+roller+coaster**  **Work**  Renatta Gass is out with her friends. Misfortune occurs and Renatta and her friends find themselves getting a workout. They apply a cumulative force of 1080 N to push the car 218 m to the nearest fuel station. Determine the work done on the car. Find answer at this link -(<http://www.physicsclassroom.com/calcpad/energy/problem>)  **Challenge**  The ski slopes at Bluebird Mountain make use of tow ropes to transport snowboarders and skiers to the summit of the hill. One of the tow ropes is powered by a 22-kW motor which pulls skiers along an icy incline of 14° at a constant speed. Suppose that 18 skiers with an average mass of 48 kg hold onto the rope and suppose that the motor operates at full power.  a. Determine the cumulative weight of all these skiers. b. Determine the force required to pull this amount of weight up a 14° incline at a constant speed. c. Determine the speed at which the skiers will ascend the hill.  Find answer at this link -(<http://www.physicsclassroom.com/calcpad/energy/problem> |
| **Standard 1 – Mechanics - 2 weeks** | | | | | | | |
| **CLE 3231.1.5** Investigate and apply Archimedes’s Principle.  **CLE 3231.1.6** Explore Pascal’s Principle.  **CLE 3231.1.7** Develop an understanding of Bernoulli’s Principle and its applications.    Scaffolded (Unpacked) Ideas  1. Archimedes principle involves fluids.  2. Liquids and gaseous states of matter comprise fluids.  3. Archimedes Principle states that an object submerged into a fluid will experience an upward, buoyancy force that is equal in magnitude to the weight of the fluid displaced by the objects volume.  4. Objects submerged in fluids have an apparent weight less than the objects weight when not submerged in the fluid.  5. A fluid exerts pressure in all directions.  6. Pressure is defined as a force per unit area.  7. The force due to fluid pressure is exerted normal (perpendicular) to any surface at the boundary of the fluid.  8. Energy contained in a fluid is related to its pressure, speed and depth.  9. Bernoulli’s Principle is based upon the conservation of energy and mass for a system.  10. The faster a fluid is flowing parallel to a surface, the lower the fluid pressure is against that surface. | **CLE 3231.Inq.2** Design and conduct scientific investigations to explore new phenomena, verify previous results, test how well a theory predicts, and compare opposing theories.  **CLE 3231. Inq.5** Compare experimental evidence and conclusions with those drawn by others about the same testable question.  **CLE3231.Inq.6** Communicate and defend scientific findings.  **CLE3231**.Math.4 Investigate trigonometric connections to physics. | Evaluate and describe the phenomena related to Archimedes’ Principle, Pascal’s Principle, and Bernoulli’s Principle. | | **Holt Physics, Chapter 8 – Fluid Mechanics**  8.1 – Fluids and Buoyant Force  8.2 – Fluid Pressure  8.3 – Fluids in Motion  Sample Problem A - pp. 278-279  Sample Problem B – pp. 281-289  Graphing Calculator Practice p.291  **SciLinks: (**[**www.scilinks.org**](http://www.scilinks.org)**)**  Archimedes – HF60093  Buoyancy – HF60201  Atmospheric Pressure –HF60114 | | | **Academic Vocabulary**  Fluid, mass density, buoyant force, pressure, ideal fluids  **Performance Tasks**  **Force or Acceleration**  The owner of a fleet of tractor-trailers has contracted you after a series of accidents involving tractor-trailer passing each other on the highway. The owner wants to know how drivers can minimize the pull exerted on one tractor-trailer passes another going in the same direction. Should the passing tractor-trailer try to pass as quickly as possible or as slowly as possible? Design experiments to determine the answer by using model motor boats in a swimming pool. Indicate exact what you will measure and how.  **Shake it Up: Animating Oobleck with Sound Waves**  Students will make Oolbeck using cornstarch and water. When stress is applied to a mixture of cornstarch and water it exhibits properties of a solid. What happens to the mixture when it is disturbed at certain frequencies?  To produce effects that have to be witnessed to be believed, you will need a function generator, an amplifier, a subwoofer and a dish or pie tin containing a mixture of cornstarch and water (Oobleck). You may wish to begin with a mixture of two parts cornstarch and one part water. Support the container containing the Oobleck over the top of the subwoofer. Begin your experimentation with a 50 Hz signal and adjust until fingers of Oobleck begin to rise from the surface of the liquid. Describe what you observe during the acceleration of Oobleck with sound. |
| **Standard 1- Mechanics -1 week** | | | | | | | |
| **CLE 3231.1.4** Investigate kinematics and dynamics.  **CLE 3231.1.7** Develop an understanding of Bernoulli’s Principle and its applications.  Scaffolded (Unpacked) Ideas  Bernoulli’s Principle is based upon the conservation of energy and mass for a system. | **CLE 3231.Inq.2** Design and conduct scientific investigations to explore new phenomena, verify previous results, test how well a theory predicts, and compare opposing theories.  **CLE 3231. Inq.5** Compare experimental evidence and conclusions with those drawn by others about the same testable question.  **CLE3231.Inq.6** Communicate and defend scientific findings.  **CLE3231**.Math.4 Investigate trigonometric connections to physics. | Analyze and solve problems related to rotational motion and torque | | **Holt Physics, Chapter 7 – Circular Motion and Gravitation**  7.1 - Circular Motion  7.2 – Newton’s Law of Universal  Gravitation  7.3 – Motion in Space  7.4 – Torque and Simple Machines  Sample Problem A – pp. 235 – 236  Sample Problem B – pp. 237 – 238  Sample Problem C – p. 242  Sample Problem D – p. 251  Sample Problem E pp. 257-258  Conceptual Challenge- p. 239  Quick Lab – Gravitational Field Strength p. 245  Conceptual Challenge p. 246  Quick Lab – Kepler’s Third Law p.  249  Quick Lab – Elevator Acceleration p. 252  Quick Lab – Changing the Lever Arm p. 255  Inquiry Lab – Machines and Efficiency pp. 270-271  **SciLinks: (**[**www.scilinks.org**](http://www.scilinks.org)**)**  Gravity & Orbiting Objects – HF60692  Torque – HF61538 | | **Academic Vocabulary**  Centripetal acceleration, gravitational force, torque, lever arm Performance Tasks **Circular Motion and Gravitation** During their physics field trip to the amusement park, Tyler and Maria took a rider on the Whirligig. The Whirligig ride consists of long swings which spin in a circle at relatively high speeds. As part of their lab, Tyler and Maria estimate that the riders travel through a circle with a radius of 6.5 m and make one turn every 5.8 seconds. Determine the speed of the riders on the Whirligig.  Find the solution to the tasks at this link : <http://www.physicsclassroom.com/calcpad/circgrav/problems>  In an effort to *rev up* his class, Mr. H does a demonstration with a bucket of water tied to a 1.3-meter long string. The bucket and water have a mass of 1.8 kg. Mr. H whirls the bucket in a vertical circle such that it has a speed of 3.9 m/s at the top of the loop and 6.4 m/s at the bottom of the loop.  a. Determine the acceleration of the bucket at each location. b. Determine the net force experienced by the bucket at each location. c. Draw a free body diagram for the bucket for each location and determine the tension force in the string for the two locations.  Find the solution to the tasks at this link : <http://www.physicsclassroom.com/calcpad/circgrav/problems>  **Simple Machines**  Prepare a poster of a series of models of simple machines, explaining their use and how they work. Include a schematic diagram next to each sample or picture to identify the fulcrum, lever arm, and resistance. Add your own examples to the following list: nail clipper, wheelbarrow, can opener, nutcracker, electric drill, screwdriver, tweezers, and key in lock.  **Torque at Work**  Describe exactly which measurements you would need to make in order to identify the torques at work during a ride on a specific bicycle. Your plans should include measurements you can make with equipment available to you. Compare you model with others in the class for efficiency and mechanical advantage. | |

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| **Second Nine Weeks Toolbox** | | | |
| **Unit 2.1 Forces and Newton’s Laws of Motion** | **Unit 2.2 Impulse and Momentum**  **Work, Energy and Power** | **Unit 2.3 Fluid Mechanics** | **Unit 2.4 Rotational Inertia and Torque/**  **Rotational Equilibrium** |
| **PhET Simulations**  **(**[**http://phet.colorado.edu/en/simulations/category/physics**](http://phet.colorado.edu/en/simulations/category/physics)**)**  **The Physics Classroom Applets (Tutorials Available)**  **(**[**http://www.physicsclassroom.com/mmedia/index.cfm**](http://www.physicsclassroom.com/mmedia/index.cfm)**)**  **The Physics Classroom Quicktime Movies**  **(at bottom of Multimedia Page)**  **The Physics Classroom Lab Sheets**  **(**[**http://www.physicsclassroom.com/lab/**](http://www.physicsclassroom.com/lab/)**)**    **HyperPhysics Notes – Conservation of Energy**  <http://hyperphysics.phy-astr.gsu.edu/hbase/conser.html#coneng>  **Walter-Fendt Applet – Pulleys**  <http://www.walter-fendt.de/ph14e/pulleysystem.htm> | **PhET Simulations**  **(**[**http://phet.colorado.edu/en/simulations/category/physics**](http://phet.colorado.edu/en/simulations/category/physics)**)**  Collision Lab  Energy Forms & Changes  Energy Skate Park  Energy Skate Park: Basics  **The Physics Classroom Applets (Tutorials Available)**  Momentum & Collisions  Work & Energy  **The Physics Classroom Quicktime Movies (at bottom of Multimedia Page)**  Momentum & Collisions  Work & Energy  **The Physics Classroom Lab Sheets**  Momentum & Collisions  Work & Energy  **HyperPhysics Notes – Conservation of Momentum**  <http://hyperphysics.phy-astr.gsu.edu/hbase/conser.html#conmom>  **Walter-Fendt Applet – Newton’s Cradle**  <http://www.walter-fendt.de/ph14e/ncradle.htm>  **Walter-Fendt Applet – Collisions**  http://www.walter-fendt.de/ph14e/collision.htm | **PhET Simulations**  **(**[**http://phet.colorado.edu/en/simulations/category/physics**](http://phet.colorado.edu/en/simulations/category/physics)**)**  Balloons & Buoyancy  Buoyancy  Density  Fluid Pressure & Flow  Under Pressure  **HyperPhysics Notes**  **(**[**http://hyperphysics.phy-astr.gsu.edu/hbase/pbuoy.html**](http://hyperphysics.phy-astr.gsu.edu/hbase/pbuoy.html)**)**  **Walter Fendt Buoyant Force Applet** (<http://www.walter-fendt.de/ph14e/buoyforce.htm>) | **PhET Simulations**  **(**[**http://phet.colorado.edu/en/simulations/category/physics**](http://phet.colorado.edu/en/simulations/category/physics)**)**  Balancing Act  Gravity & Orbits  Gravity Force Lab  Ladybug Motion 2D  Ladybug Revolution  Torque  **The Physics Classroom Applets**  Circular, Satellite & Rotational Motion  **Shockwave Physics Studios**  **(**[**http://www.physicsclassroom.com/shwave/**](http://www.physicsclassroom.com/shwave/)**)**  Uniform Circular Motion  Gravitation  Orbital Motion  **The Physics Classroom Lab Sheets**  Circular Motion & Satellite Motion  **HyperPhysics Notes – Circular Motion**  <http://hyperphysics.phy-astr.gsu.edu/hbase/circ.html#circ>  **Walter-Fendt Applet – Levers/Torque**  <http://www.walter-fendt.de/ph14e/lever.htm>  **Walter-Fendt Applet – Circular Motion**  <http://www.walter-fendt.de/ph14e/circmotion.htm>  **Walter-Fendt Applet – Centripetal Force**  <http://www.walter-fendt.de/ph14e/carousel.htm> |