

Unit: Motion

Essential Questions

1. What are the differences between a vector quantity and a scalar quantity, including: distance, displacement, speed, velocity, and acceleration?
2. How is a frame of reference used to describe motion, including uniformly accelerated motion?
3. What is the proper process for problem solving?
4. What information can be interpreted from 1-D Motion graphs (including d vs. t , v vs. t and a vs. t)?
5. How do you draw the magnitude and direction of a vector?
6. How do you graphically and mathematically represent vector quantities?
7. How do you solve for variables involving projectiles?
 - ...including horizontal launch between uneven surfaces
 - ...an angled launch on a level surface
 - ...an angled launch between uneven surfaces, requiring trigonometric identities

Framework Standard	Content/Skills	Resources	Instructional Strategies	Assessments
1.1 Compare and contrast vector quantities (e.g., displacement, velocity, acceleration force, linear momentum) and scalar quantities (e.g., distance, speed, energy, mass, work).	<p>Identify the difference between a vector quantity and a scalar quantity</p> <p>Identify the difference between a distance and a displacement.</p> <p>Identify the difference between a speed and a velocity</p> <p>Draw the magnitude and direction of a vector.</p> <p>Multiply or divide a vector quantity by a scalar quantity</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhET: Collisions Lab</p> <p>Popsicle Stick Vectors</p> <p>Sparktimers or Photogate Motion</p> <p>Vernier Lab Activities</p> <p>Video: Cliff Divers</p> <p>Video: Vectors Adding</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Lab 001: Physics 500</p> <p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects

<p>1.2 Distinguish between displacement, distance, velocity, speed, and acceleration. Solve problems involving displacement, distance, velocity, speed, and constant acceleration.</p>	<p>Define acceleration.</p> <p>Apply frame of reference to describe motion.</p> <p>Identify the equations used to describe uniformly accelerated motion.</p> <p>Apply the proper process for problem solving.</p> <p>Use trigonometry to resolve vector components in the x and y directions</p> <p>Use trigonometry to determine the vector resultant in problems involving multiple vectors?</p> <p>Solve for variables involving projectiles: ...including horizontal launch between uneven surfaces ...an angled launch on a level surface</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhysClips www.animations.physics.unsw.edu.au</p> <p>PhET: Moving Man</p> <p>PhET: Forces & Motion</p> <p>Video: Frames of Reference</p> <p>Video: Cliff Diver</p> <p>Video: Vectors Adding</p> <p>Spark Timers or Photogate Motion</p> <p>Marble Launchers</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Lab 002: Ready for Launch</p> <p>Project 001: Egg Drop</p> <p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets
<p>1.3 Create and interpret graphs of 1-dimensional motion, such as position vs. time, distance vs. time, speed vs. time, velocity vs. time, and acceleration vs. time where acceleration is constant.</p>	<p>Present information using 1-D Motion graphs (including d vs. t, v vs. t and a vs. t).</p> <p>Interpreted information from 1-D Motion graphs (including d vs. t, v vs. t and a vs. t).</p> <p>Use methods of graphical analysis to determine the magnitude and direction of the vector resultant in problems involving multiple vectors.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhET: Moving Man</p> <p>Spark Timers or Photogate Motion</p> <p>Motion Detectors Graph Matching</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Lab 001: Physics 500</p> <p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
<p>SIS: (SCIENTIFIC INQUIRY SKILLS)</p>	<p>SIS 1. Make observations, raise questions, and formulate hypotheses.</p>	<p>Examples SIS 1. Lab 001: Physics 500 Lab 002: Ready for Launch</p>		
	<p>SIS 2. Design and conduct scientific investigations.</p>	<p>Examples SIS 2. Lab 001: Physics 500 Lab 002: Ready for Launch</p>		

	SIS 3. Analyze and interpret results of scientific investigations.	Examples SIS 3. Lab 001: Physics 500 Lab 002: Ready for Launch
	SIS 4. Communicate and apply the results of scientific investigations.	Examples SIS 4. Lab 001: Physics 500 Lab 002: Ready for Launch
RSL: (READING STANDARDS FOR LITERACY)	<u>Key Ideas and Details</u> RSL 1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. RSL 2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. RSL 3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.	Examples RSL 1. Project 001: Egg Drop, Article Summary RSL 2. Project 001: Egg Drop, Article Summary RSL 3. Project 001: Egg Drop, Article Summary
	<u>Craft and Structure</u> RSL 4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. RSL 5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole. RSL 6. Assess how point of view or purpose shapes the content and style of a text.	Examples RSL 4. Chapter Summary RSL 5. Chapter Summary RSL 6. Chapter Summary
	<u>Integration of Knowledge and Ideas</u> RSL 7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.* RSL 8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. RSL 9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.	Examples RSL 7. Video Analysis RSL 8. Project 001: Egg Drop, Article Summary RSL 9. Project 001: Egg Drop

	<p><u>Range of Reading and Level of Text Complexity</u> RSL 10. Read and comprehend complex literary and informational texts independently and proficiently.</p>	<p><u>Examples</u> RSL 10. Article Summary or Book Excerpt Summary</p>
<p>WSL: WRITING STANDARDS FOR LITERACY</p>	<p><u>Text Types and Purposes*</u> WSL 1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence. WSL 2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. WSL 3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.</p>	<p><u>Examples</u> WSL 1. Article Summary or Book Excerpt Summary WSL 2. Project 001: Egg Drop, Article Summary WSL 3. Narrative Summarizer</p>
	<p><u>Production and Distribution of Writing</u> WSL 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. WSL 5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. WSL 6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.</p>	<p><u>Examples</u> WSL 4. Project 001: Egg Drop WSL 5. Project 001: Egg Drop, Research Paper WSL 6. Online collaboration on Labs, Projects, Etc. (Moodle, Google Docs, etc.)</p>
	<p><u>Research to Build and Present Knowledge</u> WSL 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. WSL 8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. WSL 9. Draw evidence from literary or informational texts to support analysis, reflection, and research.</p>	<p><u>Examples</u> WSL 7. Project 001: Egg Drop WSL 8. Project 001: Egg Drop, Research Paper WSL 9. Project 001: Egg Drop, Research Paper</p>

	<p><u>Range of Writing</u> WSL 10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.</p>	<p><u>Examples</u> WSL 10. Lab Report (with or without revision), Research Paper (with or without revision), Narrative Summarizer, Article Summary, Book Excerpt Summary</p>

Unit: Forces

Essential Questions

1. What are Newton's three laws of motion and how are they applied?
2. How do you use vectors to determine the net force acting on an object?
3. What is the difference between static and kinetic friction?
4. How do Newton's laws of motion relate to the concept of centripetal acceleration and centripetal force?
5. What is Newton's universal law of gravitation?

Framework Standard	Content/Skills	Resources	Instructional Strategies	Assessments
1.4 Interpret and apply Newton's three laws of motion.	<p>Understand Newton's three laws of motion</p> <p>Define the term net force</p> <p>Identify differences between mass, inertia, and weight</p> <p>Apply Newton's three laws of motion to solve word problems</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhysClips www.animations.physics.unsw.edu.au</p> <p>Video: NOVA: Newton's Dark Secret</p> <p>Video: The Real Life UP</p> <p>Skateboards</p> <p>Cars on ramps</p> <p>Rolling bowling balls</p> <p>Demo: Table Cloth Pull</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Project 001: Egg Drop</p> <p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets
1.5 Use a free-body force diagram to show forces acting on a system consisting of a pair of interacting objects. For a diagram with only co-linear forces, determine the net force acting on a	<p>Use vectors to determine the net force acting on an object</p> <p>Create free-body diagrams</p> <p>Use free-body diagrams with the application of Newton's three laws of motion</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhET: Forces & Motion</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I</p>	<p>Lab 003: Friction</p> <p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects

system and between the objects.			Do Get/Don't Get) Summarizers	
1.6 Distinguish qualitatively between static and kinetic friction, and describe their effects on the motion of objects.	Identify the difference between static and kinetic friction	PowerPoint Giancoli CD-ROM (Modified as needed) PhET: Forces & Motion Demo: Tug-o-War: Socks vs. Shoes	Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers	Lab 003: Friction Project 002: Mouse Trap Cars Suggested: <ul style="list-style-type: none"> • Moodle problem sets • Worksheets
1.7 Describe Newton's law of universal gravitation in terms of the attraction between two objects, their masses, and the distance between them.	Explain Newton's universal law of gravitation. Determine the magnitude and direction of the gravitational force. Describe the orbital motion of satellites through Newton's Laws.	PowerPoint Giancoli CD-ROM (Modified as needed) PhET: Gravity & Orbits Video: NOVA: Monsters of the Milky Way Video: Gravity Experiment Video: Cavendish Experiment Demo: Elevators & Weight	Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers	Suggested: <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects

<p>1.8 Describe conceptually the forces involved in circular motion.</p>	<p>Determine centripetal acceleration and centripetal force for objects in circular motion.</p> <p>Use Newton's laws of motion to determine a centripetal acceleration</p> <p>Identify the relationship between centripetal acceleration, tangential velocity, and radius.</p> <p>Identify the relationship between the period of the motion and the frequency of rotation</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhysClips www.animations.physics.unsw.edu.au</p> <p>PhET: Gravity & Orbits</p> <p>Video: Car on Level Track</p> <p>Video: Car on Banked Track</p> <p>Video: Skoda- Skid Front</p> <p>Video: Skoda- Skid Rear</p> <p>Video: Centripetal Acceleration</p> <p>Video: Amazing Japanese Drifting</p> <p>Demo: Bucket of Water Swinging</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
<p>SIS: (SCIENTIFIC INQUIRY SKILLS)</p>	<p>SIS 1. Make observations, raise questions, and formulate hypotheses.</p>	<p>Examples SIS 1. Lab 003: Friction</p>		
	<p>SIS 2. Design and conduct scientific investigations.</p>	<p>Examples SIS 2. Lab 003: Friction</p>		
	<p>SIS 3. Analyze and interpret results of scientific investigations.</p>	<p>Examples SIS 3. Lab 003: Friction</p>		
	<p>SIS 4. Communicate and apply the results of scientific investigations.</p>	<p>Examples SIS 4. Lab 003: Friction</p>		

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Unit: Conservation of Energy and Momentum

Essential Questions

1. How do you define work in terms of force and displacement?
2. What are the types of mechanical energy?
3. How do conservative and non-conservative forces differ?
4. What is the law of conservation of energy and how is it applied?
5. What is power in the scientific sense?
6. What is the Law of Conservation of Momentum and how is it applied?

Framework Standard	Content/Skills	Resources	Instructional Strategies	Assessments
2.1 Interpret and provide examples that illustrate the law of conservation of energy.	Describe the difference between conservative and non-conservative forces. Identify law of conservation of energy. Apply the law of conservation of energy in problem solving.	PowerPoint Giancoli CD-ROM (Modified as needed) PhysClips www.animations.physics.unsw.edu.au PhET: Energy Skate Park Video: NOVA: Car of the Future Demo: Loop Track Windup Cars/Rubber Band Car Marble Launchers	Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers	Project 002: Mousetrap Cars Suggested: <ul style="list-style-type: none"> • Moodle problem sets • Worksheets
2.2 Interpret and provide examples of how energy can be converted from gravitational potential energy to kinetic energy and vice versa.	Identify the difference between kinetic and potential energy. Explain the work energy theorem.	PowerPoint Giancoli CD-ROM (Modified as needed) Video: NOVA: Car of the Future Demo: Loop Track Demo: Bowling Balls on Ramp	Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I	Project 002: Mousetrap Cars Suggested: <ul style="list-style-type: none"> • Moodle problem sets • Worksheets

			Do Get/Don't Get) Summarizers	
2.3 Describe both qualitatively and quantitatively how work can be expressed as a change in mechanical energy.	<p>Define work in terms of force and displacement.</p> <p>Determine the work done by a constant force.</p> <p>Determine work done from a force versus displacement graph.</p> <p>Identify the types of mechanical energy</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhysClips www.animations.physics.unsw.edu.au</p> <p>Video: NOVA: Car of the Future</p> <p>Video: North Bay Runaway Truck Ramp Test</p> <p>Demo: Car on Table w/ weight pulling</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
2.4 Describe both qualitatively and quantitatively the concept of power as work done per unit time.	<p>Define power in the scientific sense.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhysClips www.animations.physics.unsw.edu.au</p> <p>Demo: Stair Run</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects

<p>2.5 Provide and interpret examples showing that linear momentum is the product of mass and velocity, and is always conserved (law of conservation of momentum). Calculate the momentum of an object.</p>	<p>Define linear momentum.</p> <p>Relate Newton's Laws of Motion to momentum.</p> <p>Define impulse.</p> <p>Identify Law of Conservation of Momentum.</p> <p>Apply the laws of conservation of momentum in problem solving.</p> <p>Determine the difference between an elastic collision and an inelastic collision.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhysClips www.animations.physics.unsw.edu.au</p> <p>PhET: Collisions</p> <p>Video: Amazing Billiards in Super Slow Motion</p> <p>Demo: Bowling Ball Collisions</p> <p>Demo: Collision Carts</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
<p>SIS: (SCIENTIFIC INQUIRY SKILLS)</p>	<p>SIS 1. Make observations, raise questions, and formulate hypotheses.</p>	<p><u>Examples</u> SIS 1. Lab</p>		
	<p>SIS 2. Design and conduct scientific investigations.</p>	<p><u>Examples</u> SIS 2. Lab</p>		
	<p>SIS 3. Analyze and interpret results of scientific investigations.</p>	<p><u>Examples</u> SIS 3. Lab</p>		
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Unit: Heat and Heat Transfer

Essential Questions

1. What is the difference between temperature and heat?
2. What is meant by specific heat, latent heat of fusion, and latent heat of vaporization?
3. How does heat transfer occur by: conduction, convection, and radiation?
4. What are the laws of thermodynamics and how are they applied?
5. What are isothermal processes, isobaric processes, isochoric processes and adiabatic processes?

Framework Standard	Content/Skills	Resources	Instructional Strategies	Assessments
3.1 Explain how heat energy is transferred by convection, conduction, and radiation.	Describe how heat transfer occurs by: conduction, convection, and radiation. Identify difference between an open system and a closed system.	PowerPoint Giancoli CD-ROM (Modified as needed) Video: Lighting a Match in Slow Motion Demo: Radiometer Demo: Smoke Chamber	Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers	Suggested: <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
3.2 Explain how heat energy will move from a higher temperature to a lower temperature until equilibrium is reached.	Describe the first law of thermodynamics. Draw a PV diagram. Determine the work done by a gas from a PV diagram. Determine the amount of heat which must be added or removed to change the temperature of a gas.	PowerPoint Giancoli CD-ROM (Modified as needed) Video: Carnot Cycle	Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get)	Suggested: <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects

	<p>Define the second law of thermodynamics three ways.</p> <p>Describe the difference between a reversible processes and irreversible processes.</p>		Summarizers	
<p>3.3 Describe the relationship between average molecular kinetic energy and temperature. Recognize that energy is absorbed when a substance changes from a solid to a liquid to a gas, and that energy is released when a substance changes from a gas to a liquid to a solid. Explain the relationships among evaporation, condensation, cooling, and warming.</p>	<p>Define specific heat, latent heat of fusion, and latent heat of vaporization.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>Iowa State Calorimetry http://group.chem.iastate.edu/greenbowe/sections/projectfolder/flashfiles/thermochem/heat_metal.html</p> <p>Demo: heat ice to water to steam with thermometer</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
<p>3.4 Explain the relationships among temperature changes in a substance, the amount of heat transferred, the amount (mass) of the substance, and the</p>	<p>Identify the difference between temperature and heat.</p> <p>Apply specific heat, latent heat of fusion, and latent heat of vaporization.</p> <p>Apply the law of conservation of energy to heat problems.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>Iowa State Calorimetry http://group.chem.iastate.edu/greenbowe/sections/projectfolder/flashfiles/thermochem/heat_metal.html</p> <p>Demo: heat ice to water to steam with thermometer</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects

specific heat of the substance.			I Do Get/Don't Get) Summarizers	
SIS: (SCIENTIFIC INQUIRY SKILLS)	SIS 1. Make observations, raise questions, and formulate hypotheses.	Examples SIS 1. Lab		
	SIS 2. Design and conduct scientific investigations.	Examples SIS 2. Lab		
	SIS 3. Analyze and interpret results of scientific investigations.	Examples SIS 3. Lab		
	SIS 4. Communicate and apply the results of scientific investigations.	Examples SIS 4. Lab		
RSL: (READING STANDARDS FOR LITERACY)	<u>Key Ideas and Details</u> RSL 1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. RSL 2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. RSL 3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.		Examples RSL 1. Article Summary RSL 2. Article Summary RSL 3. Article Summary	

	<p><u>Craft and Structure</u> RSL 4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. RSL 5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole. RSL 6. Assess how point of view or purpose shapes the content and style of a text.</p>	<p><u>Examples</u> RSL 4. Chapter Summary RSL 5. Chapter Summary RSL 6. Chapter Summary</p>
	<p><u>Integration of Knowledge and Ideas</u> RSL 7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.* RSL 8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. RSL 9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.</p>	<p><u>Examples</u> RSL 7. Video Analysis RSL 8. Article Summary RSL 9. Research Paper</p>
	<p><u>Range of Reading and Level of Text Complexity</u> RSL 10. Read and comprehend complex literary and informational texts independently and proficiently.</p>	<p><u>Examples</u> RSL 10. Article Summary or Book Excerpt Summary</p>
<p>WSL: WRITING STANDARDS FOR LITERACY</p>	<p><u>Text Types and Purposes*</u> WSL 1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence. WSL 2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. WSL 3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.</p>	<p><u>Examples</u> WSL 1. Article Summary or Book Excerpt Summary WSL 2. Article Summary WSL 3. Narrative Summarizer</p>

	<p><u>Production and Distribution of Writing</u> WSL 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. WSL 5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. WSL 6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.</p>	<p><u>Examples</u> WSL 4. Research Paper WSL 5. Research Paper WSL 6. Online collaboration on Labs, Projects, Etc. (Moodle, Google Docs, etc.)</p>
	<p><u>Research to Build and Present Knowledge</u> WSL 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. WSL 8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. WSL 9. Draw evidence from literary or informational texts to support analysis, reflection, and research.</p>	<p><u>Examples</u> WSL 7. Research Paper WSL 8. Research Paper WSL 9. Research Paper</p>
	<p><u>Range of Writing</u> WSL 10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.</p>	<p><u>Examples</u> WSL 10. Lab Report (with or without revision), Research Paper (with or without revision), Narrative Summarizer, Article Summary, Book Excerpt Summary</p>

Unit: Waves (and Sound)

Essential Questions

1. What is SHM and how can it be described?
2. What conditions are necessary for resonance and what is damped harmonic motion?
3. What are the differences and similarities between a longitudinal wave and a transverse wave?
4. How is the energy of a wave affected by its surrounding?
5. How are standing waves formed and how do they produce harmonic frequencies?
6. Describe the energy of a sound wave including: pitch, frequency, wavelength, sound intensity, and loudness?
7. How do sound waves interact with each other and propagate?

Framework Standard	Content/Skills	Resources	Instructional Strategies	Assessments
4.1 Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period) and explain the relationships among them. Recognize examples of simple harmonic motion.	<p>Describe the conditions required to produce simple harmonic motion (SHM).</p> <p>Determine the period, velocity, acceleration, potential, and kinetic energy at any point in the motion of an object undergoing SHM.</p> <p>Describe the equations for displacement, velocity, and acceleration as sinusoidal functions of time for an object undergoing SHM.</p> <p>Define resonance.</p> <p>Define pitch, frequency, wavelength, sound intensity, and loudness.</p> <p>Discuss intensity level in decibels of a sound.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhysClips www.animations.physics.unsw.edu.au</p> <p>PhET: Resonance</p> <p>PhET: Pendulums</p> <p>PhET: Springs and Masses</p> <p>Video: Tacoma Bridge Collapse</p> <p>Video: Haunted Swing</p> <p>Video: Pendulum Waves</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Project 003:Physics Jam Band</p> <p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets

<p>4.2 Distinguish between mechanical and electromagnetic waves.</p>	<p>Describe longitudinal waves and a transverse waves for mechanical and electrical systems.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhysClips www.animations.physics.unsw.edu.au</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
<p>4.3 Distinguish between the two types of mechanical waves, transverse and longitudinal.</p>	<p>Describe difference between a longitudinal wave and a transverse wave.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>Demo: Slinky & Snake Springs</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
<p>4.4 Describe qualitatively the basic principles of reflection and refraction of waves.</p>	<p>Determine energy transmitted by a wave.</p> <p>Describe wave reflection from a barrier.</p> <p>Describe refraction.</p> <p>Determine constructive and destructive interference.</p> <p>Explain standing waves be produced in a string or rope.</p> <p>Describe harmonic frequencies.</p> <p>Describe beat frequencies.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>Demo: Laser & Mirrors</p> <p>Demo: Laser & Water</p> <p>Demo: String It</p> <p>Demo: Beating Chimes</p> <p>Tuning Forks</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects

<p>4.5 Recognize that mechanical waves generally move faster through a solid than through a liquid and faster through a liquid than through a gas.</p>	<p>Determine the speeds of longitudinal waves and transverse waves in various mediums.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p>	<p>Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
<p>4.6 Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).</p>	<p>Define the Doppler effect.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhysClips www.animations.physics.unsw.edu.au</p> <p>Video: Big Bang Theory Doppler Effect Montage</p> <p>Video: The Doppler Effect</p> <p>Video: Sonic Boom</p>	<p>Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
<p>SIS: (SCIENTIFIC INQUIRY SKILLS)</p>	<p>SIS 1. Make observations, raise questions, and formulate hypotheses.</p>		<p>Examples SIS 1. Lab</p>	
	<p>SIS 2. Design and conduct scientific investigations.</p>		<p>Examples SIS 2. Lab</p>	
	<p>SIS 3. Analyze and interpret results of scientific investigations.</p>		<p>Examples SIS 3. Lab</p>	
	<p>SIS 4. Communicate and apply the results of scientific investigations.</p>		<p>Examples SIS 4. Lab</p>	

<p>RSL: (READING STANDARDS FOR LITERACY)</p>	<p><u>Key Ideas and Details</u> RSL 1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. RSL 2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. RSL 3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.</p>	<p><u>Examples</u> RSL 1. Article Summary RSL 2. Article Summary RSL 3. Article Summary</p>
	<p><u>Craft and Structure</u> RSL 4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. RSL 5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole. RSL 6. Assess how point of view or purpose shapes the content and style of a text.</p>	<p><u>Examples</u> RSL 4. Chapter Summary RSL 5. Chapter Summary RSL 6. Chapter Summary</p>
	<p><u>Integration of Knowledge and Ideas</u> RSL 7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.* RSL 8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. RSL 9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.</p>	<p><u>Examples</u> RSL 7. Video Analysis RSL 8. Article Summary RSL 9. Research Paper</p>

	<p><u>Range of Reading and Level of Text Complexity</u> RSL 10. Read and comprehend complex literary and informational texts independently and proficiently.</p>	<p><u>Examples</u> RSL 10. Article Summary or Book Excerpt Summary</p>
<p>WSL: WRITING STANDARDS FOR LITERACY</p>	<p><u>Text Types and Purposes*</u> WSL 1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence. WSL 2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. WSL 3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.</p>	<p><u>Examples</u> WSL 1. Article Summary or Book Excerpt Summary WSL 2. Article Summary WSL 3. Narrative Summarizer</p>
	<p><u>Production and Distribution of Writing</u> WSL 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. WSL 5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. WSL 6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.</p>	<p><u>Examples</u> WSL 4. Research Paper WSL 5. Research Paper WSL 6. Online collaboration on Labs, Projects, Etc. (Moodle, Google Docs, etc.)</p>
	<p><u>Research to Build and Present Knowledge</u> WSL 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. WSL 8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. WSL 9. Draw evidence from literary or informational texts to support analysis, reflection, and research.</p>	<p><u>Examples</u> WSL 7. Research Paper WSL 8. Research Paper WSL 9. Research Paper</p>

	<p><u>Range of Writing</u> WSL 10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.</p>	<p><u>Examples</u> WSL 10. Lab Report (with or without revision), Research Paper (with or without revision), Narrative Summarizer, Article Summary, Book Excerpt Summary</p>
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Unit: Electromagnetism

Essential Questions

1. What is Coulomb's law and how does it relate to fundamental particles?
2. What are insulators, conductors, and semiconductors?
3. What is an electric field and how is it represented both mathematically and graphically?
4. What is Ohm's Law and how is it applied to moving charges?
5. How is Ohm's Law applied to complex circuits?
6. What are Faraday's Law and Lenz' Law?

Framework Standard	Content/Skills	Resources	Instructional Strategies	Assessments
5.1 Recognize that an electric charge tends to be static on insulators and can move on and in conductors. Explain that energy can produce a separation of charges.	Describe the magnitude and sign of the charge on an electron and proton. Define insulators, conductors, and semiconductors.	PowerPoint Giancoli CD-ROM (Modified as needed) Demo: Van deGraff Generator	Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers	Suggested: <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
5.2 Develop qualitative and quantitative understandings of current, voltage, resistance, and the connections among them (Ohm's law).	Explain how a simple battery produces an electrical current. Define current, ampere, emf, voltage, and resistance. Describe the difference between a direct current and an alternating current. Interpret a simple circuit diagram. Define Ohm's law.	PowerPoint Giancoli CD-ROM (Modified as needed) PhET: Circuit Construction Kit PhET: Ohm's Law Demo: Lemon Battery Vernier Circuit Boards	Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers	Suggested: <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects

<p>5.3 Analyze simple arrangements of electrical components in both series and parallel circuits. Recognize symbols and understand the functions of common circuit elements (battery, connecting wire, switch, fuse, resistance) in a schematic diagram.</p>	<p>Determine the equivalent resistance of resistors arranged in series or in parallel.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p>	<p>Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
<p>5.4 Describe conceptually the attractive or repulsive forces between objects relative to their charges and the distance between them (Coulomb's law).</p>	<p>Apply Coulomb's Law. Describe the law of conservation of charge. Identify the relationship between electric potential and electric field.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed) Demo: Van deGraff Generator</p>	<p>Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
<p>5.5 Explain how electric current is a flow of charge caused by a potential difference (voltage), and how power is equal to current multiplied by voltage.</p>	<p>Define an electric field. Draw the electric field pattern and equipotential line pattern which exist between charged objects. Describe the difference between electric potential, electric potential energy, and electric potential difference. Determine the magnitude of the potential at a point a known distance from a point charge.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed) PhET: Charges and Fields PhET: Electric Field Hockey</p>	<p>Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects

<p>5.6 Recognize that moving electric charges produce magnetic forces and moving magnets produce electric forces. Recognize that the interplay of electric and magnetic forces is the basis for electric motors, generators, and other technologies.</p>	<p>Identify the conventions adopted to represent the direction of a magnetic field, the current in a current-carrying wire and the direction of motion of a charged particle moving through a magnetic field.</p> <p>Apply the right hand rule.</p> <p>Apply Faraday's law to determine the magnitude of the induced emf in a straight wire moving through a magnetic field.</p>	<p>PowerPoint Giancoli CD-ROM (Modified as needed)</p> <p>PhET: Faraday's Electromagnetic Lab</p> <p>PhET: Generators</p> <p>PhET: Faraday's Law</p> <p>Generators</p> <p>Louis Motors</p>	<p>Dip Sticking</p> <p>Ticket to Leave/ Journal to Go</p> <p>Learning Partners</p> <p>WIDGETs (What I Do Get/Don't Get)</p> <p>Summarizers</p>	<p>Suggested:</p> <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
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	<p><u>Research to Build and Present Knowledge</u> WSL 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. WSL 8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. WSL 9. Draw evidence from literary or informational texts to support analysis, reflection, and research.</p>	<p><u>Examples</u> WSL 7. Research Paper, Project 004: Science & Society (Seniors), Project 004: Epic Battles in Science (Juniors) WSL 8. Research Paper, Project 004: Science & Society (Seniors), Project 004: Epic Battles in Science (Juniors) WSL 9. Research Paper, Project 004: Science & Society (Seniors), Project 004: Epic Battles in Science (Juniors)</p>

	<p><u>Range of Writing</u> WSL 10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.</p>	<p><u>Examples</u> WSL 10. Lab Report (with or without revision), Research Paper (with or without revision), Narrative Summarizer, Article Summary, Book Excerpt Summary</p>
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Unit: Electromagnetic Radiation

Essential Questions

1. How are electromagnetic waves produced?
2. How can you draw a diagram representing the field strengths of an electromagnetic wave?
3. How do you calculate the velocity of electromagnetic waves in a vacuum?
4. What are the different segments of the electromagnetic spectrum?
5. What are the approximate range of wavelengths associated with each segment of the electromagnetic spectrum?
6. How do the speed of an electromagnetic wave relate to the frequency and wavelength?

Framework Standard	Content/Skills	Resources	Instructional Strategies	Assessments
6.1 Recognize that electromagnetic waves are transverse waves and travel at the speed of light through a vacuum. ultraviolet rays, x-rays, and gamma rays on the spectrum.	Describe electromagnetic waves. Draw a diagram representing the field strengths of an electromagnetic wave. Calculate the velocity of electromagnetic waves in a vacuum.	PowerPoint Giancoli CD-ROM (Modified as needed) PhysClips www.animations.physics.unsw.edu.au PhET: Radio Waves & Electromagnetic Fields	Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers	Suggested: <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects
6.2 Describe the electromagnetic spectrum in terms of frequency and wavelength, and identify the locations of radio waves, microwaves, infrared radiation, visible light (red, orange, yellow, green, blue, indigo, and violet),	Describe the different segments of the electromagnetic spectrum. Identify the approximate range of wavelengths associated with each segment of the electromagnetic spectrum. Determine the speed of an electromagnetic wave and the relationship between frequency and wavelength.	PowerPoint Giancoli CD-ROM (Modified as needed) PhysClips www.animations.physics.unsw.edu.au PhET: Radio Waves & Electromagnetic Fields PhET: Color Vision PhET: Molecules and Light	Dip Sticking Ticket to Leave/ Journal to Go Learning Partners WIDGETs (What I Do Get/Don't Get) Summarizers	Suggested: <ul style="list-style-type: none"> • Moodle problem sets • Worksheets • Projects

SIS: (SCIENTIFIC INQUIRY SKILLS)	SIS 1. Make observations, raise questions, and formulate hypotheses.	Examples SIS 1. Lab
	SIS 2. Design and conduct scientific investigations.	Examples SIS 2. Lab
	SIS 3. Analyze and interpret results of scientific investigations.	Examples SIS 3. Lab
	SIS 4. Communicate and apply the results of scientific investigations.	Examples SIS 4. Lab
RSL: (READING STANDARDS FOR LITERACY)	Key Ideas and Details RSL 1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. RSL 2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. RSL 3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.	Examples RSL 1. Article Summary RSL 2. Article Summary RSL 3. Article Summary
	Craft and Structure RSL 4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. RSL 5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole. RSL 6. Assess how point of view or purpose shapes the content and style of a text.	Examples RSL 4. Chapter Summary RSL 5. Chapter Summary RSL 6. Chapter Summary

	<p><u>Integration of Knowledge and Ideas</u> RSL 7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.* RSL 8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. RSL 9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.</p>	<p><u>Examples</u> RSL 7. Video Analysis RSL 8. Article Summary RSL 9. Research Paper</p>
	<p><u>Range of Reading and Level of Text Complexity</u> RSL 10. Read and comprehend complex literary and informational texts independently and proficiently.</p>	<p><u>Examples</u> RSL 10. Article Summary or Book Excerpt Summary</p>
<p>WSL: WRITING STANDARDS FOR LITERACY</p>	<p><u>Text Types and Purposes*</u> WSL 1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence. WSL 2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. WSL 3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.</p>	<p><u>Examples</u> WSL 1. Article Summary or Book Excerpt Summary WSL 2. Article Summary WSL 3. Narrative Summarizer</p>
	<p><u>Production and Distribution of Writing</u> WSL 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. WSL 5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. WSL 6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.</p>	<p><u>Examples</u> WSL 4. Research Paper WSL 5. Research Paper WSL 6. Online collaboration on Labs, Projects, Etc. (Moodle, Google Docs, etc.)</p>

	<p><u>Research to Build and Present Knowledge</u> WSL 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. WSL 8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. WSL 9. Draw evidence from literary or informational texts to support analysis, reflection, and research.</p>	<p><u>Examples</u> WSL 7. Research Paper WSL 8. Research Paper WSL 9. Research Paper</p>
	<p><u>Range of Writing</u> WSL 10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.</p>	<p><u>Examples</u> WSL 10. Lab Report (with or without revision), Research Paper (with or without revision), Narrative Summarizer, Article Summary, Book Excerpt Summary</p>