Bayonne High School

Unit 1: One-Dimensional Linear Motion

Revised 2022-23

Aligned to the New Jersey Student Learning Standards 2020

Marking Period	Unit Title	Recommended Instructional Days
1	**One-Dimensional Linear Motion**	**22**

NJSLS - Science: ***Title***	**NJSLS - Science:** ***Performance Expectations***	**Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSLS-S within Unit**
Motion and Stability: Forces and Interactions	**HS-PS2-1:** 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. [Clarification Statement: Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object sliding down a ramp, or a moving object being pulled by a constant force.] [Assessment Boundary: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.]	
FOUNDATION Disciplinary: ***Core Idea***	**FOUNDATION Disciplinary:** ***Statement***	
None	**None**	**<u>Essential Question/s:</u>** • What does it mean for an object to be moving? • How can you represent the motion of an object visually?

FOUNDATION **Science and Engineering Practices:** ***Core Idea***	**FOUNDATION** **Science and Engineering Practices:** ***Statement***	
Planning and Carrying Out Investigations: Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models. **Analyzing and Interpreting Data:** Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. **Using Mathematics and Computational Thinking:** Mathematical and computational thinking at the 9–12 builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational	• Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. • Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. • Use mathematical representations of phenomena to describe explanations. • Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects. • Communicate scientific and technical information (e.g. about	• How can you represent the motion of an object mathematically? • How do objects move near Earth's surface? **<u>Activity Description</u>**: • **Spotlight on Scientists and their accomplishments: Do you see yourself as a scientist? Activity:** Students will explore the conceptions they carry of scientists through a self-inventory and class discussion. Following this discussion, students will investigate the contributions of scientists from all backgrounds that helped advance the fields they will study over the course of the following units. Examples of LGBTQ scientists who can be included in this activity: Alan Turing, Sally Ride, Nergis Mavalvala. Examples of notable black physicists who can be included in this activity: Dr. Stephon Alexander, Dr. Aprielle Ericcson-Jackson, Catherine Johnson, Dr. Warren Washington. Example of an astrophysicist with disability: Wanda Diaz-Merced. Example of a Holocaust survivor physicist: George Zimmerman. • **Science Safety Training:** Students will review the science safety contracts in class, with an opportunity to ask any questions. The teacher will demonstrate safe lab practices, as needed in the classroom. Students will complete a science safety quiz. • **Toy Car Activity:** Students will develop a procedure to determine if the object moves at constant velocity or not. Students may use equal intervals of time and mark positions or use equal intervals of distance and record times. Students will graph their data using paper, graphing calculator or a graphing software, dependent quantity vs. independent quantity, to find a pattern between position and time. Students and the teacher will develop a mathematical equation that represents the motion of the toy car (linear graph, slope of the graph represents constant velocity). As a follow-up to this, students can use graphs, motion diagrams and problems to test the model for constant velocity.

simulations are created and used based on mathematical models of basic assumptions. **Constructing Explanations and Designing Solutions:** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories. **Obtaining, Evaluating, and Communicating Information:** Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.	the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).	• **What is your CO_2 contribution? (Understanding Units Activity):** Students will collect industry statistics (average car's mile per gallon, mass of CO_2 emitted per gallon, average mileage in a year), and practice converting between the values to arrive at an estimate of the mass of CO_2 emitted by the family or individual car in a year. Students will also compare their estimates to different industries. This activity will provide an early assessment of each student's ability to convert units, building on work from previous science courses. Comparisons to other activities and industries will also provide students practice in scale and proportion. https://www.aps.org/policy/reports/popa-reports/energy/climate.cfm • **Meeting Point Investigation:** In groups, students develop a way to predict where two battery-powered cars, which move at constant velocity, will collide if they are released from opposite ends of a straight line, at the same time. Students collect data, make predictions for the meeting point 10 and test their predictions. In their lab journals, students include multiple representations of their investigation that validate their prediction. These include verbal descriptions, motion diagrams, graphical analyses, and equations. • **Free Fall Investigation:** Students will use the following video experiment to collect position vs. time data for an object in free fall. Students will graph and analyze their data. Teacher will use a video of a very light object and a heavy object falling in vacuum along with the results from this experiment to develop the idea of free fall acceleration. http://paer.rutgers.edu/pt3/experiment.php?topicid=2&exptid=38 **Interdisciplinary Connections: Content: NJSLS:**
FOUNDATION **Crosscutting Concepts:** ***Core Idea***	**FOUNDATION** **Crosscutting Concepts:** ***Statement***	
• **Patterns** • **Cause and Effect** • **Systems and System Models**	• Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.	

<table>
<tr><td></td><td>● When investigating or describing a system, the boundaries and initial conditions of the system need to be defined.</td><td rowspan="3">Connections to NJSLS – English Language Arts

● RST.11-12.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
● RST.11-12.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Connections to NJSLS – Mathematics

● MP.2: Reason abstractly and quantitatively.
● MP.4: Model with mathematics.
● HSN-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
● HSN-Q.A.2: Define appropriate quantities for the purpose of descriptive modeling.</td></tr>
<tr><td>Social and Emotional Learning:
Competencies</td><td>Social and Emotional Learning:
Sub-Competencies</td></tr>
<tr><td>● Self-Awareness
● Social Awareness
● Relationship Skills</td><td>● Recognizing Strengths
● Respect for Others
● Communication
● Social Engagement
● Teamwork</td></tr>
<tr><td colspan="2">Assessments (Formative)
To show evidence of meeting the standard/s, students will successfully engage within:</td><td colspan="2">Assessments (Summative)
To show evidence of meeting the standard/s, students will successfully complete:</td></tr>
<tr><td colspan="2"><u>Formative Assessments:</u>
● Pretest, warm-up quizzes, student responses through group work and class discussion</td><td colspan="2"><u>Benchmarks:</u>
● District Assessment

<u>Summative Assessments:</u>
● Kinematics Test
● Written report based on the Meeting Point Investigation</td></tr>
<tr><td colspan="4">Differentiated Student Access to Content:
Teaching and Learning Resources/Materials</td></tr>
<tr><td>Core
Resources</td><td>Alternate
Core Resources</td><td>ELL
Core Resources</td><td>Gifted & Talented
Core Resources</td></tr>
</table>

	IEP/504/At-Risk/ESL		
● Student Chromebooks ● Lab equipment such as constant velocity cars, etc. ● Course textbook	● Scaffolded Notes ● Leveled physics games and simulations	● Scaffolded Notes ● Google Translate	● Extension Activities ● Leveled physics games and simulations
Supplemental Resources			
Technology: ● Schoology ● Investigative Science Learning Environment Physics Videos ● PhET Physics Simulations ● Physics-related and school-appropriate YouTube videos ● Universe and More Physics Games			
Differentiated Student Access to Content: **Recommended *Strategies & Techniques***			
Core Resources	**Alternate Core Resources *IEP/504/At-Risk/ESL***	**ELL Core Resources**	**Gifted & Talented Core**
● Promote an approach that benefits multiple learning styles exploring phenomena through readings, videos, and collaborative work. ● Establishing proper safety protocols for using specialized equipment and gathering materials. ● Establishing communication protocols for collaborative activities to ensure all students properly communicate and involve every student.	● Utilize a multi-sensory approach during instruction, provide multiple presentations of skills by varying the method (repetition, simple verbal explanations, mathematical representations, visual representations, etc.), modify test content and/or format, allow students to retake test for additional credit, provide additional times and preferential seating as needed, review,	● Utilize a multi-sensory approach during instruction, provide multiple presentations of skills by varying the method (repetition, simple verbal explanations, mathematical representations, visual representations, etc.), modify test content and/or format, allow students to retake test for additional credit, provide additional times and preferential seating as needed, review, restate and repeat directions, provide study guides, and/or break	● Create an enhanced set of introductory activities, integrate active teaching/learning opportunities, incorporate authentic components, propose interest-based extension activities, and connect students to related talent development opportunities.

● Demonstrate that the Engineering Design Process is a flexible cycle that allows for steps to be repeated.	restate and repeat directions, provide study guides, and/or break assignments into segments of shorter tasks.	assignments into segments of shorter tasks.	

NJSLS CAREER READINESS, LIFE LITERACIES & KEY SKILLS	**Disciplinary Concept:** Creativity and Innovation	
	Core Ideas:	With a growth mindset, failure is an important part of success.
	Performance Expectation/s:	9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a)..
	Career Readiness, Life Literacies, & Key Skills Practices	
	Practice: Demonstrate creativity and innovation.	***Description:*** Students regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

New Jersey Legislative Statutes and Administrative Code (place an "X" before each law/statute if/when present within the curriculum map)									
x	Amistad Law:	x	Holocaust Law:	x	LGBT and Disabilities Law:	x	Diversity & Inclusion: *N.J.S.A. 18A:35-4.36a*	x	Standards in Action:

	N.J.S.A. 18A 52:16A-88		*N.J.S.A. 18A:35-28*		*N.J.S.A. 18A:35-4.35*				*Climate Change*