Course: Physics 1 *Course Code: 2003380*

SEMESTER I
QUARTER 1
UNIT 1

Topic of Study: Scientific Thought and Process
Standards: N1 – Scientific Practices N2 – Scientific Knowledge

Key Learning:
~Scientists construct explanations based on well-reasoned, logical arguments built upon multiple lines of valid scientific evidence using what they already know as a foundation.
~Science disciplines may differ from one another in what is studied, techniques used, and outcome sought, but they share a common purpose and philosophy.
~Scientists construct explanations based on well-reasoned, logical arguments built upon multiple lines of valid scientific evidence using what they already know as a foundation.

RESOURCES COMMON CORE PACING GUIDE

Additional Information: The Nature of Science Concepts should be integrated into the Physics Curriculum throughout the school year. The Nature of Science is critical for our students understanding of what Science entails. Completion of formal Laboratory reports is expected. These skills are essential for success in college preparatory courses, advanced placement courses, and on college entrance exams.

VOCABULARY: hypothesis, observation, research, scientific method, trial, conclusion, constant, data, variables, formal laboratory report, results, independent variable, dependent variable, pseudoscience, line graph, best fit graph, direct variation, inverse variation, apparatus, accuracy, precision, inferring, empirical evidence, cause and effect, accuracy, precision, best fit graph, direct variation, inverse variation, metric system, model, computer simulation, theory, law

SUGGESTED LABS:
1. Making Observations
2. Density (graph mass vs. volume and use the slope to determine the density)
3. Measurement (learn to use the vernier caliper and the micrometer caliper)

NGSSS	CONTENT	TARGETS
SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. pose questions about the natural world, 2. conduct systematic observations, 3. examine books and other sources of information to see what is already known, 4. review what is known in light of empirical evidence, 5. plan investigations, 6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), 7. pose answers, explanations, or descriptions of events, 8. generate explanations that	**CONCEPT: Scientific Thought** 1. Explain how "scientific understandings" are different from beliefs. 2. Scientific knowledge is acquired in many different ways. 3. Identify current public concerns/issues and describe what scientists are doing to resolve these issues. **ESSENTIAL QUESTIONS:** A. What are the components of scientific thought? B. How are scientific investigations and experiments conducted? C. What roles do variables, controls, and constants play in an experiment or an investigation? D. How are observations obtained during a scientific investigation communicated? E. What is the relationship between inference and observations?	~Explain the difference between an experiment and other types of scientific investigations. ~Explain that science is based on evidence based facts. ~Compare and contrast the investigations used in Science to those of other disciplines. ~Understand the difference between "scientific understandings" and beliefs ~Discuss how inferences are made from observations ~Why are repetition and replication important in science

explicate or describe natural phenomena (inferences), 9. use appropriate evidence and reasoning to justify these explanations to others, 10. communicate results of scientific investigations, and 11. evaluate the merits of the explanations produced by others. LA.910.2.2.3 The student will organize information or relationships among facts, ideas, and events. SC.912.N.1.2 Describe and explain what characterizes science and its methods SC.912.N.2.2 Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressing other ways of knowing, such as art, philosophy, and religion. SC.912.N.3.2 Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science. SC.912.N.3.3 Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships. SC.912.N.3.4 Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions. SC.912.N.4.1 Explain how scientific knowledge and reasoning provide an empirically based perspective to inform society's decision making		
SC.912.N.1.3 Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of the alternative scientific explanations to explain the	**<u>CONCEPT: Scientific Processes</u>** 1. Demonstrate the use of controls, variables, and constants. 2. Make sure the different types of variables are explored (independent/manipulating and dependent/responding).	~Distinguish among independent variables, dependent variables, controls, and variable that are held constant. ~Develop a hypothesis from given information and be able to determine what data should be collected to test

data presented. SC.912.N.1.4 Identify sources of information and assess their reliability according to the strict standards of scientific investigation. SC.912.N.1.6 Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied. SC.912.N.2.4 Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. MA.912.S.3.2 Collect, organize, and analyze data sets, determine the best format for the data and present visual summaries	3. Apply various methods of organization and analysis of data. 4. Explore various methods of graphing and different scales. **ESSENTIAL QUESTIONS:** A. What are the essential components of laboratory safety? B. How do we use lab equipment to make accurate and precise measurements? C. What roles do variables, controls, and constants play in an experiment or an investigation? D. How are collection, organization, and analysis of data essential to the scientific process? E. What is the relationship between significant figures and precision?	that hypothesis. ~Demonstrate the use of controls, variables, and constants. ~Understand that scientific knowledge is acquired in many different ways. ~Correctly use the metric system to accurately and precisely make measurements using lab equipment. ~Determine appropriate and consistent standards of measurement for the data. ~Calculate and determine the % error of the data.
SC.912.N.1.5 Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome. SC.912.N.1.7 Recognize the role of creativity in constructing scientific questions, methods, and explanations. SC.912.N.2.5 Describe instances in which scientists varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations. SC.912.N.3.5 Describe the function of models in science, and identify the wide range of models used in science.	**<u>CONCEPT: Models and Technology</u>** 1. Define the usefulness of models. 2. Discuss the technologies of different time periods and how science often precedes the technology. **ESSENTIAL QUESTIONS:** A. How are scientific models useful in investigations? B. How do scientific discoveries influence the development of technologies?	~Discuss the benefits of models. ~Identify technologies that came after the development of the science.

SEMESTER I QUARTER 1 UNIT 2		
TOPIC of STUDY: Kinematics/ Motion in One Dimension **STANDARDS:** 12: Motion **KEY LEARNING:** ~Representing motion through the use of words, graphs, and mathematics ~What are the most effective ways to represent motion in one-dimension ~Apply the kinematic equations to solve problems of one-dimensional motion		
VOCABULARY: frame of reference, distance, displacement, scalar, vector, speed velocity, acceleration, kinematics, air resistance,		
SUGGESTED LABS: 1. CBR Motion Lab 2. Constant Motion Vehicle		
NGSSS	**CONTENT**	**TARGETS**
SC.912.P.12.1 Distinguish between scalar and vector quantities and assess which should be used to describe an event	**<u>CONCEPT: Components of Motion</u>** 1. Define frames of reference. 2. Describe motion in terms of displacement, time, and velocity. **ESSENTIAL QUESTIONS:** A. How do you differentiate between various mathematical representations of motion? B. How do you relate the similarities of scalars and vectors to everyday language use?	~Be able to identify the frame of reference used in a given situation. ~Identify which quantities are scalar and which quantities are vector. ~Add and subtract vectors that are parallel.

SC.912.P.12.2 Analyze the motion of an object in terms of position, velocity, and acceleration (with respect to a frame of reference) as a function of time	**CONCEPT: Relationship between the Components of Motion** 1. Calculate the displacement of an object traveling at a known velocity for a specific time interval. 2. Construct and interpret graphs of position-time and velocity-time. **ESSENTIAL QUESTIONS:** A. What are the differences between instantaneous and average values of motion?	~Construct and interpret graphs of position vs. time. ~Construct and interpret graphs of velocity vs. time.
SC.912.P.12.2 Analyze the motion of an object in terms of position, velocity, and acceleration (with respect to a frame of reference) as a function of time SC.912.P.12.9 Recognize that time, length, and energy depend upon the frame of reference	**CONCEPT: Motion with a Constant Acceleration** 1. Describe motion in terms of changing velocity. 2. Compare graphical representations of accelerated and non-accelerated motions. 3. Apply kinematic equations to calculate distance, time, or velocity under conditions of constant acceleration. **ESSENTIAL QUESTIONS:** A. What are the characteristics of an object in free fall? B. How do you evaluate motion with constant acceleration through the use of rearranging and substituting kinematic equations? C. How do the components of motion relate to real life applications?	~Determine if an object's speed is increasing or decreasing by examining the velocity and the acceleration of the object. ~Use the Kinematic Equations of Uniformly Accelerated Motion to solve for displacement, velocity, acceleration, or time in one-dimensional motion (including free-fall motion) given the appropriate information.

SEMESTER I QUARTER 1 Unit 3		
TOPIC of STUDY: Vector Resolution and Motion in Two-Dimensions **STANDARDS:** 12: Motion **KEY LEARNING:** ~Apply Trigonometric functions to the operation of vector addition ~Resolve vectors into components ~Apply the kinematic equations to solve problems involving projectile motion		
VOCABULARY: , magnitude, resultant, scalar, vector, component, sine, cosine, tangent, relative motion, projectile, range, trajectory,		
SUGGESTED LABS: 1. Vector Addition 2. Projectile Motion		
NGSSS	**CONTENT**	**TARGETS**
SC.912.P.12.1 Distinguish between scalar and vector quantities and assess which should be used to describe an event.	**CONCEPT:** Vector Addition 1. Distinguish between a vector and a scalar. 2. Add and subtract vectors by the graphical method (head to tail or diagonal methods) 3. Use the Pythagorean Theorem and the tangent function to find the magnitude and direction of a resultant vector given vectors that are at right angles to each other. **ESSENTIAL QUESTIONS:** A. What are the similarities and the differences between scalars and vectors? B. How are vectors related to	~Identify which quantities are scalar and vector quantities ~Distinguish between the magnitude and the direction of a given vector. ~Add and subtract vectors that are parallel AND perpendicular

	navigational processes?	
SC.912.P.12.2 Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.	**CONCEPT:** Vector Resolution 1. Resolve vectors into components using sine and cosine functions. 2. Add vectors that are not parallel or perpendicular **ESSENTIAL QUESTIONS:** A. How can a vector be resolved into two perpendicular components?	~Calculate vertical and horizontal components of vectors ~Use components of vectors to add vectors that are NOT parallel or perpendicular (1) may use method of summation of vertical and horizontal components and then using Pythagorean's Theorem and the Tangent function (2) may use the Law of Sines and the Law of Cosines
SC.912.P.12.9 Recognize that time, length, and energy depend on the Frame of Reference	**CONCEPT:** Relative Motion 1. Describe situations in terms of a frame of reference 2. Solve problems involving relative velocity **ESSENTIAL QUESTIONS:** A. How are vectors important within a relative motion problem?	~Use the Kinematic Equations of Motion to solve for displacement, velocity, acceleration, or time given the appropriate information. ~Calculate relative velocities of an object in different frames of reference.
SC.912.P.12.2 Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.	**CONCEPT**: Projectile Motion 1. Recognize examples of projectile motion. 2. Know that in projectile motion the horizontal and the vertical motions are independent of each other 3. Describe the path of a projectile as a parabola. **ESSENTIAL QUESTIONS:** A. Given an object in projectile motion, what is the value of the horizontal component of the acceleration? B. Given an object in projectile motion, what is the value of the vertical component of the acceleration? C. How can you use vectors and the Kinematic Equations to predict the range and the height of a projectile that is launched at varying angles?	~Use the Kinematic equations in Horizontal and Vertical form to solve projectile problems.