8.3 Physics Marking Period 3

Content Area: **Science**
Course(s):
Time Period: **Marking Period 3**
Length: **10 weeks**
Status: **Published**

Course Pacing Guide

Part	Marking Period	Length (weeks)
Introduction to Physics	3	1
Part 1: Describing Motion	3	2
Part 2: Speed, Velocity and Acceleration	3	2
Part 3: Newton's Law of Motion	3	3
Part 4: Forces, Momentum and Friction	3	2

Unit Overview

This unit is based on the New Jersey Student Learning Standards for Science. Throughout the Physics unit students will develop a deep understanding of the inner workings of the world around us by modeling, analyzing and exploring phenomena that provide students with anchors of understanding. Students will gain an understanding that can be applied to explain phenomena that they experience in their everyday lives.

The course begins with a review of methodology and measurement, leading into an in-depth investigation of how and why we move. The students will take both a hands on and mathematical approach to the calculation of speed. Students will then explore the differences between vector and scalar quantities when applying what they have learned to differentiating between speed and velocity. This will then open into our exploration of acceleration. Once students have mastered the topics of speed, velocity and acceleration we will begin a hands on exploration of Newton's Laws of Motion with the balloon car project. This will allow students to explore friction, momentum and force in an explorative way. This will bridge into the concepts of work and simple machines with another hands on exploration in the form of a Rube Goldberg machine construction. Intertwined throughout all of our material in these units will be the application of kinetic and potential energy in all aspects of the units to show the conservation of energy throughout all aspects of Physics application. It is the goal of this unit to allow students to have the ability to explain the phenomena of motion in aspects

experienced in the world around them.

Enduring Understandings

Overarching concepts

- All objects and systems in nature move relative to each other.
- Forces either maintain or cause changes in this motion.
- Newton's Laws can be used to describe motion both in a straight line and around a fixed point of rotation.

Unit 1: Describing Motion

- Motion is described by magnitude and direction
- Unbalanced forces cause acceleration to occur
- The relationships of different types of motion can be displayed mathematically and graphically

Unit 2: Speed, Velocity and Acceleration

- Speed is calculated using the formula Speed = Distance/Time
- Speed is a scalar quantity (magnitude) compared to velocity as a vector quantity (magnitude and direction)
- Acceleration is the rate at which velocity changes
- Constant speed graphs are linear, constant acceleration graphs create a parabola

Unit 3: Newton’s Laws of Motion

- Without an outside force there is no change in motion
- Force is calculated using the equation Fnet = ma
- For every action there is an equal and opposite reaction
- The forces created in Newton’s 3rd law of motion do not cancel because they act on different objects.

Unit 4: Forces, Momentum and Friction

- Force is a push or a pull
- Friction is a force that always opposes motion
- Force and momentum are conserved in a closed system
- Force is measured in Newtons

Essential Questions

Overarching concepts

- Why are reference points so important when describing motion?
- What are the differences between balanced and unbalanced forces and what type of motion will each cause?
- How can Newton's three laws be applied to analyze the motion of any object?

Unit 1: Describing Motion

- How is motion is described?
- What is the main cause of acceleration?
- How can the relationships of different types of motion be displayed ?

Unit 2: Speed, Velocity and Acceleration

- How is speed calculated?
- How is speed and velocity related?
- What is acceleration?
- What is the difference between a constant speed graph and a constant acceleration graph?

Unit 3: Newton's Laws of Motion

- What is needed for a change in motion?
- How is force calculated?
- What is Newton's Third Law of Motion and how is it applied to a closed system?

- Why don't the forces, created in Newton's 3rd law of motion cancel each other out?

Unit 4: Forces, Momentum and Friction

- In what ways are forces transferred from one object to another?
- What is the force that always opposes motion ?
- Why is force and momentum conserved in a closed system?
- What unit is used to measure force?

New Jersey Student Learning Standards (No CCS)

SCI.MS-PS2-3	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
SCI.MS-PS2-2	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
SCI.MS-PS2-4	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
SCI.MS-PS2-1	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
SCI.MS-PS2-5	Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

Interdisciplinary Connections

MA.8.EE.B.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
MA.8.SP.A.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

Technology Standards

TECH.8.1.8.A.3	Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
TECH.8.1.8.A.4	Graph and calculate data within a spreadsheet and present a summary of the results.

21st Century Themes/Careers

CRP.K-12.CRP4	Communicate clearly and effectively and with reason.

Instructional Strategies & Learning Activities

- Quiz quiz trade
- Alpha block
- Gallery Walk
- Newton's Cars
- Roller Coaster
- Reaction Time (Speed and Velocity)
- Science Carnival
- Momentum
- Force
- Newton's Laws
- Gravity
- Weight
- Speed/Velocity
- Acceleration
- Metric System

Differentiated Instruction

Examples may include:

Inquiry/Problem-Based Learning
Learning preferences integration (visual, auditory, kinesthetic)
Sentence & Discussion Stems
Tiered Learning Targets
Meaningful Student Voice & Choice
Relationship-Building & Team-Building
Self-Directed Learning
LMS use
Student Data Inventories
Mastery Learning (feedback toward goal)
Grouping
Rubrics
Jigsaws

Assessment Design & Backwards Planning
Student Interest & Inventory Data

Formative Assessments

Classwork on various topics

Homework Assignments

Science Notebook entries

Differentiated Projects

Teacher observations

Discussion/Class participation

Exit Tickest

Summative Assessment

End of Unit Test
Differentiated Projects

Benchmark Assessments

Fall/Winter LinkIt Assessments

Alternate Assessments

Modifications to assessments based on IEP/504; alternate assessments may include oral explanations, scaffolded templates, digital choice for final model representations

Resources & Technology

http://www.glencoe.com/sites/common_assets/science/virtual_labs/E12/E12.html

https://www.thephysicsaviary.com/Physics/Programs/Labs/find.php

BOE Approved Texts

IScience Physical Science McGraw Hill Copyright 2017

Closure

Individual classes and lessons will end with a closure activity that reinforces what students figured out during class, and helps navigate toward next steps.

Closure activities may include:

- Scientists' Circle
- Post-it reflection
- Google form exit ticket
- Group performance reflection
- Science notebook jot

ELL

- Alternate Responses
- Extended Time
- Teacher Modeling
- Simplified Written and Verbal Instructions
- Frequent Breaks
- Google Translate

Special Education

Accommodations will be made in accordance with students' IEPs. The following list provides examples:

- Shorten assignments to focus on mastery of key concepts.
- Substitute alternatives for written assignments (clay models, posters, panoramas, collections, etc.)
- Keep workspaces clear of unrelated materials.
- Provide a computer for written work.
- Seat the student close to the teacher or a positive role model.
- Provide an unobstructed view of the chalkboard, teacher, movie screen, etc.
- Keep extra supplies of classroom materials (pencils, books) on hand.
- Maintain adequate space between desks.
- Give directions in small steps and in as few words as possible.
- Number and sequence the steps in a task.
- Have students repeat the directions for a task.
- Provide visual aids.
- Go over directions orally.
- Allow the student to complete an independent project as an alternative test.
- Show a model of the end product of directions (e.g., a completed math problem or finished quiz).
- Stand near the student when giving directions or presenting a lesson.
- Mark the correct answers rather than the incorrect ones.
- Use a pass-fail or an alternative grading system when the student is assessed on his or her own growth.

504

Examples of accommodations in 504 plans include but are not limited to:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork

- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits

At Risk

Examples may include:

- Have students restate information
- Provision of notes or outlines
- Concrete examples
- Assistance in maintaining uncluttered space
- Weekly home-school communication tools (notebook, daily log, phone calls or email messages)
- Peer or scribe note-taking
- Use of manipulatives
- No penalty for spelling errors or sloppy handwriting
- Follow a routine/schedule
- Teach time management skills
- Verbal and visual cues regarding directions and staying on task
- Adjusted assignment timelines
- Visual daily schedule
- Immediate feedback
- Work-in-progress check
- Pace long-term projects
- Preview test procedures

- Film or video supplements in place of reading text
- Pass/no pass option
- Cue/model expected behavior
- Use de-escalation strategies
- Use peer support and mentoring
- Have parent(s) sign homework/behavior chart

Gifted and Talented

Examples may include:

- Offer choice
- Speak to Student Interests
- Allow G/T students to work together
- Tiered learning
- Focus on effort and practice
- Encourage risk taking