Curriculum Map: Physics

Course: PHYSICS Sub-topic: Physics

Grade(s): 11 to 12

Course Description: This class is an algebra based Physics class. For the first half of the year we focus on Newtonian Mechanics which involve motion, forces, momentum and energy. The second half of the year we study a variety of other topics: thermal energy, waves and vibrations, sound, light, and optics.

Course Textbooks, Workbooks, Materials Citations: Physics: Principles and Problems

McGraw Hill Glencoe 2009

Unit: Chapter 1 - A Physics Toolkit

Timeline: Week 1 to 2

Unit Description: In this unit we will discuss topics that are basic for all science classes. We will discuss topics such as measurement, scientific method, metric system, and mathematic procedures.

Unit Essential Questions: How can one explain the structure, properties, and interactions of matter?

How can one explain and predict interactions between objects within systems?

Unit Big Ideas: Big Idea 1: Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms

Big Idea 2: Interactions between any two objects can cause changes in one or both of them.

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments: Assignments:

Exercises at the end of the chapter

Lab Experiments

Chapter Test

Unit Key Terminology & Definitions : Accuracy Error Figures Percent error Precision Significant

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-3 (Advanced) Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

(* standards consolidated from Topic level)

Topic: Measurement in Science

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-3 (Advanced) Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

Topic: Scientific Method

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-3 (Advanced) Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

Topic:

Unit: Chapter 2 - Describing Motion

Timeline: Week 3

Unit Description: In this unit we will discuss the introductory concepts of motion. Linear Constant speed and velocity. This is the beginning of Kinetics.

Unit Essential Questions: How can one explain and predict interactions between objects within systems?

Unit Big Ideas: Big Idea 2: Interactions between any two objects can cause changes in one or both of them

Unit Materials: Textbook and associated curriculum

Lab Equipment.

Unit Assignments: End of Chapter Exercises

Study Guide

Lab Experiments

Chapter Test

Unit Key Terminology & Definitions : Force System Velocity

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-3 (Advanced) Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

(* standards consolidated from Topic level)

Topic: Speed

Minutes for Topic: 88

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-3 (Advanced) Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

Topic: Velocity

Minutes for Topic: 132

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-3 (Advanced)	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

Unit: Chapter 3 - Accelerated Motion

Timeline: Week 4 to 5

Unit Description: In this Unit will be discussing more advanced concepts of Kinematics with the introduction of acceleration. This a very important Unit that will be utilized throughout the rest of the year.

Unit Essential Questions: How can one explain and predict interactions between objects within systems?

Unit Big Ideas: Big Idea 2: Interactions between any two objects can cause changes in one or both of them.

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments: End of Chapter Exercises

Study Guide

Lab Experiments

Chapter Test

Unit Key Terminology & Definitions : Force System Velocity

Acceleration

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced)	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.

(* standards consolidated from Topic level)

Topic: Acceleration

Minutes for Topic: 88

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced)	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.

Topic: Kinematics

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced)	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.

Topic: Free Fall

Minutes for Topic: 132

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced)	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.

Unit: Chapter 4 - One Dimensional Forces

Timeline: Week 6

Unit Description: In this unit we discuss an introduction of Newton's Laws of motion.

Unit Essential Questions: How can one explain and predict interactions between objects within systems?

Unit Big Ideas: Big Idea 2: Interactions between any two objects can cause changes in one or both of them.

Unit Materials: Textbook and associated curriculum

Lab Equipment

Unit Assignments: End of Chapter Exercises

Study Guide

Lab Experiment

Chapter Test

Unit Key Terminology & Definitions : Force System Velocity

Acceleration Mass Net Force

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced)	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.

(* standards consolidated from Topic level)

Topic: Newton's Laws of Motion

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced)	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.

Unit: Chapter 5 - Forces in Two Dimensions

Timeline: Week 8 to 10

Unit Description: In this unit we discussed a more advanced application of Newton's Laws of Motion. Forces in two dimensions and friction are used in conjunction of Newton's Laws.

Unit Essential Questions: How can one explain and predict interactions between objects within systems?

Unit Big Ideas: Big Idea 2: Interactions between any two objects can cause changes in one or both of them.

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments: End of chapter exercises

Study guide

Lab experiment

Chapter test

Unit Key Terminology & Definitions : Force System Velocity

Acceleration Mass Net Force

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced) 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.

(* standards consolidated from Topic level)

Topic: Vectors

Minutes for Topic: 264

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced) 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.

Topic: Friction

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced) 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.

Topic: Forces in Two Dimensions

Minutes for Topic: 176

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced) 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.

Unit: Chapter 6 - Motion in Two Dimensions

Timeline: Week 10 to 11

Unit Description: In this unit we will discuss motion in two dimensions. This includes projectile motion and circular motion.

Unit Essential Questions: How can one explain and predict interactions between objects within systems?

Unit Big Ideas: Big Idea 2: Interactions between any two objects can cause changes in one or both of them.

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments: End of chapter exercises

Study guide

Lab experiment

Chapter test

Unit Key Terminology & Definitions : Force System Velocity

Acceleration Mass Net Force

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced)	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.

(* standards consolidated from Topic level)

Topic: Projectile Motion

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced)	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.

Topic: Circular Motion

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced)	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.

Unit: Chapter 7 - Graviation

Timeline: Week 12 to 13

Unit Description: In this unit we will be discussing Planetary Motion and Newton's Laws of Gravitation.

Unit Essential Questions: How can one explain and predict interactions between objects within systems?

Unit Big Ideas: Big Idea 2: Interactions between any two objects can cause changes in one or both of them.

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments: End of chapter exercies

Study guide

Lab experiment

Chapter test

Unit Key Terminology & Definitions : Gravitational forces Mathematical representation Newton's Law of Gravitation

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced)	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.
HS-PS2-4 (Advanced)	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

(* standards consolidated from Topic level)

Topic: Planetary Motion and Gravitation

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced)	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.
HS-PS2-4 (Advanced)	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

Topic: Using the Law of Universal Gravitation

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-1 (Advanced)	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.
HS-PS2-4 (Advanced)	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

Unit: Chapter 8 - Rotational Motion

Timeline: Week 14

Unit Description: In this unit we will discuss the concept of rotational motion. We will apply the concepts of kinematics in chapter 2 and 3 to rotational motion.

Unit Essential Questions: How can one explain and predict interactions between objects within systems?

Unit Big Ideas: Big Idea 2: Interactions between any two objects can cause changes in one or both of them

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments: End of chapter exercises

Study Guide

Lab experiment

Chapter Test

Unit Key Terminology & Definitions : Force System Velocity

Acceleration Mass Net Force

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-2 (Advanced)	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.
HS-PS2-3 (Advanced)	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

(* standards consolidated from Topic level)

Topic: Describing Rotational Motion

Minutes for Topic: 88

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-2 (Advanced)	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.
HS-PS2-3 (Advanced)	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

Topic: Rotational Dynamics

Minutes for Topic: 132

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-2 (Advanced)	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.
HS-PS2-3 (Advanced)	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

Unit: Chapter 9 - Momentum and Its Conservation

Timeline: Week 15 to 16

Unit Description: In this unit will be discussing the concepts of momentum and its conservation.

Unit Essential Questions: How can one explain and predict interactions between objects within systems?

How is energy transferred and conserved?

Unit Big Ideas: Big Idea 2: Interactions between any two objects can cause changes in one or both of them.

Big Idea 3: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments: End of chapter exercises

Study guide

Lab experiment

Chapter test

Unit Key Terminology & Definitions : Elastic collision Impulse Inelastic collision Momentum

Claims Mathematical representation Momentum Net force System

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-2 (Advanced)	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.
HS-PS2-3 (Advanced)	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

(* standards consolidated from Topic level)

Topic: Impulse and Momentum

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-2 (Advanced)	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.
HS-PS2-3 (Advanced)	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

Topic: Conservation of Momentum

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS2-2 (Advanced)	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.
HS-PS2-3 (Advanced)	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

Unit: Chapter 10 - Energy, Work, and Simple Machines

Timeline: Week 17

Unit Description: In this unit we will discuss the concept of Energy, Work, and Machines. This is a quick review chapter.

Unit Essential Questions: How can one explain and predict interactions between objects within systems?

How is energy transferred and conserved?

Unit Big Ideas: Big Idea 2: Interactions between any two objects can cause changes in one or both of them

Big Idea 3: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments: End chapter exercises

Study guide

Lab experiment

Chapter test

Unit Key Terminology & Definitions : Conservation of energy Evidence Investigation

Kinetic energy Mechanical energy Potential energy

Energy transfer Model System

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-1 (Advanced)	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.
HS-PS3-2 (Advanced)	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).
HS-PS3-3 (Advanced)	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

(* standards consolidated from Topic level)

Topic: Energy and Work

Minutes for Topic: 88

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-1 (Advanced)	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.
HS-PS3-2 (Advanced)	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).
HS-PS3-3 (Advanced)	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

Topic: Machines

Minutes for Topic: 132

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-1 (Advanced)	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.

HS-PS3-2 (Advanced)	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).

Unit: Chapter 11 - Conservation of Energy

Timeline: Week 18 to 19

Unit Description: In this unit we will discuss Kinetic and Potential Energy as well as the Conservation of Energy.

Unit Essential Questions: How can one explain and predict interactions between objects within systems?

How is energy transferred and conserved?

Unit Big Ideas: Big Idea 2: Interactions between any two objects can cause changes in one or both of them

Big Idea 3: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments: End of chapter exercises

Study Guide

Lab experiment

Chapter test

Unit Key Terminology & Definitions : Kinetic energy Mechanical energy Potential energ

Energy transfer Model System

Design Energy transfer Solution System

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-1 (Advanced)	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.
HS-PS3-2 (Advanced)	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).
HS-PS3-3 (Advanced)	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

(* standards consolidated from Topic level)

Topic: The Many Forms of Energy

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-1 (Advanced)	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.
HS-PS3-2 (Advanced)	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).
HS-PS3-3 (Advanced)	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

Topic: Conservation of Energy

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-1 (Advanced)	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.
HS-PS3-2 (Advanced)	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).
HS-PS3-3 (Advanced)	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

Unit: Chapter 12 - Thermal Energy

Timeline: Week 20 to 21

Unit Description:	In this unit we will be discussing the concepts of temperature and states of matter. We will also be discussing Thermodynamics,
Unit Essential Questions:	How can one explain the structure, properties, and interactions of matter? How is energy transferred and conserved?
Unit Big Ideas:	Big Idea 1: Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms. Big Idea 3: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation
Unit Materials:	Textbook and associated curriculum Lab equipment
Unit Assignments:	End of chapter exercises Study guide Lab experiment Chapter test
Unit Key Terminology & Definitions :	Boiling point Bonding Dispersion Forces Freezing point Hydrogen Intermolecular "Like dissolves like" London Van der Waals Melting point Polarity Surface tension Vapor pressure
STANDARDS:	**STANDARDS** NGSS Arranged by Topic - Science (2013) HS-PS3-4 (Advanced) Plan and conduct an investigation to provide evidence that

the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

(* standards consolidated from Topic level)

Topic: Temperature and Thermal Energy

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-4 (Advanced) Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

Topic: Changes of State of State and the Law of Thermodynamics

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-4 (Advanced) Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

Unit: Chapter 13 - States of Matter

Timeline: Week 22 to 24

Unit Description: In this unit we will be discussing in detail fluid dynamics including properties of fluids, forces within fluids, and fluids a rest.

Unit Essential Questions: How can one explain the structure, properties, and interactions of matter?

Unit Big Ideas: Big Idea 1: Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments: End of Chapter exercises

Study guide

Lab experiment

Chapter Test

Unit Key Terminology & Definitions : Boiling point Bonding Dispersion Forces Freezing point Hydrogen Intermolecular "Like dissolves like" London Van der Waals Melting point Polarity Surface tension Vapor pressure

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-4 (Advanced) Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

(* standards consolidated from Topic level)

Topic: Properties of Fluids

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-4 (Advanced)	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

Topic: Forces Within Liquids

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-4 (Advanced)	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

Topic: Fluids at Rest and In Motion

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-4 (Advanced)	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

Topic: Solids

Minutes for Topic: 132

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS3-4 (Advanced)	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

Unit: Chapter 14 - Waves and Vibrations

Timeline: Week 25 to 26

Unit Description:	In this unit we will discuss the basics of wave interactions. This is a foundation chapter for the remaining chapters.
Unit Essential Questions:	How are waves used to transfer energy and information?
Unit Big Ideas:	Big Idea 4: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.
Unit Materials:	Textbook and associated curriculum Lab equipment
Unit Assignments:	End of chapter exercises Study guide

Lab experiment

Chapter test

Unit Key Terminology & Definitions :

Medium Frequency Wave Wavelengt

Reflection Refraction Transmission

Constructive interference Destructive interference

Superposition

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-1 (Advanced)	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-4 (Advanced)	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

(* standards consolidated from Topic level)

Topic: Periodic Motion

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-1 (Advanced)	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-4 (Advanced)	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Topic: Wave Properties

Minutes for Topic: 132

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-1 (Advanced)	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-4 (Advanced)	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Topic: Wave Behavior

Minutes for Topic: 88

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-1 (Advanced)	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-4 (Advanced)	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Unit: Chapter 15 - Sound and Music

Timeline: Week 27 to 28

Unit Description: In this unit we will be discussing Sound. We will use the concepts that we learned in Chapter 14.

Unit Essential Questions: How are waves used to transfer energy and information?

Unit Big Ideas: Big Idea 4: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments: End of chapter exercises

Study guide

Lab experiment

Chapter Test

Unit Key Terminology & Definitions : Constructive interference Destructive interferenc

Absorption Reflection Refraction Transmission

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-1 (Advanced)	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-4 (Advanced)	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

(* standards consolidated from Topic level)

Topic: Properties and Direction of Sound

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-1 (Advanced)	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-4 (Advanced)	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Topic: The Physics of Sound

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-1 (Advanced)	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-4 (Advanced)	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Unit: Chapter 16 - Fundamentals of Light

Timeline: Week 29 to 30

Unit Description:	In this unit will be applying the concepts of Chapter 14 to light and the Electromagnetic Spectrum.
Unit Essential Questions:	How are waves used to transfer energy and information?
Unit Big Ideas:	Big Idea 4: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.
Unit Materials:	Textbook and associated curriculum Lab equipment
Unit Assignments:	End of chapter exercises Study guide Lab experiment Chapter Test
Unit Key Terminology & Definitions :	Medium Frequency Wave Wavelength Electromagnetic wave Particle model Photon Wave model Electromagnetic wave Frequency Proportional Electromagnetic wave Pulses Wavelength

STANDARDS: **STANDARDS**

NGSS Arranged by Topic - Science (2013)

HS-PS4-1 (Advanced)	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-4 (Advanced)	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

(* standards consolidated from Topic level)

Topic: Illumination

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-1 (Advanced)	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-4 (Advanced)	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Topic: The Wave Nature of Light

Minutes for Topic: 220

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-1 (Advanced)	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Unit: Chapter 17 - Reflection and Mirrors

Timeline: Week 31 to 33

Unit Description: In this unit we will discussing reflection of light and the application in plane and curved mirrors.

Unit Essential Questions: How are waves used to transfer energy and information?

Unit Big Ideas: Big Idea 4: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments:

End of chapter exercises

Study guide

Lab experiment

Chapter test

Unit Key Terminology & Definitions :

Electromagnetic wave Frequency Proportiona

Electromagnetic wave Pulses Wavelength

Constructive interference Destructive interference Encode

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-4 (Advanced)	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

(* standards consolidated from Topic level)

Topic: Reflection from a Plane Mirror

Minutes for Topic: 264

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-4 (Advanced)	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Topic: Curved Mirrors

Minutes for Topic: 396

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Unit: Chapter 18 - Refraction and Lenses

Timeline: Week 34 to 36

Unit Description: In this unit we will discuss the concepts of light and lenses.

Unit Essential Questions: How are waves used to transfer energy and information?

Unit Big Ideas: Big Idea 4: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Unit Materials: Textbook and associated curriculum

Lab equipment

Unit Assignments: End of chapter exercises

Study guide

Lab experiment

Chapter Test

Unit Key Terminology & Definitions : Electromagnetic wave Particle model Photon Wave model

Electromagnetic wave Frequency Proportional

Electromagnetic wave Pulses Wavelength

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-1 (Advanced)	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

(* standards consolidated from Topic level)

Topic: Refraction of Light

Minutes for Topic: 264

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Topic: Convex and Concave Lenses

Minutes for Topic: 396

STANDARDS

NGSS Arranged by Topic - Science (2013)

HS-PS4-1 (Advanced)	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-3 (Advanced)	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for

	some situations one model is more useful than the other.
HS-PS4-5 (Advanced)	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.