Physics I

Unit 1 Methods in Science (Systems of Units)

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Estimated					Suggested		
Time Frame	Big Ideas	Essential	Concepts	Competencies	Resources and	Vocabulary	Standards
for Units		Questions	(Know)	(Do)	Materials		
10 Days	Tools are needed for the study of Physics, such as measurement, conversions, significant figures, experimental design, data collection and analysis.	What is Physics? How are Mathematical models constructed and used in our daily lives?	Physics is the study of matter and energy and their relationships. Significant digit identification and operations The result of any mathematical operation with measurements never can be more precise than the least-precise measurement involved in the operation. The scientific method is a systematic method of observing, experimenting, and analyzing to answer questions about the natural world.	Students should be able to demonstrate scientific methods. Students should be able to use the metric system. Students should be able to evaluate answers using dimensional analysis. Students should be able to perform arithmetic operations using scientific notation.	Physics-Principals and Problems Glencoe (2005) Section 1-1 (pgs. 3-10)	Physics Dimensional analysis Significant digits Scientific methods Scientific theory	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics 3.2.P.B.7 Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe.

		Scientific ideas change in response to new data. Scientific laws and theories are well established descriptions and explanations of nature.				Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models.
Tools are needs for the study of Physics, such as measurement, conversions, significant figure experimental design, data collection and analysis.	f How are Mathematical models constructed	New scientific findings must be reproducible. All measurements are subject to some uncertainty. Precision is the degree of exactness with which a quantity is measured. Scientific Notation shoes how precise a measurement is. Accuracy is the extent to which a measurement matches its true value.	Students should be able to distinguish between accuracy and precision. Students should be able to explain the importance of accuracy and precision in making valid measurements. Students should be able to determine the precision of measured quantities.	Physics-Principals and Problems Glencoe (2005) Section 1-2 (pgs. 11-14)	Measurement Precision Accuracy	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics 3.2.P.B.7 Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and

	Tools are needed for the study of Physics, such as measurement, conversions, significant figures, experimental design, data collection and analysis.	What is Physics? How are Mathematical models constructed and used in our daily lives?	Data is plotted in graphical form to show the relationship between two variables. The line that best passes through or near graphed data is called the line of best fit and is used to describe the data in order to predict where new data would lie on the graph. A graph in which data points lie on a straight line is the graph of a linear relationship. The slope of a line graph is the vertical change (rise) divided by the horizontal change (run) and often has a physical meaning.	Students should be able to graph the relationship between independent and dependent variables. Students should be able to interpret graphs. Students should be able to recognize common relationships in graphs.	Physics-Principals and Problems Glencoe (2005) Section 1-3 (pgs. 15-19)	Independent Variables Dependent variables Line of best fit Linear relationship Quadratic relationship Inverse relationship	concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics 3.2.P.B.1 Differentiate among translational motion, and rotational motion, simple harmonic motion, and rotational motion in terms of position, velocity and acceleration. 3.2.P.B.7 Compare and contrast scientific theories. Know that both direct
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The graph of a quadratic relationship is a parabolic curve.	and indirect observations are used by scientists to study the natural world and universe.
The graph of an inverse relationship between is a hyperbolic curve.	Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and
	evidence. Recognize and analyze alternative explanations and models.

Review Unit 1 Methods in Science (Systems of Units)

Assessment Unit 1 Methods in Science (Systems of Units)

Unit 2 One Dimensional (Linear) Motion

Estimated Time Frame for Units	Big Ideas	Essential Questions	Concepts (Know)	Competencies (Do)	Suggested Resources and Materials	Vocabulary	Standards
25 Days	Objects that move in translational motion are described in terms of position, velocity and acceleration.	How can the motion of an object be described in a measurable and quantitative way?	The position of an object is its separation form a reference point. A motion diagram shows the position of an object at successive times.	Students should be able to draw motion diagrams to describe motion. Students should be able to develop a particle model to represent a moving object.	Physics-Principals and Problems Glencoe (2005) Section 2-1 (pgs. 31-33) Physics-Principals and Problems Glencoe (2005) Section 2-2	Motion Diagrams Particle model Coordinate system Origin	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text.

Objects that move	How can the motion	In a particle model, the object in the motion diagram is replaced by a series of single points. One can define any coordinate system in describing motion; however some are more useful than others.	Students should be able to define coordinate systems for motion problems. Students should be able to recognize that the chosen coordinate system affects the sign of objects' position.	(pgs. 34-37) Physics-Principals	Position	CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics 3.2.P.B.1 Differentiate among translational motion, simple harmonic motion, and rotational motion in terms of position, velocity and acceleration. 3.2.P.B.7 Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. CC.3.5.11-12.C
in translational	of an object be	difference between	able to define	and Problems		Follow precisely a complex multi-step

motion a		two times.	displacement.	Glencoe (2005) Section 2-2	Displacement	procedure carrying out experiments, taking
described of position and accel	n, velocity quantitative w		Students should be able to determine a time interval. Students should be able to use a motion diagram to answer questions about an objects position or displacement. Students should be able to discriminate between the distance an object moves and the displacement of an object.	(pgs. 34-37)	Time interval	measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics 3.2.P.B.1 Differentiate among translational motion, simple harmonic motion, and rotational motion in terms of position, velocity and acceleration.
						3.2.P.B.7 Compare and contrast scientific theories. Know that both direct
						and indirect observations are used by scientists to study the natural world and universe.
						Identify questions and concepts that guide scientific investigations.
						Formulate and revise explanations and models using logic and

						evidence.
						Recognize and analyze alternative explanations and models.
Objects that move in translational motion are described in terms of position, velocity and acceleration.	How can the motion of an object be described in a measurable and quantitative way?	The length of a displacement vector represents how far the object was displaced and the vector points in the direction of the displacement. A Scalar quantity is described completely by its magnitude, while a vector quantity requires both magnitude and direction.	Students should be able to define velocity. Students should be able to discriminate between speed and velocity of an object.	Physics-Principals and Problems Glencoe (2005) Section 2-2 (pgs. 34-37) Physics-Principals and Problems Glencoe (2005) Section 2-4 (pgs. 43-47)	Magnitude Vector Scalar Resultant Speed velocity	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics 3.2.P.B.1 Differentiate among translational motion, simple harmonic motion, and rotational motion in terms of position, velocity and acceleration. 3.2.P.B.7 Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe.

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						Formulate and revise explanations and models using logic and evidence.
						Recognize and analyze alternative explanations and models.
Objects that move in translational motion are described in terms of position, velocity and acceleration.	How can the motion of an object be described in a measurable and quantitative way?	Average velocity is the displacement (change in position) divided by the time interval.	Students should be able to describe motion of an object in terms of a reference frame. Students should be able to create a mathematical model for the relationship between velocity, displacement and time. Students should be able to algebraically manipulate mathematical models of constant velocity to solve for variables.	Physics-Principals and Problems Glencoe (2005) Section 2-3 (pgs. 38-42) Physics-Principals and Problems Glencoe (2005) Section 2-4 (pgs. 43-47)	Time interval Instantaneous position Average velocity Average speed Instantaneous velocity	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics 3.2.P.B.1 Differentiate among translational motion, simple harmonic motion, and rotational motion in terms of position, velocity and acceleration.
						3.2.P.B.7

						Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations.
						Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models.
Objects that move in translational motion are described in terms of position, velocity and acceleration.	How can the motion of an object be described in a measurable and quantitative way?	The slope of an object's position-time graph is the average velocity of the objects motion. When the position-time graph is a straight line, the object is moving with a constant velocity. A velocity - time graph can be used to find velocity and acceleration of an object.	Students should be able to create velocity – time graphs. Students should be able to determine the velocity from a position –time graph. Students should be able to interpret the motion of an object moving with constant velocity using a position-time graph as well as a velocity-time	Physics-Principals and Problems Glencoe (2005) Section 2-3 (pgs. 38-42) Physics-Principals and Problems Glencoe (2005) Section 2-4 (pgs. 43-47) Physics-Principals and Problems Glencoe (2005) Section 3-1 (pgs. 57-64)	Slope Velocity-time graph	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics 3.2.P.B.1

						translational motion, simple harmonic motion, and rotational motion in terms of position, velocity and acceleration. 3.2.P.B.7 Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations
Objects that move in translational motion are described in terms of position, velocity and acceleration.	How can the motion of an object be described in a measurable and quantitative way?	Acceleration is the ratio of the change in velocity to the time interval over which it occurs. The average acceleration of an object is the slope of the velocity – time graph. If an objects average	Students should be able to relate velocity and acceleration to the motion of an object. Students should be able to interpret position-time graphs for motion with constant acceleration.	Physics-Principals and Problems Glencoe (2005) Section 3-1 (pgs. 57-64) Physics-Principals and Problems Glencoe (2005) Section 3-2 (pgs. 65-71)	Acceleration Average Acceleration Instantaneous acceleration	and models. CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and

	acceleration during a	Students should be		phrases as they are used
	time interval is	able apply graphical		in a specific scientific or
	known, the change in	and mathematical		technical context; relevant to grade 11-12
	velocity during that	relationships to		texts and topics
	time period can be	solve problems		'
	found.	related to constant		3.2.P.B.1
		acceleration.		Differentiate among
	Average acceleration			translational motion,
	vectors on a motion	Student should be		simple harmonic
	diagram indicate the	able to create		motion, and rotational motion in terms of
	size and direction of	mathematical		position, velocity and
	the average	models for the		acceleration.
	acceleration during a	relationship		
	=	·		3.2.P.B.7
	time interval.	between constant		Compare and contrast
		acceleration, initial		scientific theories.
	When the	and final velocities,		
	acceleration and	time and		Know that both direct and indirect
	velocity are in the	displacement.		observations are used
	same direction, the			by scientists to study the
	object speeds up;	Students should be		natural world and
	when they are in	able to algebraically		universe.
	opposite directions,	manipulate		Identify questions and
	the object slows	mathematical		concepts that guide
	down.	models of constant		scientific investigations.
		acceleration to		
	Velocity – time graphs	solve for variables.		Formulate and revise
	and motion diagrams			explanations and models using logic and
	can be used to	Students should be		evidence.
	determine sign of an	able to relate		
	object's acceleration.	velocity and		Recognize and analyze
	2.5,222.2.2.300.0.0000	acceleration to the		alternative explanations
	The area under an	motion of an object.		and models.
	objects velocity time	motion or an object.		
	graph is it's			
	displacement.			
	uispiacement.			
	In motion with			
	constant acceleration,			
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		there is a relationship among position,				
		velocity, acceleration, and time.				
in translational motion are described in terms	How can the motion of an object be described in a measurable and quantitative way?	Constant acceleration on the y-axis (free fall) The acceleration due to gravity on earth is 9.8 m/s^2 downward. The sign associated with gravity in equations depends upon the choice of the coordinate system. Equations for motion with constant acceleration can be used to solve problems involving free fall.	Students should be able to define acceleration due to gravity. Students should be able to solve problems involving objects in free fall. Students should be able to explain factors that affect the rate of a falling object.	Physics-Principals and Problems Glencoe (2005) Section 3-3 (pgs. 72-75)	Free Fall Acceleration due to gravity	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics 3.2.P.B.1 Differentiate among translational motion, and rotational motion, and rotational motion in terms of position, velocity and acceleration. 3.2.P.B.7 Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe.

			Identify questions and concepts that guide scientific investigations.
			Formulate and revise explanations and models using logic and evidence.
			Recognize and analyze alternative explanations and models.

Review Unit 2 One Dimensional (Linear) Motion

Assessment Unit 2 One Dimensional (Linear) Motion

Unit 3 Two Dimensional Motion

Estimated Time Frame for Units	Big Ideas	Essential Questions	Concepts (Know)	Competencies (Do)	Suggested Resources and Materials	Vocabulary	Standards
15 Days	Objects that move in translational motion are described in terms of position, velocity and acceleration.	How does the motion in the vertical direction affect motion in the horizontal direction?	Projectile motion Vector trigonometry When two vectors are at right angles, you can use the Pythagorean Theorem to determine the magnitude of the resultant vector. The law of sines and	Students should be able to evaluate the sum of two or more vectors in two dimensions graphically. Students should be able to determine the components of vectors. Students should be	Physics-Principals and Problems Glencoe (2005) Section 5-1 (pgs. 119-125)	Components Vector resolution Hypotenuse Opposite side Adjacent side Sine	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain

Objects that move in translational	How does the motion in the	cosines can be used to find the magnitude of the resultant of any two vectors. The components of a vector are projections of the component vectors. Vectors can be summed by separately adding the x- and y- components.	able to solve the sum of two or more vectors algebraically by adding the components of the vectors. Students should be able to recognize	Physics-Principals and Problems	Tangent Right triangles Pythagorean Theorem Law of Sines Law of cosines	specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics 3.2.P.B.1 Differentiate among translational motion, simple harmonic motion, and rotational motion in terms of position, velocity and acceleration. 3.2.P.B.7 Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. CC.3.5.11-12.C Follow precisely a
motion are described in terms	vertical direction affect motion in the	of a projectile, forces (or the lack thereof)	that the vertical and horizontal motions	Glencoe (2005) Section 6-1	Trajectory	complex multi-step procedure carrying out experiments, taking

of position, velocity and acceleration.	horizontal direction?	that influence these behavior	of a projectile are independent.	(pgs. 147-154)	Range	measurements, or performing technical tasks; analyze the
		·· · · ·				results based on
		The vertical and	Student should be			explanations in the text.
		horizontal motions of	able to relate the			
		a projectile are	height, time in the			CC.3.5.11-12.D
		independent.	air, and initial			Determine the meaning of symbols, key terms,
			vertical velocity of a			and other domain
		A projectile moves	projectile using its			specific words and
		with constant velocity	vertical motion, and			phrases as they are used
		in the horizontal	then determine the			in a specific scientific or
		direction and a	range using the			technical context; relevant to grade 11-12
		changing velocity in	horizontal motion.			texts and topics
		the vertical direction.				·
			Students should be			3.2.P.B.1
		When there is no air	able to explain the			Differentiate among
		resistance, the	trajectory of a			translational motion,
		horizontal motion	projectile based on			simple harmonic motion, and rotational
		component does not	the frame of			motion in terms of
		experience	reference from			position, velocity and
		acceleration, and has	which it is observed.			acceleration.
		constant velocity.				
		Projectile problems	Students should be			3.2.P.B.7
		are solved by first	able to solve			Compare and contrast
		using the vertical	problems involving			scientific theories.
		motion to relate	projectiles launched			Know that both direct
		height, time in the air	horizontally from an			and indirect
		and initial vertical	elevated position.			observations are used
		velocity. Then the				by scientists to study the natural world and
		distance traveled	Students should be			universe.
		horizontally if found.	able to solve			
		-	problems involving			Identify questions and
		The range of a	projectiles fired at			concepts that guide scientific investigations.
		projectile depends on	an angle above			Scientific investigations.
		the acceleration due	zero.			Formulate and revise
		to gravity and on both				explanations and
		components of the				models using logic and evidence.
		initial velocity.				eviderice.

		The curved flight path of a projectile is called a parabola				Recognize and analyze alternative explanations and models.
Objects that move in translational motion are described in terms of position, velocity and acceleration.	How does the motion in the vertical direction affect motion in the horizontal direction?	Vertical and horizontal behaviors of a projectile, forces (or the lack thereof) that influence these behaviors Vector addition can be used to solve problems of relative velocity. The key to properly analyzing a two-dimensional relative velocity problem is drawing a proper triangle to represent all three velocity vectors. When a coordinate system is moving, two velocities are added together if both motions are in the same direction. When a coordinate system is moving, one vector is subtracted from the other when	Students should be able to analyze situations in which the coordinate system is moving. Students should be able to solve relative-motion problems.	Physics-Principals and Problems Glencoe (2005) Section 6-3 (pgs. 157-159)	Relative velocity	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics 3.2.P.B.1 Differentiate among translational motion, simple harmonic motion, and rotational motion in terms of position, velocity and acceleration. 3.2.P.B.7 Compare and contrast scientific theories. Know that both direct and indirect observations are used

the motions are in opposite directions.		by scientists to study the natural world and universe.
		Identify questions and concepts that guide scientific investigations.
		Formulate and revise explanations and models using logic and evidence.
		Recognize and analyze alternative explanations and models.

Review Unit 3 Two Dimensional Motion

Assessment Unit 3 Two Dimensional Motion

Unit 4 Newton's Law's

Estimated Time Frame for Units	Big Ideas	Essential Questions	Concepts (Know)	Competencies (Do)	Suggested Resources and Materials	Vocabulary	Standards
20 days	All changes in translational motion are due to forces.	How can the linear motion of an object be determined by analyzing the forces on it?	Newton's First Law states that an object that is at rest will remain at rest, and an object that is moving will continue to move in a straight line with constant speed, if and only if the net force acting upon it is zero	Students should be able to define force. Students should be able to explain the meaning of Newton's first law. Students should be able to solve problems with net	Physics-Principals and Problems Glencoe (2005) Section 4-1 (pgs. 87-95)	Force Free-body diagram Net force Newton's First Law Newton's	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning

	An object with no net	force equal to zero,	 Second Law	of symbols, key terms,
	force acting on it is in	simple angle forces		and other domain
	equilibrium.	or inclines.	Inertia	specific words and phrases as they are used
				in a specific scientific or
	Newton's Second Law	Students should be	Equalibrium	technical context;
	states that the	able to apply		relevant to grade 11-12
	acceleration of a	Newton's second		texts and topics.
	system equals the net	law to solve		CC 2 C 44 42 D
	force acting on it,	problems with non-		CC.3.6.11-12.B Write informational and
	divided by its mass.	zero net force,		explanatory text,
	divided by its mass.	•		including the narration
	0	some using the		of historical events,
	An object that	coefficient of		scientific
	experiences a push or	friction.		procedures/experiments or technical processes.
	a pull has a force			or technical processes.
	exerted on it.	Students should be		CC.3.6.11-12.C
		able to construct a		Produce clear and
	Forces have both	free body diagram		coherent writing in
	direction and	indicating the		which the development,
	magnitude.	magnitude and		organization and style are appropriate to task,
		direction of the		purpose, and audience.
	Forces may be divided	forces on an object		
	into contact and field	and use information		3.2.P.B.1
	forces.	from the diagram to		Use force and mass to
		determine the		explain translational
	In a free body	motion of the		motion or simple
	diagram, always draw	object.		harmonic motion.
	the force vectors			
	leading away from the			3.2.P.B6
	object, even if the			Patterns scale models
	force is a push.			constancy/change; use Newton's laws of
	. STOC IS a pasin			motion and gravitation
	The forces acting			to describe and predict
	upon an object can be			the motion of objects
	added using vector			ranging from atoms to
	_			the galaxies.
	addition to find net			22007
	force.			3.2.P.B.7
				Compare and contrast scientific theories.
				scientific tricories.

translational motion are due to forces. motion of an object be determined by analyzing the forces on it? no it? motion of an object be determined by analyzing the forces on it? Ne sta acc system	Students shot able to describe that is at rest will emain at rest, and an object that is moving will continue to move in a straight line with onstant sped, if and only if the net force cting upon it is zero Newton's Second Law tates that the cceleration of a ystem equals the net orce acting on it, livided by its mass. The weight of an object depends upon the acceleration due	ibe and Problems Glencoe (2005) Section 4-2 (pgs. 96-101) Ild be entiate ual	Apparent weight Weightlessness Drag force Terminal velocity	Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics. CC.3.6.11-12.B Write informational and explanatory text,
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to gravity and the mass of the object. An object's apparent weight is the force an object experiences as a result of the contact forces acting upon it, giving the object with no apparent weight weight is the object with no apparent weight experiences weightesness. An object with no apparent weight experiences weightesness. The effect of drag on an object's motion is determined by the object weight, size and shape. If a falling object reaches a velocity such that the drag force is equal to the object's weight, it maintains that velocity, called terminal velocity If a falling object's meight, it maintains that velocity, called terminal velocity In the object's weight, it maintains that velocity, called terminal velocity If a falling velocity is meight of the object's weight, it maintains that velocity, called terminal velocity If a falling velocity is maintains that velocity, called terminal velocity is such that the drag force is equal to the object's weight, it maintains that velocity, called terminal velocity is such that the drag force is equal to the object's weight, it maintains that velocity, called terminal velocity is such that the interminal velocity is such th		
mass of the object. An object's apparent weight is the force an object experiences as a result of the contact forces acting upon it, giving the object acceleration. An object with no apparent weight experiences weightlessness. The effect of drag on an object's motion is determined by the object's motion is determined by the object's weight, size and shape. If a falling object reaches a velocity such that the drag force is equal to the object's weight, it maintains that velocity, called terminal velocity In ending the drag of the object's weight, it maintains that velocity, called terminal velocity If a falling object reaches a velocity such that the drag force is equal to the object's weight, it maintains that velocity, called terminal velocity If a falling object reaches a velocity such that the drag force is equal to the object's weight, it maintains that velocity, called terminal velocity If a falling object reaches a velocity such that the drag force is equal to the object's weight, it maintains that velocity, called terminal velocity	to gravity and the	
An object's apparent weight is the force an object experiences as a result of the contact forces acting upon it, giving the object acceleration. An object with no apparent weight experiences weightlessness. The effect of drag on an object's motion is determined by the object's motion is determined by the object reaches a velocity, size and shape. If a falling object reaches a velocity such that the drag force is equal to the object's weight, it maintains that velocity, called terminal velocity Length of the object's motion is determined by the object's weight, size and shape. If a falling object reaches a velocity such that the drag force is equal to the object's weight, it maintains that velocity, called terminal velocity If a falling object reaches a velocity such that the drag force is equal to the object's weight, it maintains that velocity, called terminal velocity defends an acceleration of objects and indirect observations are used by scientist to study the natural world and natures.		
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							Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models.
tran	due to forces.	How can the linear motion of an object be determined by analyzing the forces on it?	Action/ reaction pairs All forces result from interactions between objects. Newton's third law states that the two forces that make up an interaction pair of forces are equal in magnitude, but opposite in direction and act on different objects. Tension is the specific name for the force exerted by a rope or a string. The normal force is a support force resulting from the contact between the two objects.	Students will be able to define Newton's third law. Students will be able to explain the tension in ropes and strings in terms of Newton's third law. Students will be able to define the normal force. Students will be able to determine the value of the normal force by applying Newton's second law. Students will be able to identify action/ reaction pairs.	Physics-Principals and Problems Glencoe (2005) Section 4-3 (pgs. 102-107)	Interaction Pairs Newton' third law Tension Normal force	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics. CC.3.6.11-12.B Write informational and explanatory text, including the narration of historical events, scientific procedures/experiments or technical processes. CC.3.6.11-12.C Produce clear and coherent writing in which the development, organization and style are appropriate to task,

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						purpose, and audience.
						3.2.P.B.1 Use force and mass to explain translational motion or simple harmonic motion.
						3.2.P.B6 Patterns scale models constancy/change; use Newton's laws of motion and gravitation to describe and predict the motion of objects ranging from atoms to the galaxies.
						3.2.P.B.7 Compare and contrast scientific theories.
						Know that both direct and indirect observations are used by scientists to study the natural world and universe.
						Identify questions and concepts that guide scientific investigations.
						Formulate and revise explanations and models using logic and evidence.
						Recognize and analyze alternative explanations and models.
Objects that move in translational motion are	How does the motion in the vertical direction	Vertical and horizontal behaviors of an object, forces	Students should be able to define the friction force.	Physics-Principals and Problems Glencoe (2005)	Kinetic friction Static friction	CC.3.5.11-12.C Follow precisely a complex multi-step

described in terms	affect motion in the	(or the lack thereof)		Section 5-2		procedure carrying out
of position, velocity	horizontal	that influence these	Students should be	(pgs. 126-130)	Coefficient of	experiments, taking
and acceleration.	direction?	behavior	able to distinguish	(1-03: 220 200)	kinetic friction	measurements, or
			between static and			performing technical tasks; analyze the
		A frictional force acts	kinetic friction.		Coefficient of	results based on
		when two surfaces			static friction	explanations in the text.
		touch				
						CC.3.5.11-12.D Determine the meaning
		The frictional force is				of symbols, key terms,
		proportional to the				and other domain
		force pushing the				specific words and
		surfaces together.				phrases as they are used in a specific scientific or
						technical context;
		Kinetic friction force is				relevant to grade 11-12
		equal to the				texts and topics
		coefficients of kinetic friction times the				3.2.P.B.1
		normal force.				Differentiate among
		normar force.				translational motion,
		The static friction				simple harmonic motion, and rotational
		force is less than or				motion in terms of
		equal to the				position, velocity and
		coefficient of static				acceleration.
		friction times the				3.2.P.B.7
		normal force.				Compare and contrast
						scientific theories.
						Know that both direct
						Know that both direct and indirect
						observations are used
						by scientists to study the
						natural world and universe.
						Identify questions and
						concepts that guide scientific investigations.
						Formulate and revise
						explanations and models using logic and

						evidence.
						Recognize and analyze alternative explanations and models.
Objects that move in translational motion are described in terms of position, velocity and acceleration.	How does the motion in the vertical direction affect motion in the horizontal direction?	Vertical and horizontal behaviors of an object, forces (or the lack thereof) that influence these behavior The force that must be exerted on an object to cause it to be in equilibrium is called the equilibrant. The equilibrant is found by finding the net force on an object, then applying a force with the same magnitude but in the opposite direction. An object on an incline plane has a component of the force of gravity in a direction parallel to the plane; the component can accelerate the object down the plane.	Students should be able to determine the force that produces equilibrium when three forces act on an object. Student should be able to analyze the motion of an object on an incline plane.	Physics-Principals and Problems Glencoe (2005) Section 5-3 (pgs. 131-135)	Equilibrium Equilibrant	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics 3.2.P.B.1 Differentiate among translational motion, simple harmonic motion, and rotational motion in terms of position, velocity and acceleration. 3.2.P.B.7 Compare and contrast scientific theories. Know that both direct and indirect observations are used

							by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models.
			Review Unit 4 News	ton's Law's			
			Assessment Unit 4 N	ewton's Law's			
		Unit	t 5 Uniform Circul	ar Motion and G	ravity		
Estimated Time Frame for Units	Big Ideas	Essential Questions	Concepts (Know)	Competencies (Do)	Suggested Resources and Materials	Vocabulary	Standards
15 Days	All forces arise from the interaction between different objects.	How do we apply uniform circular motion to object in gravitational orbit?	Uniform circular motion is applied to objects that change directions An object moving in circular motion at a constant speed	Students should be able to describe the motion of an object in Uniform Circular Motion, pictorially, verbally and mathematically.	Physics-Principals and Problems Glencoe (2005) Section 6-3 (pgs. 153-156)	Uniform Circular motion Centripetal Acceleration Centripetal Force	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text.

accelerates toward

the center of the

Students should be

able to algebraically

Newton's

circle.	manipulate	Second Law for	CC.3.5.11-12.D
	mathematical	Circular Motion	Determine the meaning
F(net) is called a	models of Uniform		of symbols, key terms,
centripetal force and	Circular Motion to		and other domain
must be directed to	predict unknown		specific words and phrases as they are used
the center of the	variables.		in a specific scientific or
circular motion for an	variables.		technical context;
	Charles to also add by		relevant to grade 11-12
object to move in	Students should be		texts and topics.
Uniform circular	able to draw free		
motion	body diagrams of		CC.3.6.11-12.B
	objects in circular		Write informational and explanatory text,
Centripetal	motion, apply to		including the narration
acceleration depends	turning vehicles and		of historical events,
directly on the square	swinging objects,		scientific
of the objects speed	e.g. Pendulum, yo-		procedures/experiments
and inversely on the	yo, roller coaster.		or technical processes.
radius of the circle.	, , , , , , , , , , , , , , , , , , , ,		66 2 6 11 12 6
	Students should be		CC.3.6.11-12.C Produce clear and
The centripetal	able to explain why		coherent writing in
acceleration for an	an object moving in		which the development,
	a circle at constant		organization and style
object traveling in a			are appropriate to task,
circle can also be	speed is		purpose, and audience.
expressed as a	accelerating.		
function of its period.			3.2.P.B.1
	Students should be		Differentiate among
Period is the time for	able to describe		translational motion, simple harmonic
one revolution.	how centripetal		motion, and rotational
	acceleration		motion in terms of
A net force must be	depends on the		position, velocity and
exerted toward the	object's speed and		acceleration.
circle's center to	the radius of the		Dalata taunus and
cause centripetal	circle.		Relate torque and rotational inertia to
acceleration.	ch cic.		explain rotational
acceleration.	Students should be		motion
The velocity vestor of			
The velocity vector of	able to identify the		3.2.P.B2
a object with a	force that causes		Describe the rotational
centripetal	centripetal		motion of objects using
acceleration is always	acceleration.		conservation of energy

		tangent to the circular path				and conservation of angular momentum.
						Explain how gravitational, electrical, and magnetic forces and torques give rise to rotational motion.
						3.2.P.B.7 Compare and contrast scientific theories.
						Know that both direct and indirect observations are used by scientists to study the natural world and universe.
						Identify questions and concepts that guide scientific investigations.
						Formulate and revise explanations and models using logic and evidence.
						Recognize and analyze alternative explanations and models.
						Examine the importance of accuracy and precision in making valid measurements
						Evaluate experimental information for relevance to science process
All forces arise from the interaction between different	How do we apply uniform circular motion to object in	Kepler's three laws describe the motion of objects in orbit.	Students should be able to apply Kepler's law to the	Physics-Principals and Problems Glencoe (2005)	Kepler's First Law	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out

objects.	gravitational orbit?		motion of celestial	Section 7-1	Kepler's Second	experiments, taking
objects.	Bravitational orbit:	When an object is in	objects and/or	(pgs. 171-178)	Law	measurements, or
		orbit around a planet	satellites.	(P63. 1/1 1/0)	Lavv	performing technical
		(e.g. a satellite),	satellites.		Kepler's Third	tasks; analyze the
		' •	Charles also all la la			results based on
		gravity provides the	Students should be		Law	explanations in the text.
		centripetal force that	able to describe the			CC 2 F 44 42 D
		can be calculated with	importance of the		Gravitational	CC.3.5.11-12.D
		Newton's law of	Cavendish		force	Determine the meaning of symbols, key terms,
		universal gravitation.	experiment.			and other domain
					Law of Universal	specific words and
		Newton's law of	Students should be		Gravitation	phrases as they are used
		universal gravitation	able to use the			in a specific scientific or
		Can also be applied to	gravitational force			technical context;
		any two masses	equation for			relevant to grade 11-12 texts and topics.
		separated by a	celestial objects and			texts and topics.
		distance.	celestial orbits.			CC.3.6.11-12.B
		distance.	Celestiai Orbits.			Write informational and
		Newton's law of	Churdonko ala aulal la a			explanatory text,
			Students should be			including the narration
		universal gravitation	able to calculate			of historical events,
		states that the	orbital speeds and			scientific procedures/experiments
		gravitational force	periods.			or technical processes.
		between two objects				·
		is directly				CC.3.6.11-12.C
		proportional to the				Produce clear and
		product of their				coherent writing in
		masses and inversely				which the development, organization and style
		proportional to the				are appropriate to task,
		square of the distance				purpose, and audience.
		between their				
		centers. The force is				3.2.P.B.1
		attractive and along a				Differentiate among
		_				translational motion,
		line connecting their				simple harmonic
		centers.				motion, and rotational
						motion in terms of position, velocity and
		Newton's law of				acceleration.
		universal gravitation				
		can be used to rewrite				Relate torque and
		Kepler's third law to				rotational inertia to

relate the radius and period of a planet to the mass of the sun. 3.2.P.B2 Describe the rotational motion of objects using conservation of energy and conservation of energy and conservation of energy and conservation of angular momentum. Explain how gravitational, electrical, and magnetic forces and torques give rise to rotational motion. 3.2.P.B.7 Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Lidentify questions and concepts that guide scientific investigations. Formulate and rovice explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Examine the importance of accuracy and precision in making valid precision in making valid precision in making valid		 	 	
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and models. Examine the importance of accuracy and precision in making valid				Recognize and analyze
Examine the importance of accuracy and precision in making valid				
of accuracy and precision in making valid				and models.
of accuracy and precision in making valid				Evamine the importance
precision in making valid				of accuracy and
, i measurements ,				measurements
Evaluate experimental		 	 	 Evaluate experimental

						information for
						relevance to science
						process
All forces arise from	How do we apply	All objects have	Students should be	Physics-Principals	Gravitational	CC.3.5.11-12.C
the interaction	uniform circular	gravitational fields	able to solve orbital	and Problems	Field	Follow precisely a
between different		around them.	problems.	Glencoe (2005)	riciu	complex multi-step
	motion to object in	around them.	problems.	T		procedure carrying out
objects.	gravitational orbit?			Section 7-2	Inertial mass	experiments, taking
		Gravitational mass	Students should be	(pgs. 179-185)		measurements, or
		and inertial mass are	able to relate		Gravitational	performing technical
		two essentially	weightlessness to		mass	tasks; analyze the
		different concepts.	objects in free fall.			results based on explanations in the text.
		·	,		Geosynchronous	explanations in the text.
		The gravitational and	Students should be		orbits	CC 2 F 11 12 D
		inertial masses of an	able to describe		010103	CC.3.5.11-12.D
						Determine the meaning of symbols, key terms,
		object are numerically	gravitational fields.			and other domain
		equal.				specific words and
			Students should be			phrases as they are used
		Einstein's general	able to compare			in a specific scientific or
		theory of relativity	views on			technical context;
		describes	gravitation.			relevant to grade 11-12
		gravitational	J			texts and topics.
		attraction as a	Students should be			CC.3.6.11-12.B
		property of space	able to calculate the			Write informational and
						explanatory text,
		itself.	properties of			including the narration
			geosynchronous			of historical events,
			orbits.			scientific
						procedures/experiments
						or technical processes.
						CC.3.6.11-12.C
						Produce clear and
						coherent writing in which the development,
						organization and style
						are appropriate to task,
						purpose, and audience.
						3.2.P.B.1
						Differentiate among
						translational motion,
						simple harmonic

			motion, and rotational
			motion in terms of
			position, velocity and
			acceleration.
			Relate torque and
			rotational inertia to
			explain rotational
			motion
			3.2.P.B2
			Describe the rotational
			motion of objects using
			conservation of energy
			and conservation of
			angular momentum.
			Explain how
			gravitational, electrical,
			and magnetic forces and
			torques give rise to
			rotational motion.
			3.2.P.B.7
			Compare and contrast
			scientific theories.
			scientific trieories.
			Know that both direct
			and indirect
			observations are used
			by scientists to study the
			natural world and
			universe.
			Identify questions and
			concepts that guide
			scientific investigations.
			Formulate and revise
			explanations and
			models using logic and
			evidence.
			December 1
			Recognize and analyze
			alternative explanations
	<u> </u>		and models.

			Examine the importance of accuracy and precision in making valid measurements
			Evaluate experimental information for relevance to science process

Review Unit 5 Uniform Circular Motion and Gravity

Assessment Unit 5 Uniform Circular Motion and Gravity

Unit 6 Rotational Motion

Estimated Time Frame for Units	Big Ideas	Essential Questions	Concepts (Know)	Competencies (Do)	Suggested Resources and Materials	Vocabulary	Standards
20 Days	The rotational motion of an object is described in terms of angular position, angular velocity, and angular acceleration. All changes in rotational motion are due to torques.	How can we change the rotational motion of an object?	The behavior of a rotating object results both from the torque applied to the object as well as the rotational inertia. Angular position and its changes are measured in radians. One complete revolution is 2(pi) radians	Students should be able to describe angular displacement. Students should be able to calculate angular velocity. Students should be able to calculate angular acceleration. Students should be	Physics-Principals and Problems Glencoe (2005) Section 8-1 (pgs. 197-200)	Radian Angular displacement Angular velocity Angular acceleration	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a

			T	
	For a rotating, rigid	able to solve		specific scientific or
	object, the angular	problems involving		technical context;
	displacement is equal	rotational motion.		relevant to grade 11-
	for all radii.			12 texts and topics.
	Tor un ruan.			3.2.P.B.1
				Differentiate among
				translational motion,
				simple harmonic
				motion, and
				rotational motion in
				terms of position,
				velocity and
				acceleration.
				Relate torque and
				rotational inertia to
				explain rotational
				motion
				111011011
				3.2.P.B2
				Describe the
				rotational motion of
				objects using
				conservation of
				energy and
				conservation of
				angular momentum.
				Explain how
				gravitational,
				electrical, and
				magnetic forces and
				torques give rise to
				rotational motion.
				22007
				3.2.P.B.7
				Compare and
				contrast scientific
				theories.
				Marana kata da
				Know that both direct
				and indirect

						observations are used by scientists to study the natural world and universe.
						Identify questions and concepts that guide scientific investigations.
						Formulate and revise explanations and models using logic and evidence.
						Recognize and analyze alternative explanations and models.
						Examine the importance of accuracy and
						precision in making valid measurements
						Evaluate experimental information for relevance to science process
 The rotational motion of an object is described in terms of angular	How can we change the rotational motion of an	Torque measurements and calculations.	Students should be able to describe torque and the factors that	Physics-Principals and Problems Glencoe (2005) Section 8-2	Lever arm Torque	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out
position, angular velocity, and angular	object?	Newton's second law for rotation (effect of rotational inertia on	determine it. Students should be	(pgs. 201-210)	Moment of inertia	experiments, taking measurements, or performing technical tasks; analyze the
acceleration. All changes in		acceleration, given a set torque)	able to calculate net torque.		Newton's second law for rotational	results based on explanations in the text.
 All Clianges III					Totational	CC.3.5.11-12.D

-	,				,
	rotational motion	Newton's second law	Students should be	motion	Determine the
	are due to torques.	for rotational motion	able to calculate the		meaning of symbols,
		states that angular	moment of inertia.	Axis of rotation	key terms, and other
		acceleration is directly			domain specific
		proportional to the			words and phrases as they are used in a
		net torque and			specific scientific or
		inversely proportional			technical context;
		to the moment of			relevant to grade 11-
		inertia.			12 texts and topics.
		When torque is			3.2.P.B.1
		exerted on an object,			Differentiate among
		if angular velocity			translational motion,
		changes.			simple harmonic
		J			motion, and rotational motion in
		Torque depends on			terms of position,
		the magnitude of the			velocity and
		force and the radius			acceleration.
		from the axis of			
		rotation to the point			Relate torque and
		where the force is			rotational inertia to
		applied.			explain rotational
					motion
		The moment of inertia			3.2.P.B2
		of an object depends			Describe the
		on the way the			rotational motion of
		object's mass is			objects using
		distributed about the			conservation of
		rotational axis.			energy and
					conservation of
					angular momentum.
					Explain how
					gravitational,
					electrical, and
					magnetic forces and
					torques give rise to
					rotational motion.

	1		1	-	1	22007
						3.2.P.B.7
						Compare and
						contrast scientific
						theories.
						Know that both direct
						and indirect
						observations are used
						by scientists to study
						the natural world and
						universe.
						Identify questions
						and concepts that
						guide scientific
						investigations.
						Formulate and revise
						explanations and
						models using logic
						and evidence.
						una evidence.
						Recognize and
						analyze alternative
						explanations and
						models.
						Examine the
						importance of
						accuracy and
						precision in making
						valid measurements
						Evaluata
						Evaluate experimental
						-
						information for
						relevance to science process
The rotational	How can we change	The center of mass of	Students should be	Physics-Principals	Center of mass	CC.3.5.11-12.C
motion of an object	the rotational	an object is the point	able to define	and Problems		Follow precisely a
is described in	motion of an	on the object that	center of mass.	Glencoe (2005)	Centrifugal "force"	complex multi-step
terms of angular	object?	moves in the same	center of mass.	Section 8-3		procedure carrying out
terrins or angular	object:	moves in the same	l	Jection 6-3	1	

 position, angular	way that a point	Students should be	(pgs. 211-217)	Coriolis "force"	experiments, taking
velocity, and	particle would move.	able to explain how			measurements, or
angular		the location of the		Equilibrium	performing technical tasks; analyze the
acceleration.	An object is stable	center of mass		C	results based on
	against rollover if its	affects the stability		Static equilibrium	explanations in the text.
All changes in	center of mass is	of an object.		Dynamic	
rotational motion	above its base.	,		equilibrium	CC.3.5.11-12.D
are due to torques.		Students should be		equilibrium	Determine the
·	An object is in	able to define the		Rotational	meaning of symbols,
	equilibrium if there	conditions for		equilibrium	key terms, and other
	are no net forces	equilibrium.		·	domain specific
	exerted on it and if	- 1			words and phrases as they are used in a
	there are no net	Students should be			specific scientific or
	torques acting on it.	able to describe			technical context;
		how rotating frames			relevant to grade 11-
	Equilibrium is a state	of reference give			12 texts and topics.
	of no change whether	rise to apparent			
	moving or not.	forces.			3.2.P.B.1
					Differentiate among
	Static equilibrium	Students should be			translational motion,
	(rest)	able to solve for			simple harmonic
	(1631)	unknown quantities			motion, and rotational motion in
	Dynamic equilibrium	in order to establish			terms of position,
	(moving)	rotational			velocity and
	(111041116)	equilibrium for a			acceleration.
	Centrifugal "force"	system.			
	and Coriolis "force"	System.			Relate torque and
	are two apparent				rotational inertia to
	forces that appear				explain rotational
	when rotating objects				motion
	are analyzed from a				2 2 0 02
	coordinate system				3.2.P.B2 Describe the
	that rotates with it.				rotational motion of
	mat rotates with it.				objects using
					conservation of
					energy and
					conservation of
					angular momentum.

		Explain how gravitational, electrical, and magnetic forces and torques give rise to rotational motion.
		3.2.P.B.7 Compare and contrast scientific theories.
		Know that both direct and indirect observations are used by scientists to study the natural world and universe.
		Identify questions and concepts that guide scientific investigations.
		Formulate and revise explanations and models using logic and evidence.
		Recognize and analyze alternative explanations and models.
		Examine the importance of accuracy and precision in making valid measurements
		Evaluate

			experimental
			information for
			relevance to science
			process

Review Unit 6 Rotational Motion

Assessment Unit 6 Rotational Motion

Unit 7 Momentum

							I
Estimated					Suggested		
Time Frame	Big Ideas	Essential	Concepts	Competencies	Resources and	Vocabulary	Standards
for Units		Questions	(Know)	(Do)	Materials		
20 Days	All simple harmonic motion can be explained using force and/or torque.	In a closed system, how do conservation laws predict the behavior of an object?	The momentum of an object is the product of its mass and velocity and is a vector quantity. The impulse of an object is the average net force exerted on the object multiplied by the time interval over which a force acts. Lengthening the time of impact minimizes the force in a collision. The angular	Students should be able to define the momentum of an object. Students should be able to determine the impulse given an object. Students should be able to define the angular momentum of an object. Students should be able to solve impulsemomentum problems.	Physics-Principals and Problems Glencoe (2005) Section 9-1 (pgs. 229-235)	Impulse Momentum Impulse- momentum theorem Angular momentum Angular impulse- angular momentum theorem	CC.3.5.11-12.B Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning

		momentum of a	of symbols, key terms,
		rotating object is the	and other domain
		product of its moment	specific words and
			phrases as they are used
		of inertia and its	in a specific scientific or
		angular velocity.	technical context;
			relevant to grade 11-12
		The impulse- angular	texts and topics.
		momentum theorem	
			CC.3.5.11-12.G
		states that the	integrate and evaluate
		angular impulse on an	multiple sources of
		object is equal to the	information presented
		change in the object's	in diverse formats and
		angular momentum.	media (quantitative
		angular momentami	data, video, multimedia)
			in order to address a question or solve
			problems.
			problems.
			66 3 5 11 13 1
			CC. 3.5.11-12.I
			Synthesize information
			from a range of sources (texts, experiments,
			simulations) into a
			coherent understanding
			of a process,
			phenomenon, or
			concept resolving
			conflicting information
			when possible.
			·
			CC.3.6.11-12.A
			Write arguments
			focused on discipline
			specific content.
			CC.3.6.11-12.H Draw
			evidence from
			informational text to
			support analysis,
			reflection and research.
			3.2.P.B2
			Explain the translation
•	•		

						and simple harmonic motion of objects using conservation of energy and conservation of momentum.
						3.2.P.B.7 Compare and contrast scientific theories.
						Know that both direct and indirect observations are used by scientists to study the natural world and universe.
						Identify questions and concepts that guide scientific investigations.
						Formulate and revise explanations and models using logic and evidence.
						Recognize and analyze alternative explanations and models.
						Examine the importance of accuracy and precision in making valid measurements
						Evaluate experimental information for relevance to science process
All simple harmonic motion can be explained using force and/or	In a closed system, how do conservation laws predict the	Conservation of momentum Types of collisions	Students should be able to relate law of conservation of momentum to	Physics-Principals and Problems Glencoe (2005) Section 9-2	Closed system Isolated system	CC.3.5.11-12.B Determine the central ideas or conclusions of a text; summarize
torque.	behavior of an object?	Conceptual and	Newton's third law of motion.	(pgs. 236-245)	Law of conservation of	complex concepts, processes, or information presented in a text by paraphrasing

mathematical analysis		momentum	them in simpler but still
of isolated systems	Students should be		accurate terms.
involving two colliding	able to recognize	Law of	
objects	the conditions	conservation of	CC.3.5.11-12.C
•	under which	angular	Follow precisely a complex multi-step
According to	momentum is	momentum	procedure carrying out
Newton's law third	conserved.		experiments, taking
law of motion and the			measurements, or
law of conservation of	Students should be		performing technical
momentum, the	able to solve		tasks; analyze the results based on
forces exerted by	conservation of		explanations in the text.
colliding objects on	momentum		
each other are equal	problems.		CC.3.5.11-12.D
in magnitude and	prosierio.		Determine the meaning
opposite in direction.	Students should be		of symbols, key terms,
opposite in an ectioni	able to algebraically		and other domain specific words and
A closed system is one	manipulate		phrases as they are used
in which no objects	mathematical		in a specific scientific or
enters or leavse the	models of		technical context;
system.	conservation of		relevant to grade 11-12
System.	momentum to		texts and topics.
An isolated system is	predict unknown		CC.3.5.11-12.G
one in which no net	variables for		integrate and evaluate
external force is	collisions and		multiple sources of
			information presented
exerted on the	explosions.		in diverse formats and
objects in the system.			media (quantitative data, video, multimedia)
			in order to address a
Momentum is			question or solve
conserved in a closed,			problems.
isolated system.			
			CC. 3.5.11-12.I
The law of			Synthesize information
conservation of			from a range of sources
momentum can be			(texts, experiments, simulations) into a
used to explain the			coherent understanding
propulsion of rockets.			of a process,
			phenomenon, or
Vector analysis is used			concept resolving

to solve momentum-	T =-
	conflicting information
conservation	when possible.
problems in two	
dimensions.	CC.3.6.11-12.A
unicisions.	Write arguments
The law of	focused on discipline
The law of	specific content.
conservation of	00 2 0 11 12 11 2
angular momentum	CC.3.6.11-12.H Draw
states that if there are	evidence from informational text to
no external torques	support analysis,
acting on a system,	reflection and research.
then the angular	
momentum is	3.2.P.B2
conserved.	Explain the translation
Conserved.	and simple harmonic
	motion of objects using
Because angular	conservation of energy
momentum is	and conservation of momentum.
conserved, the	momentum.
direction of a rotation	22007
of a spinning object	3.2.P.B.7
can be changed by	Compare and contrast scientific theories.
applying torque.	scientific theories.
applying to quel	Know that both direct
	and indirect
	observations are used
	by scientists to study the
	natural world and
	universe.
	Identify questions and
	concepts that guide
	scientific investigations.
	Formulate and revise
	explanations and
	models using logic and
	evidence.
	Recognize and analyze
	alternative explanations
	and models.

			Examine the importance
			of accuracy and
			precision in making valid
			measurements
			Evaluate experimental
			information for
			relevance to science
			process
•	•		

Review Unit 7 Momentum

Assessment Unit 7 Momentum

Unit 8 Energy

Estimated Time Frame for Units	Big Ideas	Essential Questions	Concepts (Know)	Competencies (Do)	Suggested Resources and Materials	Vocabulary	Standards
15 days	All motion can be explained using the laws of conservation of energy, the conservation of momentum, and/or the conservation of angular momentum.	In a closed system, how do the conservation laws predict the behavior of an object?	When a net force is exerted on an object over a llinear displacement, the product of these two quantities describes the work done. Work is the transfer of energy by mechanical means. Work is energy and has the same units as energy. Work done on a	Students should be able to describe the relationship between work and energy. Students should be able to calculate work. Students should be able to calculate the power used. Students should be able to identify cases in which work is done/not done.	Physics-Principals and Problems Glencoe (2005) Section 10-1 (pgs. 257-265	Work Energy Kinetic energy Work-energy theorem Joule Power Watt	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific or technical context; relevant to grade 11-12 texts and topics.

T	Т		1		1	1
		system is equal to the				
		change in energy of				3.2.P.B2
		the system.				Explain the translation
		.,				and simple harmonic
		Mank on he mutints				motion of objects using
		Work can be put into				conservation of energy
		a system (positive) or				and conservation of
		can be removed from				momentum.
		a system (negative)				
		a system (megative)				3.2.P.B.7
						Compare and contrast
		A moving object has				scientific theories.
		kinetic energy				
						Know that both direct
		Kinetic Energy is the				and indirect
		energy of an object				observations are used
						by scientists to study the
		moving at a speed				natural world and
						universe.
		Power is the rate of				
		doing work that is the				Identify questions and
		rate in which energy is				concepts that guide
						scientific investigations.
		transferred.				
						Formulate and revise
						explanations and
						models using logic and evidence.
						evidence.
						Recognize and analyze
						alternative explanations
						and models.
						Examine the importance
						of accuracy and
						precision in making valid
						measurements
						Evaluate experimental
						information for
						relevance to science
All II	<u> </u>		C. I.	DI : D : : :	1 1 1 1	process
All motion can be	In a closed system,	Machines, whether	Students should be	Physics-Principals	Machine	CC.3.5.11-12.C
explained using the	how do the	powered by engines	able to	and Problems		Follow precisely a
laws of	conservation laws	or humans, do not	demonstrate the	Glencoe (2005)	Effort force	complex multi-step
		<u> </u>		<u> </u>		procedure carrying out

 conservation of	predict the	change the amount of	usefulness of simple	Section 10-2		experiments, taking
energy, the	behavior of an	work done, but they	machines.	(pgs. 266-273	Resistance force	measurements, or
conservation of	object?	do make the task				performing technical
momentum, and/or	23,000.	easier.	Students should be		Mechanical	tasks; analyze the results based on
the conservation of			able to use simple		advantage	explanations in the text.
angular		A machine eases the	machines to		aavantage	
momentum.		load, either by	determine how		Ideal mechanical	CC.3.5.11-12.D
momentum.		changing the	much work is		advantage	Determine the meaning
		magnitude or the	actually done by the		auvantage	of symbols, key terms, and other domain
		direction of the force	machine versus		Efficiency	specific words and
		exerted to do the	what is put into it.		Efficiency	phrases as they are used
			what is put into it.		Compound	in a specific scientific or
		work.	Students should be		Compound machines	technical context;
		The mechanical	able to differentiate		macinies	relevant to grade 11-12 texts and topics.
			between ideal and			texts and topics.
		advantage is the ratio	real machines in			3.2.P.B2
		of resistance force to				Explain the translation
		effort force	terms of efficiency.			and simple harmonic
			6			motion of objects using
		The ideal mechanical	Students should be			conservation of energy and conservation of
		advantage is the ratio	able to analyze			momentum.
		of the distances	compound			momentum.
		moved.	machines in terms			3.2.P.B.7
			of combinations of			Compare and contrast
		The efficiency of a	simple machines.			scientific theories.
		machine is the ratio to				
		output work to input				Know that both direct
		work.				and indirect observations are used
						by scientists to study the
		In all real machines,				natural world and
		mechanical advantage				universe.
		is less than ideal				Identify questions and
		mechanical				concepts that guide
		advantage.				scientific investigations.
						Formulate and revise
		The efficiency of a				explanations and
		machine can be found				models using logic and
		from the real and				evidence.
		ideal mechanical				

	advantage.				Recognize and analyze alternative explanations and models. Examine the importance of accuracy and precision in making valid measurements Evaluate experimental information for relevance to science
All motion can be explained using the laws of conservation of energy, the conservation of momentum, and/or the conservation of angular momentum.	The kinetic energy of an object is proportional to its mass and the square of its velocity. The rotational kinetic energy of an object is proportional to the object's moment of inertia and the square of its angular velocity. When the earth is included in the system, the work done by gravity is replaced by gravitational potential energy. The gravitational potential potential energy of an object depends upon the object's weight and its distance from the earth's surface.	Students should be able to use models to relate work and energy. Students should be able to calculate kinetic energy. Students should be able to determine the gravitational potential energy of a system. Students should be able to show that gravitational potential energy can be interpreted as the work done by the Earth. Students should be able to predict/show how gravitational potential energy	Physics-Principals and Problems Glencoe (2005) Section 11-1 (pgs. 285-292	Rotational kinetic energy Gravitational potential energy of a system Reference level Elastic potential	cc.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. cc.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics. 3.2.P.B2 Explain the translation and simple harmonic motion of objects using conservation of energy and conservation of momentum. 3.2.P.B.7 Compare and contrast scientific theories.

		The reference level is the position where the gravitational potential energy is defined as zero. Elastic energy may be stored in an object as a result of its change in shape. Albert Einstein recognized that mass itself has potential energy and this energy is called rest energy.	can be transformed into kinetic energy or work. Students will be able to identify how elastic potential energy is stored.			Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Examine the importance of accuracy and precision in making valid measurements Evaluate experimental information for relevance to science process
All motion can be explained using the laws of conservation of energy, the conservation of momentum, and/or	In a closed system, how do the conservation laws predict the behavior of an object?	The sum of kinetic and potential energy is called mechanical energy. If no objects enter or leaves the system, the	Students should be able to solve problems using law of conservation of energy. Students should be	Physics-Principals and Problems Glencoe (2005) Section 11-2 (pgs. 293-301)	Law of conservation of energy Mechanical energy	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on
the conservation of angular momentum.		system is considered to be a closed system. If there are no forces acting on a system, the system is considered to be an	able to use the laws of conservation to predict quantities that describe motion. Students should be		Non-mechanical energy Thermal energy Elastic collision	explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used

isolated system.	able to analyze	Inelastic collision	in a specific scientific or
·	collisions to find the		technical context;
The total energy of a	change in kinetic		relevant to grade 11-12
closed system is	energy.		texts and topics.
constant.	55.81.		2 2 0 02
constant.	Students should be		3.2.P.B2
Mithin a system	able to use the		Explain the translation and simple harmonic
Within a system,			motion of objects using
energy can change	conservation of		conservation of energy
form, but the total	momentum and		and conservation of
amount of energy	kinetic energy to		momentum.
does not change.	determine the final		
Thus, energy is	velocities of		3.2.P.B.7
conserved.	colliding objects		Compare and contrast
	when elastic		scientific theories.
The type of collision in	collisions take		Know that both direct
which the kinetic	place.		and indirect
energy after the	·		observations are used
collision is less than	Students should be		by scientists to study the
the kinetic energy	able to use the laws		natural world and
before the collision is	of conservation of		universe.
called an inelastic			Identify questions and
	energy to predict		concepts that guide
collision.	the quantities that		scientific investigations.
	describe motion.		_
The type of collision in			Formulate and revise
which kinetic energy			explanations and
before and after the			models using logic and evidence.
collision is the same is			eviderice.
called an elastic			Recognize and analyze
collision.			alternative explanations
			and models.
Momentum is			Francisco Mariana de Com
conserved in collisions			Examine the importance of accuracy and
if the external force is			precision in making valid
			measurements
zero.			
Nick colorie			Evaluate experimental
Not only is			information for
momentum			relevance to science
conserved in			process

	kinetic energy is conserved as well. The mechanical energy may be unchanged or decreased by the collisions, depending on whether the collision is elastic or inelastic.				
Review Unit 8 Energy					

Assessment Unit 8 Energy

Unit 9 Simple Harmonic Motion and Waves

Estimated Time Frame for Units	Big Ideas	Essential Questions	Concepts (Know)	Competencies (Do)	Suggested Resources and Materials	Vocabulary	Standards
25 Days	All simple harmonic motion can be explained using force and/or torque.	How do waves transfer energy and information?	Periodic motion is a motion that repeats in a regular cycle. Restoring forces contribute to periodic motion.	Students should be able to describe the force on an elastic spring. Students should be able to determine	Physics-Principals and Problems Glencoe (2005) Section 14-1 (pgs. 375-380)	Periodic motion Simple harmonic motion Period	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on

		the energy stored in	Amplitude	explanations in the text.
	Simple harmonic	an elastic spring.		
	motion results when	, ,	Hooke's law	CC.3.5.11-12.D
	the restoring force on	Students should be		Determine the meaning
	an object is directly	able to compare	Pendulum	of symbols, key terms,
			rendulum	and other domain
	proportional to the	simple harmonic		specific words and phrases as they are used
	objects displacement	motion and the	Resonance	in a specific scientific or
	from equilibrium.	motion of a		technical context;
		pendulum.		relevant to grade 11-12
				texts and topics.
				3.2.P.B5
				Explain how waves
				transfer energy without
				transferring matter.
				Explain how waves carry
				information from
				remote sources that can
				be directed and
				interpreted.
				Determine the causes of
				wave frequency, sped
				and wave length.
				and mare rengan
				3.2.P.B.7
				Compare and contrast
				scientific theories.
				Know that both direct
				and indirect
				observations are used
				by scientists to study the natural world and
				universe.
				Identify questions and
				concepts that guide
				scientific investigations.
				Farmer plate and marie :
				Formulate and revise explanations and
				models using logic and
1	l .		l	models using logic unu

						evidence.
						Recognize and analyze alternative explanations and models.
						Examine the importance of accuracy and precision in making valid measurements
						Evaluate experimental information for relevance to science process
All simple harmonic	How do waves	Waves transfer	Students should be	Physics-Principals	Wave	CC.3.5.11-12.C
motion can be explained using force and/or	transfer energy and information?	energy without transferring matter.	able to identify how waves transfer energy without	and Problems Glencoe (2005) Section 14-2	Wavelength	Follow precisely a complex multi-step procedure carrying out experiments, taking
torque.		In transverse waves, the displacement of	transferring matter.	(pgs. 381-386)	Wave pulse	measurements, or performing technical
		the medium is	Students should be		Periodic wave	tasks; analyze the results based on
		perpendicular to the direction of wave	able to compare and contrast		Transverse wave	explanations in the text.
		motion.	transverse and longitudinal waves.		Longitudinal	CC.3.5.11-12.D
		In longitudinal waves,			wave	Determine the meaning of symbols, key terms,
		the displacement of the medium is parallel	Students should be able to relate wave		Surface wave	and other domain specific words and
		to the direction of	speed wavelength,			phrases as they are used in a specific scientific or
		wave motion.	and frequency.		Trough	technical context; relevant to grade 11-12
		Frequency is the number of cycle per			Crest	texts and topics.
		second.			Frequency	3.2.P.B5 Explain how waves
						transfer energy without transferring matter.
						Explain how waves carry information from
						remote sources that can

				<u> </u>	<u> </u>	be directed and
						be directed and interpreted.
						interpreteu.
						Determine the causes of
						wave frequency, sped
						and wave length.
						3.2.P.B.7
						Compare and contrast
						scientific theories.
						Know that both direct
						and indirect
						observations are used by scientists to study the
						natural world and
						universe.
						Identify questions and
						concepts that guide
						scientific investigations.
						Formulate and revise
						explanations and
						models using logic and
						evidence.
						Recognize and analyze
						alternative explanations
						and models.
						Examine the importance
						of accuracy and
						precision in making valid
						measurements
						Evaluate experimental
						information for
						relevance to science
						process
All simple harmonic	How do waves	When a wave crosses	Students should be	Physics-Principals	Incident wave	CC.3.5.11-12.C
motion can be	transfer energy and	a boundary between	able to relate a	and Problems		Follow precisely a
explained using	information?	two media, it is	wave's speed to the	Glencoe (2005)	Reflective wave	complex multi-step
	iiiioiiiiatioii:				Nellective wave	procedure carrying out
force and/or		partially transmitted	medium in which	Section 14-3	5	experiments, taking
torque.		and partially	the wave travels.	(pgs. 387-391)	Principle of	measurements, or

		superposition	performing technical
		Japerposition	perioriting technical
	idents should be		tasks; analyze the
The principal of able to	le to describe	Interference	results based on explanations in the text.
	w waves are		explanations in the text.
		Node	CC.3.5.11-12.D
	racted at	Node	Determine the meaning
		Antinode	of symbols, key terms,
	tween media.	Antinode	and other domain
sum of the		Standing wave	specific words and
		Standing wave	phrases as they are used
· ·	udents should be	\\/	in a specific scientific or technical context;
		Wave front	relevant to grade 11-12
	nciple of	_	texts and topics.
	•	Ray	·
	enomenon of		3.2.P.B5
		Law of reflection	Explain how waves
	edict interference		transfer energy without
time. effect	ects.	refraction	transferring matter.
			Explain how waves carry
Constructive			information from
interference occurs			remote sources that can
when the			be directed and
displacements of the			interpreted.
two waveforms are in			Determine the causes of
the same direction.			wave frequency, sped
			and wave length.
Destructive			
interference occurs			3.2.P.B.7
when the			Compare and contrast
displacements of the			scientific theories.
·			Know that both direct
two waveforms are in			and indirect
the opposite			observations are used
direction.			by scientists to study the
			natural world and
When two-			universe.
dimensional waves			Identify questions and
are reflected from			concepts that guide
boundaries, the			scientific investigations.
angles of incidence			

		and reflection are equal. The change in direction of waves at the boundary between two different media is called refraction. Standing waves are formed when the waves are reflected off of fixed or open ends of a medium interfere. Nodes are areas of total destructive interference. Antinodes are areas of total constructive interference.				Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Examine the importance of accuracy and precision in making valid measurements Evaluate experimental information for relevance to science process
All simple harmonic motion can be explained using force and/or torque.	How do waves transfer energy and information?	Sound is a pressure variation transmitted through matter as a longitudinal wave. A sound wave has frequency, wavelength, speed, and amplitude. Sound waves reflect and interfere. The speed of sound in	Students should be able to demonstrate the properties that sound shares with other waves. Students should be able to relate the physical properties of sound waves to our perception of sound.	Physics-Principals and Problems Glencoe (2005) Section 15-1 (pgs. 403-410)	Pitch Loudness Sound level Decibel Doppler effect	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used

air at room	Students should be	in a specific scientific o
temperature (20	able to identify	technical context;
degrees Celsius) is	applications of the	relevant to grade 11-12
343m/s.	Doppler effect.	texts and topics.
34311/3.	Doppier effect.	22005
_, ,,		3.2.P.B5
The speed increases		Explain how waves transfer energy withou
approximately 0.6 m/s		transferring matter.
with each 1 degree		
Celsius increase in		Explain how waves carr
temperature.		information from
		remote sources that ca
Sound detectors		be directed and
convert the energy		interpreted.
carried into another		Determine the causes of
form of energy.		wave frequency, sped
form of energy.		and wave length.
_, ,		
The human ear is a		3.2.P.B.7
highly efficient and		Compare and contrast
sensitive detector of		scientific theories.
sound waves.		
		Know that both direct
The frequency of a		and indirect observations are used
sound is heard as its		by scientists to study th
pitch.		natural world and
piteii.		universe.
The pressure		
		Identify questions and
amplitude of a sound		concepts that guide
wave can be		scientific investigations
measured in decibels.		Formulate and revise
		explanations and
The loudness of sound		models using logic and
as perceived by the		evidence.
ear and brain depends		
mainly on its		Recognize and analyze alternative explanation
amplitude.		and models.
ampiitude.		and models.
The Doppler effect is		Examine the important
		of accuracy and
the change in		precision in making val

		frequency of sound				measurements
		caused by the motion of either the source or the detector.				Evaluate experimental information for relevance to science process
All simple harmonic motion can be explained using force and/or torque.	How do waves transfer energy and information?	Visible light can have a wavelength between 400 and 700 nm. Light can be described as a particle, wave, or particle-wave duality/photon. Light is an electromagnetic wave which can propagate through space Speed of light is 3.0 x 10^8 m/s in a vacuum. White light is the combination of the spectrum of colors, each color having a different wavelength. Combining primary colors, red, blue and green forms white light. Combinations of two	Students should be able to describe how diffraction demonstrates that light is a wave. Students should be able to predict the effect of combining colors of light and mixing pigments. Students should be able to explain phenomena such as polarization and the Doppler effect.	Physics-Principals and Problems Glencoe (2005) Section 16-2 (pgs. 439-447)	Diffraction Primary color Secondary color Complimentary color Primary pigment Polarization Malus's law	CC.3.5.11-12.C Follow precisely a complex multi-step procedure carrying out experiments, taking measurements, or performing technical tasks; analyze the results based on explanations in the text. CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context; relevant to grade 11-12 texts and topics. 3.2.P.B5 Explain how waves transfer energy without transferring matter. Explain how waves carry information from remote sources that can be directed and interpreted. Determine the causes of wave frequency, sped and wave length. 3.2.P.B.7
		primary colors form				J.Z.F.D./

the secondary colors,	Compare and contrast
yellow, cyan, and	scientific theories.
magenta.	
magenta.	Know that both direct
	and indirect
The primary pigments	observations are used by scientists to study the
cyan, magenta and	natural world and
yellow are used in	universe.
combination of two to	
produce secondary	Identify questions and
pigments, red blue	concepts that guide
and green.	scientific investigations.
und green.	Farm late and order
Polarized light	Formulate and revise explanations and
	models using logic and
consists of waves	evidence.
oscillating in the same	
plane.	Recognize and analyze
	alternative explanations
When two polarizing	and models.
filters are used to	Forming the investment
polarize light, the	Examine the importance of accuracy and
intensity of the light	precision in making valid
	measurements
coming out of the last	
filter is dependent	Evaluate experimental
upon the angle	information for
between polarizing	relevance to science
axis of the two filters.	process
Light waves traveling	
through a vacuum can	
be characterized in	
terms of frequency,	
wavelength, and the	
speed of light.	
Light waves are	
Doppler shifted based	
upon the relative	
speed along the axis	

			of the observer and the source of light.						
Review Unit 9 Simple Harmonic Motion and Waves									
Assessment Unit 9 Simple Harmonic Motion and Waves									