COURSE: Regents Physics
Grade Level: 12th

MAIN/ GENERAL TOPIC	SUB-TOPIC:	ESSENTIAL QUESTIONS:	WHAT THE STUDENTS WILL KNOW:	WHAT THE STUDENT WILL BE ABLE TO DO:	Assessments:	WHEN STUDENT DOES IT:
Fundamental SI units	Basic Units	What are the basic units used by all physicists around the world?	The basic SI units are the: Meter (distance), Kilogram (mass), Second (time), Coulomb (electric charge) angle (degrees) temperature (degrees C),	Use fundamental units to measure in lab Apply appropriate units to appropriate quantities	Through out the course in all assessments	Throughout the course
	Derived Units	How can the basic units be combined to create units for quantities that result from changes.	Units for: Motion (m/s, m/s/s) Force (Newton: Kgm/s/s) , Momentum: kgm/s, Work/Energy (Joule: Nm or Kgm/s/s or electron-volt eV), Power (watt (J/s) Spring stiffness (N/m) Electric field strength (N/C) Potential difference (Volt), Electrical current (Ampere) Electrical Resistance (Ohm) Frequency (hertz)	Use derived units to measure in lab Apply appropriate units to appropriate quantities and calculations	Throughout the course in all assessments	Throughout the course
Measurement	Precision vs. accuracy	What is the difference between precision and accuracy	Precision is how finely a quantity can be measured. Accuracy is how close a measurement is to the actual value	Compare accuracy in experimental results Determine the precision of a measurement instrument. Estimate a measurement to one decimal place past the marked scale of the instrument	Throughout the course in all assessments	Throughout the course
	Significant figures	What digits in a quantity are significant	Calculation cannot improve precision. A calculation is only as precise as its least precise measurement	Identify the measurement in a calculation that has the fewest number of significant figures and round to that decimal place.	Throughout the course in all assignments	Throughout the course
	Acceptable error	What is an acceptable level of uncertainty in data?	No measurement is perfect and is limited by the precision of the least accurate instrument in the experiment	Recognize sources of error Recognize acceptable and unacceptable differences in data values. Be able to express error as a deviation from an actual value.	Throughout the course in multiple assessments	Throughout the course
	Graphing	What is an acceptable way to visually represent Data?	Line graphs show relationships between variables. Line graphs are actually a “curve of best fit” not connected points Equations are derived from particular types of graphs. Ex. linear	Explain the placement of an unknown element in the Periodic table based on its properties. Interpret and write isotopic notation.	Labs Test/Quizes Homework	In class and lab
The Scientific Method	Scientific procedures	What methods to learn about the universe and share their findings?	.A well run experiment has: • A hypothesis that predicts an outcome • A clear definitive plan • Data that is organized using charts and graphs • Conclusions based on data • Assessments of experimental error	Plan, write and carry out experiments to answer a specific question.	Lab: Relationship between Circumference and Diameter Lab	Lab

Kinematics	Motion	What is motion and how do we define it?	Motion depends on a relative point of view	.Describe motion from a reference point using positive and negative integers and traditional directions (Up, Down, Left, Right, North South, East, West , Clockwise Counterclockwise etc)	Homework, Test/Quizzes Labs	1st Semester usually first quarter
	Vectors	How do vectors and scalars differ?	Vectors are measurable quantities that include direction. Vectors are properly expressed in three dimensions. (X,Y,Z) Vectors can be added or subtracted Examples of vectors: displacement, velocity, acceleration, momentum, Examples of scalars: time, distance, energy, electric charge etc	Distinguish vector and scalar quantities Add and subtract vector quantities Use geometry and trigonometry to analyzed vector quantities Determine the resultant of two or more vectors graphically or algebraically Draw scaled force diagrams with protractor and ruler. Resolve a vector into horizontal and vertical components.	Lab: The paper river, Homework Test/quizzes	In class and lab
	Velocity	How do we measure changes in position with respect to time?	Changes in distance with respect to time are called speed Changes in displacement with respect to time are called velocity. An objects total change in displacement divided by the total time of the displacement is its average velocity V = d/t = (Vfinal +Vinitial)/2	Calculate average velocity. Determine average velocity from a Displacement vs Time Graph or Velocity vs Time	Motion detector Lab. “Shoot for you grade” Tests/Quizzes	In class and lab
	Acceleration	How do we measure changes in velocity with respect to time?	Change in velocity with respect to time is called acceleration. a = (Vfinal – Vinitial)/time	Determine acceleration from graphs of distance ,velocity, and acceleration vs time		
	Motion graphs	How can we represent motion graphically and what information can we gather from that.	Slopes and Areas created by graphs give us information about an object’s motion	Create and Interpret graphs for an object’s Velocity, Acceleration and Position.	Lab: Using Motion Detectors	
Dynamics and Momentum	Momentum	How do we define momentum?	Momentum is defined as an object’s mass multiplied by its velocity p = mv Momentum is a vector quantity	Calculate the momentum of an object or particle	Lab: Conservation of momentum	In class and lab
	Impulse	What changes an object’s momentum? How do changes in momentum occur	A change in Momentum is called an impulse (J) An Impulse is a force acting over a certain time span J = (Fnet)(t)	Calculate an object’s change in momentum		I

	Force	What is a force?	Forces cause changes in momentum There are four fundamental forces in Nature: Gravitational, Electromagnetic, Weak and Strong Nuclear Forces Gravitational force is the attraction of two objects due to their mass Gravity decreases exponentially with time Fgravity = Gm1m2/r^2 G = 6.67x10^-11Nm^2/kg^2 Felectric = kq1q2/r^2 Net force results in a change in momentum or acceleration (F = ma) Forces perpendicular to the direction of motion crate circular motion. (Fcentripetal = mV^2/r	Name the four fundamental forces Calculate Gravitational and Electric Force Calculate the centripetal force on an object	Lab	In class
Energy	Energy	What is energy	Energy is conserved and can be converted to different forms in a system Work external to the system changes the total energy of a system Energy is a scalar quantity On Earth potential energy between in an earth object system is (mass)(g)(height above surface) Kinetic energy of an object at speed much less than *c* is .5(m)(v^2) Potential energy of a spring is (.5)(k)(dx^2)	Describe and explain the exchange between potential energy, kinetic energy, and internal energy for a simple mechanical system such as a pendulum, roller coaster, spring, freely falling object. Predict velocities, heights, and spring compression based on energy conservation. Determine the energy stored in a spring. Determine the factors that affect the period of a pendulum Observe and explain energy conversion in real-world situations. Recognize and describe conversions among different forms of energy in real or hypothetical devices such and a motor, generator, photocell , battery .	Pendulum Lab Rollercoaster Lab Power Lab	
	Work	What changes the energy in a system	W = (Force)(Distance) W = Change in KE Energy	Calculate the amount of work done on a system.		
	Power	How do we determine the rate of energy change (work) in a system?	P = W/t = FV	Compare the power developed when the same work is done at different rates		
Electricity	Electric Charge	How is charge defined? What is an electric field?	An objects charge is defined by how it interacts with objects of known charge. Electric fields are created by charged objects Electric fields are infinite Electric fields do not effect other electric fields	Describe the interaction between charged objects Draw field lines to represent the	Labs Electrostatics and forces Potential difference Resistance of A wire Parallel and Series circuits	

	Electric Current					
	Potential Difference	What happens when we move charges through electric fields				
	Electric Circuits	What is an electric current? How do electrons move in paths? What effect do various paths have on current and potential difference? How can we measure current and Voltage?	Current is flow of charge/sec	Measure the current and voltage in a circuit Use measurements to determine the resistance of a circuit element. Interpret graphs of voltage versus current. Measure and compare the resistance of conductors of various lengths and cross-sectional area. Construct simple and parallel circuits Draw and interpret circuit diagrams which include voltmeters and ammeters. Predict the behavior of light bulbs in series and parallel circuits.		

Waves		Compare the characteristics of two transverse waves such as amplitude, frequency, wavelength, speed, period, and phase. Draw wave forms with various characteristics Indentify nodes and antinodes in standing waves. Differentiate between transverse and longitudinal waves. Determine the speed of sound in air. Predict the superposition of two waves interfering contructively and destructively (indicationg nodes, anitnodes, and standing waves) Observe , sketch, and interpret the behavior of wave fronts as they reflect, refract and diffract. Draw ray diagrams to represent the reflection and refraction of waves. Determine empirically the index of refraction of a transparent medium				

Modern Physics		Interpret energy-level diagrams. Correlate spectral lines with an energy-level diagram. Know the significance of the quarks in the standard atomic model.				