Physics *(Master)*

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September 2021

Content	Skills	Learning Targets	Standards	Assessment	Resources & Technology
CEQ **HOW DO WE USE GRAPHICAL AND MATHEMATICAL MODELS TO DESCRIBE MOTION?** **HOW DO FORCES AFFECT THE MOTION OF OBJECTS?** **HOW DO THE FOUR FIELD FORCES ALLOW US TO TRANSFORM ENERGY FROM ONE FORM TO ANOTHER?** **WHAT ARE THE PROPERTIES OF WAVES AND HOW ARE THEY USED**	**One Dimensional Motion** 1) Calculate average velocity, displacement, and time for a moving object. 2) Calculate Acceleration, Displacement, Final Velocity, Initial Velocity, or time for an object moving with changing velocity. 3) Given a position time graph draw the corresponding velocity and acceleration time graphs. 4) Calculate displacement and acceleration from a segment of a velocity time graph. 5) Calculate the velocity and position of an object in freefall if given the time falling or being shot upward as well as the initial velocity. **Newton's Laws** 1) Use Newton's 2nd Law to solve for force, mass, and acceleration. 2) Use Newton's laws to explain the motion of an object. 3) Calculate the weight of an object given its mass. 4) Calculate the friction acting on an object given the coefficient of kinetic or static friction and the objects normal force.	**One Dimensional Motion** 1) I can mathematically and visually represent average velocity, displacement, and time for a moving object. 2) I can calculate Acceleration, Displacement, Final Velocity, Initial Velocity, or time for an object moving with changing velocity. 3) I can switch the axis between position time, velocity time, or acceleration time graphs. 4) I can calculate the velocity and position of an object in freefall if given the time falling or being shot upward as well as the initial velocity. **Newton's Laws** 1) I can use Newton's 2nd Law to solve for force, mass, and acceleration. 2) I can use Newton's laws to explain the motion of an object. 3) I can calculate the weight of an object given its mass. 4) I can calculate the friction acting on an object given the coefficient of kinetic or static friction and the objects normal force. 5) I can draw a free body diagram for an object acted on by multiple forces and find the net force acting on an object.	**9P.1.3**	**One Dimensional Motion** 1-3 1D motion lab **Outdoor Lesson**=3-4 Walking a line graph activity 1-4 Graphing quiz 2 & 5 Freefall Lab **1-5 CA= 1D kinematics Test** **Newton's Laws** 1-3 Newton's 2nd Law Lab 1-4 Friction Lab	***One Dimensional Motion*** *Glencoe Physics Principles and Problems* Tape Timers Pasco Motion Sensors Data Studio Software Bucket Lids and Sinkers Graph Paper Stop Watches Meter Sticks and Stop Watches Long Metric Tape Measure **"tech integration:** Pasco motion detector with data studio software" **"Outdoor Lesson:** Walking a line graph activity"

TO TRANSFER ENERGY? **UEQ** • ***What does it mean to say motion is relative?*** • ***How do we use mathematical models to describe the way things with constant velocity move?*** • ***How do we use mathematical models to describe the way things with uniform acceleration move?*** • ***How do we change between graphs of position vs. time, velocity vs. time, and acceleration vs. time?***	5) Draw a free body diagram for an object acted on by multiple forces. 6) Find the net force acting on an object. 7) Given the net force find the acceleration of an object.	6) Given the net force I can find the acceleration of an object.		1-7 **CA=Newton's Laws Test**	**Key Vocabulary** Distance Displacement Speed Velocity Acceleration Freefall Scalar Vector Rate Terminal Velocity **Newton's Laws** Force Scales Pasco Cars Pulleys Mass Sets Stop Watches **Key Vocabulary** Mass

• ***How does gravity affect the motion of an object?*** **One Dimensional Motion** Distance vs. displacement Speed vs. velocity Acceleration Graphing motion Freefall **UEQ** • **How are Free Body Diagrams used to account for the forces acting on an object?** • **How do Newton's 3 Laws of motion apply to constant and changing velocity of objects?**			**9P.2.2**		Weight Inertia Force Net Force Tension Friction Coefficient of Friction Normal Free Body Diagram

• **How do frictional forces affect the motion of an object?** **Newton's Laws** Inertia F=ma Equal and opposite reactions Friction Weight and Mass Free Body Diagrams Tension Net Force					

October

Content	Skills	Learning Targets	Standards	Assessment	Resources & Technology
UEQs • *How is the force of weight resolved for objects on inclined planes?* • *How are force and velocity vectors resolved*	**Vectors and Two-Dimensional Motion** 1. Use trigonometry to resolve vectors into x- and y- components	**Vectors and Two-Dimensional Motion** 1. I can use trigonometry to resolve vectors into x- and y- components		**Vectors and Two-Dimensional Motion** 1-3 Coefficient of Friction Quarter Lab 1-3 2-D Forces Quiz	**Vectors and Two-Dimensional Motion** *Glencoe Physics Principles and Problems* CPO marble launchers, photogates Quarters Ramps Marbles

into components to make predictions about static and dynamic situations? ● *How does projectile motion represent an application of both constant velocity and constant acceleration?* **Vectors and Two-Dimensional Motion** Vector Scalar Vector Components Inclined Plane Net Force Free-Body Diagrams Projectile Motion **UEQs** ● *What is the impulse momentum theorem?*	2. Resolve the weight vector for objects on inclined planes 3. Use free-body diagrams and vector components to predict the motion of an object acted on by forces in two dimensions. 4. Apply kinematic equations to calculate the motion of objects in two-dimensions 5. Resolve the displacement, velocity, and acceleration of a projectile into their horizontal and vertical components 6. Describe the motion of a projectile using the equations for constant velocity	2. I can resolve the weight vector for objects on inclined planes 3. I can use free-body diagrams and vector components to predict the motion of an object acted on by forces in two dimensions. 4. I can apply kinematic equations to calculate the motion of objects in two-dimensions 5. I can resolve the displacement, velocity, and acceleration of a projectile into their horizontal and vertical components 6. I can describe the motion of a projectile using the equations for constant velocity and constant acceleration		4-6 Projectile Motion Lab 4-6 Bulls-Eye Lab **1-6 CA = Vectors and 2-D Motion Test** **Energy, Momentum, and Conservation Laws** 1-2 Conservation of Momentum Lab 1-4 Momentum Quiz 5-7 Conservation of Energy Lab 5-7 Energy Quiz 7-9 "Bungee Jumper" Lab **1-10 CA = Energy, Momentum, and**	Graph paper Meter sticks Stopwatches Protractors **Key Vocabulary** Resultant Resolve Components Trajectory Projectile Range Equilibrium **Energy, Momentum, and Conservation Laws** *Glencoe Physics Principles and Problems* CPO tracks and cars Pasco Cars and Motion Sensors Ramps Springs Billiard balls Graph paper Stopwatches Meter Sticks **Key Vocabulary** Momentum Conservation Impulse Elastic Collision Inelastic Collision Perfectly Elastic Collision Energy Kinetic Energy Potential Energy Work

• *How do we use conservation laws to interpret interactions between objects?* • *How do we distinguish between elastic and inelastic collisions?* • *What is energy?* • *What are some forms of potential energy and how is potential energy gained?* **Energy, Momentum, and Conservation Laws** Momentum Conservation of Momentum Impulse-Momentum Theorem Elastic Collision Inelastic Collision Perfectly Inelastic Collision Energy Conservation of	and constant acceleration **Energy, Momentum, and Conservation Laws** 1. Determine the momentum vector for moving objects 2. Use the Law of Conservation of Momentum to calculate momentum of objects before and after collisions 3. Calculate the change in momentum due to a force acting for a given time using the Impulse-Momentum Theorem. 4. Describe how an elastic collision differs from an inelastic collision.	**Energy, Momentum, and Conservation Laws** 1. I can determine the momentum vector for moving objects 2. I can use the Law of Conservation of Momentum to calculate momentum of objects before and after collisions 3. I can calculate the change in momentum due to a force acting for a given time using the formula impulse=change in momentum 4. I can show mathematically how energy is lost in inelastic collisions 5. I can calculate the kinetic energy of a given mass moving at a known velocity. 6. I can calculate the gravitational	**9P.2.3**	**Conservation Laws Test**	Power

Energy Work Work-Energy Theorem Power	5. Calculate the kinetic energy of a given mass moving at a known velocity. 6. Calculate the gravitational potential of a mass at a given height. 7. Use the law of conservation of energy to calculate the results of an energy transformation from kinetic to potential or potential to kinetic. 8. Calculate the work done by a known force acting over a given displacement. 9. Use the work-energy theorem to calculate the change in kinetic energy due to a	potential of a mass at a given height. 7. I can use the law of conservation of energy to calculate speed at the bottom of a hill or height an object will climb to. 8. I can calculate the work done by a known force acting over a given displacement. 9. I can show that changes in an onjects potential and kinetic energy are equal to the work done on the object. 10. I can calculate power given work done in a period of time.			

	given amount of work being done. 10. Calculate power given work done in a period of time.				

November

Content	Skills	Learning Targets	Standards	Assessment	Resources & Technology
UEQ • **How may Newton's laws be utilized to analyze real and perceived phenomena for a body in circular motion?** • **What factors affect the rotational inertia of a rigid object?** • **How do we distinguish between linear**	**Circular and Rotational Motion** 1) Calculate the centripetal acceleration of revolving mass given its radius and period. 2) Identify and solve for centripetal forces acting on objects in uniform circular motion. 3) Make predictions about the rotational inertia of various objects. 4) Balance torques acting on a mass 5) Solve for the	**Circular and Rotational Motion** 1) I can calculate the centripetal acceleration of revolving mass given its radius and period. 2) I can identify and solve for centripetal forces acting on objects in uniform circular motion. 3) I can make predictions about the rotational inertia of various objects. 4) I can balance torques acting on a mass to make it in equilibrium 5) I can solve for the		**Circular and Rotational Motion** 1-2 Circular motion lab 3 Soup can races 4 Torque worksheet **1-5** **CA=Circular & Rotational Mot ion**	**Circular and Rotational Motion** Rubber Stopper String Mass Sets Stop Watches Meter Sticks **Key Vocabulary** Centripetal Centrifugal Torque Radius Period Frequency Angular Displacement Angular Velocity Angular Acceleration

and angular velocity, acceleration, and momentum? • **How do we balance clockwise and counterclockwise torques about an objects pivot point or center of mass?** • **Why does gravity play the dominant role of the four field forces in universal interactions.** **Circular and Rotational Motion** Centripetal force linear velocity angular velocity angular momentum rotational inertia torque gravitational force	gravitational force between 2 masses.	gravitational force between 2 masses.			Moment of Inertia Universal Gravitation

December

Content	Skills	Learning Targets	Standards	Assessment	Resources & Technology
UEQs ● *What factors affect the movement of charge?* ● *How is Ohm's Law used to calculate the equivalent resistance of series and parallel circuits as well as the current in and voltage across its various components?* ● *What is the relationship between electricity and magnetism* ● *What technology takes advantage of electromagnetism and electromagnetic induction?* ● *How does production and transmission of*	**Electricity and Magnetism** 1 Describe how an object becomes charged. 2 Make predictions about the behavior of charged objects 3 Use Coloumbs law to calculate the forces acting between electric charges at various distances. 4 Calculate electric field surrounding a charge 5 Calculate electric potential difference and relate it to work and energy 6 Draw circuit diagrams for series and parallel circuits 7 Use Ohms law to calculate current in and voltage across resistors in series and parallel circuits 8 Calculate the power	**Electricity and Magnetism** 1 I can explain how an object becomes charged. 2 I can make predictions about the behavior of charged objects 3 I can use Coloumbs law to calculate the forces acting between electric charges at various distances. 4 I can calculate the electric field surrounding a charge 5 I can calculate electric potential difference (voltage) and relate it to work and energy 6 I can draw circuit diagrams for series and parallel circuits 7 I can use Ohms law to calculate current in and voltage across resistors in series and parallel circuits 8 I can calculate the power dissipated by a		**Electricity and Magnetism** 1-3 Coulombs law problems wksht 4-5 Electirc Field Problems 6-7 Series and Parallel Problems worksheet 6-8 Ohm's law lab 9-12 Electro magnetism Worksheet 12 Speaker Design Project 13 Electro magnetic Induction Wksht **1-13 CA=EM test**	**Electricity and Magnetism** Animal fur Core-X Rubber Rods Silk and Glass Rods Aluminum Pans Electroscope Balloons Van De Graf Generator Circuit Boards with batteries and resistors Multimeters Magnets DC Power Supplies Naills and Wire for electromagnets Skeweres, wire, and paper for speakers DC Motors CPO ripcord generators **Key Vocabulary** Proton Neutron

alternating current differ from direct current? **Electricity and Magnetism** Charge Proton Electron Neutron Coulomb's Law Electric Potential Voltage Resistance Current Alternating Current Direct Current Ohm's Law Magnetism Electromagnetism Induction Motors Generators Speakers **Mousetrap Car Design** Engineering Design Process Measuring Efficiency	dissipated by a resistor as well as energy use in KWH. 9 Make predictions about the froces between magnetic poles 10 Use the right hand rule to predict the direction of magnetic field around a current carrying wire 11 Use the right hand rule to predict the direcetion of force on a moving charge in a magnetic field and calculate the strenght of the force 12 Use the right hand rule to predict the direction of force on a current carrying wire in a magnetic field and calculate the strength of the force. 13 Describe how electromagnetism can be harnassed for practical application 14 Describe how changing magnetic fields can generate electic potential differences.	resistor as well as energy use in KWH. 9 I can make predictions about the froces between magnetic poles 10 I can use the right hand rule to predict the direction of magnetic field around a current carrying wire 11 I can use the right hand rule to predict the direcetion of force on a moving charge in a magnetic field and calculate the strenght of the force 12 I can use the right hand rule to predict the direction of force on a current carrying wire in a magnetic field and calculate the strength of the force. 13 I can describe how electromagnetism can be harnassed for practical application such as speakers and motors 14 I can describe how changing magnetic fields can generate electic potential differences.			Electron Positive Charge Negative Charge Coulomb's Law Electric Field Voltage Electric Potential Capacitor Ohm's Law Battery Resistance Current Series Circuit Parallel Circuit Circuit Breaker Fuse

	15 Describe how electromagnetic induction is applied in the construction of generators and transformers. **Mousetrap Car Design** 1) Build a car powered by a mousetrap and make modifications to improve its efficiency 2) Calculate the work done by a variable force in pulling back the mousetrap 3) Calculate the kinetic energy of the car 4) Calculate the cars efficiency	15 I can describe how electromagnetic induction is applied in the construction of generators and transformers. **Mousetrap Car Design** 1) I can build a car powered by a mousetrap and make modifications to improve its efficiency 2) I can calculate the work done by a variable force in pulling back the mousetrap 3) I can calculate the kinetic energy of the car 4) I can calculate the cars efficiency			Switch Power Power Dissipated Electrical Energy Kilowatt-Hour North Pole South Pole Electromagnet Electromagnetic Induction Solenoid Domain Motor Generator Transformer Commutator Brush

					Right Hand Rule **Mousetrap Car** Measuring Tape Stop Watches Electric Balance Force sensors or Newton Scales **Narrative=Mousetrap Car Report Journal** **Informative=Mousetrap lab Report**

January 2022

Content	Skills	Learning Targets	Standard	Assessment	Resources & Technology
UEQ • **What are the properties of waves?** • **How do waves transfer energy?** • **What causes standing waves and how do they differ from**	**Waves, Sound, & Light** 1. Draw a sine wave and label its parts 2. Draw a longitudinal wave and label it. 3. Calculate wave speed from frequency and wavelength. 4. Use resonance to find the natural frequency of an open or closed tube. 5. Calculate the wavelength of an open or	**Waves, Sound, & Light** 1. I can draw a sine wave and label its parts 2. I can draw a longitudinal wave and label it. 3. I can calculate wave speed from frequency and wavelength. 4. I can use resonance to find the natural frequency of an open or closed tube. 5. I can calculate the wavelength of an open or		**Waves, Sound, & Light** 1-5 Waves Quiz 3-5 Speed of sound lab 7-11 Sound Worksheet 7-11 Sound topic presentation **1-14 CA=Wa**	**Waves, Sound, & Light** Boom Wacker Sound Tubes Resonance Tubes Tuning Forks Waves demonstratros Sine Wave Generator Waveport Software Laser Decibel Meter **Key Vocabulary** Transverse waves Longitudinal waves

traveling waves? ● **What causes resonance?** ● **How do wave properties explain the production and transfer of sound and music?** ● **What causes the Doppler Effect and what is it used for?** ● **How are light and sound waves different?** **Waves, Sound, & Light** **Transverse waves** **Longitudinal waves** **Mechanical waves** **Sound Waves** **Ultrasound** **Infrasound** **Frequency/Pitch** **Amplitude** **Decibels** **Standing Waves**	closed tube. 6. Explain how waves are transmitted (and refracted), reflected, or abosorbed at a boundary between media 7. Use the principal of superposition to explain interference of waves 8. Calculate the beat freqency of 2 sound waves that are close in pitch 9. Describe how sound is transferred through your ear to your brain. 10. Calculate the doppler shift in frequency for a moving source or observer. 11. Describe how standing waves set up in strings or air columns. 12. Explain the ray model of light 13. Describe the effect of distance on lights illumination 14. Solve problems involving the speed of light.	closed tube. 6. I can explain how waves are transmitted (and refracted), reflected, or abosorbed at a boundary between media 7. I can use the principal of superposition to explain interference of waves 8. I can calculate the beat freqency of 2 sound waves that are close in pitch 9. I can describe how sound is transferred through your ear to your brain. 10. I can calculate the doppler shift in frequency for a moving source or observer. 11. I can describe how standing waves set up in strings or air columns. 12. I can explain the ray model of light 13. I can describe the effect of distance on lights illumination 14. I can solve problems		**ves Sound and Light Test**	Mechanical waves Sound Waves Ultrasound Infrasound Frequency/Pitch Amplitude Decibels Standing Waves Resonance Interference Doppler Effect Electromagnetic waves Electromagnetic Spectrum Reflection Absorption Transmission

Resonance **Interference** **Doppler Effect** **Electromagnetic waves** **Electromagnetic Spectrum** **Reflection** **Absorption** **Transmission**		involving the speed of light.			

February

Content	Skills	Learning Targets	Standards	Assessment	Resources & Technology
UEQ *How do wave properties of energy transfer apply to electromagnetic waves?* *How does optical technology apply reflection and refraction of light?* *How is interference of diffracted waves affected by wavelength?*	**Optics** 1) Use the law of reflection to predict the position of a reflected image 2) Use snells law to find the index of refraciton of a transparent object. 3) Construct Ray diagrams to find the position, size, and orientation of images with concave and convex mirrors and lenses.	**Optics** 1) I can use the law of reflection to predict the position of a reflected image 2) I can use snells law to find the index of refraciton of a transparent object. 3) I can construct Ray diagrams to find the position, size, and orientation of images with concave and convex mirrors and lenses. 4) I can find the critical		**Optics** 1-3 Ray diagrams worksheet 1-3 Optical Bench Lab 5 Diffraction Lab 5 Diffraction Problems **1-7 CA=Optics Test**	**Optics** Meter Sticks Plane Mirrors Concave and Convex Mirrors Concave and Convex Lenses Candles Gratings Lasers Lucite Fiber Optics Material Polarizing Filters Overhead Projector **Key Vocabulary**

How does refraction cause dispersion? **Optics** ' Law of Reflection Snells Law Ray Diagrams focal point Convex and Concave Lenses Convex and Concave Mirrors Convergent and Divergent Rays Real and Virtual Images Total Internal Reflection Diffraction Single Slit, Double Slit, and Grating interference Polarization Dispersion	4) Find the critical angle for optically dense mediums and describe how total internal reflection can be used in fiber optics. 5) Use diffraction to make predictions about maxima and minima at various distances when laser light is shined thru single slits, double slits, and diffraction gratings. 6) Explain applications of polarizing filters for light. 7) Explain how refraction causes dispersion	angle for optically dense mediums and describe how total internal reflection can be used in fiber optics. 5) I can use diffraction to make predictions about maxima and minima at various distances when laser light is shined thru single slits, double slits, and diffraction gratings. 6) I can explain applications of polarizing filters for light. 7) I can explain how refraction causes dispersion			Law of Reflection Snells Law Ray Diagrams focal point Convex Concave Convergent rays Divergent Rays Real Images Virtual Images Total Internal Reflection Diffraction Single Slit Interference Double Slit Interference Grating interference Polarization Dispersion

March 2016

Content	Skills	Learning Targets	Standards	Assessment	Resources & Technology
UEQ *What developments, early in the 1900s led*	**Modern and Nuclear** 1. Describe the spectrum of a hot body 2. Explain the	**Modern and Nuclear** 1. I can describe the spectrum of a hot body and explain the		**Modern and Nuclear** 1-2 Photoelectric	**Modern and Nuclear** Laser Cathode Rays Gas Tube Lamps

to a quantum view of atoms and energy? *What historical evidence supports the particle and wave nature of light?* *What causes transmutation of radioactive isotopes and what are the characteristics of the various types of radiation produced?* *How do we use fission and fusion to convert potential energy from the strong nuclear force to other forms of energy?* **Modern and Nuclear** Blackbody Radiation The Photoelectric Effect Cathode Ray Tube Milikan Oil Drop Experiment Rutherford Model Bohr Model and Spectral Line	photoelectric effect and make calculations of stopping potential if given incident frequency and work function for a metal. 3. Explain how Milikan found the charge of an electron. 4. Describe evidence for the wave nature of matter 5. Describe the structure of the atom 6. Use the Bohr model to explain spectral lines. 7. Calculate the products of alpha and beta decay of atoms 8. Identify the number of protons and neutrons for an isotope 9. Use activity to predict the half life of a radioactive isotope. 10. Explain how binding energy per nucleon changes with atoms size and relate this to fission and fusion	ultraviolet catastrophe 2. I can explain the photoelectric effect and make calculations of stopping potential if given incident frequency and work function for a metal. 3. I can explain how Milikan found the charge of an electron. 4. I can describe evidence for the wave nature of matter 5. I can describe the structure of the atom 6. I can use the Bohr model to explain spectral lines. 7. I can predict the products of alpha and beta decay of atoms including the mass and atomic number of the daughter nucleus 8. I can identify the number of protons and neutrons for an isotope 9. I can use activity to predict the half life of a radioactive isotope. 10. I can explain how binding energy per		Problems 3 Millikans Black Box Lab 7 Transmutation Series 9 Exp. Decay lab **1-9 CA=Modern and Nuclear Test** 10 Day 1 reaction paper	Gratings Cups and Masses for Millikan Lab Dry Ice and Isopropyl Alcohol for cloud chamber Dice for exponential Decay activity CPO Atom Buildier **Persuasive=*Day 1 reaction*** **Key Vocabulary** Blackbody Radiation The Photoelectric Effect Cathode Ray Tube Milikan Oil Drop Experiment Rutherford Model Bohr Model Spectral Line Compton Effect Matter Waves Debroglie's Equation Schroedinger Model Wave Equation Heisenberg Uncertainty Principle Pauli Exclusion Principle Bequeral Radiation Transmutation of Atoms Isotopes

Compton Effect Matter Waves and Debroglie's Equation Schroedinger Model and Wave Equation Heisenberg Uncertainty Principle Pauli Exclusion Principle Bequeral and Radiation Transmutation of Atoms Isotopes Fission and Fussion $E=mc^2$		nucleon changes with atoms size and relate this to fission and fusion			Fission Fusion $E=mc^2$