Physical Science

Teacher: Keith Kuhn
The Units are sometimes taught in a different order than they are listed.

September 2020

Content	Skills	Learning Targets	Assessment	Resources & Technology
CEQ **WHAT MAKES A GOOD EXPERIMENTAL DESIGN?** **HOW IS MOTION DESCRIBED AND MEASURED IN PHYSICS?** **HOW DO WE USE WAVES AND PARTICLES TO EXPLAIN ENERGY TRANSFERS?** **HOW CAN WORK DONE CAUSE ENERGY TO CHANGE FORMS?** **WHAT ARE THE COSTS AND BENEFITS OF USING VARIOUS FORMS OF ENERGY?** **Question about problem solving should go here**	**Measurement and Motion** **1) Make measurements with a metric ruler and balance** **2) Convert from unit to unit in the metric system** **3) Design a controlled experiment to test the relationship between variables** **4) Distinguish between speed and velocity** **5) Calculate average velocity if given displacement and time.** **6) Make a line graph of distance vs. time and velocity vs. time** **7) Find velocity on a d vs. t graph** **8) Find acceleration on a v vs. t graph** **9) Calculate average acceleration if given change in velocity and time.** **Force and Motion**	**Measurement and Motion** 1. I can make metric measurements and convert from unit to unit. 2. I can design a scientific experiment to test the relationship between variables. 3. I can calculate velocity, distance, and time using the equation $v = d/t$. 4. I can create and use graphs of distance vs. time and velocity vs. time to describe and make predictions about motion. 5. I can use the equation $a = (v_f - v_i)/t$ to calculate acceleration, initial and final velocity, and time.	**Measurement and Motion** 1. metric measurement lab practical 2. metric converting quiz 3. experimental design and lab report using lab rubric 6-8. graphing quiz 5,9. motion problems quiz **1-9 CA=Measurement and Motion unit Test.** **Force and Motion** 1. Inertia Lab 2. Newton's 2nd Law Lab 3. Motion Problems Quiz 4. Momentum Lab	**Measurement and Motion** *Physics a FIRST Course* CPO Science Tom Hsu Copyright 2005 Chapters 1, 2.2 CPO lab equipment Writing Assignment: Persuasive/Argument: Lab Report *Key Vocabulary:* **Physics** **Mass** **Gram** **Meter** **Hypothesis** **Independent Variable** **Dependent Variable**

UEQ ● *What should be considered when making scientific measurements?* ● *How do graphs help us describe the motion of an object?* ● *What considerations should be taken when designing an experiment?* **Measurement and Motion** Metric Measurements Metric Converting Experimental Design Speed and Velocity Graphing Motion Acceleration **UEQ** ● *How do Newtons laws explain the differences between constant and*	**1) Use Newton's 3 laws to explain how force, mass, and acceleration are related.** **2) Solve problems using Newton's 2nd law.** **3) Calculate the speed and displacement of an object in freefall** **4) Explain the difference between mass and weight. Calculate weight as a force.** **5) Calculate momentum if given mass and velocity.** **6) Use Newton's 3rd law or conservation of momentum to calculate changes in velocity for particles in an isolated system.**	6. I can use the equation $d = [(v_f + v_i)/2]t$ to calculate the distance travelled by an accelerating object. **Force and Motion** 1. I can use Newton's 1st law, explain how an object's motion demonstrates its inertia. 2. I can use Newton's 2nd law to calculate mass, acceleration, and force. 3. I can use Newton's 3rd law to explain action and reaction force pairs acting on different objects. 4. I can calculate the speed of an object that has been in freefall for a given amount of time. 5. I can explain the difference between mass and weight and calculate weight as a force. 6. I can calculate momentum, mass, and	**1-6 CA=Force and Motion unit Test.**	**Control Test Group** **Experimental Test Group** **Controlled Variables (Constants)** **Inference** **Observation** **Data** **Analysis** **Conclusion** **Displacement** **Speed** **Velocity** **Average Velocity** **Acceleration** **Force and Motion** *CPO Science* Chapters 2, 3.1, & 3.3 Tech Integration: CPO lab equipment

changing velocity motion? ● *In the absence of air resistance, why do all objects fall with the same acceleration?* ● *Why is momentum conserved in collisions between objects?* **Forces and Motion** Newton's Laws Inertia F=ma Action Reaction Force Pairs Gravity and Freefall Mass and Weight Conservation of Momentum		velocity using p = mv. 7. I can use the law of conservation of momentum to calculate changes in velocity for colliding objects.		*Key Vocabulary* **Force** **Net Force** **Newtons** **Inertia** **Newton's 1st Law** **Newton's 2nd Law** **Newton's 3rd Law** **Freefall** **Air Resistance** **Terminal Velocity** **Gravity** **Acceleration due to gravity** **Weight** **Momentum** **Conservation of Momentum** **Elastic Collision** **Inelastic Collision**

October

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ ● *How are free body diagrams useful in analyzing stationary and moving objects?* ● *How are work, energy, and power related?* ● *How does energy conservation help us make predictions about the motion of objects?* ● *How does friction affect the motion of an object?* **Energy in Systems** Free Body Diagrams Net Force Frictional Force Universal Gravitation Work Potential Energy Kinetic Energy	**Energy in Systems** 1. Use Free Body Diagrams to calculate the net force on an object. 2. Calculate the work done by a force on an object. 3. Use the work energy theorem to relate work to changes in potential or kinetic energy 4. Use Conservation of Energy to describe how potential energy changes to kinetic. 5. Describe the effect of friction on Mechanical energy. 6. Calculate power as the rate at which work is done.	1. I can draw a Free Body Diagram of the forces acting on an object. 2. I can calculate work using the equation W = Fd. 3. I can explain how energy changes from work to potential energy to kinetic energy. 4. I can solve problems related to changes between potential and kinetic energy. 5. I can describe the effect of friction on mechanical energy. 6. I can calculate power using the equation P = W/t.	**Energy in Systems** 1. Free Body Diagram Quiz 6. Friction Lab 2 & 7. Horsepower Lab 4-5. Conservation of Energy Lab **1-7 CA=Energy Unit Test**	**Energy in Systems** *Physics a FIRST Course* CPO Science Chapters 4.1 & 5.1-5.3 CPO Energy Car and Track *Key Vocabulary:* Vector Resultant/Net force Friction Static Friction Kinetic Friction Free body diagram Work Work Energy Theorem Potential Energy Kinetic Energy

Work Energy Theorem Conservation of Energy Power				Conservation of Energy Mechanical Energy Power Joules Watts Horsepower

November

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ ● *How do machines make work easier?* ● *Why do objects float or sink in fluids?* ● *What are some practical applications of fluid mechanics?* **Mechanics** Mechanical Advantage Simple Machines (6) Efficiency	**Mechanics** 1. Explain how simple machines give us a mechanical advantage. 2. Describe the properties of fluids. 3. Calculate the density of solids and fluids. 4. Calculate pressure, force, and area using the equation P=F/A. 5. Use Archimedes Principle to predict whether an object will sink or float in a fluid.	1. I can explain how simple machines make work easier. 2. I can calculate pressure, force, and area using the equation P = F/A. 3. I can use Archimedes Principle to predict whether an object will sink or float in a fluid, as well as find the buoyant force. 4. I can explain how	**Mechanics** 1. Simple Machines Lab 2-3. Density Lab 3. Density Quiz 4. Pressure Lab 5-8 Fluids Lab 1-8. Mechanics Test	**Mechanics** *CPO* Chapter 4.2, 4.3, 8.2 CPO Lab Equip. *Key Vocabulary* Machine Mechanical Advantage Input Force Output Force

Fluids Pressure Density Archimedes' Principle Pascal's Principle Bernoulli's Principle	6. Calculate the buoyant force on an object in a fluid given its mass and volume. 7. Use Pascal's Principle to explain how a hydraulic system give us a mechanical advantage. 8. Use Bernoulli's Principle to explain how lift force is generated.	hydraulics work. 5. I can explain how airplanes get lift using Bernoulli's Principle.		Input Distance Output Distance Inclined Plane Wedge Screws Pitch Lever Fulcrum Pulley Tension Wheel and Axle Gears Efficiency Fluid Viscosity Pressure Pascals Volume

				Density Archimedes' Principle Buoyancy Bernoulli's Principle Lift Pascal's Principle Hydraulics

December

Content	Skills	Learning Targets	Assessment	Resources & Technology
Experimental Design Bridge Project Engineering Careers Truss Design Material Selection Load Testing **UEQ** ● *How does an object become charged?* ● *Why do charges move?*	**Experimental Design Bridge Project** Apply science concepts and mathematical techniques to build a bridge. Describe how engineers test and modify designs. **Electricity and Magnetism** 1. Identify the 2 types of charge and the particles responsible	1. I can explain static electricity, including attraction, repulsion, charging, and discharging 2. I can solve circuit problems for current, resistance, and voltage using Ohms law. 3. I can analyze resistors in series and parallel to get equivalent resistances.	**Experimental Design Bridge Project** **CA = Bridge Design Project and Research Paper (see rubric)** **Electricity and Magnetism** 1-3 Static Lab and Demo 4-5 Circuits Lab 4 Ohms Law Quiz 6 Cost of Electricity	**Experimental Design Bridge Project** truss design websites (given in class) bridge testing equipment Writing Assignment: Information/Explanatory: Bridge Journal and Research Paper **Electricity and Magnetism** *CPO Physics* Chapter 13, 14, 15.1, 15.2, 16, 17

• *How are electricity and magnetism related?* **Electricity and Magnetism** Static Electricity Circuits Ohms Law Electrical Power and Energy Cost of Electricity Magnetic Fields Electromagnetism Electromagnetic Induction Transformers and Transmission	2. Predict the behavior of charged objects when placed near other charged or neutral objects 3. Explain how to charge objects by friction and induction. 4. Use Ohm's law to calculate the current, voltage, or resistance of a circuit. 5. Compare the equivalent resistance of resistors connected in series and parallel. 6. Given the Wattage of a device and the time of operation calculate the Energy used in kWh. 7. Predict the behavior of a magnetized object such as a compass needle when placed in a magnetic field. 8. Describe how moving electric charges produce magnetic fields and	4. I can calculate an electric bill given wattage, time, and KWH rates. 5. I can predict the behavior of magnetic poles near magnetic fields. 6. I can explain how motors, generators, and transformers work.	Lab 8 Bldg Electromagnets **1-9 CA=E & M Unit Test**	*Key Vocabulary:* static electricity charge neutral friction induction electroscope conductor insulator polarization Van de Graff generator voltage electrical potential potential difference circuit series circuit

	moving magnets produce electric forces. 9. Explain how motors, generators, and transformers work.			parallel circuit open circuit closed circuit short circuit schematic diagram resistance current alternating current direct current Ohm's Law battery fuse circuit breaker ammeter voltmeter power

				ohms amps watts electrical energy kilowatt-hours (kWh) magnet pole domain magnetic field electromagnet motor commutator armature brush electromagnetic induction generator

				transformer

January

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ ● *What is the structure of an atom and what forces exist within the atom?* ● *Why do nuclear reactions occur and why is energy given off?* ● *How are fission and fusion different?* **Atomic Structure and Nuclear Energy** Atomic # Protons Electrons Mass # Neutrons Periodic Table Electron Energy Levels Strong Nuclear Force Radiation Transmutation Binding Energy	**Atomic Structure and Nuclear Energy** 1. Identify and describe the particles found in the atom 2. Determine the name, symbol, number of protons, electrons, neutrons, atomic number, and mass number of an isotope. 3. Explain transmutation of atoms through alpha, beta, and gamma decay. 4. Explain how the size of atoms and the number of nucleons relate to the binding energy of the atom. 5. Use the idea that small amounts of matter are transformed into large amounts of energy in	1. I can identify and describe the particles found in the atom 2. I can determine the name, symbol, number of protons, electrons, neutrons, atomic number, and mass number of an isotope. 3. I can explain transmutation of atoms through alpha, beta, and gamma decay. 4. I can explain how the size of atoms and the number of nucleons relate to the binding energy of the atom. 5. I can compare fission and fusion in terms of beginning and ending products and the amount of energy released.	**Atomic Structure and Nuclear Energy** 1-2 Atom Game 1-2 Atomic Structure Quiz 3-5 Nuclear Quiz **1-5 CA = Atomic Structure and Nuclear Energy Test**	**Atomic Structure and Nuclear Energy** *CPO Science* Chapter 9.1, 9.2, 11.2, 11.3 CPO Lab Equipment *Key Vocabulary:* Atom Proton Neutron Electron Valence Electron Nucleus Mass Number Atomic Number Isotope

Nuclear vs. Chemical Reactions Fission and Fusion	nuclear reactions to compare fission and fusion in terms of beginning and end products and the amount of energy released.			Nucleons Strong Nuclear Force Weak Nuclear Force Electromagnetic Force Transmutation Alpha Decay Beta Decay Gamma Decay Binding Energy Radiation Ionizing Radiation Radioactive Half Life Fission Fusion

				Parent Nucleus Daughter Nucleus Chain Reaction

February

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ: ● *How does simple harmonic motion relate to wave behavior?* ● *How are wave properties used to explain the transfer of energy?* **Simple Harmonic Motion & Waves** Pendulums Wave Speed, Wavelength, Frequency Parts of a Wave Transverse and Longitudinal Waves Standing Waves Interference Reflection Refraction	**Simple Harmonic Motion and Waves** 1. Identify the frequency and amplitude of an object in simple harmonic motion. 2. Calculate the speed of a wave given the frequency and wavelength. 3. Describe how vibrations set up transverse and longitudinal waves in various mediums. 4. Explain how wave properties such as interference, resonance, refraction, and	**Simple Harmonic Motion and Waves** 1. I can identify the frequency and amplitude of an object in simple harmonic motion. 2. I can calculate speed, frequency, and wavelength using the equation $v = f \times \lambda$ 3. I can describe the difference between transverse and longitudinal waves. 4. I can explain how interference, resonance, refraction, and reflection affect waves. **Sound & Light**	**Simple Harmonic Motion and Waves** 1 Pendulum Lab 1-2 Simple Harmonic Motion Quiz 3 Slinky Labs **1-4 CA = SHM & Waves Unit Test** **Sound & Light** 1 Speed of Sound Lab 3 Resonance Lab 1-4 Sound Quiz 6 Optics Lab **1-6 CA = Sound & Light Unit Test**	**Simple Harmonic Motion and Waves** CPO Science Chapters 19-20 CPO Lab Equipment Outdoor Activity: To be determined *Key Vocabulary* Absorption Amplitude Compression Crest

Diffraction **UEQ:** ● *How does sound show wave properties?* ● *How does light show wave properties?* ● *How are sound and light similar and different?* **Sound & Light** Standing Waves Sound Waves Resonance Interference Reflection Refraction Diffraction Doppler Effect Electromagnetic Waves Color Polarization Wave Particle Duality	reflection affect waves. **Sound & Light** 1. Explain how sound displa properties of waves including, amplitude, frequency (pitch), speed and wavelength. 2. Analyze how wave intera such as interference, resonan reflection affect sound waves. 3. Explain the formation of standing waves. 4. Describe the Doppler Effe result of the motion of the sou source, observer or both. 5. Describe the properties a of electromagnetic radiation f radio through gamma radiatic 6. Determine how wave interactions of light (reflectior refraction, diffraction, interfe and the Doppler Effect) explai phenomena.	1. I can explain how the amplitude and frequency of a sound wave create the sound we hear. 2. I can explain how wave interactions such as interference, resonance, and reflection affect sound waves. 3. I can explain how standing waves form. 4. I can explain the Doppler Effect as seen in both sound and light. 5. I can describe the properties and uses of electromagnetic radiation from radio through gamma radiation. 6. I can determine how reflection, refraction, diffraction, and interference affect light.		Diffraction Frequency Hertz Interference Longitudinal wave Medium Period Rarefaction Simple harmonic motion Transverse wave Trough Wavelength Resonance

				Natural frequency Refraction Reflection **Sound & Light Unit** CPO Science Chapters 19-20 CPO Lab Equipment *Key Vocabulary* Interference Natural frequency Resonance Refraction

				Reflection Law of Reflection Total internal reflection Incident Diffraction Absorption Pitch Decibels Fundamental Harmonic Standing wave Node Antinode

				Doppler Effect Electromagnetic wave Electromagnetic spectrum Photon Polarization Dispersion Convex (lens or mirror) Concave (lens or mirror) Converging

				Diverging Additive primary colors Secondary colors of light Complimentary colors of light Subtractive primary colors (pigments)

March

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ: ● *How are valence electrons involved in Ionic and Covalent Bonding?* ● *How are formulas for compounds written?* ● *How is the Law of Conservation of Mass demonstrated*	**Chemical Reactions & the Periodic** 1. Generate Lewis Dot Structures. 2. Identify elements in metal, nonmetal and metalloid families of elements. 3. Determine Oxidation Numbers of Ions. 4. Write Chemical Formulas for Ionic and Covalent compounds.	**Chemical Reactions & the Periodic** 1. I can generate Lewis Dot Structures. 2. I can Identify elements in metal, nonmetal and metalloid families of elements. 3. I can determine Oxidation Numbers of Ions. 4. I can write Chemical Formulas for Ionic and Covalent	**Chemical Reactions & the Periodic** General Review or Concepts **Quiz** **Element quizzes** **CA = Unit Test**	**Chemical Reactions & the Periodic** CPO Science Chapter 9 CPO Lab Equipment *Key Vocabulary:* energy level- valence electrons-

in a balanced equation? **Chemical Reactions & the Periodic Table of Elements**  Lewis Dot Structures Families of Elements Oxidation Numbers of Ions Chemical Formulas Ionic & Covalent Bonding Law of Conservation of Mass	5. Balance equations to demonstrate the Law of Conservation of Mass.	compounds. 5. I can and will balance equations to demonstrate the Law of Conservation of Mass.		metal- nonmetal- family/group- metalloid- period- subscript– coefficient- Law of Conservation of Mass- chemical symbols- chemical formulas- chemical equations- chemical reaction- Lewis Dot Structures- Octet Rule- Ion- Ionic bond- Covalent bond- Oxidation number- Reactants- Products-