Physical Science - Spring 2021 Jessica Svoboda

Goal: By the end of the semester, students will be able to analyze and summarize data and use it to discern “good” science from pseudoscience.

Quarter 1: Chemistry

Unit	Pacing	Standards	Big Ideas	Essential Questions	Materials
Classification of Matter	Week 1	**HS-PS1-7. *** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	Units, measurements, and scales used in science (base ten, units, conversions) - SI Units - Dimensional Analysis - Significant Figures	How do we appropriately measure various items?	1. Doodle notes on measurement and units. 2. Practice with units and conversions (WS)
	Week 2	**HS-PS1-7. *** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	Properties of matter Physical vs. Chemical Change - Heterogeneous vs. homogeneous - Signs of a chemical reaction (demo with notes?)	How do you identify, classify, and measure matter?	1. Doodle Notes 2. Separation of Matter Lab
Atomic Structure and Periodic Table	Week 3-4	**HS-PS1-1.** Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.	Atomic Structure and Nuclear Chem - Atoms, Ions, Isotopes - Atomic weight	Why is the periodic table useful in identifying atomic structure? How is the periodic table used as a tool to predict patterns and properties of atoms and their electrons?	1. Doodle Notes 2.

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	Week 4	**HS-PS1-1.** Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.	Electrons and Orbitals - Electrons, orbitals, and electron configuration	Why is the periodic table useful in identifying atomic structure? How is the periodic table used as a tool to predict patterns and properties of atoms and their electrons?	1. Doodle Diagrams on atomic structure and electron orbitals 2. Phet Structure of an Atom SImulation
	Week 5	**HS-PS1-2.** Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.	Periodic Table Trends - Valence Electrons - Ionization Energy - Electron Affinity - Metal/nonmetal Reactivity	Why is the periodic table useful in identifying atomic structure? How is the periodic table used as a tool to predict patterns and properties of atoms and their electrons?	1. Build a periodic table - class activity 2. Doodle Notes
Nomenclature, Formulas, and Bonding	Week 6	**HS-PS1-3.** Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.	Chemical Bonds - Ionic and Covalent (naming?) - Lewis Structures with	How do electrons drive the formation of compounds and their names? Why are there different types of attractive forces in bonding?	1. Doodle Notes 2. Phet Simulation on bonding or ChemLibre Activity? 3. Hands-on lewis structure-activity

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Chemical Reactions	Week 7	**HS-PS1-2.** **HS-PS1-4.** Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. **HS-PS1-7.**	Types of Reactions: - Solubility basics, - Acid-base reactions - Redox reactions - Metal reactions	Based on reaction types, how do you predict the products of a reaction? How does balancing chemical equations demonstrate the conservation of matter?	1. Doodle notes 2. Each One Teach One - students research a reaction, teach and demonstrate (with teacher approval).
Moles and Stoichiometry	Week 8	**HS-PS1-7. *** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	Introduction to Stoichiometry - Moles - Stoichiometry	Why are moles used to quantify the amounts of products or reactants? How can we predict the exact amount of products or reactants in a chemical reaction?	1. Doodle Diagram 2. Stoichiometry Lab - How much Sodium in Sodium Bicarb investigation
Thermochemistry	Week 9	**HS-PS1-5.** Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.	Enthalpy and specific heat - Phase change lab	How does energy drive or inhibit chemical reactions?	1. Doodle Notes 2. Phase Change Lab

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		HS-PS3-1. **HS-PS3-4.**			
Solutions, Acids, and Bases *drop if no time, cover basic concepts with reactions	Week 10	**HS-PS1-5.** **HS-PS1-6.** Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.	Acids, Bases, and Equilibrium - Definitions of acids and bases - What happens when mixed?	How do the properties of acids and bases demonstrate equilibrium in a chemical reaction? How do we use our understanding of equilibrium to predict the shift in the concentration of reactants or products?	Doodle diagrams Titration lab (virtual)

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Quarter 2: Physics					
Mechanical Equilibrium and Newton's Laws	Weeks 1-2	**HS-PS2-1.** Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.	Vectors, Newton's Laws - speed vs. velocity - Mass vs. weight - Given two of the three quantities (force, mass, acceleration) calculate the third	What is mechanical equilibrium and how does it relate to Newton's Laws? What is a force and how do force interactions influence an object's state of motion?	1. Doodle Notes 2. Vectors Practice 3. 2 dimensional motion lab
Momentum and Energy Principles	Weeks 3-4	**HS-PS3-1.** Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.	Conservation of Momentum and Energy - momentum, define how it is conserved - Collisions - Define work and power - Calculate work and power	What is momentum and how is it measured? What is energy and how is it measured? How can energy & momentum principles be applied to analyze the state of motion of an entire system of objects?	1. Doodle Notes 2. Momentum lab

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		HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. **HS-PS3-3.** Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*			
Projectile, Circular, and Rotational Motion	Week 5	**HS-PS3-1.** Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other	Build off 2 plane projection, apply to circular/rotational movement - add rotational movement to existing formulas	How do force interactions cause objects to move in parabolic and circular paths? How can the law of conservation of angular momentum be used to describe the fact that the earth's rotation is slowing down due to the moon moving farther away over	1. Doodle Notes 2. Rotational Motion Lab

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		component(s) and energy flows in and out of the system are known. **HS-PS2-2.** Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. **HS-PS3-3.** Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*		time?	

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Gravity, Satellites, and Einstein's Theory of Relativity* Drop TOR if time needs	Week 6	**HS-PS3-1.** Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. **HS-PS2-2.** Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. **HS-PS3-3.** Design, build, and refine a device that works within given	Gravity - explain how gravity keeps moon in orbit - Explain how newton's laws apply to gravitational forces	What is the Universal Gravitational Constant and how was it discovered? Why do satellites orbiting the earth, including the moon, have to maintain a particular speed based on their orbital altitude? What are the postulates of Einstein's theory of Relativity and why are they necessary for GPS technology?	1. Doodle Notes 2. Simulation?

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		constraints to convert one form of energy into another form of energy.*			
Mechanical Vibrations, Waves, and Sounds	Week 7	**HS-PS3-2.** Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects). **HS-PS4-1.** Use mathematical representations to support a claim regarding relationships among the	Wave Motion - use equations to determine velocity of a wave - Frequency vs wavelength - Identify energy as being transmitted by a wave - Identify sound as a logitudental wave - Relate amplitude to intensity of sound.	What is a natural frequency and why do all objects have their own? Where do all sounds originate? What is resonance and how does it show up in nature?	1. Doodle notes 2. Build a wave machine

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		frequency, wavelength, and speed of waves traveling in various media.			
Light and Electromagnetic Waves	Week 8-9	**HS-PS3-5.** Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. **HS-PS4-3.** Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some	Electromagnetic waves - relate light to electromagnetic waves - Relate number on a radio dial to the radio wave that is received - Describe ways in which light acts as a wave and a particle	How do atoms interact over astronomically large distances? Why does the sky appear to be blue? How do glasses improve vision?	1. Doodle Notes 2. Phett simulation - radio waves

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		situations one model is more useful than the other. **HS-PS4-4.** Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.			
Electricity and Magnetism	Week 10	**HS-PS2-5.** Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.	E and M - Identify similarities between electricity and magnetism - Explain how they are related and effects they have on each other	What is charge and how is it different from mass? Where does lightning come from? How do you design a circuit? What causes magnetism?	1. Doodle Notes 2. E and M lab

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		HS-PS3-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.			
Optional Unit: Atoms and Quantum Physics					