



Physical Science - 10th Grade

Timeline	Unit/theme	Standard	Student Focused Objective	Resources/ Suggested Activities
Q1	Atoms & Elements	<p>4a. Obtain, evaluate, and communicate information from the periodic table concerning the structure of an atom and the arrangement of the atom's protons, neutrons, and electrons.</p> <p>4b. Predict the properties of an element based on the element's number of protons and valence electrons.</p> <p>4d. Use mathematics and computational thinking to determine the charge of an ion and the mass number of an isotope based on the number of subatomic particles</p>	<p>SWBAT determine mass and charge of atoms based on number of subatomic particles (and reverse: determine number and kind of subatomic particles based on element, charge, and mass).</p> <p>SWBAT create models of atoms (including accurate numbers and arrangements of subatomic particles) using information provided in the periodic table.</p> <p>SWBAT read and use the periodic table to predict properties of elements.</p>	<p>Harvard-X Article: Intro to Atoms and Elements https://www.labxchange.org/library/items/lb:HarvardX:6eb1e2af.html:1</p> <p>TED-Ed The 2,400-year search for the atom https://www.youtube.com/watch?v=xazQRcSCRaY&list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&index=18 The genius of Mendeleev's periodic table https://www.youtube.com/watch?v=fPnwBITSmgU&list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&index=40</p> <p>Jefferson Lab https://education.jlab.org/itselemental/ –What is Matter? https://education.jlab.org/beamsactivity/6thgrade/whatismatter/whatismatter.pdf –How to Draw an Atom: https://education.jlab.org/frost/how-to-draw-an-atom.html</p> <p>PBS Documentary Film: <i>Hunting the Elements</i></p>

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				<p>https://www.pbs.org/wgbh/nova/video/hunting-the-elements/</p> <p>ChemistryTalk.org Interactive Periodic Table: https://chemistrytalk.org/interactive-periodic-table/ Article: The Atom and its Structure https://chemistrytalk.org/the-structure-of-an-atom/</p> <p>PHET Simulation: Build an Atom https://phet.colorado.edu/en/simulations/build-an-atom Simulation: Build a Nucleus https://phet.colorado.edu/sims/html/build-a-nucleus/latest/build-a-nucleus_all.html Simulation: Isotopes and Atomic Mass https://phet.colorado.edu/en/simulations/isotopes-and-atomic-mass</p>
Q1	Atomic Nuclei & Radioactivity	<p>4e. Analyze and interpret data to explain how radioactive decay changes a radioactive isotope over time and explain how the age of an object can be estimated by the ratio of radioactive isotopes contained within the object's atoms.</p> <p>4f. Use mathematics and computational thinking to identify types of radioactive</p>	<p>SWBAT describe and create models of radioactive decay.</p> <p>SWBAT to analyze instances of radioactive decay to determine 1) type of radioactive decay, 2) parent isotope, and 3) daughter isotope and emitted particles when given 2 of 3.</p> <p>SWBAT to calculate 1) the half-life of a radioactive</p>	<p>PBS Documentary Film: <i>Downwinders and the Radioactive West</i> https://www.pbsutah.org/pbs-utah-productions/shows/downwinders-and-the-radioactive-west/</p> <p>PBS Crash Course Physics:Nuclear Physics https://www.youtube.com/watch?v=IUhJL7o6_cA</p> <p>TED-Ed Is radiation dangerous? https://www.youtube.com/watch?v=zl2vRwFKnHQ</p>

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		decay based on balanced chemical equations, penetrating power, identity of emitted particles, and charge.	isotope, 2) the amount of an initial radioactive sample, 3) the amount of final radioactive sample, and 4) the length of time over which a sample has been decaying when given 3 of 4.	&list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&index=9 PHET Simulation: Radioactive dating game https://phet.colorado.edu/en/simulations/radioactive-dating-game Jefferson Lab Radioactive Half-Life Experiment (data collection using videos of JLab's equipment being used) https://education.jlab.org/frost/half-life_part1.html
Q1	Nuclear Energy Sept 9-13 Sept 16-20	<p>4g. Use models to explain how nuclear fission and fusion reactions can be used as energy sources.</p> <p>4h. Generate and defend a data-based claim regarding the use of radioactive materials as an energy source.</p> <p>3f. Analyze and interpret data concerning the advantages and disadvantages of the energy sources used to produce electricity</p>	<p>SWBAT to create models of nuclear fission and fusion processes.</p> <p>SWBAT to articulate, support, and present an argument about the safety, advantages, and disadvantages of nuclear power as a source of electricity.</p>	PHET Simulation: Nuclear Fission https://phet.colorado.edu/en/simulations/nuclear-fission Science News Article: The Periodic Table Might Soon Have a New Element https://www.snexplores.org/article/periodic-table-new-element-120 https://www.science.org/content/article/u-s-back-race-forge-unknown-superheavy-elements Documentary Film: Nuclear Now https://www.nuclearnowfilm.com/

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Q2	Chemical Compounds	4c. Analyze and interpret data to predict properties of ionic and covalent compounds.	<p>SWBAT to determine the number and type of atoms in a compound when given a chemical formula.</p> <p>SWBAT predict the kind of chemical bond formed between two or three atoms based on the periodic table.</p> <p>SWBAT create models of chemical compounds illustrating the arrangement of valence electrons in both ionic and covalent bonds.</p> <p>SWBAT distinguish between ionic and covalent bonds, and describe the differences between ionic and covalent compounds.</p>	<p>ChemTalk Article: Molecule vs Compound https://chemistrytalk.org/molecule-vs-compound/#:~:text=Definition%20of%20a%20Molecule,held%20together%20by%20chemical%20bonds.</p> <p>TED-Ed How atoms bond https://www.youtube.com/watch?v=NgD9yHSJ29I&list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&index=29</p> <p>PHET Simulation: Build a Molecule https://phet.colorado.edu/en/simulations/build-a-molecule</p>
Q2	Chemical Reactions – Chemical vs Physical Properties	<p>5a. Carry out investigations and use results to compare and contrast the physical and chemical properties of matter.</p> <p>5d Utilize multiple types of</p>	<p>SWBAT distinguish between physical and chemical properties of matter.</p> <p>SWBAT determine the type of chemical reaction (combination,</p>	<p>Generation Genius Intro to Chemical Reactions Video https://www.generationgenius.com/videolessons/chemical-reactions-video-for-kids/</p> <p>TED-Ed The law of the conservation of mass</p>

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		models to support and verify the claim that matter is conserved during a simple chemical reaction	de-composition, single replacement, double-replacement, or combustion) when given chemical formulas of products and reactants. SWBAT determine whether a given chemical equation is balanced.	https://www.youtube.com/watch?v=2S6e11NBwiw&list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&index=16 Is fire a solid, a liquid, or a gas? https://www.youtube.com/watch?v=YV8TT9LRBrY&list=PLD018AC9B25A23E16&index=107
Q2	Solutions & pH	6a. Plan and carry out investigations to determine how various factors, including temperature, surface area, and stirring, affect the rate at which a solute dissolves in a solvent 6b. Develop and use particle diagrams to illustrate diluted and concentrated solutions and describe how adjusting amounts of solute and solvent impacts the concentration of a solution 6c. Analyze and interpret data from experiments to determine whether solutions are acidic, basic, or neutral and to predict properties of	SWBAT to create models illustrating solutes dissolving in solvents. SWBAT to make calculations about solutions using the equation $C = m/V$; and explain the relationships among the quantities of concentration, solute mass, and total volume of a solution. SWBAT explain and create models that illustrate how various factors influence the rate at which a solute dissolves in a solvent. SWBAT determine whether solutions are acidic, basic, or neutral based on	ChemTalk Article: What is a solution? https://chemistrytalk.org/what-is-solution-chemistry/ Article: Intro to Acids & Bases https://chemistrytalk.org/acid-base-chemistry-made-easy/ TED-Ed The strengths and weaknesses of acids and bases https://www.youtube.com/watch?v=DupXDD87oHc&list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&index=27

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		<p>the solutions</p> <p>6d Plan and carry out investigations concerning neutralization reactions and describe the properties of the reactants and products</p>	<p>experimental results.</p> <p>SWBAT to predict properties of solutions based on their pH.</p> <p>SWBAT create models of neutralization reactions and predict the products of neutralization reactions when given the chemical formulas of the reactants.</p>	
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Q3	Intro to Energy	<p>1a Plan and carry out investigations to explore how mechanical energy is transformed within a system, including kinetic energy, gravitational potential energy, elastic energy, and work.</p> <p>1d. Investigate collisions and other real-world situations to evaluate the effects of impulse on changes in momentum</p>		<p>Generation Genius: Intro/Recap of Potential vs Kinetic Energy Video https://www.generationgenius.com/videolessons/potential-vs-kinetic-energy-video-for-kids/</p> <p>PHET Simulation: Energy Forms & Changes https://phet.colorado.edu/en/simulations/energy-forms-and-changes</p> <p>TED-Ed Where does energy come from? https://www.youtube.com/watch?v=dmcevC55K3s&list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&index=24</p> <p>Institute of Physics</p>

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				https://spark.iop.org/collections/energy-new-curriculum
Q3	Electricity	<p>3c. Use mathematical and computational thinking to represent and determine the quantitative relationships between voltage, current, and resistance, in series and parallel circuits in terms of Ohm's law.</p> <p>3d. Develop and use models to determine the relationships among voltage, current, and resistance at specific loads in series and parallel circuits.</p>	<p>SWBAT create models of simple, series, and parallel DC circuits.</p> <p>SWBAT calculate parameters of simple, series, and parallel DC circuits using $V = I \cdot R$; and explain the relationships among the quantities of voltage, resistance, and current.</p>	<p>Generation Genius: Intro to Electricity & Circuits Video https://www.generationgenius.com/videolessons/electricity-and-circuits-video-for-kids/</p> <p>PHET Simulation: Balloons and Static Electricity https://phet.colorado.edu/en/simulations/balloons-and-static-electricity Simulation: Ohm's Law https://phet.colorado.edu/en/simulations/ohms-law Simulation: Circuit Construction Kit DC https://phet.colorado.edu/en/simulations/circuit-construction-kit-dc</p> <p>TED-Ed The science of static electricity https://www.youtube.com/watch?v=yc2-363MIQs How batteries work https://www.youtube.com/watch?v=9OVtk6G2TnQ</p> <p>Institute of Physics Physics Narrative: Modeling simple electrical loops https://spark.iop.org/collections/modelling-simple-electrical-loops-physics-narrative Approaches: https://spark.iop.org/collections/modelling-electrical-loops Electric Circuits: https://spark.iop.org/sites/default/files/media/docu</p>

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				ments/iop-classroom-physics-december2019_web_1.pdf
Q3	Magnetism	<p>3a. Construct an argument using evidence to support the claim that field forces exist between objects and act on objects even when the objects are not in contact</p> <p>3b. Plan and carry out investigations to identify the factors that affect the strength of the electric and magnetic forces between objects</p>	<p>SWBAT create models/illustrations that show and explain the function of electrons in magnetism.</p> <p>SWBAT conduct demonstrations of magnetism and explain the factors that affect the strength of magnetic forces between objects</p>	<p>PBS Physics in Motion: Magnetism https://www.gpb.org/physics-in-motion/unit-5/magnetism</p> <p>National Geographic Article & Images: Magnetism https://education.nationalgeographic.org/resource/magnetism/</p> <p>Institute of Physics Physics Narrative: Exploring Magnets https://spark.iop.org/collections/exploring-magnets-physics-narrative Approaches: Exploring Magnets https://spark.iop.org/collections/exploring-magnets-teaching-approaches</p>
Timeline	Unit/theme	Standard	Student Focused Objective	Resources/ Suggested Activities
Q4	Focus on Thermal Energy	<p>1b. Collect, analyze, and use data to explain how thermal energy is transferred by conduction, convection, and radiation</p> <p>1c. Construct explanations to justify the selection of materials based on the</p>		<p>ThePhysicsClassroom: Thermal Physics: Articles, Images, and Interactives https://www.physicsclassroom.com/class/thermalP</p> <p>Generation Genius: Intro to Thermal Energy Video https://www.generationgenius.com/videolessons/thermal-energy-video-for-kids/ Thermal Energy Transfer Video</p>

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		materials' specific heat values		https://www.generationgenius.com/videolessons/he-at-transfer-of-thermal-energy-video-for-kids/ TED-Ed What is the coldest thing in the world? https://www.youtube.com/watch?v=W6aL9YyRx1A&list=PLJicmE8fK0EgnWzPUgQ4D1_oLuye0wc2Z&index=47 Crash Course Physics: Temperature https://www.youtube.com/watch?v=6BHbJ_gBok0
Q4	States of Matter – Focus on Properties of Gases	5b. Analyze and interpret data to predict changes in the phase of a material based on changes in particle motion, temperature, pressure, or thermal energy 5c. Use mathematical and computational to determine the quantitative relationships among temperature, pressure, and volume of confined gases		TED-Ed Solid, liquid, gas and... plasma? https://www.youtube.com/watch?v=tJplytSR-ww&list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&index=11 How heavy is air? https://www.youtube.com/watch?v=VDf00z8sMFw&list=PLJicmE8fK0EgnWzPUgQ4D1_oLuye0wc2Z&index=21 PHET Simulation: States of Matter https://phet.colorado.edu/en/simulations/states-of-matter Simulation: Gas Basics https://phet.colorado.edu/en/simulations/gases-intro
Q4	Waves – Focus on	2a. Analyze and interpret data to identify and describe		Generation Genius Intro to Electromagnetic Spectrum Video

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	EMR	<p>the relationships among wavelength, frequency, amplitude, and energy in waves</p> <p>2b. Develop models to illustrate reflection, refraction, interference, and diffraction</p> <p>2c. Analyze the ways in which different media and their characteristics affect the speed of sound and light waves</p> <p>2d. Use models to illustrate the Doppler effect and explain the changes in sound perception associated with it</p> <p>2e. Obtain and communicate information from published materials to explain how transmitting and receiving devices use the principles of wave behavior and wave interactions to transmit and capture information and energy</p>		<p>https://www.generationgenius.com/videolessons/electromagnetic-spectrum-video-for-kids/</p> <p>StarTalk (with Neil deGrasse Tyson): The Electromagnetic Spectrum https://www.youtube.com/watch?v=3JOmXvRF-fg</p> <p>Jefferson Lab Light is a Particle: https://education.jlab.org/frost/light_is_a_particle.html</p> <p>PBS Crash Course Physics: Light is Waves https://www.youtube.com/watch?v=IRBfpBPELmE</p> <p>TED-Ed Light waves, visible and invisible https://www.youtube.com/watch?v=O0PawPSdk28 Is light a particle or a wave? https://www.youtube.com/watch?v=J1yIApZtLos</p> <p>Institute of Physics https://spark.iop.org/sites/default/files/media/documents/classroom_physics_september_2020_digital_0_0_0.pdf</p> <p>PHET Simulation: Waves Intro https://phet.colorado.edu/sims/html/waves-intro/latest/waves-intro_all.html Simulation: Bending Light https://phet.colorado.edu/en/simulations/bending-li</p>
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