



## 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 determines 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><b>Harvard-X</b> Article: Intro to Atoms and Elements <a href="https://www.labxchange.org/library/items/lb:HarvardX:6eb1e2af.html:1">https://www.labxchange.org/library/items/lb:HarvardX:6eb1e2af.html:1</a></p> <p><b>TED-Ed</b> The 2,400-year search for the atom <a href="https://www.youtube.com/watch?v=xazQRcSCRaY&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=18">https://www.youtube.com/watch?v=xazQRcSCRaY&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=18</a> The genius of Mendeleev's periodic table <a href="https://www.youtube.com/watch?v=fPnwBITSmgU&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=40">https://www.youtube.com/watch?v=fPnwBITSmgU&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=40</a></p> <p><b>Jefferson Lab</b> <a href="https://education.jlab.org/itselemental/-What%20is%20Matter?">https://education.jlab.org/itselemental/-What is Matter?</a> <a href="https://education.jlab.org/beamsactivity/6thgrade/whatismatter/whatismatter.pdf">https://education.jlab.org/beamsactivity/6thgrade/whatismatter/whatismatter.pdf</a> –How to Draw an Atom: <a href="https://education.jlab.org/frost/how-to-draw-an-atom.html">https://education.jlab.org/frost/how-to-draw-an-atom.html</a></p>



				<p><b>PBS</b> Documentary Film: <i>Hunting the Elements</i> <a href="https://www.pbs.org/wgbh/nova/video/hunting-the-elements/">https://www.pbs.org/wgbh/nova/video/hunting-the-elements/</a></p> <p><b>ChemistryTalk.org</b> Interactive Periodic Table: <a href="https://chemistrytalk.org/interactive-periodic-table/">https://chemistrytalk.org/interactive-periodic-table/</a> Article: The Atom and its Structure <a href="https://chemistrytalk.org/the-structure-of-an-atom/">https://chemistrytalk.org/the-structure-of-an-atom/</a></p> <p><b>PHET</b> Simulation: Build an Atom <a href="https://phet.colorado.edu/en/simulations/build-an-atom">https://phet.colorado.edu/en/simulations/build-an-atom</a> Simulation: Build a Nucleus <a href="https://phet.colorado.edu/sims/html/build-a-nucleus/latest/build-a-nucleus_all.html">https://phet.colorado.edu/sims/html/build-a-nucleus/latest/build-a-nucleus_all.html</a> Simulation: Isotopes and Atomic Mass <a href="https://phet.colorado.edu/en/simulations/isotopes-and-atomic-mass">https://phet.colorado.edu/en/simulations/isotopes-and-atomic-mass</a></p>
Q1	Atomic Nuclei & Radioactivity	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	<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</p>	<p><b>PBS</b> Documentary Film: <i>Downwinders and the Radioactive West</i> <a href="https://www.pbsutah.org/pbs-utah-productions/shows/downwinders-and-the-radioactive-west/">https://www.pbsutah.org/pbs-utah-productions/shows/downwinders-and-the-radioactive-west/</a></p> <p><b>PBS</b></p>



		<p>isotopes contained within the object's atoms.</p> <p>4f. Use mathematics and computational thinking to identify types of radioactive decay based on balanced chemical equations, penetrating power, identity of emitted particles, and charge.</p>	<p>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 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.</p>	<p>Crash Course Physics:Nuclear Physics  <a href="https://www.youtube.com/watch?v=IUhJL7o6_cA">https://www.youtube.com/watch?v=IUhJL7o6_cA</a></p> <p><b>TED-Ed</b>          Is radiation dangerous?  <a href="https://www.youtube.com/watch?v=zI2vRwFKnHQ&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=9">https://www.youtube.com/watch?v=zI2vRwFKnHQ&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=9</a></p> <p><b>PHET</b>          Simulation: Radioactive dating game  <a href="https://phet.colorado.edu/en/simulations/radioactive-dating-game">https://phet.colorado.edu/en/simulations/radioactive-dating-game</a></p> <p><b>Jefferson Lab</b>          Radioactive Half-Life Experiment (data collection using videos of JLab's equipment being used)  <a href="https://education.jlab.org/frost/half-life_part1.html">https://education.jlab.org/frost/half-life_part1.html</a></p>
Q1	<p>Nuclear Energy</p> <p>Sept 9-13            Sept 16-20</p>	<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>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>	<p><b>PHET</b>          Simulation: Nuclear Fission  <a href="https://phet.colorado.edu/en/simulations/nuclear-fission">https://phet.colorado.edu/en/simulations/nuclear-fission</a></p> <p><b>Science News Article:</b>          The Periodic Table Might Soon Have a New Element  <a href="https://www.snexplores.org/article/periodic-table-new-element-120">https://www.snexplores.org/article/periodic-table-new-element-120</a>  <a href="https://www.science.org/content/article/u-s-back-ra">https://www.science.org/content/article/u-s-back-ra</a></p>



		3f. Analyze and interpret data concerning the advantages and disadvantages of the energy sources used to produce electricity		ce-forge-unknown-superheavy-elements  <b>Documentary Film: <i>Nuclear Now</i></b> <a href="https://www.nuclearnowfilm.com/">https://www.nuclearnowfilm.com/</a>
Timeline	Unit/theme	Standard	Student Focused Objective	Resources/ Suggested Activities
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,</p>	<p><b>ChemTalk</b> Article: Molecule vs Compound <a href="https://chemistrytalk.org/molecule-vs-compound/#:~:text=Definition%20of%20a%20Molecule,held%20together%20by%20chemical%20bonds.">https://chemistrytalk.org/molecule-vs-compound/#:~:text=Definition%20of%20a%20Molecule,held%20together%20by%20chemical%20bonds.</a></p> <p><b>TED-Ed</b> How atoms bond <a href="https://www.youtube.com/watch?v=NgD9yHSJ29I&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=29">https://www.youtube.com/watch?v=NgD9yHSJ29I&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=29</a></p> <p><b>PHET</b> Simulation: Build a Molecule <a href="https://phet.colorado.edu/en/simulations/build-a-molecule">https://phet.colorado.edu/en/simulations/build-a-molecule</a></p>



			and describe the differences between ionic and covalent compounds.	
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 models to support and verify the claim that matter is conserved during a simple chemical reaction</p>	<p>SWBAT distinguish between physical and chemical properties of matter.</p> <p>SWBAT determine the type of chemical reaction (combination, de-composition, single replacement, double-replacement, or combustion) when given chemical formulas of products and reactants.</p> <p>SWBAT determine whether a given chemical equation is balanced.</p>	<p><b>Generation Genius</b> Intro to Chemical Reactions Video <a href="https://www.generationgenius.com/videolessons/chemical-reactions-video-for-kids/">https://www.generationgenius.com/videolessons/chemical-reactions-video-for-kids/</a></p> <p><b>TED-Ed</b> The law of the conservation of mass <a href="https://www.youtube.com/watch?v=2S6e11NBwiw&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=16">https://www.youtube.com/watch?v=2S6e11NBwiw&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=16</a> Is fire a solid, a liquid, or a gas? <a href="https://www.youtube.com/watch?v=YV8TT9LRBrY&amp;list=PLD018AC9B25A23E16&amp;index=107">https://www.youtube.com/watch?v=YV8TT9LRBrY&amp;list=PLD018AC9B25A23E16&amp;index=107</a></p>
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	<p>SWBAT to create models illustrating solutes dissolving in solvents.</p> <p>SWBAT to make calculations about solutions using the equation <math>C = m/V</math>; and</p>	<p><b>ChemTalk</b> Article: What is a solution? <a href="https://chemistrytalk.org/what-is-solution-chemistry/">https://chemistrytalk.org/what-is-solution-chemistry/</a> Article: Intro to Acids &amp; Bases <a href="https://chemistrytalk.org/acid-base-chemistry-made-easy/">https://chemistrytalk.org/acid-base-chemistry-made-easy/</a></p>



		<p>solute dissolves in a solvent</p> <p>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</p> <p>6c. Analyze and interpret data from experiments to determine whether solutions are acidic, basic, or neutral and to predict properties of the solutions</p> <p>6d Plan and carry out investigations concerning neutralization reactions and describe the properties of the reactants and products</p>	<p>explain the relationships among the quantities of concentration, solute mass, and total volume of a solution.</p> <p>SWBAT explain and create models that illustrate how various factors influence the rate at which a solute dissolves in a solvent.</p> <p>SWBAT determine whether solutions are acidic, basic, or neutral based on 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>	<p><b>TED-Ed</b> The strengths and weaknesses of acids and bases <a href="https://www.youtube.com/watch?v=DupXDD87oHc&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=27">https://www.youtube.com/watch?v=DupXDD87oHc&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=27</a></p>
<b>Timeline</b>	<b>Unit/theme</b>	<b>Standard</b>	<b>Student Focused Objective</b>	<b>Resources/ Suggested Activities</b>



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><b>Generation Genius:</b> Intro/Recap of Potential vs Kinetic Energy Video <a href="https://www.generationgenius.com/videolessons/potential-vs-kinetic-energy-video-for-kids/">https://www.generationgenius.com/videolessons/potential-vs-kinetic-energy-video-for-kids/</a></p> <p><b>PHET</b> Simulation: Energy Forms &amp; Changes <a href="https://phet.colorado.edu/en/simulations/energy-forms-and-changes">https://phet.colorado.edu/en/simulations/energy-forms-and-changes</a></p> <p><b>TED-Ed</b> Where does energy come from? <a href="https://www.youtube.com/watch?v=dmcevC55K3s&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=24">https://www.youtube.com/watch?v=dmcevC55K3s&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=24</a></p> <p><b>Institute of Physics</b> <a href="https://spark.iop.org/collections/energy-new-curriculum">https://spark.iop.org/collections/energy-new-curriculum</a></p>
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</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 <math>V = I \cdot R</math>; and explain the relationships among the quantities of</p>	<p><b>Generation Genius:</b> Intro to Electricity &amp; Circuits Video <a href="https://www.generationgenius.com/videolessons/electricity-and-circuits-video-for-kids/">https://www.generationgenius.com/videolessons/electricity-and-circuits-video-for-kids/</a></p> <p><b>PHET</b> Simulation: Balloons and Static Electricity <a href="https://phet.colorado.edu/en/simulations/balloons-and-static-electricity">https://phet.colorado.edu/en/simulations/balloons-and-static-electricity</a> Simulation: Ohm's Law</p>



		<p>to determine the relationships among voltage, current, and resistance at specific loads in series and parallel circuits.</p>	<p>voltage, resistance, and current.</p>	<p><a href="https://phet.colorado.edu/en/simulations/ohms-law">https://phet.colorado.edu/en/simulations/ohms-law</a> Simulation: Circuit Construction Kit DC <a href="https://phet.colorado.edu/en/simulations/circuit-construction-kit-dc">https://phet.colorado.edu/en/simulations/circuit-construction-kit-dc</a></p> <p><b>TED-Ed</b> The science of static electricity <a href="https://www.youtube.com/watch?v=yc2-363MIQs">https://www.youtube.com/watch?v=yc2-363MIQs</a> How batteries work <a href="https://www.youtube.com/watch?v=9OVtk6G2TnQ">https://www.youtube.com/watch?v=9OVtk6G2TnQ</a></p> <p><b>Institute of Physics</b> Physics Narrative: Modeling simple electrical loops <a href="https://spark.iop.org/collections/modelling-simple-electrical-loops-physics-narrative">https://spark.iop.org/collections/modelling-simple-electrical-loops-physics-narrative</a> Approaches: <a href="https://spark.iop.org/collections/modelling-electrical-loops">https://spark.iop.org/collections/modelling-electrical-loops</a> Electric Circuits: <a href="https://spark.iop.org/sites/default/files/media/documents/iop-classroom-physics-december2019_web_1.pdf">https://spark.iop.org/sites/default/files/media/documents/iop-classroom-physics-december2019_web_1.pdf</a></p> <p><b>Conceptual Model Activities:</b> <a href="https://www.education.vic.gov.au/school/teachers/teachingresources/discipline/science/continuum/Pages/electriccircuit.aspx#:~:text=The%20use%20of%20models%2C%20metaphors%20and%20analogies,cannot%20see%2C%20such%20as%20energy%20and%20electrons.">https://www.education.vic.gov.au/school/teachers/teachingresources/discipline/science/continuum/Pages/electriccircuit.aspx#:~:text=The%20use%20of%20models%2C%20metaphors%20and%20analogies,cannot%20see%2C%20such%20as%20energy%20and%20electrons.</a></p>
--	--	---	--	---





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><b>PBS</b> Physics in Motion: Magnetism <a href="https://www.gpb.org/physics-in-motion/unit-5/magnetism">https://www.gpb.org/physics-in-motion/unit-5/magnetism</a></p> <p><b>National Geographic</b> Article &amp; Images: Magnetism <a href="https://education.nationalgeographic.org/resource/magnetism/">https://education.nationalgeographic.org/resource/magnetism/</a></p> <p><b>Institute of Physics</b> Physics Narrative: Exploring Magnets <a href="https://spark.iop.org/collections/exploring-magnets-physics-narrative">https://spark.iop.org/collections/exploring-magnets-physics-narrative</a> Approaches: Exploring Magnets <a href="https://spark.iop.org/collections/exploring-magnets-teaching-approaches">https://spark.iop.org/collections/exploring-magnets-teaching-approaches</a></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><b>ThePhysicsClassroom:</b> Thermal Physics: Articles, Images, and Interactives <a href="https://www.physicsclassroom.com/class/thermalP">https://www.physicsclassroom.com/class/thermalP</a></p> <p><b>Generation Genius:</b> Intro to Thermal Energy Video <a href="https://www.generationgenius.com/videolessons/thermal-energy-video-for-kids/">https://www.generationgenius.com/videolessons/thermal-energy-video-for-kids/</a> Thermal Energy Transfer Video</p>



		materials' specific heat values		<p><a href="https://www.generationgenius.com/videolessons/he-at-transfer-of-thermal-energy-video-for-kids/">https://www.generationgenius.com/videolessons/he-at-transfer-of-thermal-energy-video-for-kids/</a></p> <p><b>TED-Ed</b> What is the coldest thing in the world? <a href="https://www.youtube.com/watch?v=W6aL9YyRx1A&amp;list=PLJicmE8fK0EgnWzPUgQ4D1_oLuye0wc2Z&amp;index=47">https://www.youtube.com/watch?v=W6aL9YyRx1A&amp;list=PLJicmE8fK0EgnWzPUgQ4D1_oLuye0wc2Z&amp;index=47</a></p> <p><b>Crash Course Physics:</b> Temperature <a href="https://www.youtube.com/watch?v=6BHbJ_gBOk0">https://www.youtube.com/watch?v=6BHbJ_gBOk0</a></p>
Q4	States of Matter – Focus on Properties of Gases	<p>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</p> <p>5c. Use mathematical and computational to determine the quantitative relationships among temperature, pressure, and volume of confined gases</p>		<p><b>TED-Ed</b> Solid, liquid, gas and... plasma? <a href="https://www.youtube.com/watch?v=tJplytSR-ww&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=11">https://www.youtube.com/watch?v=tJplytSR-ww&amp;list=PLJicmE8fK0EjGmPGeh_WDu69qAsN-iHVA&amp;index=11</a> How heavy is air? <a href="https://www.youtube.com/watch?v=VDf00z8sMFw&amp;list=PLJicmE8fK0EgnWzPUgQ4D1_oLuye0wc2Z&amp;index=21">https://www.youtube.com/watch?v=VDf00z8sMFw&amp;list=PLJicmE8fK0EgnWzPUgQ4D1_oLuye0wc2Z&amp;index=21</a></p> <p><b>PHET</b> Simulation: States of Matter <a href="https://phet.colorado.edu/en/simulations/states-of-matter">https://phet.colorado.edu/en/simulations/states-of-matter</a> Simulation: Gas Basics <a href="https://phet.colorado.edu/en/simulations/gases-intro">https://phet.colorado.edu/en/simulations/gases-intro</a></p>



<p>Q4</p>	<p>Waves – Focus on EMR</p>	<p>2a. Analyze and interpret data to identify and describe 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</p>		<p><b>Generation Genius</b> Intro to Electromagnetic Spectrum Video <a href="https://www.generationgenius.com/videolessons/electromagnetic-spectrum-video-for-kids/">https://www.generationgenius.com/videolessons/electromagnetic-spectrum-video-for-kids/</a></p> <p><b>StarTalk (with Neil deGrasse Tyson):</b> The Electromagnetic Spectrum <a href="https://www.youtube.com/watch?v=3JOmXvRF-fg">https://www.youtube.com/watch?v=3JOmXvRF-fg</a></p> <p><b>Jefferson Lab</b> Light is a Particle: <a href="https://education.jlab.org/frost/light_is_a_particle.html">https://education.jlab.org/frost/light_is_a_particle.html</a></p> <p><b>PBS</b> Crash Course Physics: Light is Waves <a href="https://www.youtube.com/watch?v=IRBfpBPELmE">https://www.youtube.com/watch?v=IRBfpBPELmE</a></p> <p><b>TED-Ed</b> Light waves, visible and invisible <a href="https://www.youtube.com/watch?v=O0PawPSdk28">https://www.youtube.com/watch?v=O0PawPSdk28</a> Is light a particle or a wave? <a href="https://www.youtube.com/watch?v=J1yIApZtLos">https://www.youtube.com/watch?v=J1yIApZtLos</a></p> <p><b>Institute of Physics</b> <a href="https://spark.iop.org/sites/default/files/media/documents/classroom_physics_september_2020_digital_0_0_0.pdf">https://spark.iop.org/sites/default/files/media/documents/classroom_physics_september_2020_digital_0_0_0.pdf</a></p> <p><b>PHET</b></p>
-----------	-----------------------------	--	--	--



		capture information and energy		Simulation: Waves Intro <a href="https://phet.colorado.edu/sims/html/waves-intro/latest/waves-intro_all.html">https://phet.colorado.edu/sims/html/waves-intro/latest/waves-intro_all.html</a> Simulation: Bending Light <a href="https://phet.colorado.edu/en/simulations/bending-light">https://phet.colorado.edu/en/simulations/bending-light</a>
--	--	--------------------------------	--	--