

**Course Description:** This course will provide foundational understanding of chemistry and physics. Students will explore physical and chemical properties of matter, the atom and periodic table, bonding, chemical reactions and energy forms. The course emphasizes scientific thinking as a way of understanding the natural phenomena that surround us. The course content is grouped into smaller topics to increase retention and expand opportunities for assessment. For physics, the topics of study include motion, forces, energy, Newton's Laws, waves, electricity and magnetism. It includes real and virtual lab exercises and gives students the skills to discuss a number of scientific topics, understand how science is used in their daily lives, and become comfortable with solving simple algebraic expressions that support scientific laws.

## Full Year Plan for 8th Grade Science

| Unit Title                         | Timing and Duration     | Essential Questions   | Standard # | NGSS Standard   | Content   | Science and Engineering Practices  | Cross Cutting Concepts  | I can...  |
|------------------------------------|-------------------------|---|------------|---|---|--|---|---|
| Structure and Properties of Matter | 9 weeks (Sep/Oct)       | What is matter made of?   | PS1-1.     | Develop models to describe the atomic composition of simple molecules and extended structures.  | <ul style="list-style-type: none"> <li>Compounds</li> <li>Atomic structure</li> </ul>   | <ul style="list-style-type: none"> <li>Models</li> </ul>                     | <ul style="list-style-type: none"> <li>Patterns</li> <li>Scale Proportion Quantity</li> </ul> | <ul style="list-style-type: none"> <li>I can describe the composition of atoms.</li> <li>I can build and name molecules following bonding rules.</li> </ul>                           |
|                                    |                         | How is matter identified?                                       | PS1-3.     | Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.                                   | <ul style="list-style-type: none"> <li>Materials science</li> </ul>   | <ul style="list-style-type: none"> <li>Communicate ideas</li> </ul>          | <ul style="list-style-type: none"> <li>Structure and Function</li> </ul>                      | <ul style="list-style-type: none"> <li>I can describe how materials impact society.</li> </ul>  |
|                                    |                         | How does thermal energy affect particles?                       | PS1-4.     | Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. | <ul style="list-style-type: none"> <li>Kinetic Theory</li> <li>States of matter</li> <li>Thermal energy</li> </ul>  | <ul style="list-style-type: none"> <li>Models</li> </ul>                     | <ul style="list-style-type: none"> <li>Cause and effect</li> </ul>                            | <ul style="list-style-type: none"> <li>I can describe the states of matter.</li> <li>I can predict the changes of state due to temperature and particle motion.</li> </ul>            |
| Chemical Reactions                 | 9 weeks (Nov/Dec)       | What happens to atoms in a chemical reaction?                   | PS1-2.     | Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.       | <ul style="list-style-type: none"> <li>Physical and chemical properties</li> <li>Signs of a reaction</li> </ul>   | <ul style="list-style-type: none"> <li>Analyze and Interpret data</li> </ul> | <ul style="list-style-type: none"> <li>Patterns</li> </ul>                                    | <ul style="list-style-type: none"> <li>I can determine if a chemical reaction has occurred</li> <li>I can identify a substance based on its properties</li> </ul>                     |
|                                    |                         | How can chemical reactions be controlled or used?               | PS1-5.     | Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.                        | <ul style="list-style-type: none"> <li>Conservation of Matter</li> <li>Chemical bonding</li> <li>Balancing Equations</li> </ul>   | <ul style="list-style-type: none"> <li>Models</li> </ul>                     | <ul style="list-style-type: none"> <li>Energy and matter</li> <li>patterns</li> </ul>         | <ul style="list-style-type: none"> <li>I can describe the conservation of mass and its relationship to chemical reactions.</li> <li>I can balance chemical equations.</li> </ul>      |
|                                    |                         | How do scientists know reactions occurred?                      | PS1-6.     | Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.                    | <ul style="list-style-type: none"> <li>Endothermic vs. Exothermic reactions</li> <li>engineering</li> <li>Thermal energy</li> </ul>                                     | <ul style="list-style-type: none"> <li>Design a solution</li> </ul>          | <ul style="list-style-type: none"> <li>Energy and matter</li> </ul>                           | <ul style="list-style-type: none"> <li>I can classify reactions based on energy and the products.</li> </ul>  |
| Forces and Motion                  | 9 weeks (Jan/Feb/March) | How is motion described?  | PS2-1.     | Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.   | <ul style="list-style-type: none"> <li>Newton's 3rd law</li> <li>Momentum</li> </ul>  | <ul style="list-style-type: none"> <li>Design a solution</li> </ul>          | <ul style="list-style-type: none"> <li>Cause and effect</li> </ul>                            | <ul style="list-style-type: none"> <li>I can use Newton's 3rd law to explain the motion of two colliding objects.</li> </ul>  |
|                                    |                         | How do forces impact motion?<br>How do objects exert force with | PS2-2.     | Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.  | <ul style="list-style-type: none"> <li>Newton's 2nd Law</li> <li>Force</li> <li>Motion <ul style="list-style-type: none"> <li>Velocity vs. speed</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Plan an investigation</li> </ul>      | <ul style="list-style-type: none"> <li>Stability and change</li> </ul>                        | <ul style="list-style-type: none"> <li>I can describe the motion of an object.</li> <li>I can determine the sum of forces on an object and the resulting change in motion.</li> </ul> |

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|--------|------------------------------|------------------------------------|--------|--|---|--|---|---|
|        |                              | or without touching?               |        |  | <ul style="list-style-type: none"> <li>Acceleration</li> <li>Distance vs. displacement</li> </ul>   |  |   |   |
|        |                              |                                    | PS2-3. | Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.  | <ul style="list-style-type: none"> <li>Magnetic force</li> <li>Electric force</li> </ul>  | <ul style="list-style-type: none"> <li>Ask questions</li> </ul>                                | <ul style="list-style-type: none"> <li>Cause and effect</li> </ul>                                      | <ul style="list-style-type: none"> <li>I can determine the factors that affect the strength of electric and magnetic forces.</li> </ul>     |
|        |                              |                                    | PS2-4. | Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.  | <ul style="list-style-type: none"> <li>Gravity</li> <li>Mass vs weight</li> <li></li> </ul>   | <ul style="list-style-type: none"> <li>Argue from evidence</li> </ul>                          | <ul style="list-style-type: none"> <li>Cause and effect</li> <li>Systems and system models</li> </ul>   | <ul style="list-style-type: none"> <li>I can explain gravitational forces and the factors that influence the size of the forces.</li> </ul> |
|        |                              |                                    | PS2-5. | Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.                                | <ul style="list-style-type: none"> <li>Gravity</li> <li>Magnetism</li> <li>Electric forces</li> </ul>   | <ul style="list-style-type: none"> <li>Conduct an investigation</li> </ul>                     | <ul style="list-style-type: none"> <li>Cause and effect</li> </ul>                                      | <ul style="list-style-type: none"> <li>I can provide evidence that objects can exert forces without touching.</li> </ul>                    |
| Energy | 7 Weeks<br>(March/April/May) | What is energy?                    | PS3-1. | Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.   | <ul style="list-style-type: none"> <li>Kinetic energy</li> <li><math>KE=1/2mv^2</math></li> <li>Graphing</li> </ul>   | <ul style="list-style-type: none"> <li>Analyzing and interpreting data</li> </ul>              | <ul style="list-style-type: none"> <li>Scale, proportion quantity</li> <li>Cause and effect</li> </ul>  | <ul style="list-style-type: none"> <li>I can interpret graphs of energy.</li> </ul>   |
|        |                              | How is energy transferred?         | PS3-2. | Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.  | <ul style="list-style-type: none"> <li>Potential energy <ul style="list-style-type: none"> <li>Gravitational <ul style="list-style-type: none"> <li><math>PE=mgh</math></li> </ul> </li> <li>Elastic</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Models</li> </ul>                                       | <ul style="list-style-type: none"> <li>Cause and effect</li> <li>Systems and system models</li> </ul>   | <ul style="list-style-type: none"> <li>I can model the arrangement of objects with differing amounts of potential energy.</li> </ul>        |
|        |                              | How are energy and forces related? | PS3-3. | Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.*   | <ul style="list-style-type: none"> <li>Thermal energy</li> <li>Conductors</li> <li>Insulators</li> </ul>  | <ul style="list-style-type: none"> <li>Design a solution</li> </ul>                            | <ul style="list-style-type: none"> <li>Energy and matter</li> </ul>                                     | <ul style="list-style-type: none"> <li>I can build and test a device that optimizes thermal energy transfer.</li> </ul>                     |
|        |                              |                                    | PS3-4. | Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. | <ul style="list-style-type: none"> <li>Thermal energy</li> <li>Convection</li> <li>Conduction</li> <li>Radiation</li> </ul>   | <ul style="list-style-type: none"> <li>Plan an investigation</li> </ul>                        | <ul style="list-style-type: none"> <li>Scale, proportion, quantity</li> <li>Cause and effect</li> </ul> | <ul style="list-style-type: none"> <li>I can determine the relationship between energy, matter, and mass with temperature.</li> </ul>       |
|        |                              |                                    | PS3-5. | Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.   | <ul style="list-style-type: none"> <li>Kinetic energy</li> <li>Conservation of energy</li> <li>Momentum</li> <li>Simple Machines</li> </ul>   | <ul style="list-style-type: none"> <li>Argue from evidence</li> </ul>                          | <ul style="list-style-type: none"> <li>Energy and matter</li> </ul>                                     | <ul style="list-style-type: none"> <li>I can explain how energy is transferred to or from an object.</li> </ul>                             |
| Waves  | 2 weeks<br>(May)             |                                    | PS4-1. | Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.  | <ul style="list-style-type: none"> <li>Wave structure <ul style="list-style-type: none"> <li>Wavelength</li> <li>Frequency</li> <li>Amplitude</li> <li>Energy</li> </ul> </li> </ul>  | <ul style="list-style-type: none"> <li>Using mathematics and computational thinking</li> </ul> | <ul style="list-style-type: none"> <li>Energy and matter</li> <li>Patterns</li> </ul>                   | <ul style="list-style-type: none"> <li>I can use graphs to show the properties of waves.</li> </ul>   |
|        |                              |                                    | PS4-2. | Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.  | <ul style="list-style-type: none"> <li>Reflection</li> <li>Refraction</li> </ul>  | <ul style="list-style-type: none"> <li>Models</li> </ul>                                       | <ul style="list-style-type: none"> <li>Structure and function</li> </ul>                                | <ul style="list-style-type: none"> <li>I can use a model to describe the movement of waves.</li> </ul>                                      |

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|--|--|--|--------|--|---|---|--|---|
|  |  |  |        |  |   |   | <ul style="list-style-type: none"> <li>• patterns</li> </ul>               |   |
|  |  |  | PS4-3. | Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. | <ul style="list-style-type: none"> <li>• Digital signals</li> <li>• Analog signals</li> </ul> | <ul style="list-style-type: none"> <li>• Argue from evidence</li> </ul> | <ul style="list-style-type: none"> <li>• Structure and function</li> </ul> | <ul style="list-style-type: none"> <li>• I can support that digital signals are more reliable than analog signals.</li> </ul> |

Change blue / scientist & technology over the years

Energy yellow

Basics green

Properties Purple

Conservation (mass, energy, etc)