

Conceptual Physical Science

Meadville Area Senior High

Science

Course Description: This year long course explores the basic concepts of Physics and Chemistry also including standard science concepts of measurement, scientific methods, and experimentation. It is specifically designed for the science student who struggles with reading comprehension and mathematical application. The specific topics that may be covered in Physics are motion, forces, energy, machines, sound, light and electricity. Chemistry topics may include atomic structure and properties, the periodic table, compounds, chemical reactions, and gas laws.

Unit Title: Chemistry – Properties of Matter

Suggested time frame: Approximately 6 weeks

Standards: S11A.3.3.1, S11.A.3.3.2, S11C11.2, S11C.11.4

Big Idea: The *scientific method* is a tool used to study the properties of matter and its' behavior in the universe.

Essential Questions: How does the use of the *scientific method* facilitate the study of matter? What are the acceptable protocols for proper measurement in the scientific community?

Competency	Vocabulary	Strategy	Resource
SWBAT apply the scientific method, measure, collect and organize data and present their work in the classroom. <ul style="list-style-type: none">The <i>System International (SI)</i> is the measurement protocol used.	<ul style="list-style-type: none">AtomsElementsPhysical propertiesChemical propertiesPhysical statesPhysical changes	<ul style="list-style-type: none">Content focused lab experimentsPOGIL ActivitiesPhET Interactive Simulations	<ul style="list-style-type: none">TextbookPeriodic TablesPeriodic Table WebsitePhET WebsiteChemistry Lab Equipment

<ul style="list-style-type: none"> • Measurement involves proper estimation and limits for reportable numeric values. • Observation of phenomena may be qualitative, quantitative or both. • Some physical properties that characterize matter include: density, melting point, boiling point, volume, and conductivity. • The gas laws describe the behavior of gases under varying physical conditions. • Energy changes play an important role for modeling the behavior of matter. 	<ul style="list-style-type: none"> • Phase changes • Gas Laws • Scientific method • Observation • Hypothesis • Theory • Law • Manipulated variable • Responding variable • Control variable • Scientific notation • Conversion factor • Accuracy • Precision • Error • Percent error • Direct proportion • Inverse proportion • Slope • Model • Element and Compound • Heterogeneous and Homogeneous Mixtures 	<ul style="list-style-type: none"> • Video clips (various sources) • Notes and Demonstrations 	<ul style="list-style-type: none"> • ACS Reactions website • Learner.org • Youtube • A Demo A Day
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Unit Title: Chemical Bonding

Suggested time frame: Approximately 6 weeks

Standards: S11.C.1.1.2, S11.C.1.1.3

Big Idea: The elements have periodic properties which allow prediction of both physical and chemical behaviors.

Essential Questions: What factors determine the types of chemical bonds that form between particles? What patterns in the properties of the elements contribute to the design and utility of the periodic table?

Competency	Vocabulary	Strategy	Resource
<p>SWBAT use models to demonstrate understanding of the attractive forces between atoms.</p> <ul style="list-style-type: none">• All matter is made of atoms which consist of protons, neutrons, and electrons that are identifiable by location, mass, and charge.• History of atomic theory and the model of the atom.• Elements within the same family on the periodic table have similar chemical and physical properties because of similar atomic structure.• Atoms gain, share, or lose electrons to form chemical bonds applying the rules for stable electron configuration.• Ionic bonds result from the transfer of electrons; covalent bonds result from the sharing of electrons.	<ul style="list-style-type: none">• Protons, neutrons, electrons• Nucleus and orbitals• Periodic Table• Periodic Properties• Metals and Nonmetals• Groups and Periods• Isotopes• Octet Rule• Electron Configurations• Intermolecular and Intramolecular Bonds• Nomenclature	<ul style="list-style-type: none">• Content focused lab experiments• POGIL Activities• Interactive Simulations• Video clips (various sources)• Notes and Demonstrations	<ul style="list-style-type: none">• Texts• Periodic Table• Flinn Scientific• PhET.colorado.edu•

<ul style="list-style-type: none"> • Prediction of bond character based on properties and position on the periodic table. • Matter exists naturally in 3 states on earth: solid, liquid, and gas. 			
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Unit Title: Chemical Reactions

Suggested time frame: Approximately 6 weeks

Standards: 3.1.C.A2, 3.2.C.A4, 3.2.C.B3

Big Idea: Changes in matter are accompanied by changes in energy.

Essential Questions: How are changes in matter accompanied by changes in energy and the laws of conservation of mass and energy?

Competency	Vocabulary	Strategy	Resource
SWBAT conduct simple and safe inquiry based investigations to observe endothermic and exothermic chemical reactions, measure temperature, volume, and mass, and form conclusions based on experimental evidence. <ul style="list-style-type: none"> • Describe solutions and properly apply units of concentration. • Classify reactions (types). • Use stoichiometry to evaluate chemical processes. • Changes in matter can be chemical, physical, or nuclear. 	<ul style="list-style-type: none"> • Endothermic and Exothermic • Balanced Chemical Reaction Equation • Stoichiometry • Rate • Law of Conservation of Mass and Energy • Catalyst • Heating/Cooling Curves • Solutions • Concentration 	<ul style="list-style-type: none"> • Content focused lab experiments • POGIL Activities • PhET Interactive Simulations • Video clips (various sources) • Notes and Demonstrations 	<ul style="list-style-type: none"> • Texts • PhET Website • Chemistry Lab Equipment • Kahn Academy • ACS Reactions website • Learner.org

<ul style="list-style-type: none"> • According to the law of conservation of mass, a chemical change can be represented by a balanced chemical equation. • Factors that can affect the rate of a chemical change include temperature, concentration, nature of the reactant, and catalyst. • Classify substances as acids or bases according to chemical behavior. 	<ul style="list-style-type: none"> • Acid • Base • Buffer • pH • Equilibrium 		
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Unit Title: Physics - Force and Motion

Suggested time frame: Approximately 6 weeks

Standards: S11.A.1.1.5, S11.A.1.3.1, S11.A.3.2.1, S11.C.3.1.1, S11.C.3.1.2, S11.C.3.1.3

Big Idea: Forces between objects can act upon each object to change the position, direction, and/or speed of its motion.

Essential Questions: How can one explain and predict interactions between objects within systems?

Competency	Vocabulary	Strategy	Resource
SWBAT solve problems by applying knowledge of Newton's Laws, performing direct and indirect measurements of the motion of objects and forces acting upon objects and performing graphical analysis of this experimental data.	<ul style="list-style-type: none"> • Frame of Reference • Relative Motion • Position • Displacement • Speed • Velocity • Acceleration • Scalar • Vector 	<ul style="list-style-type: none"> • Content focused lab activities • Inquiry learning Activities • PhET Interactive Simulations • Video clips (various sources) • Notes and Demonstrations 	<ul style="list-style-type: none"> • Textbook • Computer • Computer – Lab Interface • Pasco Motion air track and accessories. • Phet.Colorado.edu • PhysicsClassroom.com • Minute Physics (iTunes) • Veritasium.com

<ul style="list-style-type: none">• The motion of an object can be described by its position, direction and speed.• Newton's three laws of motion can be used to explain and measure the motion of objects• Models and graphs can be used to determine the presence or absence of unbalanced forces.• The property of inertia is an object's resistance to a change in its motion.• Evaluate the forces that affect motion.• Weight is the result of the earth's gravitational force acting upon an object's mass.	<ul style="list-style-type: none">• Projectile• Inertia• Force• Momentum		
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Unit Title: Physics – Energy and Work

Suggested time frame: Approximately 6 weeks

Standards: S11.A.1.3.1, S11.A.1.3.2, S11.A.3.1.4, S11.A.3.3.3, S11.C.2.1.1, S11.C.2.1.3, S11.C.2.1.4, S11.C.3.1.4

Big Idea: Energy can be transferred between objects and/or can be converted into different forms, causing changes to matter.

Essential Questions: How is Energy transferred between objects and converted into different forms?

Competency	Vocabulary	Strategy	Resource
<p>SWBAT describe sources and forms of energy and explain their transformations.</p> <ul style="list-style-type: none">• Energy is the ability to cause change, whereas work is the use of energy to cause that change.• Energy can take different forms including mechanical, Thermal, chemical, and electromagnetic.• Energy can be transferred thermally, mechanically, electrically or chemically in a system.• Energy is conserved (Law of conservation of energy).• Heat energy is transferred between objects of regions by the process of convection, conduction, or radiation.• Compare and contrast energy resources.	<ul style="list-style-type: none">• Work• Energy• Power• Machines• Mechanical Advantage• Efficiency• Potential Energy• Kinetic Energy• Mechanical Energy• Chemical Energy• Electrical Energy• Thermal Energy• Electromagnetic Energy• Temperature• Heat• Radiation• Convection• Conduction• Conservation of Energy	<ul style="list-style-type: none">• Content focused lab activities• Inquiry learning Activities• PhET Interactive Simulations• Video clips (various sources)• Notes and Demonstrations	<ul style="list-style-type: none">• Textbook• Computer• Phet.Colorado.edu• PhysicsClassroom.com• Minute Physics (iTunes)• Veritasium.com

Unit Title: Physics – Vibrations, Waves and Energy transfer of energy

Suggested time frame: Approximately 6 weeks

Standards: S11.A.1.3.1, S11.A.1.3.2, S11.A.3.3.3, S11.C.2.1.1, S11.C.2.1.3, S11.C.2.1.4, S11.A.3.1.4

Big Idea: Waves are produced by vibrations that carry energy from one location to another without the transfer of matter.

Essential Questions: How do waves transfer energy?

Competency	Vocabulary	Strategy	Resource
<p>SWBAT demonstrate an understanding of the transfer of energy using waves.</p> <ul style="list-style-type: none"> • Sound and light energy are transmitted by waves. • Waves can be characterized by their velocity, frequency, wavelength, amplitude and period. • Mechanical waves can be classified according to the motions of the particles within a medium which can be transverse, longitudinal or rotational. • Waves interact with matter by reflection, refraction and/or diffraction which can result in changes in wavelength, frequency and/or speed. • The Doppler Effect occurs when the frequency of a wave at the observer changes due to the 	<ul style="list-style-type: none"> • Vibration • Wave • Medium • Transvers Wave • Longitudinal / Compressional Wave • Rotational Wave (water) • Earthquake Wave • Electromagnetic Wave • Sound • Light • Amplitude • Frequency • Period • Wavelength • Crest • Trough • Line of Equilibrium • Wave Speed • Interference • Standing wave • Pitch 	<ul style="list-style-type: none"> • Content focused lab activities • Inquiry learning Activities • PhET Interactive Simulations • Video clips (various sources) • Notes and Demonstrations 	<ul style="list-style-type: none"> • Textbook • Computer • Phone apps for sound detection and generation • Phet.Colorado.edu • PhysicsClassroom.com • Minute Physics (iTunes) • Vertiasium.com

<p>relative motion between the source and/or observer.</p> <ul style="list-style-type: none">• Electromagnetic waves are non-mechanical waves that have a spectrum that is classified by frequency, wavelength and energy.• Classify materials as transparent, translucent, opaque and polarizers.	<ul style="list-style-type: none">• Color• Doppler Effect• Reflection• Refraction• Diffraction• Polarization• Transparent• Translucent• Opaque		
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