

BUD CARLSON ACADEMY
PHYSICAL SCIENCE
SYLLABUS
MR. BUSHWAY

This course is designed to give students an introduction to the physical aspect of science. This includes many of the more important ideas covered later in Chemistry and Physics which will be taught later in high school. We will cover topics such as Newton's Laws and chemical reactions while working on developing scientific thought processes and integrating science into other aspects of daily life. We will achieve this through small group and class discussion, labs, and numerous hands-on activities inside and outside the classroom. By the end of this course, students should have a solid base in physics and chemistry, as well as a thorough understanding of correct lab procedure and safety, experimentation, and how science relates to the world around us. All instruction and related activities are adapted to the individual pace, ability, and level of the student.

Supplies:

- pencils for labs and drawings (mechanical is fine)
- Blue or black pens for class.
- Notebook for taking daily notes.
- 3 Ring binder (provided)
- Bound composition notebook for labs, preferably with graph-style paper (provided)
- Calculator (optional – a basic calculator will be provided for use in class)

SYLLABUS

Structure of atoms

- Components and properties of matter
- Atomic structure
- Nuclear forces
- Radioactivity

Structure and properties of matter

- Electrons
- Elements/Periodic table
- Bonding
- Compounds

- Solids, liquids, and gases
- Carbon atoms

Chemical reactions

- Chemical reactions occur all around us
- Energy and chemical reactions
- Mechanisms of chemical reactions
- Reaction rates
- Catalysts/enzymes

Motions and forces

- Laws of motion
- Gravity
- Electric force
- Electric forces acting between matter
- Electromagnetic force

Conservation of energy and increase in disorder

- Conservation of energy
- Kinetic, potential, or energy contained by a field
- Heat and temperature
- Increase in disorder over time

Interactions of energy and matter

- Waves
- Electromagnetic waves
- Discrete amounts of energy in atoms/molecules
- Conductors and Insulators

PHYSICAL SCIENCE

Physical Science Competencies	PS1– All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size/amount of substance).
Knowledge/ Skills	<p>S:PS1:11:2.1 Explain that the physical properties of a compound are determined by its molecular structure and the interactions among the molecules.</p> <p>S:PS1:11:2.5 Explain that states of matter rely on the arrangement and motion of molecules; and differentiate between the structures of solids, liquids, and gases.</p> <p>S:PS1:11:2.6 Use physical and chemical properties as determined through an investigation to identify a substance.</p> <p>S:PS1:11:2.7 Explain how properties of elements and the location of elements on the periodic table are related.</p>
Science Process Skills	<ol style="list-style-type: none"> 1. Students will understand the principles of the scientific method and how to apply them to answer questions and solve problems. 2. Students will understand that scientific progress is made by asking relevant questions, conducting careful investigations, and evaluating the validity of results. 3. Students will understand that matter and energy cycle through living and nonliving systems following similar patterns. 4. Students will understand that energy and matter exist in multiple forms in all living and nonliving systems, and can flow within and between all systems. 5. Students will understand that technology is used to identify and address issues of daily life on a local and global scale. 6. Students will understand that current and future learning skills and tools are needed to become active and productive citizens in our global community.
Performance Assessment	<p>Student evidence demonstrates mastery of concepts, broad themes and proficiency standards. Student assessment is based on progress of individual mastery of set lesson objectives, research projects, power point presentations and in depth student response journals. Student completed and corrected lab assignments and assessment rubrics.</p>

PHYSICAL SCIENCE

Physical Science Competencies	PS2– Energy is necessary for change to occur in matter. Energy can be stored, transferred and transformed, but cannot be destroyed.
Knowledge/ Skills	<p>S:PS2:11:1.2 Recognize that atoms interact with one another by transferring or sharing electrons that are furthest from the nucleus; and explain that the outer electrons govern the chemical properties of an element.</p> <p>S:PS2:11:1.4 Recognize that the rates of chemical reactions can vary greatly; and identify the factors that influence these reaction rates, such as how often the reacting atoms and molecules encounter one another, the temperature, and the properties of the reacting species, including shape.</p> <p>S:PS2:11:1.5 Explain relationships between and among electric charges, magnetic fields, electromagnetic forces, and atomic particles.</p> <p>S:PS2:11:2.1 Explain that chemical reactions either release or consume energy.</p> <p>S:PS2:11:2.5 Demonstrate how transformations of energy produce some energy in the form of heat and therefore the efficiency of the system is reduced (chemical, biological, and physical systems).</p> <p>S:PS2:11:3.1 Explain that all energy can be considered to be either kinetic energy, potential energy, or energy contained by a field.</p> <p>S:PS2:11:3.2 Provide examples of how kinetic and potential energy can be transformed from one to the other.</p> <p>S:PS2:11:3.5 Recognize that the human eye can only see a narrow range of wavelengths within the electromagnetic spectrum; and explain how the variations of wavelength within that range of visible light are perceived as differences in color.</p> <p>S:PS2:11:3.6 Describe the relationship between heat and temperature, explaining that heat energy consists of the random motion and vibrations of atoms, molecules, and ions; and that the higher the temperature, the greater the atomic or molecular motion.</p> <p>S:PS2:11:3.7 Explain that waves, such as light, seismic, sound waves, have energy and can transfer energy when they interact with matter.</p> <p>S:PS2:11:3.10 Using information provided about chemical changes, draw conclusions about the energy flow in a given chemical reaction (e.g., exothermic reactions, endothermic reactions).</p>

Science Process Skills	<ol style="list-style-type: none">1. Students will understand the principles of the scientific method and how to apply them to answer questions and solve problems.2. Students will understand that scientific progress is made by asking relevant questions, conducting careful investigations, and evaluating the validity of results.3. Students will understand that matter and energy cycle through living and nonliving systems following similar patterns.4. Students will understand that energy and matter exist in multiple forms in all living and nonliving systems, and can flow within and between all systems.5. Students will understand that technology is used to identify and address issues of daily life on a local and global scale.6. Students will understand that current and future learning skills and tools are needed to become active and productive citizens in our global community.
Performance Assessment	Student evidence demonstrates mastery of concepts, broad themes and proficiency standards. Student assessment is based on progress of individual mastery of set lesson objectives, research projects, power point presentations and in depth student response journals. Student completed and corrected lab assignments and assessment rubrics.

PHYSICAL SCIENCE

Physical Science Competencies	PS3– The motion of an object is affected by force.
Knowledge/ Skills	<p>S:PS3:11:1.1 Explain that magnetic forces are related to the action of electrons and can be thought of as different aspects of a single electromagnetic force; and describe how the interplay of these forces is the basis for electric motors, generators, radio, television, and many other modern technologies.</p> <p>S:PS3:11:1.5 Recognize that electromagnetic forces exist within and between atoms.</p> <p>S:PS3:11:1.6 Recognize that different kinds of materials respond to electric forces in various ways; and differentiate between insulators, semiconductors, conductors and superconductors.</p> <p>S:PS3:11:1.8 Given information (e.g., graphs, data, diagrams), use the relationships between or among force, mass, velocity, momentum, and acceleration to predict and explain the motion of objects.</p> <p>S:PS3:11:2.1 Interpret and apply the laws of motion to determine the effects of forces on the motion of objects.</p> <p>S:PS3:11:2.3 Apply the concepts of inertia, motion, and momentum to predict and explain situations involving forces and motion, including stationary objects and collisions.</p> <p>S:PS3:11:2.4 Explain the effects on wavelength and frequency as electromagnetic waves interact with matter (e.g., light diffraction, blue sky).</p>
Science Process Skills	<ol style="list-style-type: none"> 1. Students will understand the principles of the scientific method and how to apply them to answer questions and solve problems. 2. Students will understand that scientific progress is made by asking relevant questions, conducting careful investigations, and evaluating the validity of results. 3. Students will understand that matter and energy cycle through living and nonliving systems following similar patterns. 4. Students will understand that energy and matter exist in multiple forms in all living and nonliving systems, and can flow within and between all systems. 5. Students will understand that technology is used to identify and address issues of daily life on a local and global scale.

	<p>6. Students will understand that current and future learning skills and tools are needed to become active and productive citizens in our global community.</p>
Performance Assessment	<p>Student evidence demonstrates mastery of concepts, broad themes and proficiency standards. Student assessment is based on progress of individual mastery of set lesson objectives, research projects, power point presentations and in depth student response journals. Student completed and corrected lab assignments and assessment rubrics.</p>

PHYSICAL SCIENCE

<p>Physical Science Competencies</p>	<p>PS4– The growth of scientific knowledge in Physical Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.</p>
<p>Knowledge/ Skills</p>	<p>S:PS4:11:1.1 Recognize that the basic principles of energy, work and power are related to design technology.</p> <p>:PS4:11:2.1 Identify tools, such as thermostats and thermal sensors, and explain their use in environmental control systems.</p> <p>S:PS4:11:3.2 Demonstrate and explain how an engine converts chemical energy in the form of fuel, into mechanical energy in the form of motion.</p> <p>S:PS4:11:3.3 Calculate the efficiency of an engine, and explain why a perfectly efficient engine is impossible.</p> <p>S:PS4:11:3.4 Explain the relationship between energy and power.</p> <p>S:PS4:11:3.5 Explain the benefits of standardization of parts.</p> <p>S:PS4:11:4.1 Explain the kinds of applications of knowledge and skills necessary for jobs/careers specific to the physical sciences.</p>
<p>Science Process Skills</p>	<ol style="list-style-type: none"> 1. Students will understand the principles of the scientific method and how to apply them to answer questions and solve problems. 2. Students will understand that scientific progress is made by asking relevant questions, conducting careful investigations, and evaluating the validity of results. 3. Students will understand that matter and energy cycle through living and nonliving systems following similar patterns. 4. Students will understand that energy and matter exist in multiple forms in all living and nonliving systems, and can flow within and between all systems. 5. Students will understand that technology is used to identify and address issues of daily life on a local and global scale. 6. Students will understand that current and future learning skills and tools are needed to become active and productive citizens in our global community.

**Performance
Assessment**

Student evidence demonstrates mastery of concepts, broad themes and proficiency standards. Student assessment is based on progress of individual mastery of set lesson objectives, research projects, power point presentations and in depth student response journals. Student completed and corrected lab assignments and assessment rubrics.