

**Course Title:** Science – Grade 6  
**Board Approval Date:** 11/18/13  
**Credit / Hours:** NA

**Course Description:**

This course focuses on mastery of the PA Academic Standards for Science and Technology. As students progress through this course they will study standards which deal with physical sciences. Units include motion and forces, machines, energy, chemistry, and light and sound. In April, students will spend time learning about the environment in which they live.

**Learning Activities / Modes of Assessment:**

Large group instruction	Tests and Quizzes
Laboratory experiments	Checklists / Teacher Observation
Small group work	Projects with Rubrics
Computer simulations	Various websites
Summarizing activities	
Homework review	
PSSA practice questions	

**Instructional Resources:**

*Motion, Forces, and Energy* (Prentice Hall, 2007)  
*Chemical Building Blocks* (Prentice Hall 2007)  
*Sound and Light* (Prentice Hall 2007)

## Course Pacing Guide

Course: **Science – Grade Six**

<b>Course Unit (Topic)</b>	<b>Length of Instruction (Days/Periods)</b>
1. Physical Science Introduction	10 days
2. Motion and Forces	40 days
3. Simple Machines	16 days
4. Energy	14 days
5. Matter	40 days
6. Environment	17 days
7. Sound and Light	<u>35 days</u>
<b>DAYS TOTAL</b>	<b>172 Days</b>

Topic: 1-Physical Science Introduction

Subject(s): Science

Days: 10

Grade(s): 6th

Know:

Understand:

Do:

**SI.5-7.9 – Important**

Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.

**SI.5-7.1 – Important**

Understand how theories are developed.

Scientists use many process skills to study the world.

\*observing, predicting, inferring, classifying, making models, communicating

steps of the scientific method

science tools

metric system

Science is a process of thinking and analyzing the world around us.

**SI.5-7.8 – Essential**

Use mathematics in all aspects of scientific inquiry.

**SI.5-7.2 – Important**

Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions.

**SI.5-7.3 – Important**

Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations.

**SI.5-7.6 – Important**

Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories.

Use appropriate process skills in the lab.

Follow the steps of the scientific method to perform an experiment.

Use appropriate tools in the lab.

Use the metric system to do conversions and problem solving.

SI.5-7.9 - Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.

SI.5-7.1 - Understand how theories are developed.

LAB: SCIENCE PROCESS SKILLS (WEIGH IN AIR)

LAB: METRIC MEASUREMENT LICENSE (USING VARIOUS PIECES OF LAB EQUIPMENT TO MEASURE LENGTH, MASS, AND VOLUME)

Topic: 2- Motion and Forces

Subject(s): Science

Days: 40

Grade(s): 6th

Know:

Understand:

Do:

**3.2.6.B1. – Important**  
 FORCE & MOTION OF  
 PARTICLES AND  
 RIGID BODIES -  
 Explain how changes in  
 motion require a force.

**SI.5-7.4 – Important**  
 Describe relationships  
 using inference and  
 prediction.

An object is in motion  
 when its position from a  
 stationary reference  
 point changes.

Speed = distance / time

Velocity is speed in a  
 given direction.

Acceleration = change in  
 speed / time

Motion can be graphed.

A force is a push or a  
 pull.

Forces are described by  
 strength and direction.

Net forces:  
 \*Balanced forces will  
 NOT change an object's  
 velocity.  
 \*Unbalanced forces  
 acting on an object will  
 change the object's  
 velocity.

Friction and gravity are  
 forces that affect the  
 motion of an object.

All motion is affected  
 by outside forces.

**SI.5-7.2 – Important**  
 Identify questions that can be answered through  
 scientific investigations and evaluate the  
 appropriateness of questions.

**SI.5-7.3 – Important**  
 Design and conduct a scientific investigation and  
 understand that current scientific knowledge guides  
 scientific investigations.

**SI.5-7.5 – Important**  
 Use appropriate tools and technologies to gather,  
 analyze, and interpret data and understand that it  
 enhances accuracy and allows scientists to analyze and  
 quantify results of investigations.

**SI.5-7.6 – Important**  
 Develop descriptions, explanations, and models using  
 evidence and understand that these emphasize  
 evidence, have logically consistent arguments, and are  
 based on scientific principles, models, and theories.

**SI.5-7.8 – Essential**  
 Use mathematics in all aspects of scientific inquiry.

**SI.5-7.4 – Essential**  
 Describe relationships using inference and prediction.

LAB: SPEED/ACCELERATION (Calculate speed/  
 acceleration,  
 Convert SI units, Gather, record, and analyze data,  
 Interpret speed and acceleration graphs)

LAB: DESIGN AND BUILD BALOON CARS

SI.5-7.2 - Identify questions that can be answered  
 through scientific investigations and evaluate the  
 appropriateness of questions.

SI.5-7.3 - Design and conduct a scientific  
 investigation and understand that current scientific  
 knowledge guides scientific investigations.

SI.5-7.5 - Use appropriate tools and technologies to  
 gather, analyze, and interpret data and understand

Topic: 2- Motion and Forces

Subject(s): Science

Days: 40

Grade(s): 6th

Know:	Understand:	Do:
<p>Newton's Laws:            *Inertia is an object's resistance to a change in motion.            *Momentum equals mass times velocity.</p>		<p>that it enhances accuracy and allows scientists to analyze and quantify results of investigations.</p> <p>LAB: FRICTION MEASUREMENT</p> <p>LAB: DENSITY (CALCULATING DENSITIES OF VARIOUS MATERIALS)</p> <p>SI.5-7.6 - Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories.</p> <p>SI.5-7.8 - Use mathematics in all aspects of scientific inquiry.</p> <p>3.2.6.B1. - FORCE &amp; MOTION OF PARTICLES AND RIGID BODIES - Explain how changes in motion require a force.</p> <p>3.2.7.B1.a - FORCE &amp; MOTION OF PARTICLES AND RIGID BODIES - Describe how unbalanced forces acting on an object change its velocity.</p> <p>3.2.7.B1.b - FORCE &amp; MOTION OF PARTICLES AND RIGID BODIES - Analyze how observations of displacement, velocity, and acceleration provide necessary and sufficient evidence for the existence of forces.</p> <p>3.2.8.B1.a - FORCE &amp; MOTION OF PARTICLES AND RIGID BODIES - Explain how inertia is a measure of an object's mass.</p> <p>3.2.8.B1.b - FORCE &amp; MOTION OF PARTICLES AND RIGID BODIES - Explain how momentum is related to the forces acting on an object.</p> <p>3.2.5.B1. - FORCE &amp; MOTION OF PARTICLES AND RIGID BODIES - Explain how mass of an object resists change to motion.</p> <p>3.2.8.A1. - PROPERTIES OF MATTER - Differentiate between mass and weight.</p>

Topic: 3- Simple Machines

Subject(s): Science

Days: 16

Grade(s): 6th

Know:	Understand:	Do:
<p><b>3.2.6.B2.a – Essential</b>            ENERGY STORAGE AND TRANSFORMATIONS: CONSERVATION LAWS - Describe energy as a property of objects associated with heat, light, electricity, magnetism, mechanical motion, and sound.</p> <p><b>3.2.6.B1. – Important</b>            FORCE &amp; MOTION OF PARTICLES AND RIGID BODIES - Explain how changes in motion require a force.</p> <p><b>3.4.6.E3. – Essential</b>            ENERGY AND POWER TECHNOLOGIES - Investigate that power is the rate at which energy is converted from one form to another or transferred from one place to another.</p> <p><b>3.4.5.E3. – Important</b>            ENERGY AND POWER TECHNOLOGIES - Explain how tools, machines, products, and systems use energy in order to do work.</p> <p>Work =Force X Distance</p> <p>Power is the rate at which work is done.</p> <p>A machine is a device that changes the amount of force exerted, the</p>	<p>Machines make work easier.</p>	<p>Calculate work done.</p> <p>Calculate power.</p> <p>Calculate mechanical advantage.</p> <p>Calculate efficiency.</p> <p>Classify machines.</p> <p>Build a simple machine using technology.</p> <p>3.2.6.B2.a - ENERGY STORAGE AND TRANSFORMATIONS:CONSERVATION LAWS - Describe energy as a property of objects associated with heat, light, electricity, magnetism, mechanical motion, and sound.</p> <p>3.2.6.B1. - FORCE &amp; MOTION OF PARTICLES AND RIGID BODIES - Explain how changes in motion require a force.</p> <p>3.4.6.E3. - ENERGY AND POWER TECHNOLOGIES - Investigate that power is the rate at which energy is converted from one form to another or transferred from one place to another.</p> <p>3.4.5.E3. - ENERGY AND POWER TECHNOLOGIES - Explain how machines use energy in order to do work.</p> <p>LAB: PULLEYS</p> <p>LAB: LEVERAGE</p>

Topic: 3- Simple Machines  
Subject(s): Science

Days: 16  
Grade(s): 6th

Know:	Understand:	Do:
<p>distance over the which the force is exerted, or the direction in which the force is exerted.</p> <p>Simple machines may be combined to form compound machines.</p>		

Topic: 4- Energy

Subject(s):

Days: 14

Grade(s):

Know:

Understand:

Do:

**3.2.6.B2.a – Essential**  
 ENERGY STORAGE  
 AND  
 TRANSFORMATIONS:  
 CONSERVATION  
 LAWS - Describe  
 energy as a property of  
 objects associated with  
 heat, light, electricity,  
 magnetism, mechanical  
 motion, and sound.

**SI.5-7.1 – Important**  
 Understand how theories  
 are developed.

**SI.5-7.4 – Important**  
 Describe relationships  
 using inference and  
 prediction.

Six forms of energy  
 include: mechanical  
 (potential and kinetic),  
 electrical, thermal,  
 nuclear, chemical, and  
 electromagnetic

Most forms of energy  
 can be transformed.

Heat moves in  
 predictable ways.

According to the law of  
 conservation of energy,  
 energy cannot be created  
 or destroyed.

Energy can be changed  
 from one form to  
 another.

**3.2.6.B2.b – Essential**  
 ENERGY STORAGE AND TRANSFORMATIONS:  
 CONSERVATION LAWS - Differentiate between  
 potential and kinetic energy.

**SI.5-7.2 – Important**  
 Identify questions that can be answered through  
 scientific investigations and evaluate the  
 appropriateness of questions.

**SI.5-7.6 – Important**  
 Develop descriptions, explanations, and models using  
 evidence and understand that these emphasize  
 evidence, have logically consistent arguments, and are  
 based on scientific principles, models, and theories.

Make predictions about the affects of kinetic energy.

Compare and contrast forms of energy.

Use non-fiction text to learn more about energy.

3.2.6.B2.a - ENERGY STORAGE AND  
 TRANSFORMATIONS: CONSERVATION LAWS  
 - Describe energy as a property of objects associated  
 with heat and mechanical motion.  
 SI.5-7.1 - Understand how theories are developed.  
 3.2.5.B2. - ENERGY STORAGE AND  
 TRANSFORMATIONS: CONSERVATION LAWS  
 - Examine how energy can be transferred from one  
 form to another.  
 3.2.7.B2. - ENERGY STORAGE AND  
 TRANSFORMATIONS: CONSERVATION LAWS  
 - Describe how energy can be changed from one  
 form to another.  
 3.2.8.B2. - ENERGY STORAGE AND  
 TRANSFORMATIONS: CONSERVATION LAWS  
 - Identify situations where kinetic energy is  
 transformed into potential energy, and vice versa.  
 3.2.5.B3. - HEAT/HEAT TRANSFER -  
 Demonstrate how heat energy is usually a byproduct  
 of an energy transformation.



Topic: 5- Matter  
 Subject(s):

Days: 40  
 Grade(s):

Know:	Understand:	Do:
<p><b>3.2.6.A1.a – Essential</b>            PROPERTIES OF MATTER - Distinguish the differences in properties of solids, liquids, and gases.</p> <p><b>3.2.6.A3. – Important</b>            MATTER &amp; ENERGY - Explain and give examples of how mass is conserved in a closed system.</p> <p><b>3.2.6.A5. – Important</b>            UNIFYING THEMES - CONSTANCY AND CHANGE Identify characteristic properties of matter that can be used to separate one substance from the other.</p> <p><b>SI.5-7.1 – Important</b>            Understand how theories are developed.</p> <p><b>SI.5-7.4 – Important</b>            Describe relationships using inference and prediction.</p> <p><b>SI.5-7.9 – Important</b>            Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.</p> <p>Matter is anything that has mass and takes up space.</p>	<p>Matter can be described by its chemical and physical properties.</p>	<p><b>3.2.6.A1.b – Essential</b>            PROPERTIES OF MATTER - Differentiate between volume and mass. Investigate that equal volumes of different substances usually have different masses.</p> <p><b>3.2.6.A2. – Essential</b>            STRUCTURE OF MATTER - Compare and contrast pure substances with mixtures.</p> <p><b>3.2.6.A4. – Essential</b>            REACTIONS - Differentiate between physical changes and chemical changes.</p> <p><b>SI.5-7.2 – Important</b>            Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions.</p> <p><b>SI.5-7.3 – Important</b>            Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations.</p> <p><b>SI.5-7.6 – Important</b>            Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories.</p> <p><b>SI.5-7.8 – Essential</b>            Use mathematics in all aspects of scientific inquiry.</p> <p>Classify matter vs. nonmatter.            Observe chemical and physical changes.            Create a density column.            Create heterogeneous and homogeneous mixtures.            Draw the particles of matter in different states.            Create a model of an atom.            Complete research on the topic, "The Periodic Table."            Determine characteristics of an element based on information in the periodic table.</p>

Topic: 5- Matter  
 Subject(s):

Days: 40  
 Grade(s):

Know:	Understand:	Do:
<p>LAB: STEREOSCOPE (LOOK FOR CRYSTAL FORMATION)</p> <p>Know the difference between physical and chemical properties.</p> <p>Know the difference between substances, mixtures, and compounds.</p> <p>The basic structure of an atom.</p> <p>Know how states of matter go through phase changes.</p> <p>The periodic table is organized to show chemical and physical properties of elements.</p>		<p>ACTIVITY: ELEMENT RESEARCH (INDIVIDUAL STUDENT WEB-BASED RESEARCH AND PRESENTATIONS)</p> <p>SI.5-7.2 - Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions.</p> <p>SI.5-7.3 - Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations.</p> <p>SI.5-7.6 - Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories.</p> <p>SI.5-7.8 - Use mathematics in all aspects of scientific inquiry.</p> <p>3.2.6.A1.a - PROPERTIES OF MATTER - Distinguish the differences in properties of solids, liquids, and gases.</p> <p>SI.5-7.1 - Understand how theories are developed.</p> <p>SI.5-7.9 - Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.</p> <p>3.2.7.A1.a - PROPERTIES OF MATTER - Differentiate between elements, compounds, and mixtures.</p> <p>3.2.7.A1.b - PROPERTIES OF MATTER - Identify groups of elements that have similar properties.</p> <p>3.2.7.A1.c - PROPERTIES OF MATTER - Explain how materials are characterized by having a specific amount of mass in each unit of volume (density).</p> <p>3.2.7.A2. - STRUCTURE OF MATTER - Identify atoms as the basic building blocks of matter and that elements are composed of one type of atom.</p>

Topic: 5- Matter  
Subject(s):

Days: 40  
Grade(s):

Know:	Understand:	Do:
		<p>3.2.8.A1. - PROPERTIES OF MATTER - Differentiate between mass and weight.</p> <p>3.2.8.A2. - STRUCTURE OF MATTER - Identify characteristics of elements derived from the periodic table.</p> <p>CCR.W.7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.</p> <p>CCR.W.8 - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.</p>

Topic: 6- Environment

Subject(s): Science

Days: 17

Grade(s): 6th

Know:	Understand:	Do:
<p><b>3.2.6.B6.a – Important</b>            UNIFYING THEMES - ENERGY Demonstrate that heat moves in predictable ways from warmer objects to cooler ones.</p> <p><b>SI.5-7.9 – Important</b>            Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.</p> <p><b>SI.5-7.4 – Important</b>            Describe relationships using inference and prediction.</p> <p><b>4.5.6.C. – Important</b>            Identify key people and events that shaped the environmental history in the United States.</p> <p>Earth Day began in 1970 to raise awareness about the problems affecting our environment.</p> <p>Recycling helps the environment by reducing the amount of trash going to landfills.</p>	<p>Preserving our environment is critical to survival.</p>	<p><b>SI.5-7.5 – Important</b>            Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations.</p> <p><b>SI.5-7.2 – Important</b>            Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions.</p> <p><b>3.4.5.B2. – Essential</b>            TECHNOLOGY AND ENVIRONMENT - Describe how waste may be appropriately recycled or disposed of to prevent unnecessary harm to the environment.</p> <p>Participate in a PPL assembly on energy efficiency. (October)</p> <p>Participate in Earth Day activities. (April)</p> <p>Collect and sort recyclable materials.</p> <p>Use non-fiction text to learn more about environmentally friendly materials.</p> <p>SI.5-7.5 - Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations.</p> <p>SI.5-7.2 - Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions.</p> <p>SI.5-7.9 - Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.</p> <p>4.3.7.A.a - Explain how products are derived from natural resources.</p>

Topic: 6- Environment

Subject(s): Science

Days: 17

Grade(s): 6th

Know:

Understand:

Do:

4.3.7.A.c - Differentiate between renewable and nonrenewable resources.

4.5.6.C. - Identify key people and events that shaped the environmental history in the United States.

LAB: SEPERATION OF MATERIALS IN A MIXTURE (RELATED TO WASTE MANAGEMENT)

Topic: 7- sound and light

Subject(s): Science

Days: 35

Grade(s): 6th

Know:

**3.2.6.B2.a – Essential**  
 ENERGY STORAGE  
 AND  
 TRANSFORMATIONS:  
 CONSERVATION  
 LAWS - Describe  
 energy as a property of  
 objects associated with  
 heat, light, electricity,  
 magnetism, mechanical  
 motion, and sound.

**3.2.6.B5. – Essential**  
 NATURE OF WAVES  
 (SOUND AND LIGHT  
 ENERGY) -  
 Intentionally Blank

There are two types of  
 mechanical waves.  
 (transverse and  
 longitudinal)

A wave's speed is related  
 to its wavelength and  
 frequency.

Reflection, refraction,  
 and diffraction can  
 change a wave's  
 direction.

Interference can be  
 constructive or  
 destructive.

Amplitude, wavelength,  
 frequency, and speed are  
 properties of waves.

Sound is a disturbance  
 that travels through a  
 medium as a  
 longitudinal wave.

Understand:

Sound energy and light  
 energy are transmitted  
 by waves.

Do:

3.2.6.B2.a - ENERGY STORAGE AND  
 TRANSFORMATIONS: CONSERVATION LAWS  
 - Describe energy as a property of objects associated  
 with light, and sound.

3.2.5.B5.a - NATURE OF WAVES (SOUND AND  
 LIGHT ENERGY) - Compare the characteristics of  
 sound as it is transmitted through different materials.

3.2.5.B5.b - NATURE OF WAVES (SOUND AND  
 LIGHT ENERGY) - Relate the rate of vibration to  
 the pitch of the sound.

3.2.7.B5.b - NATURE OF WAVES (SOUND AND  
 LIGHT ENERGY) - Explain the construct of the  
 electromagnetic spectrum.

3.2.7.B5.a - NATURE OF WAVES (SOUND AND  
 LIGHT ENERGY) - Demonstrate that visible light is  
 a mixture of many different colors.

3.2.7.B5.c - NATURE OF WAVES (SOUND AND  
 LIGHT ENERGY) - Describe how sound and light  
 energy are transmitted by waves.

LAB: GPS/COMPASS

LAB: HALF-LIFE CALCULATION

Topic: 7- sound and light  
Subject(s): Science

Days: 35  
Grade(s): 6th

Know:	Understand:	Do:
Electromagnetic waves consist of electric and magnetic fields.		