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SECRETARY OF STATE

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ADMINISTRATIVE LAW DIVISION

Form #2

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OFFICE WEST VIRGINIA SECRETARY OF STATE

NOTICE OF A COMMENT PERIOD ON A PROPOSED RULE

AGENCY: West Virginia Board of Education TITLE NUMBER: 126

RULE TYPE: Legislative ; CITE AUTHORITY: W. Va. Constitution, Article XII, §2, W.Va. Code §18-2-5 and §18-9A-22

AMENDMENT TO AN EXISTING RULE: YES X NO ____

IF YES, SERIES NUMBER OF RULE BEING AMENDED: 44C

TITLE OF RULE BEING AMENDED: 21st Century Science Content Standards and Objectives for West Virginia Schools (2520.3)

IF NO, SERIES NUMBER OF NEW RULE BEING PROPOSED: _____

TITLE OF RULE BEING PROPOSED: _____

IN LIEU OF A PUBLIC HEARING, A COMMENT PERIOD HAS BEEN ESTABLISHED DURING WHICH ANY INTERESTED PERSON MAY SEND COMMENTS CONCERNING THESE PROPOSED RULES. THIS COMMENT PERIOD WILL END ON September 2, 2006 AT 4:45 p.m. . ONLY WRITTEN COMMENTS WILL BE ACCEPTED AND ARE TO BE MAILED TO THE FOLLOWING ADDRESS:

Keith Butcher, Executive Director
Office of Federal Progams and Accountability
West Virginia Department of Education
Capitol Building 6, Room 330
1900 Kanawha Boulevard, East
Charleston, West Virginia 25305-0330

COMMENTS TO BE CONSIDERED ARE LIMITED TO THIS PROPOSED RULE.

Jack McClanahan
Deputy State Superintendent of Schools

ATTACH A **BRIEF** SUMMARY OF YOUR PROPOSAL

EXECUTIVE SUMMARY
FOR
WEST VIRGINIA BOARD OF EDUCATION POLICY 2520.3
21st CENTURY SCIENCE CONTENT STANDARDS AND OBJECTIVES FOR WEST VIRGINIA SCHOOLS

Policy Number and Title: West Virginia Board Of Education Policy 2520.3: *21st Century Science Content Standards and Objectives for West Virginia Schools*

Background: Policies 2520 define the content standards and objectives for the programs of study required by Policy 2510 and establish a standardized format for such.

- The original effective date of the policy was July, 1997.
- In October, 2001, a revision of the Policy incorporating the Content Standards and Objectives (CSOs) for Mathematics, Reading and English Language Arts, Science, Social Studies and Technology was presented to the West Virginia Board of Education.
- Policy 2520.3 was placed on public comment and was approved by the Board on December 13, 2001 and became effective on July 1, 2003.

Major Revisions or Reasons for New Policy: A repeal and replace of Policy 2520.3 is being recommended due to the format changes. A crosswalk from the 2003 science standards and this revision has been provided.

- The format of the science CSOs has been redesigned to facilitate easier use by West Virginia educators.
- The science CSOs have been revised to
    - reorganize the science content under three standards,
    - incorporate higher levels of critical thinking skills and problem solving skills,
    - establish an improved alignment with national assessments (NAEP, ACT, and SAT), and
    - incorporate 21st century knowledge and skills that West Virginia students will need to be successful in the global world of the 21st century.

Impact:

- Students will be better prepared for success on national assessments, in postgraduate studies and in the workplace of the 21st century.
- Students will acquire a higher level of critical thinking and problem solving skills needed for success in post graduate studies and the workplace of the 21st century.
- The revised format will better enable West Virginia educators to focus instruction on the approved CSOs.

TITLE 126
LEGISLATIVE RULE
BOARD OF EDUCATION

SERIES 44C
21st CENTURY SCIENCE CONTENT STANDARDS AND OBJECTIVES FOR WEST VIRGINIA SCHOOLS (2520.3)

§126-44C-1. General.

1.1. Scope. -- West Virginia Board of Education Policy 2510 provides a definition of a delivery system for, and an assessment and accountability system for, a thorough and efficient education for West Virginia public school students. Policy 2520.1 defines the content standards (or instructional goals) and objectives for the science as required by W.Va. 126CSR42 (Policy 2510).

1.2. Authority. -- W.Va. Constitution, Article XII, §2, W. Va. Code §18-2-5 and §18-9A-2.

1.3. Filing Date. --

1.4. Effective Date. --

1.5. Repeal of former rule.-- This legislative rule repeals and replaces W. Va. 126CSR44C "Science Content Standards and Objectives for West Virginia Schools (2520.3)" filed February 25, 2003 and effective July 1, 2003.

§126-44C-2. Purpose.

2.1. This policy defines the content standards (or instructional goals) and objectives for the program of study required by Policy 2510 in science.

§126-44C-3. Incorporation by Reference.

3.1. A copy of 21st Century Science Content Standards and Objectives for West Virginia Schools is attached and incorporated by reference into this policy. Copies may be obtained in the Office of the Secretary of State and in the West Virginia Department of Education, Office of Instructional Services.

§126-44C-4. Summary of the Content Standards and Objectives.

4.1. The West Virginia Board of Education has the responsibility for establishing high quality standards pertaining to all educational standards (W.Va. Code §18-9A-22). The content standards and objectives provide a focus for teachers to teach and students to learn those skills and competencies essential for future success in the workplace and further education. The document includes content standards for science, an explanation of terms, objectives that reflect a rigorous and challenging curriculum, and performance descriptors.

West Virginia Department of Education

West Virginia Board of Education Policy 2520.3
21st Century Science Content Standards and Objectives for West Virginia Schools

Steven L. Paine
State Superintendent

Foreword

A 21st century science curriculum is an increasingly important aspect of developing learners prepared for success in the 21st century. Thus, the West Virginia Board of Education and the West Virginia Department of Education are pleased to present Policy 2520.3, 21st Century Science Content Standards and Objectives for West Virginia Schools. The West Virginia Science Standards for 21st Century Learning includes 21st century *content* standards and objectives as well as 21st century standards and objectives for *learning skills* and *technology tools*. This broadened scope of science curriculum is built on the firm belief that quality engaging instruction must be built on a curriculum that triangulates rigorous 21st century content, 21st century learning skills and the use of 21st century technology tools.

Committees of educators from across the state convened to revise the content standards and objectives. The overarching goal was to build a rigorous, relevant and challenging science curriculum that would prepare students for the 21st century. West Virginia educators, including regular classroom teachers, special education teachers, and teachers representing higher education institutions played a key role in shaping the content standards to align with national standards, rigorous national assessments and research and best practice in the field of science education. The contribution of these professionals was critical in creating a policy that is meaningful to classroom teachers and appears in a format that can easily be used and understood.

Policy 2520.3 is organized around the three major components of a standards-based curriculum: learning standards, instructional objectives and performance descriptors. The learning standards are the *broad descriptions* of what *all* students must know and be able to do at the conclusion of the instructional sequence. The accompanying grade-level objectives are specific descriptors of knowledge, skills and attitudes that when mastered will enable the student to attain the standard. The instructional objectives guide instructional *planning* and provide a basis for determining appropriate *assessments, instructional strategies and resources*. The performance descriptors provide the basis for *assessing* overall student competence of grade level standards. The performance descriptors define the five student performance levels ranging from novice to distinguished. With the ultimate goal of "learning for all," these descriptors allow the teacher, students and parents to judge the *level* of student proficiency in each 21st century learning standard.

In combination, the use of learning standards, instructional objectives and performance descriptors become a comprehensive guide for delivering a rigorous and relevant science curriculum to all West Virginia students. These elements, when used to guide the instructional process and when delivered with the creativity and instructional expertise of West Virginia teachers, will become a powerful resource for preparing students to meet the challenges of the 21st century.

Steven L. Paine
State Superintendent of Schools

Explanation of Terms

Content Standards are broad descriptions of what students should know and be able to do in a content area. Content standards describe what students' knowledge and skills should be at the end of a K-12 sequence of study.

Objectives are incremental steps toward accomplishment of content standards. Objectives are listed by grade level and are organized around the content standards. Objectives build across grade levels as students advance in their knowledge and skills.

Performance Descriptors describe in narrative format how students demonstrate achievement of the content standards. West Virginia has designed five performance levels: distinguished, above mastery, mastery, partial mastery and novice. Performance Descriptors serve two functions. Instructionally, they give teachers more information about the level of knowledge and skills students need to acquire. Performance levels and descriptors are also used to categorize and explain student performance on statewide assessment instruments.

Numbering of Standards
The number for each content standard is composed of four parts, each part separated by a period:

- the content area code is SC for Science,
- the letter S, for Standard,
- the grade level (exceptions are grades 10-12 science courses) and
- the standard number.

Illustration: SC.S.4.1 refers to fourth grade science content standard #1.

Numbering of Objectives
The number of each objective is composed of five parts, each part separated by a period:

- the content area code (SC for Science),
- the letter O is for Objective,
- the grade level (exceptions are grades 10-12 science courses),
- the number of the content standard addressed, and
- the objective number.

Illustration: SC.O.6.2.3 refers to a science sixth grade objective that addresses standard #2 in science, and that is the third objective listed under that standard.

Numbering of Performance Descriptors
The number for each group of three performance descriptors is composed of four parts, each part separated by a period:

- the content area (SC for Science),
- the letters PD are for Performance Descriptors,
- the grade level (See exceptions noted above for grade level under numbering of objectives), and
- the standard number.

Illustration: SC.PD.9.2 refers to science performance descriptors for ninth grade, content standard 2.

Unique Electronic Numbers (UENs)
Unique Electronic Numbers (or UENs) are numbers that help to electronically identify, categorize and link specific bits of information. Once Policy 2520.3 is available on the Web, each standard, each objective, and each group of five performance descriptors will have a Unique Electronic Number (UEN) that will always remain the same.

The codes printed in Policy 2520.3 form the basis of the UENs. The only additional set of numbers that will be added to each code to formulate its UEN will be a prefix that indicates the year and month that a particular version of Policy 2520.3 is approved by the State Board of Education.

The prefix for the UENs for each content area in Policy 2520.3 is noted at the top of each page containing standards, objectives and performance descriptors. As sections of 2520.3 are revised, UENs will be changed to reflect the new approval date.

UENs (Unique Electronic Numbers) are unique numbers that facilitate implementation of WV Standards into Electronic formats such as Databases and XML Files. The WV Department of Education encourages everyone who is going to use the WV Content Standards in any kind of electronic distribution, alignment, or software development to use the UENs so that all efforts can be cross-referenced and there is consistency across initiatives.

Illustration: The UEN for fifth grade science standard #2 will be "200602.SC.S.5.2".

Abbreviations

Content Areas

SC	Science

High School Courses

Science

AB	Advanced Biology
AC	Advanced Chemistry
AP	Advanced Physics
AES	Advanced Earth Science
BTC	Biology – Technical Conceptual
CTC	Chemistry – Technical Conceptual
HAP	Human Anatomy and Physiology
PTC	Physics – Technical Conceptual

Other Abbreviations

PD	Performance Descriptors
O	Objective
S	Standard (Content Standard)

SCIENCE – POLICY 2520.3

The science content standards identify what students should know, understand and be able to do in the natural sciences throughout their K-12 education. Because each content standard utilizes the knowledge and skills of other standards, they are designed to be used as an integrated whole. Although material can be added to the content standards, using only a subset of the standards will leave gaps in the students' scientific literacy.

A three-dimensional instructional strategy model must be utilized to address the science curriculum and assure students' depth of understanding and breadth of knowledge. That model uses the nature, content and application of science concepts to develop scientific inquiry and reasoning skills in students.

Standard 1: Nature of Science
The study of science as a human endeavor provides for the acquisition of ideas leading toward the current knowledge base that represents science content. The nature of science encompasses the basic values and beliefs that make up the scientific world view, how scientists go about their work and the general culture of scientific enterprise. Studying historical and current discoveries of scientists and scientific milestones provides students with information about how discoveries have influenced current scientific thought and advancements. Students should understand that the continuous development of scientific knowledge shapes history. The study of the history and nature of science clarifies scientific inquiry and the role of science in the development of world cultures. Students will engage in active inquiry through investigations and hands-on activities a minimum of 50% of the instructional time. Developing scientific literacy requires a learning environment in which students actively participate in meaningful hands-on activities while developing current technology skills. These investigations explore the natural world, require critical thinking and develop process skills. Learning activities are sequenced to shape, modify and develop students' knowledge in order for them to become independent inquirers.

Standard 2: Content of Science
Science subject matter focuses on the scientific facts, concepts, principles, theories and models that are important for all students to know, understand and apply. Through the integration of the fields of science and the development of unifying themes, students will understand the interrelationships among biology, chemistry, physics and the earth sciences. Scientifically literate students will make connections in the formal education setting and will apply their knowledge and skills to daily life experiences. The objectives describe the specific subject matter/concepts that students are to master at each grade level.

Standard 3: Application of Science
Broad unifying themes complement the perspectives presented in the other content standards. These themes are fundamental to understanding and unifying the various science disciplines. Major unifying themes are systems, models and changes. Scientific design and application permits the extension of senses, the enhancement of the knowledge base, transportation of materials and information, synthesizing of new products and the modification of the world. Students must learn to use technology to analyze situations, gather relevant information, generate and evaluate creative ideas, pose tangible solutions and communicate their analyses, results and suggestions concisely. The need to adapt to the rapid changes that are likely to occur in the future makes it imperative that students develop a broad spectrum of technology-related skills and an openness to change. Applying science and technological innovations to personal and social issues such as health, populations, resources and

environment helps students to develop decision-making skills. As students expand their conceptual horizons, they should recognize that collective individual actions manifest as societal issues. Students must recognize that society cannot afford to deal only with symptoms; personal and societal actions must be focused on elimination of the causes of problems. Students should recognize that unless imposed by legislation social change involves negotiation among different interest groups. Students must be allowed to encounter and examine social change in a variety of current and historical contexts.

The Role of Technology

West Virginia's vision for education includes the integration of technology throughout the curriculum so that all West Virginia students have the opportunity to develop technology skills that support learning and provide the ability to adapt to change. Successful learning environments provide opportunities for students to use education technology interwoven with relevant curricular content. West Virginia teachers are responsible for integrating technology appropriately in the students' learning environment.

Organization of the Science Program of Study

The West Virginia Science Program of Study is drawn from the National Science Education Standards and the Project 2061 Benchmarks to promote a rigorous and challenging science curriculum. Through experiencing a spiraling, inquiry-based program of study, students in grades K-10 will develop foundational knowledge and skills in the physical sciences, the life sciences, and the earth and space sciences. To assure scientific literacy for all students, a coordinated, integrated approach is utilized in grades K-10. Students in the 10^{th}, 11^{th} and 12^{th} grades participate in advanced in-depth laboratory-based elective courses designed to expand their conceptual understanding and enhance their research and laboratory skills.

Kindergarten Science Content Standards and Objectives

The Kindergarten Science objectives emphasize the process skills. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy and the use of 21st century skills in the physical sciences, the life sciences and the earth and space sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes and models. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Kindergarten Science enhances the child's natural curiosity about the environment and augments the awe and wonder of inquiries and discoveries using the senses and by hands-on manipulation of objects to build a strong foundation of concepts blended with safety principles. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.K.1	Students will • demonstrate an understanding of the history and nature of science as a human endeavor encompassing the contributions of diverse cultures, scientists, and careers. • demonstrate the abilities and understanding necessary to do scientific inquiry. • demonstrate the ability to think and act as scientists by engaging in active inquiries and investigations, while incorporating hands-on activities.

Performance Descriptors SC.PD.K.1

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students ask questions about themselves and their world and search for answers; use safety techniques; identify and describe unknown objects or events using their senses or scientific instruments.	Students ask questions about themselves and others; use safety techniques; compare and contrast objects or events using their senses or scientific instruments.	Students ask questions about themselves and their world; use safety techniques; explore and describe objects and events using their senses and scientific instruments.	Students ask questions about themselves and their world; describe objects or events by using their senses or scientific instruments safely.	Students ask questions about themselves; identify objects or events using their senses or scientific instruments safely.

SC.O.K.1.1	ask questions about themselves and their world.
SC.O.K.1.2	listen to and discuss stories about the lives and discoveries of scientists.
SC.O.K.1.3	demonstrate curiosity, initiative and creativity by asking questions about the environment noting patterns and variations of natural objects (e.g., trees, leaves, or animal structures).
SC.O.K.1.4	explore and describe objects and events using the five senses to develop observational skills and make predictions based on personal observation.
SC.O.K.1.5	use scientific instruments and everyday materials to investigate the natural world (e.g., hand lens, balance, or magnets).

SC.O.K.1.6	use safe and proper techniques for handling, manipulating and caring for science materials (e.g., follow safety rules, maintain a clean work area, or treat living organisms humanely).
SC.O.K.1.7	collect and record information in a variety of ways (e.g., drawings, weather calendar, or graphs).

SC.S.K.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology and the earth and space sciences. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.

Performance Descriptors SC.K.PD.2

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students compare and contrast living and nonliving things; describe life cycles of living organisms and their rate of growth; develop a classification system to sort objects; recognize that water can change states; demonstrate properties of magnetism; compare force and motion of objects; record weather changes and the effect on living things; investigate properties of soil.	Students distinguish between living and nonliving things; compare life cycles of organisms; classify objects; describe solids, liquids and gases; classify objects as magnetic or nonmagnetic; describe changes in an object's motion and energy; compare weather over time; compare land and water features.	Students identify living and nonliving things; describe changes in plants and animals and their environment; sort and group objects; identify solids and liquids; explore magnetic properties, motion and changes in energy; identify celestial objects and changes in weather; compare differences in earth materials.	Students identify living and nonliving things; list changes in plants and animals; sort objects according to a scheme; name a solid and a liquid; recognize that some objects are magnetic; identify changes in motion and energy; observe daily changes in weather; identify earth materials.	Students name a living and nonliving thing; observe plants and animals in the environment; identify colors; name a solid or liquid; examine a magnet; differentiate between fast and slow; identify the sun and moon; observe earth materials.

SC.O.K.2.1	using the five senses, identify living and non-living things.
SC.O.K.2.2	observe and describe the movement, growth and changes in plants and animals.
SC.O.K.2.3	observe and describe models of plants and animals in different environments (e.g., terrariums, aquariums, animals and plants in a forest, pond, or field).
SC.O.K.2.4	describe, compare, sort and group objects in terms of what they are made of (e.g., clay, cloth, paper, or metal) and their physical properties of size, shape, color, weight or texture.
SC.O.K.2.5	identify liquids and solids.
SC.O.K.2.6	identify colors.
SC.O.K.2.7	explore and describe changes in energy (e.g., hot/cold or light/dark).
SC.O.K.2.8	explore and discuss magnetic properties of objects.

SC.O.K.2.9	explore and state different ways objects can be moved (e.g., straight, circular, fast, or slow).
SC.O.K.2.10	observe and record daily changes in weather (e.g., clouds or air temperature).
SC.O.K.2.11	identify objects in the day and night sky (e.g., moon, stars, or sun).
SC.O.K.2.12	observe and compare differences in earth materials.

SC.S.K.3	Students will • recognize models as representations of real things. • observe that changes occur gradually, repetitively, or randomly within the environment. • listen and be tolerant of different viewpoints while working in collaborative groups. • observe and identify the use of tools and appliances in everyday life.

Performance Descriptors SC.PD.K.3

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Given a sample, construct a model; describe changes that occur within the environment; be tolerant of different viewpoints while working in a group; choose an appropriate tool or appliance to accomplish a specified task.	Recognize and use models as representations of real things; describe changes that occur within the environment; be tolerant of different viewpoints while working in a group; describe the use of a tool or appliance in everyday life.	Recognize models as representations of real things; observe and identify changes that occur within the environment; be tolerant of different viewpoints while working in a group; observe and identify the use of tools and appliances in everyday life.	Recognize models as representations of real things; name a change that occurs within the environment; be tolerant of different viewpoints while working in a group; identify tools or appliances in everyday life.	Recognize models of real things; talk about changes that occur in the environment; be tolerant of different viewpoints while working in a group; name a tool or appliance.

SC.O.K.3.1	recognize that models are representations of real things.
SC.O.K.3.2	observe and point out that change occurs gradually, repetitively, or randomly within the environment.
SC.O.K.3.3	observe and identify the uses of tools and appliances at home and at play.
SC.O.K.3.4	work in groups, listen to and be tolerant of different viewpoints.

First Grade Science Content Standards and Objectives

The First Grade Science objectives build on the process skills and add data gathering and reporting. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy and the use of 21st century skills in the fields of biology, chemistry, physics, and earth and space sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes, and models. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated in all activities. First Grade Science continues the excitement of learning about the natural world and allows the beginning of experimentation and data collection to emphasize the tools of science and the properties of matter. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.1.1	Students will • demonstrate an understanding of the history and nature of science as a human endeavor encompassing the contributions of diverse cultures, scientists, and careers. • demonstrate the abilities and understanding necessary to do scientific inquiry. • demonstrate the ability to think and act as scientists by engaging in active inquiries and investigations, while incorporating hands-on activities.

Performance Descriptors SC.PD.1.1

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students relate science discoveries to their world; use science content to explain environmental changes; use a variety of communication techniques to explain the reason for classifying.	Students relate scientist's discoveries to their own lives; develop a hypothesis to explain environmental changes; use a variety of communication techniques to explain the reason for classifying; use oral communication to explain classification systems.	Students discuss scientists' lives and discoveries; question environmental changes; compare information by using a classification system; use a variety of communication techniques to safely collect and record information.	Students discuss scientists' lives; identify environmental changes; safely collect and record information.	Students listen to a story about a scientist; observe environmental changes; sort objects.

SC.O.1.1.1	ask questions about themselves and their world.
SC.O.1.1.2	discuss the lives and discoveries of scientists after listening to stories about their lives and discoveries.
SC.O.1.1.3	demonstrate curiosity, initiative and creativity by questioning observations of changes in the environment (e.g., life cycles, motion of celestial objects, or sun and shadow).
SC.O.1.1.4	use scientific instruments and everyday materials to investigate the natural world (e.g., hand lens, balance, magnets, thermometer,

	seeds, or rocks).
SC.O.1.1.5	use safe and proper techniques for handling, manipulating and caring for science materials (e.g., follow safety rules, maintain a clean work area, or treat living organisms humanely).
SC.O.1.1.6	collect, record and compare information using a variety of classification systems (e.g., ordering, sorting, or sequencing) and using a variety of communication techniques (e.g., sketches, pictographs, or models).

SC.S.1.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology and the earth and space sciences. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.

Performance Descriptors SC.PD.1.2

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students categorize living and nonliving objects; construct diagrams to represent life cycles of various plants and animals; investigate properties of magnetism; explain how water changes state; compare and contrast the buoyancy of materials; plan a recycling project; discuss factors that affect change in an objects motion; explore pitch and volume of sound; predict weather changes and its effect on living things; compare and contrast changes in the earth and sky; draw a diagram representing land and water features; describe possible outcomes due to polluted air.	Students compare and contrast living and nonliving objects; sequence life cycles of living organisms; demonstrate properties of magnetism; predict the buoyancy of objects in water; identify materials that can be recycled; compare the force and motion of objects; compare and contrast sounds; compare changes in the weather to its effect on living things; identify and explain the changes in earth and sky; identify land and water features on a diagram; list air pollutants.	Students classify objects as living and non-living; describe needs, growth changes and life cycles in living organisms; classify objects as magnetic or nonmagnetic; recognize that water can change states and investigate buoyancy of objects in water; recognize that materials can be recycled; describe changes in an object's motion; demonstrate that sounds are produced by vibrations; record changes in weather and its effect on living things; discuss the importance of celestial objects and their movement; using models, compare land and water features; investigate properties of soil; and discuss the	Students identify living and nonliving objects; list changes in life cycles; explore and discuss magnetic properties of matter; name water in its three states; identify changes in an object's motion; identify that sound is produced by vibrations; identify changes in weather; identify the movement of the sun and moon; identify land and water features; name parts in soil; list uses of air.	Students list living and nonliving objects; name basic needs of living things; recognize that some objects are magnetic; identify liquids and solids; name an object that vibrates; observe changes in weather; identify the sun, moon and stars; identify land and water features; observe soil; name an important use of air.

		important uses of air.		

SC.O.1.2.1	classify objects as living or non-living.
SC.O.1.2.2	identify that most living things need water, food, light and air.
SC.O.1.2.3	describe changes in life cycle of living organisms.
SC.O.1.2.4	identify the parts of growing plants as they develop.
SC.O.1.2.5	depict movement of living things in air, water and on land. (e.g., birds flying, fish swimming, or worms burrowing in soil).
SC.O.1.2.6	recognize that materials are composed of smaller parts that may be seen with a magnifier.
SC.O.1.2.7	recognize that materials can be recycled and used again, sometimes in different forms.
SC.O.1.2.8	recognize that water can change from one form to another and give examples of changes.
SC.O.1.2.9	predict and investigate the buoyancy of objects in water.
SC.O.1.2.10	classify objects as magnetic or non-magnetic.
SC.O.1.2.11	observe and record shadows at different times of the day.
SC.O.1.2.12	describe the changes in the motion of objects (e.g., slowing down, speeding up, or curving).
SC.O.1.2.13	demonstrate that sounds are produced by vibrations.
SC.O.1.2.14	observe, identify and record changes in weather and effects on living organisms.
SC.O.1.2.15	recognize that the sun, moon, and stars appear to move.
SC.O.1.2.16	observe and discuss the importance of objects in the day and night sky.
SC.O.1.2.17	use a model to compare land and water features on the Earth.
SC.O.1.2.18	identify important uses of air.
SC.O.1.2.19	investigate and compare the properties of soil (e.g., sand, clay, or humus).

SC.S.1.3	Students will • identify how the parts of a system interact. • recognize and use models as representations of real things. • demonstrate the ability to distinguish between natural and man-made objects. • listen and be tolerant of different viewpoints while working in collaborative groups. • demonstrate the ability to evaluate the impact of different points of view on health, population, resources and environmental practices.

Performance Descriptors SC.PD.1.3

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students describe and identify how parts of a system interact; construct and describe a model; compare and contrast	Students describe and identify how parts of a system interact; construct a model as representations of real things; classify man-	Students identify how parts of a system interact; recognize and use models as representations of real things; distinguish between	Students list parts of a system; recognize and use models; name a natural and a man-made object; work in collaborative groups; list	Students name a system; recognize models; name a natural or man-made object; name a conservation practice.

natural and man-made objects; demonstrate tolerance of different points of view; engage and involve the community in conservation practices.	made and natural items; demonstrate tolerance of different points of view; engage in conservation practices.	natural and man-made objects; demonstrate tolerance of different points of view; engage in conservation practices.	conservation practices.	

SC.O.1.3.1	identify that systems are made of parts that interact with one another.
SC.O.1.3.2	use models as representations of real things.
SC.O.1.3.3	distinguish between natural and man-made objects.
SC.O.1.3.4	listen to and be tolerant of different viewpoints while working in collaborative groups.
SC.O.1.3.5	develop respect and responsibility for the environment by engaging in conservation practices (e.g., recycling, or trash clean-up).

Second Grade Science Content Standards and Objectives

The Second Grade Science objectives build upon the early stages of experimentation and maintenance of natural curiosity. Through a spiraling, inquiry-based program of study and the use of 21st century skills, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics and earth and space sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes and models. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated in all activities. Second Grade Science will provide opportunities for developmental and academic growth. The activities will introduce the concept that science and technology are interrelated. The curricular thrust will be to develop early problem-solving skills through observation, experimenting and concluding. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.2.1	Students will • demonstrate an understanding of the history and nature of science as a human endeavor encompassing the contributions of diverse cultures, scientists, and careers. • demonstrate the abilities and understanding necessary to do scientific inquiry. • demonstrate the ability to think and act as scientists by engaging in active inquiries and investigations, while incorporating hands-on activities.

Performance Descriptors SC.PD.2.1

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students interview people in scientific careers; design and conduct investigations using safe techniques, draw conclusions and present their findings.	Students relate science careers to their role in the community; design and conduct simple investigations using safe techniques and draw conclusions from collected data.	Students identify and discuss science careers in their community; design and conduct simple investigations using safe techniques; describe trends of data and make predictions; use scientific tools.	Students discuss science careers; carry out a directed investigation using safe techniques; collect and record data; classify tools.	Students list careers in science; observe simple investigations and view data collected; identify scientific tools.

SC.O.2.1.1	interpret science as the human's search for an understanding of the world by asking questions about themselves and their world.
SC.O.2.1.2	compare the lives and discoveries of scientists of different cultures and backgrounds.
SC.O.2.1.3	identify and discuss science careers in the community.
SC.O.2.1.4	demonstrate curiosity, initiative and creativity by observing, classifying, comparing and analyzing natural objects in the environment.
SC.O.2.1.5	manipulate scientific instruments and everyday materials to investigate the natural world (e.g., hand lens, balance, thermometer,

	metric ruler, magnets, weather instruments, or calculators).
SC.O.2.1.6	measure the length and width of various objects using standard and non-standard units (e.g., metric ruler, paper clips, or counting bears).
SC.O.2.1.7	use safe and proper techniques for handling, manipulating, and caring for science materials (e.g., follow safety rules, maintain a clean work area, or treat living organisms humanely).
SC.O.2.1.8	design and conduct simple investigations; observe, collect and record information using a variety of classification systems; describe trends of data; and make predictions based on that data (e.g., seasonal changes and plants or temperature and weather).

SC.S.2.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories, and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology and the earth and space sciences. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.

Performance Descriptors SC.PD.2.2

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students will relate various structures and functions of different plants and animals; compare and contrast various life cycles of plant and animals; explain the differences in organisms that live in various habitats; compare and contrast the changes in states of matter; predict the properties of light, heat, and magnetism; predict motion when force is applied; design an experiment to show variable pitch; predict changes in the earth and sky; examine and classify fossils.	Students will compare and contrast structures of plant and animals; construct diagrams to represent life cycles of various plants and animals; predict the organisms that would live in a habitat; explain the changes in each state of matter; investigate properties of light, heat, and magnetism; explain the effects of force verses motion and the changes in pitch and volume; compare and contrast the changes on earth and in the sky; describe and correlate fossils to original organisms.	Students identify and explain various structures and functions in plants and animals; sequence illustrations of plant and animal life cycles and relate them to the human life cycle; compare and contrast habitats; identify physical properties and changes of matter; identify and demonstrate properties of light, heat, and magnetism; explore sound and compare the force and motion of objects; observe, identify and explain the changes in earth and the sky; describe and correlate fossils to original organisms.	Students identify various structures of plant and animals; describe life cycles of plants and animals and different habitats; identify physical properties of matter; identify the properties of light, heat, and magnetism; explore the motion of objects; identify the changes in the earth and sky; explain how fossils form.	Students name structures of plants and animals; identify plant and animal life cycles; list habitats; name a physical property of matter; recognize properties of light, heat, and magnetism; describe an object's motion; describe daily weather changes; identify a fossil.

SC.O.2.2.1	identify that plants and animals have different structures.
SC.O.2.2.2	identify the structures of living things including their systems, and explain their functions (e.g., wings for flying, fins for swimming, or roots for support and obtaining water).
SC.O.2.2.3	sequence pictures of events to illustrate the changes in the life cycle of plants and animals.
SC.O.2.2.4	relate observations of the butterfly's life cycle to student's own growth and change.
SC.O.2.2.5	compare and contrast simple models of different kinds of habitats, including a forest and a stream.
SC.O.2.2.6	identify materials as a solid, a liquid or a gas and recognize that matter takes up space, and can change from one state to another.
SC.O.2.2.7	demonstrate that a magnet can attract or repel objects.
SC.O.2.2.8	identify which materials and colors conduct heat better than others.
SC.O.2.2.9	demonstrate that a shadow is cast when an object blocks light.
SC.O.2.2.10	compare the effects of force on the motion of an object.
SC.O.2.2.11	explore how sound can change in pitch and volume.
SC.O.2.2.12	identify and examine changes in the earth's surface (e.g., weathering, or erosion).
SC.O.2.2.13	identify the effects of wind movement.
SC.O.2.2.14	observe and describe different types of precipitation.
SC.O.2.2.15	describe daily and seasonal weather changes.
SC.O.2.2.16	explain how the rotation of the Earth on its axis causes day and night.
SC.O.2.2.17	understand that the moon has phases.
SC.O.2.2.18	describe how fossils are formed, and match a fossil, or a picture of a fossil, to its original organism.

SC.S.2.3	Students will • identify how the parts of a system interact. • recognize and use models as representations of real things. • observe that changes occur gradually, repetitively, or randomly within the environment. • recognize that common objects and events incorporate science to solve human problems and enhance the quality of life. • demonstrate the ability to listen to, be tolerant of, and evaluate the impact of different points of view on health, population, resources and environmental practices while working in collaborative groups.

Performance Descriptors SC.PD.2.3

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students describe and identify how parts of a system interact; construct and describe a model; observe and identify patterns of change, consistency or regularity within the environment; use	Students describe and identify how parts of a system interact; construct a model as representations of real things; observe and identify patterns of change, consistency or regularity within the environment; use	Students identify how parts of a system interact; recognize and use models as representations of real things; observe and identify patterns of change, consistency or regularity within the environment;	Students list parts of a system; recognize and use models; name patterns of change within the environment; give examples of science and technology in daily events work in collaborative groups; list	Students name a system; recognize models; list an environmental change; name an example of technology in daily events; name a conservation practice.

technology to gather and communicate data; demonstrate tolerance of different points of view; engage and involve the community in conservation practices.	technology to gather data; demonstrate tolerance of different points of view; engage in conservation practices.	recognize that science is incorporated into solving problems and enhancing daily life; demonstrate tolerance of different points of view; engage in conservation practices.	conservation practices.	

SC.O.2.3.1	identify parts of systems and identify how they interact with one another.
SC.O.2.3.2	use models as representations of real things.
SC.O.2.3.3	observe that changes occur gradually, repetitively, or randomly within the environment.
SC.O.2.3.4	recognize that common objects and events incorporate science (e.g., CD players, Velcro, or weather) to solve human problems and enhance the quality of life.
SC.O.2.3.5	listen to and be tolerant of different viewpoints while working in collaborative groups.
SC.O.2.3.6	develop respect and responsibility for the environment by engaging in conservation practices (e.g., recycling, trash clean-up, or power consumption reduction).

Third Grade Science Content Standards and Objectives

The Third Grade Science objectives build upon problem-solving and experimentation and move into a more in-depth study of science. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics and earth and space sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes, and models. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated in all activities. Third Grade Science highlights science-related careers. The study of geology and astronomy expands in Third Grade Science. Collecting materials, testing the materials, recording data and developing concepts related to physics and chemistry are introduced to expand investigative abilities that lead to logical conclusions. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.3.1	Students will • demonstrate an understanding of the history and nature of science as a human endeavor encompassing the contributions of diverse cultures, scientists, and careers. • demonstrate the abilities and understanding necessary to do scientific inquiry. • demonstrate the ability to think and act as scientists by engaging in active inquiries and investigations, while incorporating hands-on activities.

Performance Descriptors SC.PD.3.1

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students research scientists from different cultures and backgrounds and present their findings using technology; design and conduct an investigation using safe techniques; interpret, predict, and present data, control variables and conduct multiple trials.	Students compare and contrast the lives and discoveries of scientists from different cultures and backgrounds and identify their discoveries; plan and conduct investigations using safe techniques; interpret and present data and control variables.	Students study scientists from different cultures and backgrounds and identify their discoveries; recognize that scientific explanations lead to new discoveries; plan and conduct simple investigations using safe techniques; interpret and present data; control variables, and explore science careers in the community.	Students name scientists from different cultures and backgrounds and recall their discoveries; conduct investigations using safe techniques; identify variables, and record data.	Students name a scientist from a different culture and background; and observe and participate in investigations using safe techniques.

SC.O.3.1.1	recognize that scientific explanations may lead to new discoveries (e.g., new knowledge leads to new questions).
SC.O.3.1.2	study the lives and discoveries of scientists of different cultures and backgrounds.
SC.O.3.1.3	explore science careers in the community.
SC.O.3.1.4	demonstrate curiosity, initiative and creativity by planning and conducting simple investigations.
SC.O.3.1.5	recognize that developing solutions to problems takes time, patience and persistence through individual and cooperative ventures.
SC.O.3.1.6	support statements with facts found through research from various sources, including technology.
SC.O.3.1.7	use scientific instruments, technology, and everyday materials to investigate the natural world.
SC.O.3.1.8	use safe and proper techniques for handling, manipulating and caring for science materials (e.g., follow safety rules, maintain a clean work area, or treat living organisms humanely).
SC.O.3.1.9	apply mathematical skills and use metric units in measurements.
SC.O.3.1.10	interpret data presented in a table, graph, map or diagram and use it to answer questions and make predictions and inferences based on patterns of evidence.
SC.O.3.1.11	Identify and control variables.

SC.S.3.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories, and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology and the earth and space sciences. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.

Performance Descriptors SC.PD.3.2

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students construct and use classification systems based on the structure and physical characteristics of living things and propose how adverse factors affect the interrelationships of organisms; investigate and describe various properties of matter including states of matter, physical and chemical properties/ changes; design an experiment to test the reflection, refraction, and absorption of light by	Students classify a variety of organisms according to specific physical characteristics and explain the importance of plants and animals adapting to their environment; describe physical and chemical properties of matter and recognize change in temperature to state of matter; demonstrate that light can be reflected and refracted; explain the relationship between speed, distance, and time when	Students compare the physical characteristics, structures, and behaviors of living things and explain how they function, change and adapt to their environment; identify physical and chemical properties of matter including density and changes in states of matter; investigate the properties of light energy; recognize the principles of force and motion and identify examples of potential and	Students list ways living things function, change, and interact with each other and their environment; identify physical properties of matter; relate the color of an object to reflection; demonstrate the principles of force and motion; describe how erosion, volcanoes, and earthquakes change Earth's surface; describe how fossils are formed; name the planets; describe the motion of Earth and moon in relation to the	Students list the physical characteristics of living things; name the three states of matter; recognize that light can be reflected; give an example of energy of motion; list erosion, earthquakes, and volcanoes as changes that affect Earth's surface; match a fossil to its original organism; draw a model of the earth and moon in relation to the sun; list physical characteristics of rocks, name geographical

objects; measure and record changes in the direction of an object when forces have been applied; demonstrate the relationships between speed, distance, and time; evaluate the consequences of earthquakes and volcanic eruptions and explore how technologies are used to help predict the impact of future occurrences; explain the effects of the alignment of earth, moon, and sun on the earth; compare and contrast rocks and minerals and factors that affect their formation; infer how natural processes and human behavior affect geographical features.	forces have been applied; compare changes in the Earth's surface that are due to erosion, volcanic eruptions, and earthquakes; explain how fossils provide evidence about prehistoric life; compare and contrast the planets and their movement; differentiate between types of rocks and their formation; construct and interpret models that illustrate the geographical features and layers of the earth.	kinetic energy; examine the relationship between speed, distance and time; explore and describe how erosion, volcanoes, and earthquakes change Earth's surface; identify fossils as a record of time; describe the relative movement of the earth and moon in relation to the sun; describe the planets; identify the composition of rocks and explain how they are formed; compare and contrast layers of the Earth; identify geographical features using a model or map.	sun; name the three types of rocks; describe geographical features and identify layers of the Earth.	features of the Earth.

SC.O.3.2.1	identify the structures of living things, including their systems and explain their functions.
SC.O.3.2.2	observe, measure and record changes in living things (e.g., growth and development, or variations within species).
SC.O.3.2.3	compare physical characteristics and behaviors of living organisms and explain how they are adapted to a specific environment (e.g., beaks and feet in birds, seed dispersal, camouflage, or different types of flowers).
SC.O.3.2.4	observe and describe relationships among organisms and predict the effect of adverse factors.
SC.O.3.2.5	relate the buoyancy of an object to its density.
SC.O.3.2.6	identify physical and chemical properties.
SC.O.3.2.7	relate changes in states of matter to changes in temperature.
SC.O.3.2.8	investigate the dissolving of solids in liquids.
SC.O.3.2.9	investigate the reflection and refraction of light by objects.
SC.O.3.2.10	relate how the color of an object is based upon the reflection of light.
SC.O.3.2.11	recognize that it takes work to move objects over a distance.
SC.O.3.2.12	examine the relationships between speed, distance, and time.
SC.O.3.2.13	recognize that the greater a force is exerted on an object, the greater the change of its motion.
SC.O.3.2.14	identify examples of potential and kinetic energy.
SC.O.3.2.15	identify fossils as a record of time.

SC.O.3.2.16	explore erosion of different materials by water and wind (e.g., sand, soil, or rocks).
SC.O.3.2.17	describe how volcanoes and earthquakes affect the Earth.
SC.O.3.2.18	recognize the relative movement of the Earth and moon in relation to the sun.
SC.O.3.2.19	describe the similarities and differences among the planets.
SC.O.3.2.20	identify properties of minerals and recognize that rocks are composed of different minerals.
SC.O.3.2.21	explain how igneous, sedimentary and metamorphic rocks are formed.
SC.O.3.2.22	identify geographical features using a model or map.
SC.O.3.2.23	compare and contrast the layers of the Earth and their various features.

SC.S.3.3	• Students will • identify how the parts of a system interact. • recognize and use models as representations of real things. • observe and identify patterns of change, consistency or regularity within the environment. • demonstrate the ability to utilize technology to gather and organize data to communicate designs, results and conclusions. • identify that a solution to a problem often creates new problems. • demonstrate the ability to listen to, be tolerant of, and evaluate the impact of different points of view on health, population, resources and environmental practices while working in collaborative groups.

Performance Descriptors SC.PD.3.3

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students explain how parts of a system interact; construct and explain a model that represents an abstract idea; predict patterns of change within the environment; apply technology to solve problems, gather and communicate data; demonstrate tolerance of different points of view and the willingness to modify ideas when new and valid information is presented.	Students describe and identify how parts of a system interact; construct a model; observe and identify patterns of change, consistency or regularity within the environment; use technology to gather and communicate data; demonstrate tolerance of different points of view.	Students identify how parts of a system interact; recognize and use models as representations of real things; observe and identify patterns of change, consistency or regularity within the environment; cite examples of science and technology in daily events; demonstrate tolerance of different points of view.	Students list parts of a system; recognize and use models; name patterns of change within the environment; cite examples of science and technology in daily events; work in collaborative groups.	Students name a system; recognize models; name an environmental change, cite examples of science and technology in daily events.

SC.O.3.3.1	identify that systems are made of parts that interact with one another.

SC.O.3.3.2	use models as representations of real things.
SC.O.3.3.3	observe that changes occur gradually, repetitively, or randomly within the environment and question causes of changes.
SC.O.3.3.4	given a set of objects, group or order the objects according to an established scheme.
SC.O.3.3.5	given a set of events, objects, shapes, designs, or numbers, formulate patterns of constancy or regularity.
SC.O.3.3.6	cite examples of the uses of science and technology in common daily events and in the community.
SC.O.3.3.7	explain a simple problem and identify a specific solution describing the use of tools and/or materials to solve the problem or to complete the task.
SC.O.3.3.8	recognize that a solution to one scientific problem often creates new problems (e.g., recycling, pollution, conservation, or waste disposal).
SC.O.3.3.9	listen to and be tolerant of different viewpoints by engaging in collaborative activities and be willing to modify ideas when new and valid information is presented.
SC.O.3.3.10	develop respect and responsibility for the environment by engaging in conservation practices.
SC.O.3.3.11	describe how modern tools and appliances have positively and/or negatively impacted their daily lives.

Fourth Grade Science Content Standards and Objectives

The Fourth Grade Science objectives build on the study of geology, astronomy, chemistry and physics. Through a spiraling, inquiry-based program of study and the use of 21st century skills, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics and earth and space sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes and models. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities. Fourth Grade Science promotes cooperative learning, group decisions, cultural diversity, and careers and expands the development of hands-on exploration. Basic science concepts are developed and problem-solving abilities are augmented. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.4.1	Students will • demonstrate an understanding of the history and nature of science as a human endeavor encompassing the contributions of diverse cultures, scientists, and careers. • demonstrate the abilities and understanding necessary to do scientific inquiry. • demonstrate the ability to think and act as scientists by engaging in active inquiries and investigations, while incorporating hands-on activities.

Performance Descriptors SC.PD.4.1

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students analyze and evaluate new discoveries and examine how they impact society; design and conduct an investigation based on previous investigations using safe techniques and critiquing the results of both, using technology to present and defend their conclusions.	Students explain how new discoveries lead to new careers; analyze and evaluate data and design a plan to further the investigation through research and technology.	Students recognize that new discoveries lead to changes in scientific knowledge; interpret data and draw and support conclusions; make predictions and inferences based on patterns of evidence; design simple experiments using safe techniques, and support conclusions with evidence found through research.	Students recognize that scientific knowledge changes over time; collect and interpret data using safe techniques.	Students identify scientific discoveries; and participate in investigations using safe techniques and collect data using safe techniques.

SC.O.4.1.1	explain how new discoveries lead to changes in scientific knowledge.

SC.O.4.1.2	study the lives and discoveries of scientists of different cultures and backgrounds.
SC.O.4.1.3	explore science careers in West Virginia.
SC.O.4.1.4	demonstrate curiosity, initiative and creativity by developing questions that lead to investigations; designing simple experiments; and trusting observations of discoveries when trying new tasks and skills.
SC.O.4.1.5	recognize that developing solutions to problems requires persistence, flexibility, open-mindedness, and alertness for the unexpected.
SC.O.4.1.6	support statements with facts found through research from various sources, including technology.
SC.O.4.1.7	use scientific instruments, technology and everyday materials to investigate the natural world.
SC.O.4.1.8	demonstrate safe and proper techniques for handling, manipulating and caring for science materials.
SC.O.4.1.9	construct a hypothesis when provided a problem.
SC.O.4.1.10	establish variables and controls in an experiment; test variables through experimentation.
SC.O.4.1.11	interpret data presented in a table, graph, or diagram and use it to answer questions and make decisions.
SC.O.4.1.12	draw and support conclusions, make predictions and inferences based on patterns of evidence (e.g., weather maps, variation of plants, or frequency and pitch of sound).
SC.O.4.1.13	apply mathematical skills and use metric units in measurements and calculations.

SC.S.4.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories, and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology and the earth and space sciences. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.

Performance Descriptors SC.0.4.2

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Given an environment, predict organisms, their characteristics, variations, life cycles, and interactions; predict how environmental changes will affect a food web; design an investigation involving physical and chemical properties of matter; develop an energy transformation web; diagram and construct an electrical circuit; draw conclusions based on motion and applied force	Compare and contrast the characteristics, variations, and life cycles of organisms within different environments; construct and explain models of habitats, food chains, and food webs; investigate and analyze changes in states of matter; describe energy transformations; diagram an electrical circuit; draw conclusions based on motion and applied force investigations; compare	Students observe and distinguish characteristics, variation, and life cycles of organisms and how they interact within the environment; construct and explain models of habitats, food chains, and food webs; investigate and describe various properties of matter including states of matter, physical and chemical properties/changes; describe energy transformations, investigate	Describe life cycles of organisms and the environment in which they live; identify habitats, food chains and food webs; list states of matter and physical properties; identify different forms of energy; investigate conductors and nonconductors; demonstrate motion and force; identify changes caused by volcanoes, earthquakes, and landslides; list three types of	Identify the life cycle of an organism; name organisms in a food chain; list states of matter; identify a conductor and nonconductor; identify motion and force; recognize that volcanoes, earthquakes, and landslides change the earth; name one type of rock; name an example of an ocean or fresh water; list objects within the solar system.

investigations; compare and contrast factors that affect the rate of change of earth's composition; describe how the different types of rocks are formed; research estuaries; make valid predictions on location and movement of objects within the universe.	factors that affect the rate of change of earth's composition; differentiate between types of rocks; explain the differences between ocean and fresh water; compare and contrast the movement of objects within the universe.	conductors / nonconductors and electrical circuits, predict and investigate motion/force, and frequency/pitch; describe earth's geological composition and how it changes; differentiate between types of rocks; compare ocean/fresh water; identify and describe objects within the universe and their movement.	rocks in the rock cycle; name examples of oceans and fresh water; identify objects within the universe.	

SC.0.4.2.1	describe the different characteristics of plants and animals, which help them to survive in different niches and environments.
SC.0.4.2.2	associate the behaviors of living organisms to external and internal influences (e.g., hunger, climate, or seasons).
SC.0.4.2.3	identify and classify variations in structures of living things including their systems and explain their functions (e.g., skeletons, teeth, plant needles, or leaves).
SC.0.4.2.4	compare and sequence changes in cycles in relation to plant and animal life.
SC.0.4.2.5	give examples how plants and animals closely resemble their parents and that some characteristics are inherited from the parents and others result from interaction with the environment.
SC.0.4.2.6	identify human uses of plants and animals (e.g., food sources, or medicines).
SC.0.4.2.7	describe the effects of altering environmental barriers on the migration of animals.
SC.0.4.2.8	construct and explain models of habitats, food chains, and food webs.
SC.0.4.2.9	investigate how properties can be used to identify substances.
SC.0.4.2.10	design an experiment to investigate the dissolving of solids and analyze the results.
SC.0.4.2.11	examine simple chemical changes (e.g., tarnishing, rusting, or burning).
SC.0.4.2.12	explain that materials including air take up space and are made of parts that are too small to be seen without magnification.
SC.0.4.2.13	differentiate changes in states of matter due to heat loss or gain.
SC.0.4.2.14	investigate variables that affect the rate of evaporation of a liquid.
SC.0.4.2.15	compare and classify liquids based on density.
SC.0.4.2.16	identify different forms of energy and describe energy transformations that occur between them (e.g., electrical to heat, or radiant to chemical).
SC.0.4.2.17	examine types and properties of waves (e.g., transverse, longitudinal, frequency, or wavelengths).
SC.0.4.2.18	investigate static electricity and conductors/nonconductors of electricity.
SC.0.4.2.19	construct simple electrical circuits.
SC.0.4.2.20	describe and explain the relationship between a compass and a magnetic field.
SC.0.4.2.21	relate motion of an object to its frame of reference.
SC.0.4.2.22	predict and investigate the motion of an object if the applied force is changed.

SC.0.4.2.23	explore that sounds are produced by vibrating objects and columns of air and form conclusions about the relationship between frequency and pitch of sound.
SC.0.4.2.24	investigate the change in the length, tension, or thickness of the vibrating object on the frequency of vibration (e.g., string, wire, or rubber band).
SC.0.4.2.25	examine the geologic time scale.
SC.0.4.2.26	locate and identify patterns of stars and their change in location throughout the year.
SC.0.4.2.27	compare and explain the relative time differences to erode materials.
SC.0.4.2.28	investigate the cause and effects of volcanoes, earthquakes and landslides.
SC.0.4.2.29	interpret a weather chart or map and predict outcomes.
SC.0.4.2.30	identify the sun as a star.
SC.0.4.2.31	explain the effects of alignment of earth, moon and sun on the earth.
SC.0.4.2.32	describe and explain the planets orbital paths.
SC.0.4.2.33	differentiate between types of rock and describe the rock cycle.
SC.0.4.2.34	compare ocean water and fresh water.
SC.0.4.2.35	investigate soil types and soil composition.

SC.S.4.3	Students will • identify how the parts of a system interact. • recognize and use models as representations of real things. • observe and identify patterns of change, consistency or regularity within the environment. • demonstrate the ability to utilize technology to gather and organize data to communicate designs, results and conclusions. • identify that a solution to a problem often creates new problems. Demonstrate the ability to listen to, be tolerant of, and evaluate the impact of different points of view on health, population, resources and environmental practices while working in collaborative groups.

Performance Descriptors SC.PD.4.3

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students explain how parts of a system interact; construct and explain a model that represents an abstract idea; predict patterns of change within the environment; apply technology to solve problems, gather and communicate data; demonstrate tolerance of	Students describe and identify how parts of a system interact; construct a model; observe and identify patterns of change, consistency or regularity within the environment; apply technology to solve problems, gather and communicate data; demonstrate tolerance of	Students identify how parts of a system interact; recognize and create models as representations of real things; observe and identify patterns of change, consistency or regularity within the environment; apply technology to solve problems, gather and communicate data;	Students identify parts of a system; recognize and use models; list patterns of change within the environment; gather and communicate data using technology; work in collaborative groups.	Students identify a system; recognize models; list changes within the environment; gather and communicate data using technology.

different points of view, and the willingness to modify ideas when new and valid information is presented.	different points of view.	demonstrate tolerance of different points of view.		

SC.0.4.3.1	identify that systems are made of parts that interact with one another.
SC.0.4.3.2	create models as representations of real things.
SC.0.4.3.3	observe that changes occur gradually, repetitively, or randomly within the environment and question causes of change.
SC.0.4.3.4	given a set of objects, group or order the objects according to an established scheme.
SC.0.4.3.5	given a set of events, objects, shapes, designs, or numbers, find patterns of constancy or regularity.
SC.0.4.3.6	identify and explain a simple problem or task to be completed; identify a specific solution; and list task requirements.
SC.0.4.3.7	use an appropriate engineering design to solve a problem or complete a task.
SC.0.4.3.8	recognize that a solution to one scientific problem often creates new problems (e.g., recycling, pollution, conservation, waste disposal, or need for technology).
SC.0.4.3.9	listen to and be tolerant of different viewpoints by engaging in collaborative activities and modifying ideas when new and valid information is presented from a variety of resources.
SC.0.4.3.10	describe the positive and negative consequences of the application of technology on personal health and the environment.
SC.0.4.3.11	develop respect and responsibility for the environment by engaging in conservation practices.

Fifth Grade Science Content Standards and Objectives

The Fifth Grade Science objectives identify, compare, classify and explain our living and designed worlds. Through a spiraling, inquiry-based program of study all students will demonstrate scientific literacy and the use of 21st century skills in the fields of biology, chemistry, physics, and earth and space sciences. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes and models. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated in all activities. Fifth Grade Science reviews earth and the sky, life cycles and habitats of organisms, properties, positions and motions of objects and energy. New major concepts introduced at the fifth grade level include changes in properties of matter, structures, functions and adaptations of organisms, and the structure of the earth's system. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.5.1	Students will • demonstrate an understanding of the history of science and the evolvement of scientific knowledge. • demonstrate an understanding of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate an understanding of the characteristics of a scientist. • demonstrate skills of scientific inquiry.

Performance Descriptors SC.PD.5.1

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students describe the importance of the research of historical and diverse scientists in society and culture; skepticism, use careful methodology and creativity to conduct investigations; predict, hypothesize, identify variables, organize and interpret experimental data using safe investigative techniques.	Students describe the research of historical and diverse scientists in society and culture; use careful methodology and creativity to conduct an investigation; demonstrate safe investigative techniques; make predictions and organize data; suggest experimental variables for investigations.	Students recognize the research of historical and diverse scientists in society and culture; use careful methodology to observe, measure and record data as part of an investigation; demonstrate safe investigative techniques.	Students recognize the findings of historical or diverse scientists in society and culture; use a methodology to observe, measure and record data; demonstrate safe investigative techniques; recognize factors that change in an experiment.	Students recognize the findings of a scientist; observe, measure and record data; demonstrate safe investigative techniques.

SC.O.5.1.1	realize that scientists formulate and test their explanations of nature using observation and experiments.

SC.O.5.1.2	recognize scientific knowledge is subject to modification as new scientific information challenges current explanations.
SC.O.5.1.3	examine the careers and contributions of men and women of diverse cultures to the development of science.
SC.O.5.1.4	compare and contrast the historical significance of scientific discoveries.
SC.O.5.1.5	cooperate and collaborate to ask questions, design and conduct investigations to find answers and solve problems.
SC.O.5.1.6	formulate conclusions through close observations, logical reasoning, objectivity, perseverance and integrity in data collection.
SC.O.5.1.7	apply skepticism, careful methods, logical reasoning and creativity in investigating the observable universe.
SC.O.5.1.8	use a variety of technologies and scientific instruments to conduct explorations, investigations and experiments of the natural world.
SC.O.5.1.9	demonstrate safe techniques for handling, manipulating and caring for science materials, equipment, natural specimens and living organisms.
SC.O.5.1.10	utilize experimentation to demonstrate scientific processes and thinking skills (e.g., formulating questions, predicting, forming hypotheses, quantifying, or identifying dependent and independent variables).
SC.O.5.1.11	construct and use charts, graphs and tables to organize, display, interpret, analyze and explain data.
SC.O.5.1.12	use inferential reasoning to make logical conclusions from collected data.

SC.S.5.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology and the earth and space sciences. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.

Performance Descriptors SC.PD.5.2

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students will examine the structure to the function of living organisms and cells; analyze differences in niches, life cycles and energy/matter conversions of organisms in an ecosystem that contribute to survival; identify substances by their density experimentally; recognize that mass is conserved in physical changes; experimentally determine how the motion of objects are affected by variables;	Students will relate the structure to the function of living organisms and cells; explore differences in niches, life cycles and energy/matter conversions of organisms in an ecosystem that contribute to survival; identify substances by their density experimentally; recognize that mass is conserved in physical changes; experimentally determine how the motion of objects are affected by variables;	Students will identify and explain the function of living organisms, cells, and common energy conversions in cycles of matter; explore differences in niches and life cycles of organisms in an ecosystem that contribute to survival; find density experimentally; recognize that mass is conserved in physical changes; describe how the motion of objects are affected by variables; describe the structure of the	Students will identify the function of living organisms, cells, and common energy conversions in cycles of matter; explain differences in niches and life cycles of organisms in an ecosystem that contribute to survival; calculate density; recognize that mass is conserved in physical changes; identify variables that affect the motion of objects; identify the structure of the earth and characterize the lithosphere and	Students will identify structures of living organisms; identify niches in ecosystems; recognize that mass is conserved in physical changes; identify variables that affect the motion of objects; identify the structure of the earth; recognize the earth's crust is divided into plates; test an electromagnet.

compare and contrast the characteristics of the earth's layers and characterize changes that occur in the lithosphere and atmosphere; interpret the earth's history using plate tectonics and relative dating; select the appropriate materials to design and quantitatively test electromagnets to evaluate differences in design.	contrast the characteristics of the earth's layers and characterize the lithosphere and atmosphere; interpret the earth's history using plate tectonics and relative dating; select the appropriate materials to design, test and diagram the circuit of an electromagnet.	earth and characterize the lithosphere and atmosphere; explore the earth's history using plate tectonics and relative dating; select the appropriate materials to design and test an electromagnet.	atmosphere; recognize the earth's crust is divided into plates and that earth's layers can be dated; build and test an electromagnet.	

SC.O.5.2.1	demonstrate an understanding of the interconnections of biological, earth and space, and physical science concepts.
SC.O.5.2.2	identify and explain common energy conversions in cycles of matter including photosynthesis and the carbon dioxide cycle.
SC.O.5.2.3	identify the structures of living organisms and explain their function.
SC.O.5.2.4	observe and identify cells of organisms using a microscope.
SC.O.5.2.5	compare variations of plant growth and reproduction.
SC.O.5.2.6	contrast how the different characteristics of plants and animals help them to survive in different niches and environments including adaptations, natural selection, and extinction.
SC.O.5.2.7	through the use of research and technology, explore the extinction of a species due to environmental conditions.
SC.O.5.2.8	trace and describe the pathways of the sun's energy through producers, consumers and decomposers using food webs and pyramids.
SC.O.5.2.9	explain that the mass of a material is conserved whether it is together, in parts, or in a different state.
SC.O.5.2.10	recognize that elements are composed of only one type of matter.
SC.O.5.2.11	using the periodic table, identify common elements according to their symbols.
SC.O.5.2.12	through experimentation, identify substances by their relative densities (mass/volume=density).
SC.O.5.2.13	analyze diagrams of electrical circuits.
SC.O.5.2.14	measure electricity using voltage and wattage.
SC.O.5.2.15	investigate the properties of an electromagnet by selecting appropriate materials, designing and testing an electromagnet, and evaluating differences in design.
SC.O.5.2.16	describe how the variables of gravity and friction affect the motion of objects.
SC.O.5.2.17	compare and contrast the change in length, tension, or thickness of a vibrating object on the frequency of vibration.
SC.O.5.2.18	describe the layers of the earth and their various features.
SC.O.5.2.19	identify and describe natural landforms and explain how they change and impact weather and climate.
SC.O.5.2.20	use a variety of instruments and sources to collect and display weather data to describe weather patterns.
SC.O.5.2.21	compare and explain the different rates of weathering, erosion and deposition on various materials.

SC.O.5.2.22	analyze a topographical map to make inferences related to elevation and land features.
SC.O.5.2.23	identify resources as being renewable or non-renewable.
SC.O.5.2.24	explore and explain how fossils and geologic features can be used to determine the relative age of rocks and rock layers.
SC.O.5.2.25	recognize that the Earth is made of plates (plate tectonics).

SC.S.5.3	Students will • explore the relationship between the parts and the whole system; construct a variety of useful models; examine changes that occur in an object or system. • demonstrate an understanding of the interdependence between science and technology. • demonstrate the ability to utilize technology to gather data and communicate designs, results and conclusions. • demonstrate the ability to evaluate the impact of different points of view on health, population, resource and environmental practices.

Performance Descriptors SC.PD.5.3

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students evaluate the role of parts that contribute to the functioning of a model; identify an innovation with the science that makes it possible; select and use the appropriate technology to collect scientific data; use multiple media sources to evaluate different points of view regarding health, population, resources and environmental practices.	Students analyze parts as they contribute to the functioning of a model; match an innovation with the science that makes it possible; identify and use the appropriate technology to collect scientific data; compare media sources to evaluate two different points of view regarding health, population, resources and environmental practices.	Students compare the functioning of parts to the functioning of a model; report on a technological innovation; use the appropriate technology to collect scientific data; use two media sources to evaluate points of view regarding health, population, resources or environmental practices.	Students explain the function of parts of a model; identify a technological innovation; use technology to collect scientific data; identify the point of view of a media source regarding health, population, resources or environmental practices.	Students identify the parts of a model; identify a technological innovation; use a technology to collect data; recognize that media sources have a point of view regarding health, population, resources or environmental practices.

SC.O.5.3.1	explore the relationship between the parts of a system to the whole system.
SC.O.5.3.2	construct a variety of useful models of an object, event, or process.
SC.O.5.3.3	compare and contrast changes that occur in an object or a system to its original state.
SC.O.5.3.4	compare and contrast the influence that a variation in scale will have on the way an object or system works. (e.g., cooling rates of different-sized containers of water, strength of different-sized constructions from the same material, or flight characteristics of different-sized model airplanes).
SC.O.5.3.5	research everyday applications and interactions of science and technology.
SC.O.5.3.6	evaluate and critically analyze mass media reports of scientific developments and events.

SC.O.5.3.7	explore the connections between science, technology, society and career opportunities.

Sixth Grade Science Content Standards and Objectives

The Sixth Grade Science objectives demonstrate, differentiate, and apply concepts of the living and designed worlds. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy in the fields of biology, chemistry, physics, and earth and space sciences, using 21st century skills. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of major science themes of systems, changes and models. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated in all activities. Sixth Grade Science reviews changes in the properties of matter, structures, functions and adaptations of organisms, and the structure of the earth's systems. New major concepts introduced at the sixth grade level include motions and forces, ecosystems, diversity of life, energy transformations, plate tectonics, earth's resources and weather. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.6.1	Students will • demonstrate an understanding of the history of science and the evolvement of scientific knowledge. • demonstrate an understanding of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate an understanding of the characteristics of a scientist. • demonstrate skills of scientific inquiry.

Performance Descriptors SC.PD.6.1

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students explain the importance of the research of historical and diverse scientists in society and culture; display skepticism, careful methodology, logical reasoning and creativity to conduct scientific investigations; predict, hypothesize, classify independent and dependent variables, organize and interpret experimental data using safe techniques.	Students describe the importance of the research of historical and diverse scientists in society and culture; use skepticism, careful methodology, logical reasoning and creativity to conduct investigations; predict, hypothesize, and classify variables, organize and interpret experimental data using safe techniques.	Students describe the research of historical and diverse scientists in society and culture; use careful methodology, logical reasoning and creativity to conduct an investigation; and identify variables, organize and interpret experimental data using safe techniques.	Students state the research of an historical or diverse scientist; use a methodology or creativity to conduct an investigation; demonstrate safe investigation techniques; make predictions, identify variables and record data.	Students recognize the findings of an historical or diverse scientist; observe measure and record data in conducting an investigation; demonstrate safe investigation techniques; make predictions and record data.

SC.O.6.1.1	realize that scientists formulate and test their explanations of nature using observation and experiments.
SC.O.6.1.2	recognize scientific knowledge is subject to modification as new scientific information challenges current explanations.
SC.O.6.1.3	examine the careers and contributions of men and women of diverse cultures to the development of science.
SC.O.6.1.4	compare and contrast the historical significance of scientific discoveries.
SC.O.6.1.5	cooperate and collaborate to ask questions, design and conduct investigations to find answers and solve problems.
SC.O.6.1.6	formulate conclusions through close observations, logical reasoning, objectivity, perseverance and integrity in data collection.
SC.O.6.1.7	apply skepticism, careful methods, logical reasoning and creativity in investigating the observable universe.
SC.O.6.1.8	use a variety of technologies and scientific instruments to conduct explorations, investigations and experiments of the natural world.
SC.O.6.1.9	demonstrate safe techniques for handling, manipulating and caring for science materials, equipment, natural specimens and living organisms.
SC.O.6.1.10	utilize experimentation to demonstrate scientific processes and thinking skills (e.g., formulating questions, predicting, forming hypotheses, quantifying, or identifying dependent and independent variables).
SC.O.6.1.11	construct and use charts, graphs and tables to organize, display, interpret, analyze and explain data.
SC.O.6.1.12	use inferential reasoning to make logical conclusions from collected data.

SC.S.6.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology and the earth and space sciences. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.

Performance Descriptors SC.PD.6.2

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
analyze changes in chemical and living cycles of ecosystems; compare different classification systems based on different internal and external traits; use models to compare and contrast features of plant and animal cells; evaluate properties of known substances and mixtures and apply properties to	Analyze cycles of ecosystems; compare traits of different classifications of organisms; compare components of plant and animal cell models; compare and contrast properties of substances and mixtures; compare electromagnetic and sound wave properties; predict direction of heat flow;	Illustrate cycles of ecosystems; classify organisms using traits; compare plant and animal cell models; classify properties of substances and mixtures; characterize electromagnetic and sound waves; describe the flow of heat between objects; diagram simple electric circuits; relate gravity and	Illustrate a cycle in an ecosystem; classify an organism; model plant and animal cells; define properties of substances and mixtures; define light and sound waves; describe the flow of heat between objects; define parts of an electric circuit; define mass and weight; give examples of force and motion; identify	Illustrate a cycle in nature; put an organism into a group; use models of plant and animal cells; list properties of substances and mixtures; list light and sound waves terms; recognize that heat flows; list parts of an electric circuit; define weight; define force and motion; draw simple machines; recognize

identify unknown substances; compare and contrast electromagnetic and sound wave properties; evaluate movement of heat; design simple electric circuits; predict effects of changing positions of the earth, moon, and sun; associate life forms with geologic periods; select technology to predict weather; research current evidence in plate tectonics theory.	compare simple electric circuits; explain events associated with changing positions of the earth, moon, and sun; characterize life forms with geologic eras; predict weather using technology; explain advances in plate tectonics theory.	mass; examine how forces effect motion; examine simple machines; describe events associated with positions of the earth, moon, and sun; associate life forms with geologic eras; use technology to investigate weather; trace the history of plate tectonics theory.	simple machines; recognize events occur with changing positions of the earth, moon, and sun; recognize that life forms change with geologic eras; investigate weather; describe plate tectonics theory.	changing positions of the earth, moon, and sun; recognize that life forms change over time; record weather data; label plates.

SC.O.6.2.1	demonstrate the interrelationships among physics, chemistry, biology, earth and environmental science, and astronomy.
SC.O.6.2.2	use pictures to show cyclical processes in nature (e.g., nitrogen cycle, carbon cycle, or water cycle).
SC.O.6.2.3	classify living organisms according to their structure and functions.
SC.O.6.2.4	compare the similarities of internal features of organisms, which can be used to infer relatedness.
SC.O.6.2.5	examine how abiotic and biotic factors affect the interdependence among organisms.
SC.O.6.2.6	construct models of plant and animal cells and compare the basic parts (e.g., cytoplasm, cell wall, cell membrane, nucleus, or chloroplasts).
SC.O.6.2.7	compare growth cycles in different plants (e.g., mosses, ferns, perennials, biennials, woody plants, or herbaceous plants).
SC.O.6.2.8	predict changes in populations of organisms due to limiting environmental factors (e.g., food supply, predators, disease, or habitat).
SC.O.6.2.9	analyze the ecological consequences of human interactions with the environment (e.g., renewable and non-renewable resources).
SC.O.6.2.10	classify and investigate properties and processes (changes) as either physical or chemical.
SC.O.6.2.11	investigate the formation and separation of simple mixtures of matter concluding that matter is composed of tiny particles and that the particles are the same for the same type of matter.
SC.O.6.2.12	use indicators to classify substances as acidic, basic or neutral.
SC.O.6.2.13	using the periodic table, identify the symbols of elements as solids, liquids, and gases; metals or nonmetals.
SC.O.6.2.14	describe the composition and properties of matter (e.g., particles, malleability, melting point, density, inertia, or specific heat).
SC.O.6.2.15	identify forms of the electromagnetic radiation (e.g., wavelengths, frequencies, visible light, color, or x-rays).
SC.O.6.2.16	recognize that an object's color is based upon the absorption and reflection of light waves.
SC.O.6.2.17	describe light and sound in terms of longitudinal or transverse waves.
SC.O.6.2.18	describe the flow of heat between objects (e.g., hot air rises, or absorption and release of heat by metals).
SC.O.6.2.19	diagram simple parallel and series circuits (e.g., bulbs, battery, wires, or switch).
SC.O.6.2.20	correlate the relationship of mass to gravitational force (e.g., larger the mass the larger the gravitational force, or the closer the objects the stronger the force).

SC.O.6.2.21	examine simple machines and the forces involved.
SC.O.6.2.22	apply the effects of balanced and unbalanced forces on motion of objects.
SC.O.6.2.23	explain motion in terms of frames of reference and analyze graphs depicting motion and predicted future motion.
SC.O.6.2.24	monitor major atmospheric events using a variety of resources including technology.
SC.O.6.2.25	compare and contrast continental drift hypothesis to the plate tectonic theory.
SC.O.6.2.26	associate plant and animal life forms with specific geologic time periods.
SC.O.6.2.27	recognize the phases of the moon.
SC.O.6.2.28	investigate models of earth-moon-sun relationships (e.g., gravity, time, or tides).
SC.O.6.2.29	compare the earth's tilt and revolution to the seasonal changes.

SC.S.6.3	Students will • explore the relationship between the parts and the whole system; construct a variety of useful models; examine changes that occur in an object or system. • demonstrate an understanding of the interdependence between science and technology. • demonstrate the ability to utilize technology to gather data and communicate designs, results and conclusions. • demonstrate the ability to evaluate the impact of different points of view on health, population, resource and environmental practices.

Performance Descriptors SC.PD.6.3

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students evaluate the role of parts that contribute to the functioning of the system and/or model; identify innovations with the science that makes them possible; select and use the appropriate technology to collect scientific data; use multiple media sources to evaluate different points of view regarding health, population, resources and environmental practices.	Students analyze parts as they contribute to the functioning of the system or model; match innovations with the science that makes them possible; identify and use the appropriate technology to collect scientific data; use multiple media sources to evaluate different points of view regarding health, population, resources and environmental practices.	Students compare the functioning of parts to the functioning of the system or model; match innovations with the science that makes them possible; use the appropriate technology to collect scientific data; use media sources to evaluate different points of view regarding health, population, resources or environmental practices.	Students explain the function of parts of a system or model; match an innovation with the science that makes it possible; use the appropriate technology to collect scientific data; determine the point of view of a media source regarding health, population, resources or environmental practices.	Students identify the parts of a system or model; identify a technological innovation; use technology to collect data; recognize that media sources have a point of view regarding health, population, resources or environmental practices.

SC.O.6.3.1	explore the relationship between the parts of a system to the whole system.
SC.O.6.3.2	construct a variety of useful models of an object, event, or process.
SC.O.6.3.3	compare and contrast changes that occur in an object or a system to its original state.

SC.O.6.3.4	compare and contrast the influence that a variation in scale will have on the way an object or system works. (e.g., cooling rates of different-sized containers of water, strength of different-sized constructions from the same material, or flight characteristics of different-sized model airplanes).
SC.O.6.3.5	research everyday applications and interactions of science and technology.
SC.O.6.3.6	evaluate and critically analyze mass media reports of scientific developments and events.

Seventh Grade Science Content Standards and Objectives

The Seventh Grade Science objectives evaluate, interpret, and predict conditions and phenomena of the living and designed worlds. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy and use of 21st century skills in the fields of biology, chemistry, physics and earth/environmental science and astronomy. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes and models. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research laboratory skills. Safety instruction is integrated into all activities. Seventh Grade Science reviews motions and forces, ecosystems, diversity of life, energy transformations, plate tectonics, earth's resources and weather. Major concepts expanded at the seventh grade level include elements, mixtures, and compounds, populations/ecosystems, conservation of matter and energy and earth's history. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.7.1	Students will • demonstrate an understanding of the history of science and the evolvement of scientific knowledge. • demonstrate an understanding of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate an understanding of the characteristics of a scientist. • demonstrate skills of scientific inquiry.

Performance Descriptors SC.PD.7.1

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students assess the importance of the research of historical and diverse scientists in society and culture; model skepticism, careful methodology, logical reasoning and creativity to conduct scientific investigations; predict, hypothesize, quantify independent and dependent variables, organize, interpret experimental data	Students explain the importance of the research of historical and diverse scientists in society and culture; display skepticism, careful methodology, logical reasoning and creativity to conduct scientific investigations; predict, hypothesize, identify independent and dependent variables, organize and interpret experimental data	Students identify the importance of the research of historical and diverse scientists in society and culture; use skepticism, careful methodology, logical reasoning and creativity to conduct investigations; predict, hypothesize, identify variables, organize and interpret experimental data using safe techniques.	Students recognize the research of historical and diverse scientists in society and culture; use skepticism, careful methodology, logical reasoning or creativity to conduct an investigation; demonstrate safe investigation techniques; make predictions and organize data.	Students state the research of an historical or diverse scientist; use a methodology to conduct an investigation; demonstrate safe investigation techniques; make predictions and record data.

and state a conclusion demonstrating safe techniques.	demonstrating safe techniques.			

SC.O.7.1.1	realize that scientists formulate and test their explanations of nature using observation and experiments.
SC.O.7.1.2	recognize scientific knowledge is subject to modification as new scientific information challenges current explanations.
SC.O.7.1.3	examine the careers and contributions of men and women of diverse cultures to the development of science.
SC.O.7.1.4	compare and contrast the historical significance of scientific discoveries.
SC.O.7.1.5	cooperate and collaborate to ask questions, design and conduct investigations to find answers and solve problems.
SC.O.7.1.6	formulate conclusions through close observations, logical reasoning, objectivity, perseverance and integrity in data collection.
SC.O.7.1.7	apply skepticism, careful methods, logical reasoning and creativity in investigating the observable universe.
SC.O.7.1.8	use a variety of technologies and scientific instruments to conduct explorations, investigations and experiments of the natural world.
SC.O.7.1.9	demonstrate safe techniques for handling, manipulating and caring for science materials, equipment, natural specimens and living organisms.
SC.O.7.1.10	utilize experimentation to demonstrate scientific processes and thinking skills (e.g., formulating questions, predicting, forming hypotheses, quantifying, or identifying dependent and independent variables).
SC.O.7.1.11	construct and use charts, graphs and tables to organize, display, interpret, analyze and explain data.
SC.O.7.1.12	use inferential reasoning to make logical conclusions from collected data.

SC.S.7.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology, earth/environmental science, and astronomy. • apply knowledge, understanding and skills of the science subject matter/concepts to daily life experiences.

Performance Descriptors SC.PD.7.2

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
analyze the effects of diseases on human systems, organs and cells; create dichotomous keys to group similar but distinct organisms based on traits; mathematically model the effects of changing cycles in ecosystems; compare and	analyze the structure, function of human systems, organs and cells; create dichotomous keys to group organisms; analyze the effects of changing cycles in ecosystems; compare life cycles of plants and their adaptations; draw a phase	describe the function of human systems, organs and cells; create simple keys to group organisms; analyze chemical and living cycles in ecosystems; illustrate life cycles of plants; describe particle movement and energy during phase	describe the effects diseases have on human systems, organs and cells; compare groups of organisms with a key; identify the role of cycles in ecosystems; illustrate life cycles of plants; illustrate phases of matter during	Identify diseases effecting humans; compare groups of organisms; identify cycles in ecosystems; draw a plant life cycle; illustrate phases of matter; identify elements and compounds; recognize light and sound as waves; observe the interaction of

contrast life cycles of plants and their genetic adaptations; interpret a phase change diagram; classify substances as acids, bases, and salts to predict the products of neutralization reactions; predict the behavior of light waves through media change; compare alternating and direct current; evaluate the mechanical advantage of simple machines; propose changes in the force of gravity on other planets; predict weather and patterns of ocean circulation; relate rock classification and formation to topography; predict the life cycle of a star; predict climate based on latitude.	change diagram to show particle movement; classify substances as acids, bases, and salts to write neutralization word reactions; explain the behavior of light waves; explain lens technology; compare alternating and direct current; compare and contrast mechanical advantage of simple machines; research changes in the force of gravity on other planets; interpret weather and patterns of ocean circulation; relate rock formation to topography and classify rocks; investigate life cycles of a star; contrast climates at various latitudes.	changes; identify elements and compounds and place them in word equations; examine the behavior of light waves; interpret effect of medium on waves; characterize alternating and direct current; investigate energy transformation; explain mechanical advantage of simple machines; characterize gravity as a force; explain weather and patterns of ocean circulation; interpret and model topography; describe rock formation and classify rocks; explain life cycles of a star; relate latitude to climate.	phase changes; write word equations; examine the behavior of waves; recognize that waves are affected by a medium; define alternating and direct current; recognize that simple machines change force; identify gravity as a force; diagram weather and patterns of ocean circulation; group rocks with similar characteristics; model and identify topographic features; sketch the life cycle of a star; associate climates with latitudes.	waves and a medium; define current; list types of simple machines; define a force; observe weather and patterns of ocean circulation; describe types of rocks; model topography; recognize that stars have a life cycle; recognize latitude affects climate.

SC.O.7.2.1	demonstrate an understanding of the interrelationships among physics, chemistry, biology, earth/environmental science, and astronomy.
SC.O.7.2.2	identify and describe disease causing organisms (such as bacteria, viruses, protozoa, fungi) and the diseases they cause.
SC.O.7.2.3	identify and describe the functions of the skeletal, muscular and integumentary systems in the human body.
SC.O.7.2.4	compare the level of organization of cells, tissues and organs in living things.
SC.O.7.2.5	use simple keys to differentiate among living things with similar characteristics.
SC.O.7.2.6	use pictures to show cyclical processes in nature (e.g., water cycle, nitrogen cycle, or carbon cycle).
SC.O.7.2.7	discuss how the different adaptations and life cycles of plants and animals help them to survive in different niches and environments (e.g., inherited and acquired adaptations).
SC.O.7.2.8	analyze how changes in the environment have led to reproductive adaptations through natural selection.
SC.O.7.2.9	explain how an organism's behavior response is a combination of heredity and the environment.
SC.O.7.2.10	compare and contrast the differences in the growth, development and reproduction of flowering and non-flowering plants.
SC.O.7.2.11	predict the trends of interdependent populations if one of the limiting factors is changed.

SC.O.7.2.12	evaluate the consequences of the introduction of chemicals into the ecosystem (e.g., environmental consequences, human health risks, or mutations).
SC.O.7.2.13	compare differences among elements, compounds, homogeneous and heterogeneous mixtures.
SC.O.7.2.14	examine the types of solutions and their properties (e.g., solutes and solvents, relative concentrations, conductivity, or pH).
SC.O.7.2.15	examine chemical reactions involving acids and bases by monitoring color changes of indicator(s) and identifying the salt formed in the neutralization reaction.
SC.O.7.2.16	write word equations to describe chemical reactions.
SC.O.7.2.17	describe the movement of individual particles and trace energy flow during the phase changes (e.g., melting, boiling, or freezing).
SC.O.7.2.18	identify the characteristics of sound waves and describe how sound is perceived by the ear.
SC.O.7.2.19	define the absorption and reflection of light as translucent, opaque and transparent.
SC.O.7.2.20	interpret and illustrate changes in waves as they encounter various mediums (e.g., mirrors, or lenses).
SC.O.7.2.21	Investigate absorption and reflection of light by an object.
SC.O.7.2.22	characterize AC and DC circuits.
SC.O.7.2.23	explain conservation of matter and energy and investigate the different forms of energy (e.g., mechanical, potential, kinetic, or gravitational).
SC.O.7.2.24	define mechanical advantage of simple machines.
SC.O.7.2.25	characterize gravity as a force.
SC.O.7.2.26	describe and compare the causes of tides, surfs and currents.
SC.O.7.2.27	examine the effects of the sun's energy on oceans and weather (e.g., air masses, or convection currents).
SC.O.7.2.28	interpret and create topographical maps.
SC.O.7.2.29	describe rock formations (e.g., rock cycle).
SC.O.7.2.30	classify rocks (e.g., crystal/particle size, or mineral composition and uses).
SC.O.7.2.31	determine the relevant age of rock layers using index fossils and the law of superposition.
SC.O.7.2.32	explain how changing latitude affects climate.
SC.O.7.2.33	trace the life cycle of a star.

SC.S.7.3	Students will • explore the relationship between the parts and the whole system; construct a variety of useful models; examine changes that occur in an object or system. • demonstrate an understanding of the interdependence between science and technology. • demonstrate the ability to utilize technology to gather data and communicate designs, results and conclusions. • demonstrate the ability to evaluate the impact of different points of view on health, population, resource and environmental practices.

Performance Descriptors SC.PD.7.3

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
The student will predict the change in a system and/or	The student will evaluate the role of parts that	The student will analyze parts as they contribute to	The student will compare the functioning of parts to	The student will identify parts of a system; identify a

model as a result of changing a part; identify an innovation and the science that makes it possible; evaluate the appropriateness of selected technology to collect scientific data; evaluate the persuasiveness of points of view regarding health, population, resources and environmental practices presented by various media sources.	contribute to the functioning of the system; analyze changes in systems and models; identify innovations with the science that makes them possible; select and use the appropriate technology to collect scientific data; use multiple media sources to evaluate different points of view regarding health, population, resources and environmental practices.	the functioning of the system; analyze changes in systems and models; match an innovation with the science that makes it possible; identify and use the appropriate technology to collect scientific data; use multiple media sources to evaluate different points of view regarding health, population, resources and environmental practices.	the functioning of the system; match an innovation with the science that makes it possible; use the appropriate technology to collect scientific data; use media sources to evaluate different points of view regarding health, population, resources or environmental practices.	scientific/ technological innovation; use technology to collect scientific data; use media sources to identify a point of view regarding health, population, resources or environmental practices.

SC.O.7.3.1	explore the relationship between the parts of a system to the whole system.
SC.O.7.3.2	construct a variety of useful models of an object, event, or process.
SC.O.7.3.3	compare and contrast changes that occur in an object or a system to its original state.
SC.O.7.3.4	compare and contrast the influence that a variation in scale will have on the way an object or system works. (e.g., cooling rates of different-sized containers of water, strength of different-sized constructions from the same material, or flight characteristics of different-sized model airplanes).
SC.O.7.3.5	research everyday applications and interactions of science and technology.
SC.O.7.3.6	evaluate and critically analyze mass media reports of scientific developments and events.
SC.O.7.3.7	explore the connections between science, technology, society and career opportunities.

Eighth Grade Science Content Standards and Objectives

The Eighth Grade Science objectives analyze, quantify, and explain conditions and phenomena of the living and designed worlds. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy and use of 21st century skills in the fields of biology, chemistry, physics and earth/environmental science and astronomy. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes and models. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities. Eighth Grade Science reviews elements, mixtures, and compounds, populations/ecosystems, conservation of matter and energy and earth's history. Major concepts introduced at the eighth grade level include reproduction, genetics, behavior, chemical reactions and environmental concerns. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.8.1	Students will • demonstrate an understanding of history and nature of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate the ability to use the inquiry process to solve problems.

Performance Descriptors SC.PD.8.1

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students assess the importance of scientific innovation and recognize the role of these innovations in advancing societal, cultural and economic issues; use scientific methodology to conduct, communicate and revise experiments utilizing safe procedures and appropriate technology; repeat experiments to verify results; draw conclusions from data sources and models.	Students understand the importance of scientific innovation and recognize the role of these innovations in advancing societal, cultural and economic issues; use scientific methodology to conduct and communicate experiments utilizing safe procedures and appropriate technology; repeat experiments to verify results; draw conclusions from data sources and models.	Students recognize the importance of scientific innovation and report the role of these innovations in advancing societal, cultural and economic issues; use scientific methodology to conduct and communicate experiments utilizing safe procedures and appropriate technology; repeat experiments to verify results; draw conclusions from a data source or model.	Students describe the importance of scientific innovation and report the role of these innovations in advancing societal, cultural or economic issues; use a methodology to conduct and communicate experiments utilizing safe procedures and appropriate technology; match an appropriate conclusion with experimental data.	Students recognize the importance of a scientific innovation and report the role of this innovation in advancing societal, cultural or economic issues; conduct experiments utilizing safe procedures and appropriate technology; restate observations as the conclusion.

SC.O.8.1.1	formulate scientific explanations based on historical observations and experimental evidence, accounting for variability in experimental results.
SC.O.8.1.2	demonstrate how a testable methodology is employed to seek solutions for personal and societal issues. (e.g., "scientific method").
SC.O.8.1.3	relate societal, cultural and economic issues to key scientific innovations.
SC.O.8.1.4	conduct and/or design investigations that incorporate the skills and attitudes and/or values of scientific inquiry (e.g., established research protocol, accurate record keeping, replication of results and peer review, objectivity, openness, skepticism, fairness, or creativity and logic).
SC.O.8.1.5	implement safe procedures and practices when manipulating equipment, materials, organisms, and models.
SC.O.8.1.6	use appropriate technology solutions within a problem solving setting to measure and collect data; interpret data; analyze and/or report data; interact with simulations; conduct research; and present and communicate conclusions.
SC.O.8.1.7	design, conduct, evaluate and revise experiments (e.g., compose a question to be investigated, design a controlled investigation that produces numeric data, evaluate the data in the context of scientific laws and principles, construct a conclusion based on findings, propose revisions to investigations based on manipulation of variables and/or analysis of error, or communicate and defend the results and conclusions).
SC.O.8.1.8	draw conclusions from a variety of data sources to analyze and interpret systems and models (e.g., use graphs and equations to measure and apply variables such as rate and scale, evaluate changes in trends and cycles, predict the influence of external variances such as potential sources of error, or interpret maps).

SC.S.8.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology, earth/environmental science, and astronomy. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.

Performance Descriptors SC.PD.8.2

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students evaluate the structure of cells of varying functions for each human organ system; given an environment predict characteristics of organisms; defend placement of organisms in dichotomous keys; analyze	Students analyze the types of cells in organ systems; design an organism suited to an environment; construct dichotomous keys to discriminate among similar organisms; recognize the role of producers, consumers and	Students describe the importance of cell type in human systems; analyze how genetics, behavior and environment interact; construct simple dichotomous keys; trace the flow of energy in food webs; relate atomic structure and	Students identify cell types in human systems; recognize genetics, behavior and environment interact; use dichotomous keys; locate energy changes in a food web; construct Bohr models; classify types of chemical	Students recognize different cell types exist in human systems; recognize that genetics and behavior interact; group organisms using similar traits; locate an energy change in a food web; define subatomic particles; list five types of

the effect of removing producers, consumers or decomposers from an ecosystem; given the number of valence electrons, locate elements on periodic table to draw the Bohr model; predict product formation for chemical reactions by writing word equations; predict and graph diffusion rate and temperature change; compare and contrast sources of energy; interpret wave, motion, work, power, and pressure calculations; classify types of energy transformation; predict Doppler effect of a moving object; apply Newton's Laws of Motion; predict geologic events at plate boundaries; predict the effects of forces on existing geologic structures; compare and contrast the origin of a solar system object to its motion; predict climatic change caused by changing ocean conditions.	decomposers; predict and construct atomic models based on the element's placement on the periodic table; identify reaction types and predict products for word equations; measure variations in diffusion rate; compare two sources of energy; calculate and graph properties of waves, motion, work, power, and pressure; explain how energy is conserved in transformations; relate Doppler shift to sound; provide examples of Newton's Laws of Motion; explain the presence of geologic events at plate boundaries; identify forces affecting geologic structures; relate the origin of a solar system object to its motion; provide examples of climates affected by oceans.	properties to location on the periodic table; write word equations and classify type; evaluate variations in diffusion rates and examine the effect of changing temperature; examine sources of energy; calculate and/or graph properties of waves, motion, work, power, and pressure; relate conservation of energy to transformations; recognize Doppler shift to sound; explain Newton's Laws of Motion; relate plate tectonics to geologic events; describe forces which shape the Earth's surface; describe motion and the origin of solar system objects; explain the relationships among weather, climate and oceans.	reactions; recognize gases diffuse at different rates and are effected by temperature changes; relate conservation of energy to either matter or energy transformations; list Newton's Laws of Motion; locate geologic events at plate boundaries; list forces that shape the Earth's surface; describe motion of solar system objects; relate climates to proximity to oceans.	chemical reactions; recognize gases diffuse; recognize energy transformations; list two of Newton's Laws of Motion; recognize that geologic events occur at plate boundaries; list some forces that shape the Earth's surface; describe solar system objects; relate weather conditions to proximity to oceans.

SC.O.8.2.1	demonstrate an understanding of the interrelationships among physics, chemistry, biology, earth/environmental science, and astronomy.
SC.O.8.2.2	examine and describe the structures and functions of cell organelles.
SC.O.8.2.3	explain how the circulatory, respiratory and reproductive systems work together in the human body.
SC.O.8.2.4	compare the variations in cells, tissues and organs of the circulatory, respiratory and reproductive systems of different organisms.
SC.O.8.2.5	discuss how living cells obtain the essentials of life through chemical reactions of transpiration, respiration and photosynthesis.
SC.O.8.2.6	analyze how behaviors of organisms lead to species continuity (e.g., reproductive/mating behaviors, or seed dispersal).
SC.O.8.2.7	demonstrate the basic principles of genetics; introduce Mendel's law, monohybrid crosses, production of body and sex cells

	(mitosis/meiosis), genes, chromosomes, and inherited traits.
SC.O.8.2.8	compare patterns of human development to other vertebrates.
SC.O.8.2.9	organize groups of unknown organisms based on observable characteristics (e.g., create dichotomous keys).
SC.O.8.2.10	trace the energy flow through the food web; explain the chemical and energy needs for growth, reproduction, and development of organisms.
SC.O.8.2.11	use the periodic table to locate and classify elements as metallic, non-metallic or metalloid.
SC.O.8.2.12	reconstruct development models of the atom (e.g., Crookes, Thompson, Becquerel, Rutherford, or Bohr).
SC.O.8.2.13	calculate the number of protons, neutrons, and electrons and use the information to construct a Bohr model of the atom.
SC.O.8.2.14	classify elements into their families based upon their valence electrons.
SC.O.8.2.15	evaluate the variations in diffusion rates and examine the effect of changing temperatures.
SC.O.8.2.16	conduct and classify chemical reactions by reaction type (e.g., synthesis, decomposition, single replacement or double replacement); energy type (e.g., endothermic and exothermic); and write word equations for the chemical reactions.
SC.O.8.2.17	identify and describe factors that affect chemical reaction rates, including catalysts, temperature changes, light energies and particle size.
SC.O.8.2.18	examine the various sources of energy (e.g., fossil fuels, wind, solar, geothermal, nuclear, biomass).
SC.O.8.2.19	explain the Doppler effect (e.g., sound).
SC.O.8.2.20	quantitatively represent wavelength, frequency and velocity (e.g., $v=\lambda f$).
SC.O.8.2.21	relate the conservation of energy theory to energy transformations (e.g., electrical/heat, or mechanical/heat).
SC.O.8.2.22	quantitatively represent work, power, pressure (e.g., Work=Force x distance, Power=Work/time, or pressure=force/area) from collected data.
SC.O.8.2.23	graph and interpret the relationships of distance versus time, speed versus time, and acceleration versus time.
SC.O.8.2.24	demonstrate and discuss Newton's Laws of Motion.
SC.O.8.2.25	illustrate and calculate the mechanical advantage of simple machines.
SC.O.8.2.26	research and draw conclusions related to the quality and quantity of surface and ground water.
SC.O.8.2.27	identify and explain the principle forces of plate tectonics and related geological events (e.g., earthquakes, volcanoes, or landforms).
SC.O.8.2.28	determine the impact of oceans on weather and climate; relate global patterns of atmospheric movement on local weather.
SC.O.8.2.29	analyze the forces of tectonics, weathering and erosion that have shaped the earth's surface.
SC.O.8.2.30	model processes of soil formation and suggest methods of soil preservation and conservation.
SC.O.8.2.31	research and recognize the societal concerns of exploration and colonization of space.
SC.O.8.2.32	explain phenomena associated with motions in sun-earth-moon system (e.g., eclipses, tides, or seasons).
SC.O.8.2.33	describe the origin and orbits of comets, asteroids, and meteoroids.

SC.S.8.3	Students will • demonstrate the ability to use inquiry process to explore systems, models, and changes. • demonstrate an understanding of the interdependence between science and technology. • demonstrate an understanding of the utilization of technology to gather data and communicate designs, results and conclusions. • demonstrate an understanding of personal and societal benefits of science, and an understanding of public policy decisions as related to health, population, resource and environmental issues.

Performance Descriptors SC.PD.8.3

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students will construct, test and analyze data to explore systems, models, and changes across science disciplines; analyze technological innovations and the science that makes them possible; evaluate the personal and societal benefits of a scientific discovery; assess the impacts of a public policy decision regarding health, population resources or environmental issues.	Students will test, record and analyze data to explore systems, models, and changes; identify technological innovations and the science that makes them possible; explain positive outcomes and unintended consequences of a scientific discovery; explain the impact of a public policy decision regarding health, population resources or environmental issues.	Students will test and record data to explore systems, models, and changes; identify a technological innovation and the science that makes it possible; identify positive outcomes and unintended consequences of a scientific discovery; identify the impact of a public policy decision regarding health, population resources or environmental issues.	Students will observe and record data to explore systems, models, or changes; match a technological innovation with the science that makes it possible; identify a positive outcome and an unintended consequence of a scientific discovery; identify a public policy decision impacting health, population resources or environmental issues.	Students will observe and record data that relates to systems, models, or changes; identify a technological innovation; identify a positive outcome and an unintended consequence of a scientific discovery; read and restate a public policy decision impacting health, population resources or environmental issues.

SC.O.8.3.1	synthesize concepts across various science disciplines to better understand the natural world (e.g., form and function, systems, or change over time).
SC.O.8.3.2	investigate, compare and design scientific and technological solutions to personal and societal problems.
SC.O.8.3.3	communicate experimental designs, results and conclusions using advanced technology tools.
SC.O.8.3.4	collaborate to present research on current environmental and technological issues to predict possible solutions.
SC.O.8.3.5	explore occupational opportunities in science, engineering and technology and evaluate the required academic preparation.
SC.O.8.3.6	given a current science-technology-societal issue, construct and defend potential solutions.

Ninth Grade Science Content Standards and Objectives

The Ninth Grade Science objectives continue the development of foundational knowledge in biology, chemistry, physics, earth/environmental science and astronomy. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy and the use of 21st Century Skills across these major fields of science. Subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes, and models. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated in all activities. Building on the knowledge and skills acquired in Eighth Grade Science, students in Ninth Grade Science will expand and deepen their understanding of major concepts such as energy interactions, genetic probabilities, chemical changes and mineral composition of local rock layers. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.9.1	Students will • demonstrate an understanding of history and nature of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate the ability to use the inquiry process to solve problems.

Performance Descriptors SC.PD.9.1

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students analyze the importance of scientific innovation and relate these innovations to the utilization of scientific methodology, variability in experimental results to advances in societal, cultural and economic issues; design, conduct, communicate, evaluate and revise experiments utilizing safe procedures and appropriate technology; draw conclusions from multiple data sources and	Students analyze the importance of scientific innovation and recognize the role of these innovations in advancing societal, cultural and economic issues; use scientific methodology to design, conduct, communicate and revise experiments utilizing safe procedures and appropriate technology; draw conclusions from multiple data sources and models.	Students examine the importance of scientific innovation and recognize the role of these innovations in advancing societal, cultural and economic issues; use scientific methodology to conduct, communicate and revise experiments utilizing safe procedures and appropriate technology; draw conclusions from data sources and models.	Students describe the importance of scientific innovation and recognize the role of these innovations in advancing societal, cultural or economic issues; use scientific methodology to conduct and communicate experiments utilizing safe procedures and appropriate technology; select an appropriate conclusion from a list of possible conclusions drawn from experimental data.	Students identify the importance of scientific innovation and associate these innovations with advances in societal, cultural or economic issues; conduct experiments utilizing safe procedures and appropriate technology; differentiate between observations and conclusions.

interpretation of models.				

SC.O.9.1.1	formulate scientific explanations based on historical observations and experimental evidence, accounting for variability in experimental results.
SC.O.9.1.2	demonstrate how a testable methodology is employed to seek solutions for personal and societal issues (e.g., "scientific method").
SC.O.9.1.3	relate societal, cultural and economic issues to key scientific innovations.
SC.O.9.1.4	conduct and/or design investigations that incorporate the skills and attitudes and/or values of scientific inquiry (e.g., established research protocol, accurate record keeping, replication of results and peer review, objectivity, openness, skepticism, fairness, or creativity and logic).
SC.O.9.1.5	implement safe procedures and practices when manipulating equipment, materials, organisms, and models.
SC.O.9.1.6	use appropriate technology solutions within a problem solving setting to measure and collect data; interpret data; analyze and/or report data; interact with simulations; conduct research; and present and communicate conclusions.
SC.O.9.1.7	design, conduct, evaluate and revise experiments (e.g., compose a question to be investigated, design a controlled investigation that produces numeric data, evaluate the data in the context of scientific laws and principles, construct a conclusion based on findings, propose revisions to investigations based on manipulation of variables and/or analysis of error, or communicate and defend the results and conclusions).
SC.O.9.1.8	draw conclusions from a variety of data sources to analyze and interpret systems and models (e.g., use graphs and equations to measure and apply variables such as rate and scale, evaluate changes in trends and cycles; predict the influence of external variances such as potential sources of error, or interpret maps).

SC.S.9.2	Students will • demonstrate knowledge understanding and applications of scientific facts, concepts, principles, theories, and models delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology, earth/environmental science, and astronomy; and apply knowledge, understanding and skills of science subject matter/concepts to daily life.

Performance Descriptors SC.PD.9.2

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students solve and interpret dihybrid cross; populate an environment with appropriate organisms; compare the structure and function of cells, tissues and systems of different organisms; demonstrate conservation of matter and	Students solve dihybrid cross; design environments to model interdependent populations; compare and contrast cells, tissues and systems of different organisms; relate conservation of matter and energy to cellular	Students perform and interpret monohybrid crosses; design environments to model interdependent populations; compare cells, tissues and systems of different organisms; trace matter and energy through cellular	Students solve monohybrid crosses; match populations to environments; compare cells and tissues of different organisms; trace matter through cellular processes; construct models of states of matter to indicate kinetic energy;	Students complete a Punnett square; list populations in an environment; compare systems of different organisms; trace matter through a cellular process; identify models of states of matter; classify synthesis

energy through cellular processes; predict how states of matter react as kinetic energy changes; write formulas for ionically and covalently bonded compounds, balance coefficients, predict products and classify types of chemical reactions; predict density values with change of state; calculate the amount of energy produced by nuclear changes; measure the specific heat of a material; compare the properties of different magnetic fields; evaluate a circuit using Ohm's Law and power equation; calculate inverse square relations; predict the effects of a change in location on motion of a pendulum; compare and contrast transverse and longitudinal waves; make long-range weather forecasts from meteorological data; use properties to identify unknown minerals; predict the paleo-environment in which a rock type was formed; use evidence to explain the structure of the moon; explain the absence of plate tectonics on the moon; evaluate the accuracy of absolute and	processes; predict the state of matter given relative amounts of kinetic energy; write formulas, balance coefficients, predict products and classify types of chemical reactions and bonds; predict density value when mass and volume changes; write equations for types of nuclear changes; relate the properties of a material to its absorption or dissipation of heat; compare the properties of different magnets; construct an electric circuit applying Ohm's Law and power equation; predict inverse square relations; explain the effect of gravity on the motion of pendulums; classify waves as transverse or longitudinal; construct and interpret a weather map from data; test properties to classify minerals; predict the type of rock that forms in a paleo-environment; use evidence to explain differences in Earth's layers; evaluate evidence for the forces and mechanisms of plate tectonics; interpret data to determine absolute and relative ages.	processes; relate state of matter to amount of kinetic energy; write formulas, balance coefficients, and classify types of chemical reactions; classify bond types; predict density value when mass and/or volume changes; compare types of nuclear changes; assess a material's ability to absorb or dissipate heat; explore properties of a magnet; construct an electric circuit using Ohm's Law and power equation; recognize inverse square relations; examine variables that affect the motion of pendulums; differentiate transverse and longitudinal waves; predict weather using maps; relate properties to minerals; relate rocks to the environment in which they form; use evidence to interpret Earth's structure; compare and contrast the forces and mechanisms of plate tectonics; use dating techniques.	write formulas and classify types of chemical reactions; name types of bonds; calculate density when mass or volume change; identify the uses of energy produced by nuclear changes; recognize that materials absorb and dissipate heat differently; list the properties of a magnet; construct an electric circuit using Ohm's Law; recognize that changing distance of a light source affects perceived brightness; construct a pendulum and record data; model transverse and longitudinal waves; interpret weather maps; list the parts of the rock cycle; group minerals using properties; model the layers of the earth; identify heat source and model a convection cell; use relative dating techniques.	and decomposition reactions; define an ionic and covalent bond; define density; recognize that energy is produced by nuclear changes; identify objects as conductors or insulators of heat; list a property of a magnet; construct an electric circuit; observe that changing distance of a light source affects perceived brightness; construct a pendulum; model transverse and longitudinal waves; read weather maps; state the difference between rocks and minerals; name the layers of the earth; identify Earth's internal heat source; use the law of superposition to date strata.

relative dating techniques.				
SC.O.9.2.1	apply principles of Mendelian genetics to solve heredity problems.			
SC.O.9.2.2	illustrate meiosis and mitosis and relate to chromosome number and production of sperm, egg and body cells.			
SC.O.9.2.3	analyze cyclic changes in populations of organisms.			
SC.O.9.2.4	design an environment that demonstrates the interdependence of plants and animals (e.g., energy and chemical cycles, adaptations of structures and behaviors).			
SC.O.9.2.5	compare and contrast the structure and function of cells, tissues and systems of different organisms.			
SC.O.9.2.6	diagram the transfer of matter and energy in the chemical/molecular processes of photosynthesis, respiration and fermentation.			
SC.O.9.2.7	predict chemical and physical properties of an element using its position in the periodic table.			
SC.O.9.2.8	compare the types of radioactive decay in terms of particles and energy generated.			
SC.O.9.2.9	predict the changes in density as mass and volume change.			
SC.O.9.2.10	relate molecular motion, kinetic energy and states of matter.			
SC.O.9.2.11	write formulas and name compounds given oxidation numbers of monatomic and polyatomic ions.			
SC.O.9.2.12	propose the results of changing the number of protons, neutrons or electrons on the properties of an atom.			
SC.O.9.2.13	determine formulas and names for binary compounds.			
SC.O.9.2.14	classify a binary chemical bond as ionic, nonpolar covalent or polar covalent.			
SC.O.9.2.15	given a chemical equation deduce the coefficients and classify the reaction type (e.g., synthesis or combination, decomposition, single replacement, or double replacement and combustion).			
SC.O.9.2.16	assess and provide evidence to justify the occurrence of a chemical reaction (e.g., production of color, light, heat, sound, smell, gas, or precipitate).			
SC.O.9.2.17	differentiate various forms of energy and energy transformations including fission and fusion.			
SC.O.9.2.18	assess absorption and dissipation of heat by various materials.			
SC.O.9.2.19	experimentally deduce and diagram the magnetic field of a bar magnet.			
SC.O.9.2.20	construct electric circuits and mathematically model electric circuits using Ohm's Law and power equations.			
SC.O.9.2.21	establish the relationship between distance and the intensity of light, charge and gravitational attraction (e.g., inverse square law).			
SC.O.9.2.22	interpret and draw conclusions from speed-distance-time data and graphs.			
SC.O.9.2.23	analyze experiments to determine which variables affect the motion of pendulums.			
SC.O.9.2.24	differentiate between transverse and longitudinal waves and model examples of each type (e.g., light, sound, or seismic).			
SC.O.9.2.25	predict weather based on the relationships of temperature, air pressure, wind speed, wind direction and humidity as depicted on a weather map and meteorological data.			
SC.O.9.2.26	analyze the relationships among latitude, altitude and climate.			
SC.O.9.2.27	classify common rock forming minerals by examining their physical and chemical properties.			
SC.O.9.2.28	analyze the processes of the rock cycle to predict the paleo-environment in which a rock sample is formed.			
SC.O.9.2.29	examine seismographic and geologic evidence to determine structure and composition of the Earth's interior.			
SC.O.9.2.30	use relative dating techniques to determine the ages of stratagraphic layers.			
SC.O.9.2.31	interpret a half-life graph to determine the absolute age of a given sample.			
SC.O.9.2.32	compare and contrast theoretical models explaining forces driving lithospheric plate motion (e.g., slab pull, plate push, or convection).			
SC.O.9.2.33	research and organize evidence to support the theory of plate tectonics.			

SC.O.9.2.34	apply fusion, heat transfer, gravity, and electromagnetism to the sun, its evolution and its impact on earth.

SC.S.9.3	• Students will • demonstrate the ability to use inquiry process to explore systems, models, and changes. • demonstrate an understanding of the interdependence between science and technology. • demonstrate an understanding of the utilization of technology to gather data and communicate designs, results and conclusions. • demonstrate an understanding of personal and societal benefits of science, and an understanding of public policy decisions as related to health, population, resource and environmental issues.

Performance Descriptors SC.PD.9.3

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students construct, test and analyze complex systems, models, and changes across science disciplines; use a technology solution and analyze the science used in the technology; evaluate how a scientific discovery impacts public policy decisions regarding health, population resources and environmental issues.	Students construct, test and analyze data to explore systems, models, and changes across science disciplines; analyze technological innovations and identify the science that makes them possible; evaluate the personal and societal benefits of a scientific discovery; assess the impacts of a public policy decision regarding health, population resources or environmental issues.	Students test, record and analyze data to explore systems, models, and changes; analyze a technological innovation and identify the science that makes it possible; assess positive outcomes and unintended consequences of a scientific discovery; explain the impacts of a public policy decision regarding health, population resources or environmental issues.	Students test and record data to explore systems, models, and changes; explain a technological innovation and identify the science that makes it possible; identify positive outcomes and unintended consequences of a scientific discovery; identify the impacts of public policy decision regarding health, population resources or environmental issues.	Students test and record data to explore systems, models or changes; identify a technological innovation and the science that makes it possible; identify positive outcomes or unintended consequences of a scientific discovery; identify the impact of a public policy decision regarding health, population resources or environmental issues.

SC.O.9.3.1	synthesize concepts across various science disciplines to better understand the natural world (e.g., form and function, systems, or change over time).
SC.O.9.3.2	investigate, compare and design scientific and technological solutions to personal and societal problems.
SC.O.9.3.3	communicate experimental designs, results and conclusions using advanced technology tools.
SC.O.9.3.4	collaborate to present research on current environmental and technological issues to predict possible solutions.
SC.O.9.3.5	explore occupational opportunities in science, engineering and technology and evaluate the required academic preparation.
SC.O.9.3.6	given a current science-technology-societal issue, construct and defend potential solutions.

Tenth Grade Science Content Standards and Objectives

The Tenth Grade Science objectives conclude the development of foundational knowledge of biology, chemistry, physics, and the earth and space sciences. Through a spiraling, inquiry-based program of study, all students will demonstrate scientific literacy and use of 21st century skills in the fields of biology, chemistry, physics and earth/environmental science and astronomy. The subject matter is delivered through a coordinated, integrated approach with an emphasis on the development of the major science themes of systems, changes, and models. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50 percent of the instructional time to develop conceptual understanding and research laboratory skills. Safety instruction is integrated in all activities. Building on the knowledge and skills acquired in Ninth Grade Science, students in Tenth Grade Science will expand their depth of understanding of major concepts such as energy transformation qualifications; cellular biology; molecular genetics; embryology; physical, chemical and nuclear changes; fossils and environmental concerns. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.10.1	Students will • demonstrate an understanding of history and nature of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate the ability to use the inquiry process to solve problems.

Performance Descriptors SC.PD.10.1

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students evaluate the importance of scientific innovation; relate these innovations to the utilization of scientific methodology, variability in experimental results and interpret the impact of these advances in societal, cultural and economic issues; design, conduct, communicate, evaluate and revise experiments utilizing safe procedures and appropriate technology; validate and draw conclusions from	Students evaluate the importance of scientific innovation and relate these innovations to the utilization of scientific methodology, variability in experimental results to advances in societal, cultural and economic issues; design, conduct, communicate, evaluate and revise experiments utilizing safe procedures and appropriate technology; compile data to draw conclusions from multiple data sources and	Students analyze the importance of scientific innovation and relate these innovations to the utilization of scientific methodology, variability in experimental results to advances in societal, cultural and economic issues; design, conduct, communicate, evaluate and revise experiments utilizing safe procedures and appropriate technology; draw conclusions from multiple data sources and	Students recognize the importance of scientific innovation and relate these innovations to the utilization of scientific methodology, variability in experimental results to advances in societal, cultural or economic issues; conduct and communicate experiments utilizing safe procedures and appropriate technology; draw conclusions from data and generate models.	Students identify scientific innovations and associate these innovations with the utilization of scientific methodology in advancing societal, cultural or economic issues; conduct experiments utilizing safe procedures and appropriate technology and describe results; differentiate between observations and conclusions.

experimental results using historical and student collected data and constructed models.	interpretation of models.	interpretation of models.		

SC.O.10.1.1	formulate scientific explanations based on historical observations and experimental evidence, accounting for variability in experimental results.
SC.O.10.1.2	demonstrate how a testable methodology is employed to seek solutions for personal and societal issues (e.g., "scientific method").
SC.O.10.1.3	relate societal, cultural and economic issues to key scientific innovations.
SC.O.10.1.4	conduct and/or design investigations that incorporate the skills and attitudes and/or values of scientific inquiry (e.g., established research protocol, accurate record keeping, replication of results and peer review, objectivity, openness, skepticism, fairness, or creativity and logic.)
SC.O.10.1.5	implement safe procedures and practices when manipulating equipment, materials, organisms, and models.
SC.O.10.1.6	use appropriate technology solutions within a problem solving setting to measure and collect data; interpret data; analyze and/or report data; interact with simulations; conduct research; and present and communicate conclusions.
SC.O.10.1.7	design, conduct, evaluate and revise experiments (e.g., compose a question to be investigated, design a controlled investigation that produces numeric data, evaluate the data in the context of scientific laws and principles, construct a conclusion based on findings, propose revisions to investigations based on manipulation of variables and/or analysis of error, or communicate and defend the results and conclusions).
SC.O.10.1.8	draw conclusions from a variety of data sources to analyze and interpret systems and models (e.g., use graphs and equations to measure and apply variables such as rate and scale, evaluate changes in trends and cycles, predict the influence of external variances such as potential sources of error, or interpret maps).

SC.S.10.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology, earth/environmental science and astronomy. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.

Performance Descriptors SC.PD.10.2

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students suggest cell functions based on structure; debate ethics of DNA research; assess the statement "ontogeny recapitulates phylogeny";	Students classify cells based on structure and function; analyze historical research leading to current DNA knowledge; compare ontogeny and phylogeny of	Students relate cell structure to function; apply DNA's structure to its role in heredity; compare ontogeny and phylogeny of an animal; compare traditional and	Students recognize that cells have different structures and functions; list properties of DNA; trace ontogeny or phylogeny of an animal; identify a group	Students recognize that cells have different structures; recognize that DNA is the material of heredity; recognize that embryos developmentally

construct a simple cladogram; explain interactions among biogeochemical cycles; associate diseases with chemical imbalances; analyze fossil and modern evidence of adaptations in response to changing environments; experimentally determine data to predict trends in characteristics among unknown substances; design experiments to demonstrate the relationships among temperature-pressure-volume and heat in substances during physical/chemical changes; relate the frequency of electromagnetic waves to energy; explain how electricity produces magnetism and how magnets produce electricity; assess error in measuring energy conservation; interpret calculations and graphs of rate, force, momentum, work and time; suggest a simple machine to provide optimum mechanical advantage; measure calculate the spring constant and relate to its properties; evaluate multiple gravitational effects of the Earth-Moon system;	a variety of animals; interpret a cladogram of a group of organisms; explain interactions between two biogeochemical cycles; describe the role of chemicals in human body systems; trace fossil and modern adaptations in response to changing environments; experimentally determine relationships among substances; experimentally and mathematically validate the relationships among temperature-pressure-volume and heat in substances during physical/chemical changes; calculate the frequency of electromagnetic waves; explain how electricity produces magnetism; describe conservation of all forms of energy; interpret calculations and/or graphs of rate, force, momentum, work and time; compare calculated mechanical advantage of similar simple machines; measure calculate the spring constant; evaluate the gravitational effects of the moon and sun on tidal phenomenon; predict the effects of geological or biological event on climate; evaluate conditions	modern classification systems; diagram biogeochemical cycles; describe how human body systems work together; describe fossil and modern adaptations of plant and animal populations to their changing environment; experimentally determine characteristics of substances; mathematically determine the relationships among temperature-pressure-volume and heat in substances during physical /chemical changes; characterize electromagnetic waves and their uses; describe the relationship between electricity and magnetism; quantitatively determine conservation of thermal energy; relate Newton's Laws of Motion to rate, force, momentum, work and time; calculate mechanical advantage of simple machines; compare the effect of different forces on vibrating systems; predict tidal phenomenon; determine impacts of geological and biological processes on climate; explain geological and biological processes of fossil formation; explain theories of cosmology using	of organisms whose historical classification has changed; diagram the carbon or nitrogen cycle; explain the interaction of two human body systems; recognize that populations change in response to environmental changes; experimentally determine characteristics of some substances; mathematically determine the relationships among temperature-pressure-volume; list electromagnetic waves and their uses; diagram a magnetic field around an electrical wire; recognize that energy is conserved in transformations; define Newton's Laws of Motion, rate, force, momentum, work and time; calculate mechanical advantage of some simple machines; recognize vibrating systems; explain that the moon causes tides; list geological and biological processes that affect climate; explain some processes that form fossils; state theories of cosmology.	change; place organisms in a classification system; diagram the water cycle; identify human body systems; recognize that populations change over time; list characteristics of substances; state relationship among temperature-pressure-volume; list some electromagnetic waves; recognize that electricity and magnetism are interrelated; state that energy is conserved; state the three Laws of Motion; calculate mechanical advantage of a simple machine; recognize a pendulum is an example of a vibrating system; define tides; recognize that geological and biological processes affect climate; explain a process that forms fossils; state a scientifically accepted theory for the origin of the universe.

predict the effects of geological and biological events on climate; critique geological and chemical conditions to predict fossil formation; evaluate theories of cosmology using electromagnetic evidence.	necessary for fossil formation; compare theories of cosmology using electromagnetic evidence.	electromagnetic evidence.		

SC.O.10.2.1	relate the structure of cell organelles to their functions.
SC.O.10.2.2	apply knowledge of cells to variations in cells, tissues, and organs of different organisms.
SC.O.10.2.3	compare and contrast mechanisms for the movement of materials into and out of cells.
SC.O.10.2.4	explore the discovery of DNA and its structure; examine nucleotide bonding to the importance of to the double helix structure.
SC.O.10.2.5	apply DNA analysis to current societal and technological issues (e.g., DNA's role in protein synthesis, heredity, cell division, or cellular functions).
SC.O.10.2.6	integrate DNA mutations, chromosomal crossing over and linkage with the principles of genetics.
SC.O.10.2.7	compare the ontogeny and phylogeny using the embryonic development of invertebrate and vertebrate animals.
SC.O.10.2.8	compare traditional and modern classification systems.
SC.O.10.2.9	construct a scientific explanation for variation in the species and common ancestors using fossil records, homologous features and selective pressures.
SC.O.10.2.10	compare and contrast theories for the development, diversity and/or extinction of a species (e.g., natural selection, Lamarckism, or catastrophism).
SC.O.10.2.11	construct diagrams showing energy flow and cycles of matter between chemical and biological systems including photosynthesis, stored chemical energy, decomposition, carbon and nitrogen cycles.
SC.O.10.2.12	integrate the human body systems to the functioning of the entire organism.
SC.O.10.2.13	design an investigation in which the needs of growing plants are determined.
SC.O.10.2.14	evaluate environmental factors that affect succession, populations and communities.
SC.O.10.2.15	model the flow of matter and energy flow through the respiration process.
SC.O.10.2.16	compare and contrast by investigation the properties of solutions including density, conductivity, solubility, concentration, pH and colligative properties.
SC.O.10.2.17	compare and contrast the characteristics of physical, chemical and nuclear changes/reactions.
SC.O.10.2.18	determine the relationships among temperature, pressure and volume in gases and interpret graphs that depict these relationships (e.g., Charles' Law, Boyle's Law, Gay-Lussac's Law).
SC.O.10.2.19	characterize by investigation variance in thermal energy in physical and chemical changes.
SC.O.10.4.20	compare and contrast the characteristics and uses of electromagnetic waves and relate the frequency of the wave to its application.
SC.O.10.2.21	correlate the motion of a body to its Doppler shift.
SC.O.10.2.22	qualitatively explain the relationship between electricity and magnetism.
SC.O.10.2.23	qualitatively and quantitatively describe the conservation of energy (e.g., thermal, chemical, or mechanical).
SC.O.10.2.24	apply Newton's Laws of Motion to depict the relationship among rate, force, momentum, work, and time using kinematics graph and

	mathematical models.
SC.O.10.2.25	describe and quantify how machines can provide mechanical advantage.
SC.O.10.2.26	determine the effect of different forces on vibrating systems (e.g., pendulums, or springs).
SC.O.10.2.27	apply the characteristics and behaviors of mechanical waves to earth processes.
SC.O.10.2.28	predict the amplitude and frequency of tides using the concepts of gravity and positions of the earth-sun-moon (e.g., spring and neap tides).
SC.O.10.2.29	evaluate the effects of geological events on weather and climate (e.g., volcanism and bolide impact).
SC.O.10.2.30	analyze the effects of mechanical and chemical weathering mechanisms on the earth's surface to produce sediments.
SC.O.10.2.31	relate the theories of electric and magnetic fields to the dynamics of the earth's magnetosphere.
SC.O.10.2.32	examine the effects of plate tectonics on geological and biological processes (e.g., rock cycle and paleo-geography).
SC.O.10.2.33	correlate geological and chemical processes to fossil formation (e.g., petrification, permineralization, or rapid burial).
SC.O.10.2.34	explain theories of cosmology using electromagnetic evidence.

SC.S.10.3	Students will • demonstrate the ability to use inquiry process to explore systems, models, and changes. • demonstrate an understanding of the interdependence between science and technology. • demonstrate an understanding of the utilization of technology to gather data and communicate designs, results and conclusions. • demonstrate an understanding of personal and societal benefits of science, and an understanding of public policy decisions as related to health, population, resource and environmental issues.

Performance Descriptors SC.PD.10.3

Distinguished	Above Mastery	Mastery	Partial Mastery	Novice
Students will, construct, test, analyze, and evaluate complex systems, models, and changes across science disciplines; choose a technology solution and analyze the science used in the technology; evaluate how scientific discoveries impact public policy decisions regarding health, population resources and environmental issues.	Students will, construct, test and analyze complex systems, models, and changes across science disciplines; use a technology solution and analyze the science used in the technology; evaluate how a scientific discovery impacts public policy decisions regarding health, population resources and environmental issues.	Students will construct, test and analyze data to explore systems, models, and changes across science disciplines; analyze technological innovations and identify the science that makes them possible; evaluate the personal and societal benefits of a scientific discovery; assess the impacts of a public policy decision regarding health, population resources or environmental issues.	Students will test, record and analyze data to explore systems, models, and changes; analyze a technological innovation and identify the science that makes it possible; list positive outcomes and unintended consequences of a scientific discovery; identify the impacts of a public policy decision regarding health, population resources or environmental issues.	Students will test and record data to explore systems, models, and changes; use technological innovations and state that science makes them possible; identify a positive outcome or a negative consequence of a scientific discovery; identify an impact of a public policy decision regarding health, population resources or environmental issues.

SC.O.10.3.1	synthesize concepts across various science disciplines to better understand the natural world (e.g., form and function, systems, or change over time).
SC.O.10.3.2	investigate, compare and design scientific and technological solutions to address personal and societal problems.
SC.O.10.3.3	communicate experimental designs, results and conclusions using advanced technology tools.
SC.O.10.3.4	collaborate to present research on current environmental and technological issues to predict possible solutions.
SC.O.10.3.5	explore occupational opportunities in science, engineering and technology and evaluate the required academic preparation.
SC.O.10.3.6	given a current science-technology-societal issue, construct and defend potential solutions.

Advanced Biology Content Standards and Objectives

This is an advanced level course designed for students who have completed Science Nine and who desire a broader, in-depth study of the content found in many biological fields of endeavor. This course is designed to build upon and extend the Biology concepts, skills and knowledge from the science program, using skills for the 21st Century. Students interested in health and scientific related careers will build and expand their laboratory skills and experiences. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.AB.1	Students will • demonstrate an understanding of history and nature of science as a human endeavor encompassing the contributions of diverse culture and scientists. • demonstrate the ability to use the inquiry process to solve problems.
SC.O.AB.1.1	formulate scientific explanations based on historical observations and experimental evidence, accounting for variability in experimental results.
SC.O.AB.1.2	demonstrate how a testable methodology is employed to seek solutions for personal and societal issues (e.g., "scientific method").
SC.O.AB.1.3	relate societal, cultural and economic issues to key scientific innovations.
SC.O.AB.1.4	conduct and/or design investigations that incorporate the skills and attitudes and/or values of scientific inquiry (e.g., established research protocol, accurate record keeping, replication of results and peer review, objectivity, openness, skepticism, fairness, or creativity and logic.).
SC.O.AB.1.5	implement safe procedures and practices when manipulating equipment, materials, organisms, and models.
SC.AB.O.1.6	use appropriate technology solutions within a problem solving setting to measure and collect data; interpret data; analyze and/or report data; interact with simulations; conduct research; and present and communicate conclusions.
SC.O.AB.1.7	design, conduct, evaluate and revise experiments (e.g., compose a question to be investigated, design a controlled investigation that produces numeric data, evaluate the data in the context of scientific laws and principles, construct a conclusion based on findings, propose revisions to investigations based on manipulation of variables and/or analysis of error, or communicate and defend the results and conclusions).
SC.O.AB.1.8	draw conclusions from a variety of data sources to analyze and interpret systems and models (e.g., use graphs and equations to measure and apply variables such as rate and scale, evaluate changes in trends and cycles, or predict the influence of external variances such as potential sources of error).

SC.S.AB.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories, and models as delineated in the objectives; demonstrate an understanding of the interrelationships among physics, chemistry, biology and the earth and space sciences. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.
SC.O.AB.2.1	apply foundations of chemical concepts to living systems.
SC.O.AB.2.2	correlate the properties of biological molecules to their function in biochemical pathways.
SC.O.AB.2.3	relate the structure of cellular organelles to their functions and interactions in eukaryotic cells.
SC.O.AB.2.4	analyze the chemistry and structure of the cell membrane as it relates to import and export of molecules necessary for life, exploring osmosis, diffusion, active and passive transport and dialysis.
SC.O.AB.2.5	compare and contrast cell types (e.g., prokaryotic/eukaryotic, plant/animal, nerve/muscle, archaea/bacteria).
SC.O.AB.2.6	analyze the flow of energy through cellular processes such as photosynthesis, respiration and fermentation.
SC.O.AB.2.7	outline mechanisms of homeostasis in living systems (negative and positive feedback).
SC.O.AB.2.8	discriminate the events of the prokaryotic and eukaryotic cell cycles to distinguish important cellular and molecular processes.
SC.O.AB.2.9	predict phenotypic ratios by applying Mendel's Laws of Genetics (e.g., incomplete dominance, pleiotrophy, epistasis, crossing over, environment, or development and age to phenotypic changes).
SC.O.AB.2.10	distinguish the structure and function of messenger, transfer and ribosomal RNA in the processes of transcription and translation.
SC.O.AB.2.11	demonstrate the role of DNA in determining phenotype and illustrate ways of controlling and regulating expression and function of genes.
SC.O.AB.2.12	research the application of DNA technology in the context of social and political issues.
SC.O.AB.2.13	evaluate the evidence for natural selection including speciation, fossil record evidence, molecular similarities and homologous structures.
SC.O.AB.2.14	debate whether responses are attributable to heredity or environment.
SC.O.AB.2.15	evaluate the influence of the historical social context on the development of evolutionary theory.
SC.O.AB.2.16	compare morphological, cladistic and other classification systems including domains, kingdoms and other taxa.
SC.O.AB.2.17	interpret the placement of viruses in the current classification systems.
SC.O.AB.2.18	incorporate the structure and function of individual systems to the overall functioning of the organism.
SC.O.AB.2.19	assess responses of organisms to internal and environmental stimuli.
SC.O.AB.2.20	predict probability of extinction based on Hardy-Weinberg calculations.
SC.O.AB.2.21	propose ecosystem models that incorporate interactions of biotic and abiotic environmental variables.
SC.O.AB.2.22	diagram changes in energy as it flows through an ecosystem to illustrate conservation of energy.
SC.O.AB.2.23	analyze population growth curves to predict limiting factors in ecosystems as they determine carrying capacity.

SC.S.AB.3	Students will • demonstrate the ability to use inquiry process to explore systems, models and changes. • demonstrate an understanding of the interdependence between science and technology. • demonstrate an understanding of the utilization of technology to gather data and communicate designs, results and conclusions. • demonstrate the ability to evaluate personal and societal benefits, the impact of different points of view, predict the long-term societal impact and an understanding of public policy decisions as related to health, population, resource and environmental issues.
SC.O.AB.3.1	synthesize concepts across various science disciplines to better understand the natural world (e.g., form and function, systems, and change over time.
SC.O.AB.3.2	investigate, compare and design scientific and technological solutions to address personal and societal problems.
SC.O.AB.3.3	communicate experimental designs, results and conclusions using advanced technology tools.
SC.O.AB.3.4	collaborate to present research on current environmental and technological issues to predict possible solutions.
SC.O.AB.3.5	explore occupational opportunities in science, engineering and technology and evaluate the required academic preparation.
SC.O.AB.3.6	given current science-technology-societal issues, construct and defend potential solutions.

Biology - Technical Conceptual Content Standards and Objectives

This is an introductory course designed for students who have completed Science Nine and who are interested in the field of technical biology with the scientific knowledge and opportunities to develop the inquiry, problem solving and decision making abilities necessary for their future vocation. Biology - Technical Conceptual is an alternative to Advanced Biology and is designed to prepare students for entry level careers, using skills for the 21st Century. The course will provide an in-depth study in the chemical nature of life, cellular functions, microbiology, ecology, biotechnology, zoology and botany with application emphasis. It builds on the fundamental concepts developed in the science program in a rigorous and integrated manner. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.BTC.1	Students will • demonstrate an understanding of history and nature of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate the ability to use the inquiry process to solve problems.
SC.O.BTC.1.1	formulate scientific explanations based on historical observations and experimental evidence, accounting for variability in experimental results.
SC.O.BTC.1.2	demonstrate how a testable methodology is employed to seek solutions for personal and societal issues (e.g., "scientific method").
SC.O.BTC.1.3	relate societal, cultural and economic issues to key scientific innovations.
SC.O.BTC.1.4	conduct and/or design investigations that incorporate the skills and attitudes and/or values of scientific inquiry (e.g., established research protocol, accurate record keeping, replication of results and peer review, objectivity, openness, skepticism, fairness, or creativity and logic.).
SC.O.BTC.1.5	implement safe procedures and practices when manipulating equipment, materials, organisms, and models.
SC.O.BTC.1.6	use appropriate technology solutions within a problem solving setting to measure and collect data; interpret data; analyze and/or report data; interact with simulations; conduct research; and present and communicate conclusions.
SC.O.BTC.1.7	design, conduct, evaluate and revise experiments (e.g., compose a question to be investigated, design a controlled investigation that produces numeric data, evaluate the data in the context of scientific laws and principles, construct a conclusion based on findings, propose revisions to investigations based on manipulation of variables and/or analysis of error, or communicate and defend the results and conclusions).
SC.O BTC.1.8	draw conclusions from a variety of data sources to analyze and interpret systems and models (e.g., use graphs and equations to measure and apply variables such as rate and scale, evaluate changes in trends and cycles, predict the influence of external variances such as potential sources of error, or interpret maps).

SC.S.BTC.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories, and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology and the earth and space sciences. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.
SC.O.BTC.2.1	analyze the flow of matter and energy through cellular processes such as photosynthesis, respiration and fermentation.
SC.O.BTC.2.2	correlate the properties of molecules to their movement through biological membranes.
SC.O.BTC.2.3	apply the absorption spectrum of photosynthetic pigments to the action spectrum of photosynthesis.
SC.O.BTC.2.4	analyze the interactions of organisms with their environment as they perceive it through sensory mechanisms.
SC.O.BTC.2.5	relate molecules to their functions in biochemical pathways.
SC.O.BTC.2.6	predict molecular weight based on experimental evidence from separation investigations.
SC.O.BTC.2.7	assess water use practices based on water supply and quality.
SC.O.BTC.2.8	defend the use of recycling as a tool for energy and resource conservation.
SC.O.BTC.2.9	illustrate the functioning of modern sanitary landfills and compare them with historic disposal methods.
SC.O.BTC.2.10	predict the effects of human activity on cycles of matter and energy in the biosphere over time.
SC.O.BTC.2.11	compile GIS and traditional map data to locate patterns in biological and environmental systems.
SC.O.BTC.2.12	characterize complex interactions of organisms within ecosystems based on their niches including interspecific and intraspecific competition, and symbiosis.
SC.O.BTC.2.13	evaluate the use of a particular sampling technique to study ecosystems.
SC.O.BTC.2.14	predict changes in an ecosystem's productivity when environmental variables are altered.
SC.O.BTC.2.15	analyze graphs reflecting changes in populations to predict future populations.
SC.O.BTC.2.16	model cycles in soil including natural and human interactions that influence soil development.
SC.O.BTC.2.17	evaluate the effects of biocide use and chemical hazards on the diversity of life in ecosystems.
SC.O.BTC.2.18	demonstrate the role of DNA in inheritance and gene expression.
SC.O.BTC.2.19	apply principles of genetics to the molecular processes that lead to phenotypic changes.
SC.O.BTC.2.20	analyze karyotypes and pedigrees as diagnostic tools.
SC.O.BTC.2.21	debate the social and ethical implications of genetic engineering using current DNA technology.
SC.O.BTC.2.22	compare and contrast the morphology, reproduction and life cycles of plants in view of the habitats supporting the plants.
SC.O.BTC.2.23	evaluate forest management practice for short and long-term resource utilization.
SC.O.BTC.2.24	assess the importance of wild and cultivated plants to human society, economics and environment.
SC.O.BTC.2.25	analyze animal distributions and the environments supporting those populations.
SC.O.BTC.2.26	compare animal behaviors and reproductive strategies as they lead to evolutionary success in specific environments.
SC.O.BTC.2.27	compare the characteristics, structures and life cycles of simple to complex organisms

SC.S.BTC.3	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories, and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology and the earth and space sciences. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.
SC.O.BTC.3.1	synthesize concepts across various science disciplines to better understand the natural world (e.g., form and function, systems, or change over time).
SC.O.BTC.3.2	investigate, compare and design scientific and technological solutions to address personal and societal problems.
SC.O.BTC.3.3	communicate experimental designs, results and conclusions using advanced technology tools.
SC.O.BTC.3.4	collaborate to present research on current environmental and technological issues to predict possible solutions.
SC.O.BTC.3.5	explore occupational opportunities in science, engineering and technology and evaluate the required academic preparation.
SC.O.BTC.3.6	given a current science-technology-societal issue, construct and defend potential solutions.

Human Anatomy and Physiology Content Standards and Objectives

This advanced course is designed for those students wanting a deeper understanding of the structure and function of the human body. The body will be viewed as a whole using anatomical terminology necessary to describe location. Focus will be at both micro and macro levels reviewing cellular functions, biochemical processes, tissue interactions, organ systems and the interaction of those systems as it relates to the human organism. Systems covered include integumentary, skeletal, muscular, respiratory, circulatory, digestive, excretory, reproductive immunological, nervous and endocrine. This course will develop 21st century skills and be appropriate for college bound students as well as those choosing a health services career cluster. Students will engage in active inquiries, investigation, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.HAP.1	Students will • demonstrate an understanding of history and nature of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate the ability to use the inquiry process to solve problems.
SC.O.HAP.1.1	formulate scientific explanations based on historical observations and experimental evidence, accounting for variability in experimental results.
SC.O.HAP.1.2	demonstrate how a testable methodology is employed to seek solutions for personal and societal issues (e.g., "scientific method").
SC.O.HAP 1.3	relate societal, cultural and economic issues to key scientific innovations.
SC.O.HAP.1.4	conduct and/or design investigations that incorporate the skills and attitudes and/or values of scientific inquiry (e.g., established research protocol, accurate record keeping, replication of results and peer review, objectivity, openness, skepticism, fairness, or creativity and logic).
SC.O.HAP.1.5	implement safe procedures and practices when manipulating equipment, materials, organisms, and models.
SC.O.HAP.1.6	use appropriate technology solutions within a problem solving setting to measure and collect data; interpret data; analyze and/or report data; interact with simulations; conduct research; and present and communicate conclusions.
SC.O.HAP.1.7	design, conduct, evaluate and revise experiments (e.g., compose a question to be investigated, design a controlled investigation that produces numeric data, evaluate the data in the context of scientific laws and principles, construct a conclusion based on findings, propose revisions to investigations based on manipulation of variables and/or analysis of error, or communicate and defend the results and conclusions).
SC.O.HAP.1.8	draw conclusions from a variety of data sources to analyze and interpret systems and models (e.g., use graphs and equations to measure and apply variables such as rate and scale, evaluate changes in trends and cycles, predict the influence of external

	variances such as potential sources of error, or interpret maps).

SC.S.HAP.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology, earth/environmental science and astronomy. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.
SC.O.HAP.2.1	apply directional terminology (proximal, dorsal, medial, lateral, visceral, superficial, deep, etc.) to locate human body structures.
SC.O.HAP.2.2	correlate the properties of biological molecules to their function in biochemical pathways.
SC.O.HAP.2.3	diagram the role of DNA and the types of RNA in transcription and translation processes of protein synthesis.
SC.O.HAP.2.4	predict the movement of materials into and out of cells based on principles of osmosis and concentration gradients.
SC.O.HAP.2.5	relate the structure of cellular organelles to their functions and interactions in eukaryotic cells.
SC.O.HAP.2.6	describe the organizational levels, interdependency and the interaction of cells, tissues, organs, and organ systems.
SC.O.HAP.2.7	categorize, by structure and function, the various types of human tissue (e.g., muscle, epithelial, connective, or nervous).
SC.O.HAP.2.8	relate the structure of the integumentary system to its function as a sensory organ, environmental barrier and temperature regulator.
SC.O.HAP.2.9	relate how bone tissue is important to the development of the human skeleton.
SC.O.HAP.2.10	correlate the structure and function of the elements of the skeletal system (bone, articulations and insertions).
SC.O.HAP.2.11	model the mechanisms of muscular contraction on the cellular and molecular levels.
SC.O.HAP.2.12	integrate the skeletal, muscular and nervous systems to the functioning of the organism.
SC.O.HAP.2.13	model the muscular system including locations, origins, insertions, muscle groups and types of muscles.
SC.O.HAP.2.14	classify the various types of neurons emphasizing the relationship of structure and function.
SC.O.HAP.2.15	model the mechanism of a nerve impulse at the cellular and molecular levels.
SC.O.HAP.2.16	compare and contrast the parts and functions of the central and peripheral nervous system including the autonomic portions.
SC.O.HAP.2.17	apply the structure of the ear and eye to their function/dysfunction in relation to environmental perception.
SC.O.HAP.2.18	apply the action of specific enzymes to their roles in bodily functions.
SC.O.HAP.2.19	incorporate the role of endocrine glands and their hormones into the overall functions and dysfunctions of the body.
SC.O.HAP.2.20	analyze the role of components and processes of the digestive system in supplying essential nutrients.
SC.O.HAP.2.21	explain how structures of the respiratory system are essential to cellular respiration, gas exchange and communication.
SC.O.HAP.2.22	illustrate the structure of the circulatory and lymphatic systems and the function of blood to the role of transportation, cellular support and defense.
SC.O.HAP.2.23	compare the compatibility of blood types and assess the molecular basis for blood functions.
SC.O.HAP.2.24	integrate the functions of the excretory system to the maintenance of the other body systems.
SC.O.HAP.2.25	compare and contrast the structure and function of male and female reproductive systems.
SC.O.HAP.2.26	apply the purposes, processes and outcomes of meiosis and mitosis to reproduction and growth.
SC.O.HAP.2.27	outline the events of reproduction for the formation of gametes through fertilizations and embryological development.

SC.O.HAP.2.28	analyze changes in DNA activity and the effects on protein synthesis, gene expression and human inheritance.
SC.O.HAP.2.29	apply Mendel's laws of inheritance to predict and current advances in DNA research to detect genetic diseases.
SC.O.HAP.2.30	assess the role of components of the immune system in defending the body.
SC.O.HAP.2.31	research disease causative factors, symptoms, prevention and treatment.

SC.S.HAP.3	Students will • demonstrate the ability to use inquiry process to explore systems, models, and changes. • demonstrate an understanding of the interdependence between science and technology. • demonstrate an understanding of the utilization of technology to gather data and communicate designs, results and conclusions. • demonstrate an understanding of personal and societal benefits of science, and an understanding of public policy decisions as related to health, population, resource and environmental issues.
SC.O.HAP.3.1	synthesize concepts across various science disciplines to better understand the natural world (e.g., form and function, systems, or change over time).
SC.O.HAP.3.2	investigate, compare and design scientific and technological solutions to address personal and societal problems.
SC.O.HAP.3.3	communicate experimental designs, results and conclusions using advanced technology tools.
SC.O.HAP.3.4	collaborate to present research on current environmental and technological issues to predict possible solutions.
SC.O.HAP.3.5	explore occupational opportunities in science, engineering and technology and evaluate the required academic preparation.
SC.O.HAP 3.6	given a current science-technology-societal issue, construct and defend potential solutions.

Advanced Chemistry Content Standards and Objectives

An advanced level course designed for students who have completed Ninth Grade Science and desire a broader, in-depth study of the content found in the science field of chemistry. Advanced Chemistry is the advanced study of matter, its composition and its changes. This course is designed to build upon and extend the Chemistry concepts, skills and knowledge from the science program using skills for the 21st century. This course is designed to prepare a student for college chemistry, requiring a strong mathematical base. The relationship between chemistry concepts and mathematics will be emphasized. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.AC.1	Students will • demonstrate an understanding of history and nature of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate the ability to use the inquiry process to solve problems.
SC.O.AC.1.1	formulate scientific explanations based on historical observations and experimental evidence, accounting for variability in experimental results.
SC.O.AC.1.2	demonstrate how a testable methodology is employed to seek solutions for personal and societal issues (e.g., "scientific method").
SC.O.AC.1.3	relate societal, cultural and economic issues to key scientific innovations.
SC.O.AC.1.4	or design investigations that incorporate the skills and attitudes and/or values of scientific inquiry (e.g., established research protocol, accurate record keeping, replication of results and peer review, objectivity, openness, skepticism, fairness, or creativity and logic.
SC.O.AC.1.5	implement safe procedures and practices when manipulating equipment, materials, organisms, and models.
SC.O.AC.1.6	ate technology solutions within a problem solving setting to measure and collect data; interpret data; analyze and/or report data; interact with simulations; conduct research; and present and communicate conclusions.
SC.O.AC.1.7	design, conduct, evaluate and revise experiments (e.g., compose a question to be investigated, design a controlled investigation that produces numeric data, evaluate the data in the context of scientific laws and principles, construct a conclusion based on findings, or propose revisions to investigations based on manipulation of variables and/or analysis of error; communicate and defend the results and conclusions).
SC.O.AC.1.8	draw conclusions from a variety of data sources to analyze and interpret systems and models (e.g., use graphs and equations to measure and apply variables such as rate and scale, evaluate changes in trends and cycles, predict the influence of external variances such as potential sources of error, or interpret maps).

SC.S.AC.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology, earth/environmental science and astronomy. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.
SC.O.AC.2.1	classify pure substances by their position on the periodic table or their room temperature state of matter and their physical and chemical properties.
SC.O.AC.2.2	research and evaluate the contributions of Dalton, Planck, Bohr, Einstein, deBroglie, Heisenberg, and Schrödinger to the evolution of the atomic theory.
SC.O.AC.2.3	draw Bohr models to demonstrate number and relative placement of protons, neutrons, and electrons for any element on the periodic table.
SC.O.AC.2.4	determine the proper set of quantum numbers (n, l, ml, and ms) for any electron in any given element.
SC.O.AC.2.5	produce electron configurations for any element on the periodic table and predict the chemical properties of the element from the electron configuration.
SC.O.AC.2.6	illustrate Lewis' dot structures for representative elements.
SC.O.AC.2.7	generate the correct ionic or molecular formula and communicate the correct name for the compound to include roman numerals or prefixes as needed.
SC.O.AC.2.8	analyze the periodic table to predict trends in atomic size, ionic size, electronegativity, ionization energy and electron affinity.
SC.O.AC.2.9	predict the type of bonding that occurs between atoms and characterize the properties of the ionic, covalent or metallic bond formed.
SC.O.AC.2.10	construct models to explain the structure and geometry of organic and inorganic molecules and the lattice structures of crystals.
SC.O.AC.2.11	recognize simple organic functional groups and classify simple organic compounds by name.
SC.O.AC.2.12	given the reactants, anticipate the products and create balanced equations for the five general types of chemical reactions (e.g., synthesis or combination, decomposition, single replacement, or double replacement and combustion).
SC.O.AC.2.13	recognize the driving forces in reactions: formation of a solid, formation of water, transfer of electrons and formation of a gas.
SC.O.AC.2.14	justify that the net ionic equation for the combination on a strong acid and a strong base is always the same.
SC.O.AC.2.15	devise a means of preparing a gas by reacting an acid with an ionic compound.
SC.O.AC.2.16	recognize the transfer of electrons involved in synthesis, decomposition, and single replacement reactions.
SC.O.AC.2.17	generate dimensional analysis conversion factors to perform unit conversions and to verify experimental calculations.
SC.O.AC.2.18	generate mole conversions that demonstrate the ability to convert from one type of quantity to another (e.g., mass to number of particles, number of particles to volume, or volume to mass).
SC.O.AC.2.19	perform calculations using the combined and ideal gas laws.
SC.O.AC.2.20	perform calculations to communicate the molarity of solutions, percentage composition of elements in a compound, the empirical and molecular formula of elements in a compound and the formulas of hydrates.
SC.O.AC.2.21	validate the formula of a hydrated compound experimentally.
SC.O.AC.2.22	perform stoichiometric calculations to produce values for theoretical yield and to decide the limiting reactant of a given chemical reaction.
SC.O.AC.2.23	assess the factors that influence the rate of reaction.

SC.O.AC.2.24	examine colligative properties of solutions.
SC.O.AC.2.25	compare and contrast the Arrhenius and Bronsted-Lowry definitions of acids and bases.
SC.O.AC.2.26	relate the pH or pOH to the hydronium ion or hydroxide ion concentration.
SC.O.AC.2.27	compare methods of measuring pH (e.g., indicators, indicator papers, or pH meters).
SC.O.AC.2.28	given the reactants, anticipate the products and create balanced equations for nuclear reactions.
SC.O.AC.2.29	predict the amount of a radioactive sample that will remain after a given time period, given the decay constant or half-life of the sample.
SC.O.AC.2.30	research applications of radioactive isotopes in chemistry, industry and/or medicine.
SC.O.AC.2.31	compare and contrast fission, fusion and transmutation nuclear reactions.
SC.O.AC.2.32	perform experiments to determine the specific heat capacity of metal.
SC.O.AC.2.33	compare and contrast the concepts of heat and temperature.
SC.O.AC.2.34	construct electrolytic cells, write and balance the half-cell reactions and calculate cell voltage.

SC.S.AC.3	Students will • demonstrate the ability to use inquiry process to explore systems, models, and changes. • demonstrate an understanding of the interdependence between science and technology. • demonstrate an understanding of the utilization of technology to gather data and communicate designs, results and conclusions. • demonstrate an understanding of personal and societal benefits of science, and an understanding of public policy decisions as related to health, population, resource and environmental issues.
SC.O.AC.3.1	draw conclusions from a variety of data sources to analyze and interpret systems and models (e.g., use graphs and equations to measure and apply variables such as rate and scale, evaluate changes in trends and cycles, or predict the influence of external variances such as potential sources of error).
SC.O.AC.3.2	investigate, compare and design scientific and technological solutions to address personal and societal problems.
SC.O.AC.3.3	communicate experimental designs, results and conclusions using advanced technology tools.
SC.O.AC.3.4	collaborate to research present current environmental and technological issues and predict possible solutions.
SC.O.AC.3.5	explore occupational opportunities in science, engineering and technology and evaluate the required academic preparation.
SC.O.AC3.6	given a current science-technology-societal issue, construct and defend potential solutions.

Chemistry-Technical Conceptual Content Standards and Objectives

An introductory level course designed for students who have completed Science Nine and who desire an alternative to a traditional college preparatory course emphasizes real life applications of chemical principles. Mathematical based problem solving is de-emphasized. Chemistry-Technical Conceptual is the study of matter, its composition and its changes. Emphasis is placed on the important role chemistry plays in a student's personal life, career opportunities, environment and society while developing 21st century skills. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research laboratory skills. Safety instruction is integrated into all activities. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.CTC.1	Students will • demonstrate an understanding of history and nature of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate the ability to use the inquiry process to solve problems.
SC.O.CTC.1.1	formulate scientific explanations based on historical observations and experimental evidence, accounting for variability in experimental results.
SC.O.CTC.1.2	demonstrate how a testable framework is employed to seek solutions for personal and societal issues. (e.g., "scientific method").
SC.O.CTC.1.3	relate societal, cultural and economic issues to key scientific innovations.
SC.O.CTC.1.4	or design investigations that incorporate the skills and attitudes and/or values of scientific inquiry (e.g., established research protocol, accurate record keeping, replication of results and peer review, objectivity, openness, skepticism, fairness, or creativity and logic.
SC.O.CTC.1.5	ife procedures and practices when manipulating equipment, materials, organisms, and models.
SC.O.CTC.1.6	ate technology solutions within a problem solving setting to measure and collect data; interpret data; analyze and/or report data; interact with simulations; conduct research; and present and communicate conclusions.
SC.O.CTC.1.7	design, conduct, evaluate and revise experiments (e.g., compose a question to be investigated, design a controlled investigation that produces numeric data, evaluate the data in the context of scientific laws and principles, construct a conclusion based on findings, propose revisions to investigations based on manipulation of variables and/or analysis of error, or communicate and defend the results and conclusions).
SC.O.CTC.1.8	draw conclusions from a variety of data sources to analyze and interpret systems and models (e.g., use graphs and equations to measure and apply variables such as rate and scale, evaluate changes in trends and cycles, predict the influence of external variances such as potential sources of error, or interpret maps).

SC.S.CTC.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology, earth/environmental science and astronomy. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.
SC.O.CTC.2.1	classify examples of matter as pure substance or mixture.
SC.O.CTC.2.2	compare and contrast the properties of metals, nonmetals and metalloids.
SC.O.CTC.2.3	research the sources and uses of elements.
SC.O.CTC.2.4	using kinetic energy explain the physical states of matter.
SC.O.CTC.2.5	perform calculations using the gas laws.
SC.O.CTC.2.6	predict the physical and chemical properties of an element based on the relationship between its group and period on the periodic table.
SC.O.CTC.2.7	examine experimentally the methods of separating mixtures (e.g., filtration, distillation, or chromatography).
SC.O.CTC.2.8	generate the correct formula and/or name for ionic and molecular compounds.
SC.O.CTC.2.9	classify compounds as having an ionic or covalent bonds.
SC.O.CTC.2.10	predict the polarity of a bond by calculating the electronegativity difference between the two elements in the bond.
SC.O.CTC.2.11	write and balance a chemical equation, given the information in a sentence.
SC.O.CTC.2.12	classify a balanced equation into one of the five basic types. (e.g., synthesis or combination, decomposition, single replacement, double replacement, or combustion).
SC.O.CTC.2.13	perform unit conversions using dimensional analysis.
SC.O.CTC.2.14	apply the mole concept to chemical formulas to find the molar mass.
SC.O.CTC.2.15	calculate the percent composition by mass of the elements in a compound.
SC.O.CTC.2.16	perform mole conversions to generate values for theoretical yield, percentage yield and to identify the limiting reactant.
SC.O.CTC.2.17	determine experimentally the effects of temperature and concentration on solution properties (e.g., solubility, conductivity, or density and colligative properties).
SC.O.CTC.2.18	perform solution concentration calculations (e.g., molarity, or ppm).
SC.O.CTC.2.19	recognize that water's role as a solvent is dependent upon its polarity.
SC.O.CTC.2.20	compare and contrast the properties of strong and weak acids and bases.
SC.O.CTC.2.21	predict the product of an acid-base reaction.
SC.O.CTC.2.22	compare and contrast the concepts of heat and temperature.
SC.O.CTC.2.23	classify reactions as exothermic and endothermic reactions by the direction of heat flow in a chemical reaction.
SC.O.CTC.2.24	calculate specific heat.
SC.O.CTC.2.25	interpret a phase change diagram.
SC.O.CTC.2.26	predict the effect of temperature and catalysts on reaction rates.

SC.S.CTC.3	Students will • demonstrate the ability to use inquiry process to explore systems, models, and changes. • demonstrate an understanding of the interdependence between science and technology. • demonstrate an understanding of the utilization of technology to gather data and communicate designs, results and conclusions. • demonstrate an understanding of personal and societal benefits of science, and an understanding of public policy decisions as related to health, population, resource and environmental issues
SC.O.CTC.3.1	concepts across various science disciplines to better understand the natural world (e.g., form and function, or systems and change over time).
SC.O.CTC.3.2	investigate, compare and design scientific and technological solutions to address personal and societal problems.
SC.O.CTC.3.3	communicate experimental designs, results and conclusions using advanced technology tools.
SC.O.CTC.3.4	collaborate to present research on current environmental and technological issues to predict possible solutions.
SC.O.CTC.3.5	explore occupational opportunities in science, engineering and technology and evaluate the required academic preparation.
SC.O.CTC.3.6	given a current science-technology-societal issue, construct and defend potential solutions.

Advanced Earth Science Content Standards and Objectives

An advanced level lab course designed for students who have completed Science Nine and desire a broader understanding of the fundamentals of earth science that includes geology, oceanography, meteorology and astronomy. This course is designed to build on knowledge, skills, and dispositions developed during the science progression, which approached science in a rigorous and integrated manner including the traditional disciplines of biology, chemistry, and physics where appropriate. Students will engage in active inquiries, investigations and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.AES.1	Students will • demonstrate an understanding of history and nature of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate the ability to use the inquiry process to solve problems.
SC.O.AES.1.1	formulate scientific explanations based on historical observations and experimental evidence, accounting for variability in experimental results.
SC.O.AES.1.2	demonstrate how a testable methodology is employed to seek solutions for personal and societal issues (e.g., "scientific method").
SC.O.AES.1.3	relate societal, cultural, and economic issues to key scientific innovations.
SC.O.AES.1.4	conduct and/or design investigations that incorporate the skills and attitudes and/or values of scientific inquiry (e.g., established research protocols, accurate record keeping, replication of results and peer review, objectivity, openness, skepticism, fairness, or creativity and logic).
SC.O.AES.1.5	implement safe procedures and practices when manipulating equipment, materials, organisms, and models.
SC.O.AES.1.6	use appropriate technology solutions within a problem solving setting to measure and collect data; interpret data; analyze and/or report data; interact with simulations; conduct research; and to present and communicate conclusions.
SC.O.AES.1.7	design, conduct, evaluate and revise experiments (e.g., compose a question to be investigated, design a controlled investigation that produces numerical data, evaluate the data in the context of scientific laws and principles, construct a conclusion bases on findings, propose revisions to investigations based on manipulation of variables and/or analysis of error, or communicate and defend the results and conclusions).
SC.O.AES.1.8	draw conclusions from a variety of data sources to analyze and interpret systems and models (e.g., use graphs and equations to measure and apply variables such as rate and scale, evaluate changes in trends and cycles, predict the influence of external variances such as potential sources of error, or interpret maps).

SC.S.AES.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology, earth/environmental science and astronomy. • apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.
SC.O.AES.2.1	review foundational earth science concepts including rocks and the rock cycle, minerals, properties of waves, constructing and interpreting weather maps, surface features found on maps, climatic relationships to biomes, use of data gathering instruments, temperature-phase change relationships.
SC.O.AES.2.2	identify and describe the structure, origin, and evolution of the lithosphere, hydrosphere, atmosphere and biosphere.
SC.O.AES.2.3	analyze seismic, density, gravity, and magnetic data to explain the structure of the earth.
SC.O.AES.2.4	characterize the eras, epochs and periods in relation to earth history and geologic development.
SC.O.AES.2.5	analyze rock and fossil evidence to estimate the relative ages of rocks.
SC.O.AES.2.6	estimate the absolute age of materials using radiometric data.
SC.O.AES.2.7	use chemical and physical properties to distinguish between common minerals and explain their economic uses.
SC.O.AES.2.8	use rock characteristics to predict paleoenvironments or geologic conditions which existed during the formation of a given rock sample.
SC.O.AES.2.9	investigate and describe the properties of water, which contribute to its critical role in physical and chemical weathering.
SC.O.AES.2.10	compare and contrast the effectiveness of agents and processes of degradation, i.e., • weathering by gravity, • wind, • water, • ice.
SC.O.AES.2.11	predict geologic activity associated with specific plate boundaries and interactions.
SC.O.AES.2.12	analyze modern and historical seismic information to determine epicenter location and magnitude of earthquakes.
SC.O.AES.2.13	evaluate current explanations for mechanisms, which drive the motion of plates (convection, slab-pull, plate push).
SC.O.AES.2.14	relate the effect of degradation and tectonic forces on the earth's surface features, i.e., • weathering, • physical features of the ocean floor, • life with the oceans.
SC.O.AES.2.15	construct and/or interpret information on topographic maps.
SC.O.AES.2.16	identify and describe chemical and physical properties of oceans, i.e., • composition, • currents, • physical features of the ocean floor.

SC.O.AES.2.17	compare and contrast characteristics of the various oceans, including their lateral and vertical motions.
SC.O.AES.2.18	analyze the evolution of the ocean floor including ocean crust, sedimentation, active and passive continental margins.
SC.O.AES.2.19	examine the stratification of the oceans, i.e., • temperature, • salinity zones, • biological zones.
SC.O.AES.2.20	investigate to explain heat transfer in the atmosphere and its relationship to meteorological processes (e.g., pressure, winds, evaporation, condensation, or precipitation).
SC.O.AES.2.21	predict the effects of ocean currents on climate.
SC.O.AES.2.22	use meteorological evidence and weather maps (including air masses, wind, barometric pressure, and temperature data) to forecast weather.
SC.O.AES.2.23	examine global change over time, i.e., • climatic trends, • global warming, • ozone depletion.
SC.O.AES.2.24	compare and contrast theories concerning origins of the universe.
SC.O.AES.2.25	apply Newton's Law of Universal Gravitation to the motion of celestial objects to explain phenomenon observed in the sun-earth-moon system.
SC.O.AES.2.26	analyze several origin theories of the solar system to explain the planets, planet anomalies, planetary motion, and the asteroid belt.
SC.O.AES.2.27	examine celestial bodies, their formation, and their evolution (e.g., moon, stars, or comets).
SC.O.AES.2.28	relate the determination of time and location to navigation.
SC.O.AES.2.29	compare ancient and modern methods used to study astronomy.
SC.O.AES.2.30	use various wavelengths of the electromagnetic spectrum to investigate the observable universe.
SC.O.AES.2.31	compare the relationship between earth processes and natural disasters with their impact on humans.
SC.O.AES.2.32	evaluate the potential conflicts, which arise between societal reliance on natural resources and the need to act as responsible stewards to reclaim the earth, including disposal of hazardous and non-hazardous waste.
SC.O.AES.2.33	research alternative energy sources to evaluate the ecological, environmental and economic cost-benefit ratio.

SC.S.AES.3	Students will • demonstrate the ability to use inquiry process to explore systems, models, and changes. • demonstrate an understanding of the interdependence between science and technology. • demonstrate an understanding of the utilization of technology to gather data and communicate designs, results and conclusions. • demonstrate an understanding of personal and societal benefits of science, and an understanding of public policy decisions as related to health, population, resource and environmental issues.
SC.O.AES.3.1	synthesize concepts across various science disciplines to better understand the natural world (e.g., form and function, system, or

	change over time).
SC.O.AES.3.2	investigate, compare and design scientific and technological solutions to address personal and societal problems.
SC.O.AES.3.3	communicate experimental designs, results and conclusions using advanced technology tools.
SC.O.AES.3.4	collaborate to present research on current environmental and technological issues and predict possible solutions.
SC.O.AES.3.5	explore occupational opportunities in science, engineering and technology and evaluate the required academic preparation.
SC.O.AES.3.6	given a current science-technology-societal issue, construct and defend potential solutions.

Advanced Physics Content Standards and Objectives

An advanced level course designed for students who have completed Science Nine and desire a broader, in-depth study of the content found in the science field of physics. As a college preparatory course, Advanced Physics is a laboratory driven, advanced study of nature's universal laws with emphasis on process skills, using 21st century skills. This course is designed to build upon and extend the Physics concepts, skills, and knowledge from the science program. The course emphasizes a mathematical approach to the areas of kinematics, dynamics, thermodynamics, light and optics, electricity and magnetism and modern physics. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.AP.1	Students will • demonstrate an understanding of history and nature of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate the ability to use the inquiry process to solve problems.
SC.O.AP.1.1	formulate scientific explanations based on historical observations and experimental evidence, accounting for variability in experimental results.
SC.O.AP.1.2	demonstrate how a testable methodology is employed to seek solutions for personal and societal issues (e.g., "scientific method").
SC.O.AP.1.3	relate societal, cultural and economic issues to key scientific innovations.
SC.O.AP.1.4	conduct and/or design investigations that incorporate the skills and attitudes and/or values of scientific inquiry (e.g., established research protocol, accurate record keeping, replication of results and peer review, objectivity, openness, skepticism, fairness, or creativity and logic).
SC.O.AP.1.5	implement safe procedures and practices when manipulating equipment, materials, organisms, and models.
SC.O.AP.1.6	use appropriate technology solutions within a problem solving setting to measure and collect data; interpret data; analyze and/or report data; interact with simulations; conduct research; and present and communicate conclusions.
SC.O.AP.1.7	design, conduct, evaluate and revise experiments (e.g., compose a question to be investigated, design a controlled investigation that produces numeric data, evaluate the data in the context of scientific laws and principles, construct a conclusion based on findings, propose revisions to investigations based on manipulation of variables and/or analysis of error, or communicate and defend the results and conclusions).
SC.O.AP.1.8	draw conclusions from a variety of data sources to analyze and interpret systems and models (e.g., use graphs and equations to measure and apply variables such as rate and scale, evaluate changes in trends and cycles, predict the influence of external variances such as potential sources of error, or interpret maps).

SC.S.AP.2	Students will • demonstrate knowledge, understanding, and applications of scientific facts, concepts, principles, theories, and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology, and the earth and space sciences. • apply knowledge, understanding, and skills of science subject matter/concepts to daily life experiences.
SC.O.AP.2.1	construct and interpret graphs of position versus time, velocity versus time and acceleration versus time.
SC.O.AP.2.2	appraise data, either textbook generated or laboratory collected, for motion in one and/or two dimensions then select the correct mathematical method for communicating the value of unknown variables.
SC.O.AP.2.3	develop solutions for multi-step problems involving velocity, acceleration, momentum and net force.
SC.O.AP.2.4	interpret graphical, algebraic and/or trigonometric solutions to prove the values for vector components and resultants.
SC.O.AP.2.5	justify Newton's Laws of Motion in terms of equilibrium and net force situations.
SC.O.AP.2.6	evaluate the conservation of energy and momentum and deduce solutions for elastic and inelastic collisions.
SC.O.AP.2.7	assess the magnitude of buoyant force on submerged and floating objects.
SC.O.AP.2.8	compare the pressure exerted by a fluid to the depth of an object in the fluid.
SC.O.AP.2.9	anticipate the effects of Bernoulli's principal on fluid motion.
SC.O.AP.2.10	critique the properties of an Ideal Gas in a variety of conditions and calculate these properties using the Boltzman constant.
SC.O.AP.2.11	compare and contrast heat and temperature; validate this comparison by calculating values for kinetic, potential and internal energy.
SC.O.AP.2.12	examine the reflective, refractive and diffractive properties of mechanical and transverse waves.
SC.O.AP.2.13	perform calculations to determine wavelength, frequency, velocity or energy of a wave.
SC.O.AP.2.14	compare and contrast the physical properties of mechanical and transverse waves.
SC.O.AP.2.15	research applications of Doppler shift in determining an approaching or receding source in wave propagation.
SC.O.AP.2.16	apply ray optics diagrams to lenses and mirrors; use the lens/mirror equation and the magnification equation to solve optics problems.
SC.O.AP.2.17	justify the image results obtained by diagramming the ray optics of lenses and mirrors by deducing the image information from the lens/mirror equation.
SC.O.AP.2.19	predict the relative values of electric force and field strength based on the magnitude of and the distance from the point charge (e.g., Coulomb's Law and inverse square law).
SC.O.AP.2.20	construct and analyze electrical circuits and calculate Ohm's law problems for series, parallel and complex circuits including voltage drops; calculate power and energy in electrical systems.
SC.O.AP.2.21	distinguish between direct and alternating current and identify ways of generating each type.
SC.O.AP.2.22	conclude that modern astronomy reveals the universe through mathematical relationships (e.g., Kepler's Law, Newton's Law of Universal Gravitation, Einstein's special theory of relativity, Big Bang model, or inflation theory).

SC.S.AP.3	Students will • demonstrate the ability to use inquiry process to explore systems, models, and changes. • demonstrate an understanding of the interdependence between science and technology. • demonstrate an understanding of the utilization of technology to gather data and communicate designs, results and conclusions. • demonstrate an understanding of personal and societal benefits of science, and an understanding of public policy decisions as related to health, population, resource and environmental issues.
SC.O.AP.3.1	synthesize concepts across various science disciplines to better understand the natural world (e.g., form and function, systems, or change over time).
SC.O.AP.3.2	investigate, compare and design scientific and technological solutions to address personal and societal problems.
SC.O.AP.3.3	communicate experimental designs, results and conclusions using advanced technology tools.
SC.O.AP.3.4	collaborate to present research on current environmental and technological issues to predict possible solutions.
SC.O.AP.3.5	explore occupational opportunities in science, engineering and technology and evaluate the required academic preparation.
SC.O.AP.3.6	given a current science-technology-societal issue, construct and defend potential solutions.

Physics-Technical Conceptual Content Standards and Objectives

Physics-Technical Conceptual is an introductory course designed for students who have completed Science Nine and desire an in-depth study in physics to prepare them for technical careers. This course is an alternative to the traditional mathematical approach to physics. This approach covers the physics principles in a traditional sequence with an emphasis on conceptual understanding. While mathematics is de-emphasized, laboratory work will require traditional physics measurements to be made. Emphasis will be on the concepts that underlie the natural laws of the universe. Students will engage in active inquiries, investigations, and hands-on activities for a minimum of 50% of the instructional time to develop conceptual understanding and research/laboratory skills. Safety instruction is integrated into all activities. The West Virginia Standards for 21st Century Learning include the following components: 21st Century Content Standards and Objectives and 21st Century Learning Skills and Technology Tools. All West Virginia teachers are responsible for classroom instruction that integrates learning skills, technology tools and content standards and objectives.

SC.S.PTC.1	Students will • demonstrate an understanding of history and nature of science as a human endeavor encompassing the contributions of diverse cultures and scientists. • demonstrate the ability to use the inquiry process to solve problems.
SC.O.PTC.1.1	formulate scientific explanations based on historical observations and experimental evidence, accounting for variability in experimental results.
SC.O.PTC.1.2	demonstrate how a testable methodology is employed to seek solutions for personal and societal issues. (e.g., "scientific method").
SC.O.PTC.1.3	relate societal, cultural and economic issues to key scientific innovations.
SC.O.PTC.1.4	conduct and/or design investigations that incorporate the skills and attitudes and/or values of scientific inquiry (e.g., established research protocol, accurate record keeping, replication of results and peer review, objectivity, openness, skepticism, fairness, or creativity and logic).
SC.O.PTC.1.5	implement safe procedures and practices when manipulating equipment, materials, organisms, and models.
SC.O.PTC.1.6	use appropriate technology solutions within a problem solving setting to measure and collect data; interpret data; analyze and/or report data; interact with simulations; conduct research; and present and communicate conclusions.
SC.O.PTC.1.7	design, conduct, evaluate and revise experiments (e.g., compose a question to be investigated; design a controlled investigation that produces numeric data; evaluate the data in the context of scientific laws and principles; construct a conclusion based on findings; propose revisions to investigations based on manipulation of variables and/or analysis of error; communicate and defend the results and conclusions).
SC.O.PTC.1.8	draw conclusions from a variety of data sources to analyze and interpret systems and models (e.g., use graphs and equations to measure and apply variables such as rate and scale, evaluate changes in trends and cycles, predict the influence of external variances such as potential sources of error, or interpret maps).

SC.S.PTC.2	Students will • demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives. • demonstrate an understanding of the interrelationships among physics, chemistry, biology, earth/environmental science and astronomy. • apply knowledge, understanding and skills of science subject matter/concepts to daily life\experiences.
SC.O.PTC.2.1	make measurements, construct and interpret graphs of data and apply basic problem-solving solutions.
SC.O.PTC.2.2	solve right triangle vector problems both graphically and algebraically.
SC.O.PTC.2.3	compare and contrast distance, speed, velocity and acceleration of moving objects to describe accelerated and non-accelerated motions of a particle from textbook or lab collected data.
SC.O.PTC.2.4	analyze the motion of a projectile.
SC.O.PTC.2.5	illustrate forces acting on objects with free body diagrams.
SC.O.PTC.2.6	summarize Newton's laws distinguishing mass and weight to analyze and solve linear dynamics problems.
SC.O.PTC.2.7	interpret Newton's Laws in terms of natural phenomena.
SC.O.PTC.2.8	research the applications of force and acceleration in modern design and technology.
SC.O.PTC.2.9	characterize conservation of momentum and kinetic energy in terms of elastic ands inelastic collisions.
SC.O.PTC.2.10	compare and contrast kinetic and potential energies and recognize situations where mechanical energy is conserved.
SC.O.PTC.2.11	deduce work, energy, power and efficiency in mechanical systems.
SC.O.PTC.2.12	analyze Archimedes's and Pascal's principles to solve problems involving equilibrium and stability of floating systems.
SC.O.PTC.2.13	compare the calculation of pressure for a solid object upon its surroundings with the calculation of a solid object in a fluid depth.
SC.O.PTC.2.14	recognize the effects of Bernoulli's principle on fluid motion.
SC.O.PTC.2.15	compare and contrast the common temperature scales, convert from one temperature scale to another and evaluate temperature in terms of kinetic energy.
SC.O.PTC.2.16	experimentally determine an object's specific heat capacity and evaluate the heat gained or lost by the object.
SC.O.PTC.2.17	apply the mechanism of heat transfer and relate to environmental and energy conservation issues.
SC.O.PTC.2.18	relate the first law of thermodynamics to energy conservation.
SC.O.PTC.2.19	compare and contrast sound and light waves using the concepts of reflection, refraction, diffraction and interference.
SC.O.PTC.2.20	solve problems involving wave speed, frequency and wavelength; determine factors that affect the speed of sound; recognize that the speed of light is a constant.
SC.O.PTC.2.21	model the production of a standing wave and propose a practical application of such a wave.
SC.O.PTC.2.22	compare the Doppler shift effect for sound and light and point out examples of its occurrences and applications.
SC.O.PTC.2.23	diagram image location involving plane and spherical mirrors, concave and convex lenses.
SC.O.PTC.2.24	illustrate the applications of colored lights and pigments.
SC.O.PTC.2.25	research total internal reflection, its effects, and its applications.
SC.O.PTC.2.26	examine the concept of polarization and the means by which light becomes polarized.
SC.O.PTC.2.27	illustrate a sketch of symmetrical electric and magnetic fields associated with various geometric charge distributions.

SC.O.PTC.2.28	analyze simple direct current circuits using Ohm's and Kirchhoff's laws.
SC.O.PTC.2.29	distinguish between direct current and alternating current circuits and describe how AC is converted to DC.
SC.O.PTC.2.30	relate the magnitude and direction of an induced electric field to the inducing magnetic field, and visa versa.
SC.O.PTC.2.31	critique the advantages and limitations of nuclear fission and nuclear fusion as energy sources.
SC.O.PTC.2.32	compare and contrast Newton's and Einstein's concepts of gravity.
SC.O.PTC.2.33	recognize how the Special Theory of Relativity applies to time dilation, length contraction, space time, space travel and length contraction.

SC.S.PTC.3	Students will • demonstrate the ability to use inquiry process to explore systems, models, and changes. • demonstrate an understanding of the interdependence between science and technology. • demonstrate an understanding of the utilization of technology to gather data and communicate designs, results and conclusions. • demonstrate an understanding of personal and societal benefits of science, and an understanding of public policy decisions as related to health, population, resource and environmental issues.
SC.O.PTC.3.1	synthesize concepts across various science disciplines to better understand the natural world (e.g., form and function, systems, or change over time).
SC.O.PTC.3.2	investigate, compare and design scientific and technological solutions to personal and societal problems.
SC.O.PTC.3.3	communicate experimental designs, results and conclusions using advanced technology tools.
SC.O.PTC.3.4	collaborate to present research on current environmental and technological issues to predict possible solutions.
SC.O.PTC.3.5	explore occupational opportunities in science, engineering and technology and evaluate the required academic preparation.
SC.O.PTC.3.6	given a current science-technology-societal issue, construct and defend potential solutions.

FORM HD 201
(10-66)

FISCAL NOTE WORKSHEET
(Submit 4 Copies)

HD NO _____ DRAFT NO _____ BILL NO _____ RESOLUTION NO _____

SUBJECT: State Board Policy 2520.3: Science Content Standard and Objectives for West Virginia Schools FUND _____

SOURCE OF REVENUE: ☐ GENERAL FUND ☐ SPECIAL ☐ OTHER (SPECIFY) _____

COST OF ESTIMATE BASED ON: ☐ AN ORIGINAL ESTIMATE ☐ BUDGET BILL ☐ OTHER (SPECIFY) _____

INCOME ESTIMATE BASED ON: ☐ AN ORIGINAL ESTIMATE ☐ BUDGET BILL ☐ OTHER (SPECIFY) _____

SHOW OVER-ALL EFFECT IN ITEMS 1 AND 2 & GIVE EXPLANATION OF BREAKDOWN BY FISCAL YEAR INCLUDING LONG-RANGE EFFECT

EFFECT OF PROPOSAL	ANNUAL		FISCAL YEAR		
	INCREASE	DECREASE	CURRENT	NEXT	THEREAFTER
1. ESTIMATED TOTAL COST	0$	0$	0$	0$	0$
PERSONAL SERVICES CURRENT EXPENSES REPAIRS/ALTERATIONS EQUIPMENT OTHER	0$	0$	0$	0$	0$
2. ESTIMATED TOTAL REVENUES	0$	0$	0$	0$	0$

3. EXPLANATION OF ABOVE ESTIMATES (INCLUDING LONG-RANGE EFFECT):

No additional current or future cost is expected due to the revision of the content standards and objectives.

DATE: 5/15/06

AGENCY: West Virginia Department of Education

AUTHORIZED REPRESENTATIVE: Steve L. Paine

126CSR44C

POLICY 2520.3: 21st Century Science Content Standards and Objectives for West Virginia Schools

COMMENT PERIOD ENDS: September 2, 2006

COMMENT RESPONSE FORM

The following form is provided to assist those who choose to comment on Policy 2520.3: 21st Century Science Content Standards and Objectives for West Virginia Schools. Additional sheets may be attached, if necessary.

Name : _____ Organization: _____

Title: _____

Street Address: _____

City: _____ State: _____ Zip: _____

Please check the box below that best describes your role.

☐ School System Superintendent	☐ School System Staff	☐ Parent/Family
☐ Principal	☐ Teacher	☐ Business/Industry
☐ Professional Support Staff	☐ Service Personnel	☐ Community Member

COMMENTS/SUGGESTIONS
§126-44C-1. General.
§126-44C-2. Purpose.

126CSR44C

§126-44C-3. Incorporation by Reference
§126-44C-4. Summary of the Content Standards and Objectives

Please direct all comments to:

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