WESTFIELD PUBLIC SCHOOLS

Westfield, New Jersey

Office of Instruction

Course of Study

BIOLOGY I: 7011

School .....Westfield High School
Department.....Science
Length of Course.....One Year
Credit.....6.0
Grade Level.....8 (Gifted), 9, 10
Prerequisites.....None
Date .....

I. RATIONALE, DESCRIPTION, AND PURPOSE

The High School Biology I curriculum helps students develop understanding of key concepts and construct ideas that help them make sense of living systems. The ideas build upon student understanding of disciplinary core ideas, science and engineering practices, and crosscutting concepts from earlier grades. Ultimately, students learn to apply the knowledge and skills acquired in this curriculum to solve problems and answer questions about phenomena.

There are five main life science principles investigated in Biology I: Structure and Function, Inheritance and Variation of Traits, Matter and Energy in Organisms and Ecosystems, Interdependent Relationships in Ecosystems, and Natural Selection & Evolution. The performance expectations for Biology I blend core ideas with scientific and engineering practices and crosscutting concepts to support students in developing usable knowledge that can be applied across all of the science disciplines offered at Westfield High School.

Biology I is structured to be an introductory college preparatory course designed for 8th (Gifted), 9th, and 10th graders who have exhibited strong organizational, analytical and critical thinking skills. This full-year course fulfills one year of lab science per state graduation requirements. Biology I is a multidisciplinary subject, drawing content from language arts, mathematics and basic chemistry concepts. Students perform activities that help develop observational, analytical and problem-solving skills. As the course progresses, students who develop understanding acquire the knowledge and skills necessary to solve complex, real-world problems that extend beyond the core ideas of biology. As a college preparatory course, Biology I has been adapted to prepare students for further studies in the natural sciences.

II. OBJECTIVES

The district objectives are aligned with the New Jersey Student Learning Standards for Science, the New Jersey Student Learning Standards for Mathematics, English Language Arts, Technology, and 21st Century Life and Careers.

Science Practices

Students:

A. Demonstrate proper lab technique and safety precautions when working with equipment in a laboratory and field setting
New Jersey Student Learning Standards for Science: Science and Engineering Practices P3
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2

B. Understand and differentiate between the interdependence of science and technology
New Jersey Student Learning Standards for Science: Science and Engineering Practices P6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP11

C. Utilize acute observation skills to formulate testable questions and hypotheses and then apply logic in interpreting their observations to design and conduct controlled experiments using various laboratory techniques
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1,2,3
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,6,8
New Jersey Student Learning Standards for ELA: Science & Technical Subjects RST.9-10.3

D. Collect qualitative and quantitative data, present it in table and graph form, analyze it and arrive at a conclusion that evaluates the data for sources of error and poses new hypotheses for communication and further study
New Jersey Student Learning Standards for Science: Science and Engineering Practices P4,6,7,8
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8
New Jersey Student Learning Standards for Mathematical Practice SMP4
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.7

E. Recognize that scientific knowledge is tentative and predictions or explanations can be revised as new evidence emerges, and evaluate the strength of scientific arguments based on the quality of the data and evidence presented
New Jersey Student Learning Standards for Science: Science and Engineering Practices P4,7,8
New Jersey Student Learning Standards for Mathematical Practice SMP8
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.8

F. Communicate with others to test new ideas, solicit and provide feedback, articulate and evaluate emerging explanations, develop shared representations and models, and reach consensus
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,7,8
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,8
New Jersey Student Learning Standards for Mathematical Practice SMP3
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects WHST.9-10.1,8

G. Demonstrate proficiency in the use of laboratory technology including, but not limited to, data collection probe ware, video analysis software and research microscopes.
New Jersey Student Learning Standards for Science: Science and Engineering Practices P3
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,11
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.3

Biology Practices:
Students:

A. Identify genes as a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism
New Jersey Student Learning Standards for Science HS-LS1-1, LS3-1,2
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,6,7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4
New Jersey Student Learning Standards for Mathematical Practice SMP1,2

B. Recognize that most chemical transformations are made possible by protein catalysts called enzymes
New Jersey Student Learning Standards for Science HS-LS1-2
New Jersey Student Learning Standards for Science: Science and Engineering Practices P4,7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4
New Jersey Student Learning Standards for Mathematical Practice SMP1,2

C. Design and conduct experiments to demonstrate that the activities of enzymes are affected by the temperature, ionic conditions and the pH of the surroundings
New Jersey Student Learning Standards for Science HS-LS1-2,3
New Jersey Student Learning Standards for Science: Science and Engineering Practices P3,4,5,7,8
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,8,12
New Jersey Student Learning Standards for Mathematical Practice SMP1,2,4,5,6
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.3,4,5,7,9
New Jersey Student Learning Standards for ELA: Writing History, Science and Technical Subjects WHST.9-10.2,4,5,7,10

D. Model how cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings, including the transport of materials into and out of the cell
New Jersey Student Learning Standards for Science HS-LS1-2,3
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,7,8
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,8
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.4,5,7
New Jersey Student Learning Standards for ELA: Writing History, Science and Technical Subjects WHST.9-10.4,5

E. Explain how the many cells in an individual can be very different from one another, even though they are all descended from a single cell and thus have essentially identical genetic instructions

New Jersey Student Learning Standards for Science HS-LS1-1,4
New Jersey Student Learning Standards for Science: Science and Engineering Practices P6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,
New Jersey Student Learning Standards for ELA: Writing History, Science and Technical Subjects WHST.9-10.2,4,9

F. Explain how plants and many microorganisms use solar energy to combine molecules of carbon dioxide and water into complex, energy rich organic compounds and release oxygen to the environment

New Jersey Student Learning Standards for Science HS-LS1-2,5
New Jersey Student Learning Standards for Science: Science and Engineering Practices P6
New Jersey Student Learning Standards for Mathematical Practice SMP1,2
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4
New Jersey Student Learning Standards for ELA: Writing History, Science and Technical Subjects WHST.9-10.2,4,9

G. Model (using physical or digital tools) the four major categories of organic molecules (carbohydrates, fats, proteins, and nucleic acids) using unique characteristics and primary functions

New Jersey Student Learning Standards for Science HS-LS1-6
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,7,8
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,8
New Jersey Student Learning Standards for Mathematical Practice SMP1,2
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.4,5,7
New Jersey Student Learning Standards for ELA: Writing History, Science and Technical Subjects WHST.9-10.4,5,6

H. Analyze and explain how cells carry out a variety of chemical transformations, including cellular respiration, that allow conversion of energy from one form to another, the breakdown of molecules into smaller units, and the building of larger molecules from smaller ones

New Jersey Student Learning Standards for Science HS-LS1-2,5,6,7
New Jersey Student Learning Standards for Science: Science and Engineering Practices P4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.4,5,7
New Jersey Student Learning Standards for ELA: Writing History, Science and Technical Subjects WHST.9-10.2,4,9

I. Analyze the interactions between organisms that result from the ability to produce populations of infinite size in an environment where resources are finite

New Jersey Student Learning Standards for Science HS-LS2-1
New Jersey Student Learning Standards for Science: Science and Engineering Practices P4
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4
New Jersey Student Learning Standards for Mathematical Practice SMP2,4
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.1
New Jersey Student Learning Standards for ELA: Writing History, Science and Technical Subjects WHST.9-10.2

J. Recognize that certain chemicals, pathogens, and high-energy radiation can seriously impair normal cell functions and the health of the organism

New Jersey Student Learning Standards for Science HS-LS2-2
New Jersey Student Learning Standards for Science: Science and Engineering Practices P6,7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4
New Jersey Student Learning Standards for Mathematical Practice SMP2,4
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.1
New Jersey Student Learning Standards for ELA: Writing History, Science and Technical Subjects WHST.9-10.2

K. Recognize that all matter tends toward more disorganized states

New Jersey Student Learning Standards for Science HS-LS2-3
New Jersey Student Learning Standards for Science: Science and Engineering Practices P6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4
New Jersey Student Learning Standards for Mathematical Practice SMP1,2

L. Follow the transfer of matter (atoms and molecules) on Earth from one organism to another between organisms and their physical environment

New Jersey Student Learning Standards for Science HS-LS2-4
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2-6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4
New Jersey Student Learning Standards for Mathematical Practice SMP2,4

M. Trace the path that energy entering ecosystems as sunlight follows when being transferred by producers into chemical energy through photosynthesis, and then being passed from organism to organism through food webs

New Jersey Student Learning Standards for Science HS-LS2-5
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2-6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4
New Jersey Student Learning Standards for Mathematical Practice SMP2

N. Predict how direct harvesting, pollution, atmospheric changes, and natural disasters such as hurricanes, floods, volcanoes, and other factors will affect population dynamics in a given ecosystem based on data and accepted mathematical models

New Jersey Student Learning Standards for Science HS-LS2-6
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,4-7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,5,12
New Jersey Student Learning Standards for Mathematical Practice SMP2
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.1,7

O. Provide evidence of how humans intentionally and unintentionally modify ecosystems and address how it threatens current local and global ecosystem stability.

New Jersey Student Learning Standards for Science HS-LS2-7
New Jersey Student Learning Standards for Science: Science and Engineering Practices P7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,5,12
New Jersey Student Learning Standards for Mathematical Practice SMP2
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.7
New Jersey Student Learning Standards for ELA: Writing History, Science and Technical Subjects WHST.9-10.7

P. Identify examples of group behavior and explain the effect it has upon the species ability to survive and/or reproduce

New Jersey Student Learning Standards for Science HS-LS2-8
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,8
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.1,7

Q. Explain how the chemical and structural properties of DNA allow for genetic information to be both encoded in genes and replicated

New Jersey Student Learning Standards for Science HS-LS3-1
New Jersey Student Learning Standards for Science: Science and Engineering Practices P7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,8
New Jersey Student Learning Standards for Mathematical Practice SMP2

R. Explain how sexually produced offspring are never identical to either of their parents

New Jersey Student Learning Standards for Science HS-LS3-2
New Jersey Student Learning Standards for Science: Science and Engineering Practices P7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,8,12
New Jersey Student Learning Standards for Mathematical Practice SMP2
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.1
New Jersey Student Learning Standards for ELA: Writing History, Science and Technical Subjects WHST.9-10.1

S. Analyze, support and/or critique current and emerging biotechnologies that show promise in preventing and treating disease

New Jersey Student Learning Standards for Science HS-LS3-3
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1,4,6-7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP1,4
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.9

T. Integrate scientific information from a variety of disciplines to provide evidence for the relatedness of species on Earth (geology, comparative anatomy, biochemistry, and taxonomy)

New Jersey Student Learning Standards for Science HS-LS4-1
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,8,12
New Jersey Student Learning Standards for Mathematical Practice SMP2
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.1,2,4
New Jersey Student Learning Standards for ELA: Writing History, Science and Technical Subjects WHST.9-10.1

U. Recognize how heritable characteristics can strongly influence how likely an individual is to survive and reproduce

New Jersey Student Learning Standards for Science HS-LS4-2
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-2,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,8,12
New Jersey Student Learning Standards for Mathematical Practice SMP2

V. Analyze natural selection simulations and use the data generated to describe how environmentally favored traits are perpetuated over generations resulting in species survival, while less favorable traits decrease in frequency or may lead to extinction

New Jersey Student Learning Standards for Science HS-LS4-3
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4-5,8,12
New Jersey Student Learning Standards for Mathematical Practice SMP2
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.9

W. Construct an explanatory model to explain how certain adaptations developed and increased in frequency in a population over time

New Jersey Student Learning Standards for Science HS-LS4-4
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-2,4-7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,8,12
New Jersey Student Learning Standards for Mathematical Practice SMP2

X. Discuss how environmental pressure, genetic drift, mutation and competition for resources influence the evolutionary process

New Jersey Student Learning Standards for Science HS-LS4-5
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-2,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4-5,8,12
New Jersey Student Learning Standards for ELA: Reading Science and Technical Subjects RST.9-10.5

Y. Develop a model to demonstrate how ecological impacts due to human activity can be mitigated.

New Jersey Student Learning Standards for Science HS-LS4-6
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4-5,8,12
New Jersey Student Learning Standards for ELA: Writing History, Science and Technical Subjects WHST.9-10.1,9

III. CONTENT, SCOPE, AND SEQUENCE

This course presents real-life applications of biological concepts that relate to all students. Each unit is centralized around a natural phenomenon that students explore and revisit throughout the unit. Scientific practices are emphasized in all units of study.

A. Nature of Science & the Science of Life
   1. Scientific knowledge
   2. Scientific process
   3. Experimental design
   4. Characteristics of life

B. Ecology
    1. Levels of ecological study
    2. Animal behavior
    3. Carrying capacity
    4. Niche
    5. Symbiotic relationships
    6. Ecological succession
    7. Human impacts on the environment and biodiversity
    8. Invasive species
    9. Energy flow
    10. Biogeochemical cycles
    11. Food webs

C. Evolution
    1. Natural selection
    2. Artificial selection
    3. Sexual selection
    4. Coevolution
    5. Speciation
    6. Common ancestry
    7. Phylogeny

D. Chemistry of Life
    1. Macromolecules of life
        a. Carbohydrates
        b. Lipids
        c. Proteins
        d. Nucleic acids
    2. Metabolism: catabolic and anabolic reactions
    3. Enzymes

E. Cell Structure and Function
    1. Cell theory
    2. Eukaryotic and prokaryotic cells
    3. Animal and plant cells
    4. Cell organelles & structures
    5. Endosymbiotic theory
    6. Cell size
    7. Cell transport

F. Cellular Energetics
    1. ATP cycle
    2. Cell work
    3. Cell respiration
    4. Fermentation
    5. Circulatory system
    6. Respiratory system
    7. Photosynthesis
    8. Leaf structure and function
    9. Carbon cycle

G. Cell Division
    1. Stem cells
    2. Cell cycle
    3. Mitosis
    4. Cytokinesis
    5. DNA organization
    6. Cancer
    7. Meiosis
    8. Asexual and sexual reproduction
    9. Non-disjunction

H. Classical Genetics
    1. Genotype and phenotype
    2. Mendel's law of dominance
    3. Mendel's law of segregation
    4. Monohybrid crosses
    5. Mendel's law of independent assortment
    6. Dihybrid crosses
    7. Incomplete dominance
    8. Codominance
    9. Sex-linked inheritance
    10. Polygenic inheritance
    11. Extranuclear inheritance
    12. Pedigrees

I. Molecular Genetics
    1. DNA structure
    2. DNA replication
    3. Gene expression
    4. Protein synthesis
    5. Mutations
    6. Epigenetics
    7. Genetic engineering
    8. Polymerase chain reaction
    9. Gel electrophoresis.

IV. INSTRUCTIONAL TECHNIQUES

A variety of instructional approaches are employed to engage all students in the learning process and accommodate differences in readiness levels, interests and learning styles. Teaching techniques include, but are not limited to, the following:

A. Teacher-directed, whole-group instruction and modeling of procedures
B. Flexible grouping
C. Differentiated tasks
D. Laboratory activities, demonstrations, and experiments that require collection, organization, representation, and analysis of data
E. Problem-based learning
F. Integration of technology into class activities
G. Visual models, animations, and videos to illustrate or enhance instruction
H. For strategies to differentiate for special education students, English Language Learners, Students at Risk of School Failure, Gifted and Talented Students, and Students with 504 Plans, please consult the Accommodations and Modifications appendix in the appendices section of this document.

V. EVALUATION

The assessment tools the teacher employs to measure student mastery of course objectives include, but are not limited to, the following:

Baseline and benchmark assessments
A. Written tests and quizzes
B. Cumulative tests
C. Homework
D. Independent projects
E. Research papers
F. Presentations
G. Laboratory assignments and participation.

VI. PROFESSIONAL DEVELOPMENT

A. Opportunities for professional development include:
B. Teacher workshops, teacher conferences, and conventions
C. Access to professional books and journals
D. Collaboration with other departments to coordinate activities
E. College courses
F. Collaboration with colleagues about homework, unit plans, and assessment
G. Professional organizations
H. Collaboration with colleagues in the science department and interdepartmental areas to discuss and reflect upon unit plans, homework and assessment.

APPENDIX I

Instructional Resources and Pacing Guide

Instructional resource: *Biology: Exploring Life*, Campbell, Williamson & Heyden; Prentice Hall, 2004.

Unit	Approximate number of teaching days
Nature of Science & the Science of Life	14 - 17
Ecology	20 - 23
Evolution	20 - 23
Chemistry of Life	11 - 14
Cell Structure and Function	9 - 12
Cellular Energetics	19 - 23
Cell Division	11 - 14
Classical Genetics	15 - 18
Molecular Genetics	14 - 17

APPENDIX II

New Jersey Student Learning Standards for Science

HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

NGSS Appendix F - Science and Engineering Practices

NGSS Appendix F – Science and Engineering Practices
P1 - Asking Questions and Defining Problems
P2 - Developing and Using Models
P3 - Planning and Carrying Out Investigations
P4 - Analyzing and Interpreting Data
P5 - Using Mathematics and Computational Thinking
P6 - Constructing Explanations and Designing Solutions
P7 - Engaging in Argument from Evidence
P8 - Obtaining, Evaluating, and Communicating Information

The entire standards document may be viewed at: http://www.state.nj.us/education/cccs/2016/science/ http://www.nextgenscience.org/next-generation-science-standards.

APPENDIX III

New Jersey Student Learning Standards for Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

The entire standards document may be viewed at: http://www.nj.gov/education/cccs/2014/tech/

APPENDIX IV

New Jersey Student Learning Standards 21st Century Life & Careers

Career Ready Practices
CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.

The entire standards document may be viewed at http://www.state.nj.us/education/cccs/

APPENDIX V

NEW JERSEY STUDENT LEARNING STANDARDS FOR SOCIAL STUDIES

STANDARD 6.1: (U.S. History: America in the World) all students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.

STANDARD 6.2: (World History/Global Studies) all students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.

STANDARD 6.3: (Active Citizenship in the 21st-Century) all students will acquire the knowledge and skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address challenges that are inherent in living in an interconnected world.

The entire standards document may be viewed at https://www.state.nj.us/education/cccs/2020/2020%20NJSLS-SS.pdf

APPENDIX VI

NEW JERSEY STUDENT LEARNING STANDARDS-SOCIAL STUDIES PRACTICES

Social Studies practices are the skills that individuals who work in the field of social sciences use on a regular basis. Because the purpose of social studies is to provide students with the knowledge, skills and attitudes they need to be active, informed, responsible individuals and contributing members of their communities, many of the practices can be applied to daily life.

Practice	Description
Developing Questions and Planning Inquiries	Developing insightful questions and planning effective inquiry involves identifying the purposes of different questions to understand the human experience, which requires addressing real world issues. Inquiries incorporating questions from various social science disciplines build understanding of the past, present and future; these inquiries investigate the complexity and diversity of individuals, groups, and societies.

Gathering and Evaluating Sources	Finding, evaluating and organizing information and evidence from multiple sources and perspectives are the core of inquiry. Effective practice requires evaluating the credibility of primary and secondary sources, assessing the reliability of information, analyzing the context of information, and corroborating evidence across sources. Discerning opinion from fact and interpreting the significance of information requires thinking critically about ourselves and the world.
Seeking Diverse Perspectives	Making sense of research findings requires thinking about what information is included, whether the information answers the question, and what may be missing, often resulting in the need to complete additional research. Developing an understanding of our own and others' perspectives builds understanding about the complexity of each person and the diversity in the world. Exploring diverse perspectives assists students in empathizing with other individuals and groups of people; quantitative and qualitative information provides insights into specific people, places, and events, as well as national, regional, and global trends.
Developing Claims and Using Evidence	Developing claims requires careful consideration of evidence, logical organization of information, self-awareness about biases, application of analysis skills, and a willingness to revise conclusions based on the strength of evidence. Using evidence responsibly means developing claims based on factual evidence, valid reasoning, and a respect for human rights.
Presenting Arguments and Explanations	Using a variety of formats designed for a purpose and an authentic audience forms the basis for clear communication. Strong arguments contain claims with organized evidence and valid reasoning that respects the diversity of the world and the dignity of each person. Writing findings and engaging in civil discussion with an audience provides a key step in the process of thinking critically about conclusions and continued inquiry.
Engaging in Civil Discourse and Critiquing Conclusions	Assessing and refining conclusions through metacognition, further research, and deliberative discussions with diverse perspectives sharpens the conclusions and improves thinking as a vital part of the process of sense making. Responsible citizenship requires respectfully listening to and critiquing claims by analyzing the evidence and reasoning supporting them. Listening to and understanding contrary views can deepen learning and lay the groundwork for seeking consensus.
Taking Informed Action	After thoroughly investigating questions, taking informed action means building consensus about possible actions and planning strategically to implement change. Democracy requires citizens to practice discussion, negotiation, coalition-seeking, and peaceful conflict resolution. When appropriate, taking informed action involves creating and/or implementing action plans designed to solve problems and create positive change.

The entire standards document may be viewed at https://www.state.nj.us/education/cccs/2020/2020%20NJSLS-SS.pdf

APPENDIX VII

New Jersey Student Learning Standards for Mathematical Practice

SMP1 – Make sense of problems and persevere in solving them.
SMP2 – Reason abstractly and quantitatively.
SMP3 – Construct viable arguments and critique the reasoning of others.
SMP4 – Model with mathematics.
SMP5 – Use appropriate tools strategically.
SMP6 – Attend to precision.
SMP8 – Look for and express regularity in repeated reasoning.

The entire standards document may be viewed at http://www.state.nj.us/education/aps/cccs/math

APPENDIX VIII

New Jersey Student Learning Standards for English Language Arts Grades 9-10

Progress Indicators Reading Science and Technical Subjects

RST.9-10.1. Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
RST.9-10.2. Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
RST.9-10.5. Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.8. Determine if the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
RST.9-10.9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Progress Indicators for Writing History, Science and Technical Subjects

WHST.9-10.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant sufficient textual and non-textual evidence.
WHST.9-10.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.9-10.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.9-10.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-10.6. Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
WHST.9-10.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.9-10.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
WHST.9-10.9. Draw evidence from informational texts to support analysis, reflection, and research.
WHST.9-10.10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

The entire standards document can be viewed at http://www.state.nj.us/education/cccs/2016/ela/

APPENDIX IX

Integrated Accommodations and Modifications for Special Education Students, English Language Learners, Students at Risk of School Failure, Gifted and Talented Students, and Students with 504 Plans (N.J.A.C. 6A: 8)

Special Education
ENVIRONMENT
Preferential Seating

Adjust time for completion of assignments when needed
Adjust length of assignments when needed
Allow additional oral response time
Break tasks (including long range assignments) into manageable steps
Provide copies of notes
Reduce the number of problems on a page
Provide assistance with organizing a notebook or folder
Repeat/ clarify directions when needed
Make frequent checks for work/assignment completion.
Modify homework and class work if needed
Extend time on tests/quizzes
Provide study guides for tests
Provide oral component when needed
Modify format when needed- (ex: limit choices, word bank, shortened written responses)
Allow a private workspace when needed (study carrel, separate desk, desk away from the group)
Allow opportunities for movement (e.g., help with supplies, change to different part of room to work, carry messages to office)

Assist the student to keep only the materials required for the lesson on the desktop
Provide a seat away from distractions (or noise)
MATERIAL/BOOKS/EQUIPMENT
Allow use of a calculator
Allow use of a number line
Allow use of counting chips
Modify worksheets
Provide visual aids (pictures, flash cards, etc.)
Provide auditory aids (cues, tapes, etc.)
Use manipulatives
Provide hands-on learning activities
INSTRUCTIONAL STRATEGIES
Check work in progress
Provide immediate feedback
Provide extra drill/practice
Provide review sessions

Provide models
Highlight key words
Provide pictures/charts
Use mnemonics
Support auditory presentations with visuals
Have student restate information
Provide lecture notes/outline
Give oral reminders
Give visual reminders
Review directions
Use graphic organizers
Assign partners
Repeat instructions
Display key vocabulary
Monitor assignments
Provide visual reinforcement

Provide concrete examples
Use vocabulary word bank
ORGANIZATION
Post assignments
Provide a desktop list of tasks
Give one paper at a time
Provide extra space for work
List sequential steps
Provide folders to hold work
Post routines
Use pencil box for tools
Reorganize poorly designed worksheets to create simple, easy-to-follow layouts and formats
Give advance warning when transition is going to take place
Provide structure for success
Provide a contract, timer, etc., for self-monitoring
Give the student a prompt when he/she is off task (e.g., move close to the student, speak to the student, etc.)

TEST/QUIZZES/TIME
Give prior notice of test
Provide oral testing
Provide extra time for written work
Provide modified tests
Rephrase test questions/directions
Preview test procedures
Provide shortened tasks
Provide extra time for tests
Read test to student
Provide test study guides
Limit multiple choice options
Provide extra time for projects
Pace long term projects
Simplify test wording
Provide hands-on projects

Allow extra response time
ENGLISH LANGUAGE LEARNERS
GRADING
Standard Grades vs. Pass/Fail
CONTINUUM OF ENGLISH LANGUAGE DEVELOPMENT
Pre K-K WIDA CAN DO Descriptors
Grades 1-2 WIDA CAN DO Descriptors
Grades 3-5 WIDA CAN DO Descriptors
Grades 6-8 WIDA CAN DO Descriptors
Grades 9-12 WIDA CAN DO Descriptors
SIOP COMPONENTS AND FEATURES
PREPARATION
Write content objectives clearly for students
Write language objectives clearly for students
Choose content concepts appropriate for age and educational background levels of students
Identify supplementary materials to use
Adapt content to all levels of students proficiency
Plan meaningful activities that integrate lesson concepts with language practices opportunities for reading, writing, listening, and/or speaking

BUILDING BACKGROUND
Explicitly link concepts to students' backgrounds and experiences
Explicitly link past learning and new concepts
Emphasize key vocabulary for students
COMPREHENSIBLE INPUT
Use speech appropriate for students' proficiency level
Explain academics tasks clearly
Use a variety of techniques to make content concepts clear (e.g. modeling, visuals, hands-on activities, demonstrations, gestures, body language)
STRATEGIES
Provide ample opportunities for students to use strategies (e.g. problem solving, predicting, organizing, summarizing, categorizing, evaluating, self-monitoring)
Use scaffolding techniques consistently throughout lesson
Use a variety of question types including those that promote higher-order thinking skills throughout the lesson
INTERACTION
Provide frequent opportunities for interaction and discussion between teacher/students and among students about lessons concepts, and encourage elaborated responses
Use group configurations that support language and content objectives of the lesson
Provide sufficient wait time for student responses consistently
Give ample opportunities for students to clarify key concepts in LI as needed with aide, peer, or LI text

PRACTICE/APPLICATION
Provide hands-on materials and/ manipulatives for students to practice using new content knowledge
Provide activities for students to apply content and language knowledge in the classroom
Provide activities that integrate all language skills
LESSON DELIVERY
Support content objectives clearly
Support language objectives clearly
Engage students approximately 90-100% of the period
Pace the lesson appropriately to the students' ability level
REVIEW/EVALUATION
Give a comprehensive review of key vocabulary
Give a comprehensive review of key content concepts
Provide feedback to students regularly on their output
Conduct assessments of students comprehension and learning throughout lesson and all lesson objectives
STUDENTS AT RISK OF SCHOOL FAILURE (I&RS RESOURCE MANUAL)
ACADEMICS
Provide necessary services (Lit Support, Math Support, OT, PT, speech, etc.)
Literacy Support Interventions (Appendix B of IS forms)

Prompt before directions/questions are verbalized with visual cue between teacher and student
Task list laminated and placed on desk for classroom routines and organization
Preferential seating
Provide structure and positive reinforcements
Sustained working time connected to reward (If/Then statement)
Frequently check for understanding
Graphic organizers
Tracker
Slant board
Access to accurate notes
Additional time to complete tasks/long-term projects with adjusted due dates
Limit number of items student is expected to learn at one time
Break down tasks into manageable units
Directions repeated, clarified, or reworded
Frequent breaks during class
Allow verbal rather than written responses
Modify curriculum content based on student's ability level
Reduce readability level of materials

Allow typed rather than handwritten responses
Use of calculator
Use of a math grid
Provide models/organizers to break down independent tasks
Access to electronic text (e.g. Downloaded books)
Provide books on tape, CD, or read aloud computer software
Provide opportunities for using a Chromebook as well as assistive technologies
Provide buddy system
Adjust activity, length of assignment, and/or number of problems, including homework
Provide assessments in a small group setting
Educate/train relevant staff with regards to the signs/symptoms, promote tolerance of needs, and/or providing assistance
Communication with parents
Gradual release of responsibility related to writing prompts (Proximity, Sentence Starter, Attempt independently)
Rubric-based checklist
Target specific number of details and focus on organization with post-its
Accept late work/homework without penalty
Previewing material (access to PowerPoint slides, novels, syllabus, study guides when available)
SOCIAL/EMOTIONAL

Children's books addressing presenting problem
Student jots down presenting problem and erase when it goes away
Meet with guidance counselor
Student jots down presenting problem and erase when it goes away
Attendance plan
Utilize nurse during episodes of presenting problem
Provide short breaks
Attendance plan
Communication with parents
Assign "jobs" to reduce symptoms
Counseling check-ins
Praise whenever possible
ATTENTION/FOCUS
Seat student near front of room
Preferential seating
Monitor on-task performance
Arrange private signal to cue student to off-task behavior
Establish and maintain eye contact when giving oral directions

Stand in proximity to student to focus attention
Provide short breaks when refocusing is needed
Use study carrel
Arrange physical layout to limit distractions
Frequently ask questions to engage student
Refocusing and redirection
Behavior/time management system
Group directions 1 step at a time
Assign "jobs" to reduce symptoms
Arrange physical layout to limit distractions
Frequently ask questions to engage student
Educate/train relevant staff with regards to the signs/symptoms, promote tolerance of needs, and/or providing assistance
Extended time on assignments/assessments
Provide assessments in a small group setting
Provide buddy system
Establish and maintain eye contact when giving oral directions
Permit the use of headphones while working
SCHOOL REFUSAL/ELEVATED ABSENTEEISM

Attendance plan

GIFTED AND TALENTED STUDENTS

CURRICULUM
Acceleration
Compacting
Telescoping
Advanced Placement Courses
INSTRUCTION
Grouping
Independent Study
Differentiated Conferencing
Project-Based Learning
Competitions
Cluster Grouping Model with Flexible Grouping
Differentiated Instruction
Summer Work
Parent Communication

WESTFIELD PUBLIC SCHOOLS

Westfield, New Jersey

Office of Instruction

Course of Study

ENVIRONMENTAL SCIENCE: 7362

School .....Westfield High School
Department.....Science
Length of Course.....One Year
Credit.....6.0
Grade Level.....10, 11, 12
Prerequisites.....Biology
Date.....

I. RATIONALE, DESCRIPTION AND PURPOSE

Environmental Science is an interdisciplinary laboratory and field-based science course, which integrates concepts from earth science, biology, chemistry, and physics, and applies these to relevant challenges in the natural world.

Student interest in environmental issues has grown. Scientific principles, concepts, and methodologies enable students to analyze natural and human-made environmental problems, evaluate risks associated with these problems, and examine alternative solutions in an integrated societal context. This course provides another science option and fulfills one year of lab science per state graduation requirements. The curriculum address the needs of all learners through an interesting, problem-based approach to learning about human impact on the environment

The course content is organized around the four big ideas of environmental science, which mirrors objectives found in the AP Environmental Science course. The difference between the Environmental Science and the AP Environmental Science course is that the Environmental Science course is more focused on citizen science and concrete examples, while the AP course has a faster pacing and depth to which content is investigated. Environmental Science blends instruction that promotes conceptual and enduring understandings that assist students in developing an appreciation for local and global real-world issues. The course provides an opportunity to explore the careers related to environmental science.

II. OBJECTIVES

The district objectives align with the New Jersey Student Learning Standards for Science, the New Jersey Student Learning Standards for Mathematics, English Language Arts, Technology, and 21st Century Life and Careers.

Science Practices

Students:

A. Demonstrate proper lab technique and safety precautions when working with equipment in a laboratory and field setting
New Jersey Student Learning Standards for Science: Science and Engineering Practices P3
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2

B. Understand and differentiate between the interdependence of science and technology
New Jersey Student Learning Standards for Science: Science and Engineering Practices P6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP11

C. Utilize acute observation skills to formulate testable questions and hypotheses and then apply logic in interpreting their observations to design and conduct controlled experiments using various laboratory techniques
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1, 2, 3
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for ELA: Science & Technical Subjects RST.11-12.3
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 6, 8

D. Collect qualitative and quantitative data, present it in table and graph form, analyze it and arrive at a conclusion that evaluates the data for sources of error and poses new hypotheses for communication and further study
New Jersey Student Learning Standards for Science: Science and Engineering Practices P4, 6, 7, 8
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for ELA: Science & Technical Subjects RST.11-12.4
New Jersey Student Learning Standards for Mathematical Practice SMP4
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 4, 8

E. Recognize that scientific knowledge is tentative and predictions or explanations can be revised as new evidence emerges, and evaluate the strength of scientific arguments based on the quality of the data and evidence presented
New Jersey Student Learning Standards for Science: Science and Engineering Practices P4, 7, 8
New Jersey Student Learning Standards for ELA: Science & Technical Subjects RST.11-12.8
New Jersey Student Learning Standards for Mathematical Practice SMP8

F. Communicate with others to test new ideas, solicit and provide feedback, articulate and evaluate emerging explanations, develop shared representations and models, and reach consensus
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2, 7, 8
New Jersey Student Learning Standards for ELA: Science & Technical Subjects WHST.11-12.1, 11-12.8
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4, 8
New Jersey Student Learning Standards for Mathematical Practice SMP3

G. Demonstrate proficiency in the use of laboratory technology including, but not limited to, data collection probe ware, video analysis software and research microscopes.
New Jersey Student Learning Standards for Science: Science and Engineering Practices P3
New Jersey Student Learning Standards for ELA: Science & Technical Subjects RST.11-12.9
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 11

Environmental Science Practices:

Students:

Environmental Over-Arching Concept #1 Energy Transfer

A. Model the flow and conversion of energy that supports life in Earth's biotic and abiotic systems
New Jersey Student Learning Standards for Science HS-LS2-4, HS-LS 2-5, HS-ESS-2-4
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2, 4, 5 8
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for Mathematical Practice SMP4
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 4

B. Analyze environmental costs and benefits of technical solutions designed to reduce negative impacts of human energy demand on natural systems
New Jersey Student Learning Standards for Science: HS-ESS 3-4, HS-ESS3-6
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1, 4, 6, 8
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for ELA: Science & Technical Subjects WHST.11-12.8, 12.9
New Jersey Student Learning Standards for Mathematical Practice SMP1, 2
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 4, 8

Environmental Over-Arching Concept #2 Interactions between Earth's Systems

C. Contrast biogeochemical cycles of matter in Earth's systems
New Jersey Student Learning Standards for Science: HS-ESS2-6
New Jersey Student Learning Standards for Science: Science and Engineering Practices P4, 6, 7, 8
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 4, 6, 8

D. Interpret real-time or simulated data, graphs or models of movements of Earth's continental, oceanic crust and plate tectonics
New Jersey Student Learning Standards for Science HS-ESS1-5, HS-ESS-2-1, HS-ESS-2-5,
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2, 4, 5, 7, 8
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for ELA: Science & Technical Subjects RST.11-12.4
New Jersey Student Learning Standards for Mathematical Practice SMP4, 5, 6
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 4, 8

Environmental Over-Arching Concept #3 Interactions between different species and the environment

E. Provide evidence to support how various factors affect carrying capacity of ecosystems at different scales
New Jersey Student Learning Standards for Science HS-LS2-2
New Jersey Student Learning Standards for Science and Engineering Practices P1, 2, 3, 4, 5, 6, 7, 8
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for Mathematical Practice SMP1, 2, 4, 5, 6
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 4, 6, 11

F. Model the relationships between Earth's systems and human's resource management and how ineffective management impacts sustainability, populations and biodiversity
New Jersey Student Learning Standards for Science HS-ESS 3-1, HS-ESS 3-3, HS-ESS3-6
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1, 4, 5, 6, 7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for ELA: Science & Technical Subjects WHST.11-12.8, 11-12.9, RST.11-12.4, RST.11-12.8, RST.11-12.9
New Jersey Student Learning Standards for Mathematical Practice SMP1, 2, 3
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 4, 8

G. Assess technical solutions that reduce impacts of human activities on natural systems
New Jersey Student Learning Standards for Science HS-ESS 3-1, HS-ESS 3-4, HS-ESS3-6
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1, 4, 5, 6, 7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for ELA: Science & Technical Subjects WHST.11-12.8, 11-12.9, RST.11-12.4, RST.11-12.8, RST.11-12.9
New Jersey Student Learning Standards for Mathematical Practice SMP1, 2, 3
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 4, 8

Environmental Over-Arching Concept #4 A sustainable footprint is key to human's future

H. Demonstrate understanding of the relationship between economic factors and their impact on pollution, population patterns and disease patterns globally
New Jersey Student Learning Standards for Science *HS-LS2-2*
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1, 4, 6, 7, 8
New Jersey Student Learning Standards for Social Studies 6.2.12.B.6.a
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for ELA: Science & Technical Subjects WHST.11-12.8, WHST.11-12.9
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 4, 6, 8

I. Illustrate through data how direct harvesting, pollution, atmospheric changes, and natural disasters affect population dynamics in given ecosystems.
New Jersey Student Learning Standards for Science HS-LS2-2; HS-LS2-6
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1, 4, 5, 6, 7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for ELA: Science & Technical Subjects WHST.11-12.8, WHST.11-12.9, RST.11-12.4, RST.11-12.8, RST.11-12.9
New Jersey Student Learning Standards for Mathematical Practice SMP1, 2, 3
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 4, 8

J. Evaluate, and compare and contrast technical solutions that reduce impacts of human activities on natural systems
New Jersey Student Learning Standards for Science HS-ESS 3-1, HS-ESS 3-3, HS-ESS3-6
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1, 4, 5, 6, 7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for ELA: Science & Technical Subjects WHST.11-12.8, 11-12.9, RST.11-12.4, RST.11-12.8, RST.11-12.9
New Jersey Student Learning Standards for Mathematical Practice SMP 1, 2, 3
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 4, 8

K. Compile evidence of how humans intentionally and unintentionally modify ecosystems, due to population growth, technology, and consumption and illustrate how it threatens current local and global ecosystem stability and biodiversity.
New Jersey Student Learning Standards for Science HS-LS2-1, HS-LS2-2, HS-LS2-7, HS-LS4-6
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1, 4, 5, 6, 7, 8
New Jersey Student Learning Standards for Social Studies 6.1.12.B.16.a
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for ELA: Science & Technical Subjects WHST.11-12.8, WHST.11-12.9
New Jersey Student Learning Standards for Mathematical Practice SMP4
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2, 4, 6, 8

III. CONTENT, SCOPE AND SEQUENCE

The four big ideas that anchor environmental science today are energy transfer, interactions between Earth's systems, interactions between different species and the environment, and sustainability. Due to the integrated and nonlinear nature of the course content, the units that comprise this course may be taught in any logical sequence. Science practices incorporated in the course include concept explanation, models/visual representations, text analysis, experiments, data and math analysis, environmental solutions.

A. The living world: ecosystems and energy
   1. Ecosystems, terrestrial, and aquatic biomes
   2. Biogeochemical cycles
   3. Trophic levels, energy flow, food chains and webs

B. The living world: biodiversity
   1. Introduction to and human impacts on biodiversity
   2. Ecosystem services
   3. Ecological succession

C. Populations
   1. K-selected and R-selected species
   2. Carrying capacity, population growth
   3. Demographic transition

D. Earth's systems and resources
   1. Earth's spheres – geosphere, atmosphere, hydrosphere & biosphere
   2. Soil composition and properties
   3. Earth's geography and climate

E. Land and water use
   1. The Green Revolution and agricultural practices
   2. Impacts of human activities – fishing, mining, urbanization
   3. Sustainability and solutions

F. Energy resources and consumption
   1. Distribution and consumption of natural energy resources
   2. Nonrenewable resources - fossil fuels, nuclear power
   3. Renewable resources - biomass, solar, wind, geothermal

G. Atmospheric pollution
    1. Major air pollutants and their health impact
    2. Thermal inversion, indoor air pollutants
    3. Acid rain and noise pollution

H. Aquatic and terrestrial pollution
    1. Sources of pollution and human impacts on ecosystems
    2. Endocrine disruptors, eutrophication, bio-magnification
    3. Solid waste disposal
    4. Pollution, pathogens, infectious diseases and human health

I. Global change
    1. Stratospheric ozone depletion
    2. Global climate change
    3. Ocean acidification

IV. INSTRUCTIONAL TECHNIQUES

Varieties of instructional approaches are employed to engage all students in the learning process and accommodate differences in readiness levels, interests and learning styles. Teaching techniques include, but are not limited to, the following:

A. Teacher-directed, whole-group instruction and modeling of procedures
B. Flexible grouping
C. Differentiated tasks
D. Field work, laboratory activities, demonstrations, and experiments that require collection, organization, representation, and analysis of data
E. Problem-based learning
F. Integration of technology into class activities
G. Visual models, animations, and videos to illustrate or enhance instruction
H. For strategies to differentiate for special education students, English Language Learners, Students at Risk of School Failure, Gifted and Talented Students, and Students with 504 Plans, please consult the Accommodations and Modifications appendix in the appendices section of this document.

V. EVALUATION

The assessment tools the teacher employs to measure student mastery of course objectives include, but are not limited to, the following:

Baseline and benchmark assessments
A. Written tests and quizzes
B. Cumulative tests
C. Homework
D. Independent and group projects
E. Research papers and presentations
F. Laboratory activities assignments and participation
G. Class discussion
H. Field trip assignments and participation.

VI. PROFESSIONAL DEVELOPMENT

A. Opportunities for professional development include:
B. Teacher workshops, teacher conferences, and conventions
C. Access to professional books and journals
D. Collaboration with other departments to coordinate activities
E. College courses
F. Collaboration with colleagues about homework, unit plans, and assessment
G. Professional organizations
H. Collaboration with colleagues in the science department and interdepartmental areas to discuss and reflect upon unit plans, homework and assessment.

APPENDIX I

Instructional Resources and Pacing Guide

Instructional resource: *Environmental Science*, Arms, K., Houghton Mifflin Harcourt, 2008.

Unit	Approximate number of teaching days
The Living World: Ecosystems	20- 22
The Living World: Biodiversity	10 - 11
Populations	14 - 16
Earth Systems and Resources	12 - 14
Land and Water Use	18 - 24
Energy Resources and Consumption	12 - 14
Atmospheric Pollution	10 - 11
Aquatic and Terrestrial Pollution	16 - 18
Global Change	16 – 18
Health	10 - 12

APPENDIX II

New Jersey Student Learning Standards for Science

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth's systems.
HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
HS-ESS3-3. Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.
HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems.
HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth's systems and how they are being modified by human activity.

NGSS Appendix F - Science and Engineering Practices

NGSS Appendix F – Science and Engineering Practices
P1 - Asking Questions and Defining Problems
P2 - Developing and Using Models
P3 - Planning and Carrying Out Investigations
P4 - Analyzing and Interpreting Data
P5 - Using Mathematics and Computational Thinking
P6 - Constructing Explanations and Designing Solutions
P7 - Engaging in Argument from Evidence
P8 - Obtaining, Evaluating, and Communicating Information

The entire standards document may be viewed at http://www.state.nj.us/education/cccs/2016/science/ http://www.nextgenscience.org/next-generation-science-standards

APPENDIX III

New Jersey Student Learning Standards for Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

The entire standards document may be viewed at *http://www.nj.gov/education/cccs/2014/tech/*

APPENDIX IV

New Jersey Student Learning Standards for 21st Century Life and Careers

Career Readiness Practices

CRP2. Apply appropriate academic and technical skills
CRP4. Communicate clearly and effectively and with reason
CRP6. Demonstrate creativity and innovation
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them**.**
CRP11. Use technology to enhance productivity.

The entire standards document may be viewed at http://www.state.nj.us/education/cccs/

APPENDIX V

NEW JERSEY STUDENT LEARNING STANDARDS FOR SOCIAL STUDIES

STANDARD 6.1: (U.S. History: America in the World) all students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.

STANDARD 6.2: (World History/Global Studies) all students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.

STANDARD 6.3: (Active Citizenship in the 21st-Century) all students will acquire the knowledge and skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address challenges that are inherent in living in an interconnected world.

The entire standards document may be viewed at https://www.state.nj.us/education/cccs/2020/2020%20NJSLS-SS.pdf

APPENDIX VI

NEW JERSEY STUDENT LEARNING STANDARDS-SOCIAL STUDIES PRACTICES

Social Studies practices are the skills that individuals who work in the field of social sciences use on a regular basis. Because the purpose of social studies is to provide students with the knowledge, skills and attitudes they need to be active, informed, responsible individuals and contributing members of their communities, many of the practices can be applied to daily life.

Practice	Description
Developing Questions and Planning Inquiries	Developing insightful questions and planning effective inquiry involves identifying the purposes of different questions to understand the human experience, which requires addressing real world issues. Inquiries incorporating questions from various social science disciplines build understanding of the past, present and future; these inquiries investigate the complexity and diversity of individuals, groups, and societies.
Gathering and Evaluating Sources	Finding, evaluating and organizing information and evidence from multiple sources and perspectives are the core of inquiry. Effective practice requires evaluating the credibility of primary and secondary sources, assessing the reliability of information, analyzing the context of information, and corroborating evidence across sources. Discerning opinion from fact and interpreting the significance of information requires thinking critically about ourselves and the world.
Seeking Diverse Perspectives	Making sense of research findings requires thinking about what information is included, whether the information answers the question, and what may be missing, often resulting in the need to complete additional research. Developing an understanding of our own and others' perspectives builds understanding about the complexity of each person and the diversity in the world. Exploring diverse perspectives assists students in empathizing with other individuals and groups of people; quantitative and qualitative information provides insights into specific people, places, and events, as well as national, regional, and global trends.
Developing Claims and Using Evidence	Developing claims requires careful consideration of evidence, logical organization of information, self-awareness about biases, application of analysis skills, and a willingness to revise conclusions based on the strength of evidence. Using evidence responsibly means developing claims based on factual evidence, valid reasoning, and a respect for human rights.
Presenting Arguments and Explanations	Using a variety of formats designed for a purpose and an authentic audience forms the basis for clear communication. Strong arguments contain claims with organized evidence and valid reasoning that respects the diversity of the world and the dignity of each person. Writing findings and engaging in civil discussion with an audience provides a key step in the process of thinking critically about conclusions and continued inquiry.
Engaging in Civil Discourse and Critiquing Conclusions	Assessing and refining conclusions through metacognition, further research, and deliberative discussions with diverse perspectives sharpens the conclusions and improves thinking as a vital part of the process of sense making. Responsible citizenship requires respectfully listening to and critiquing claims by analyzing the evidence and reasoning supporting them. Listening to and understanding contrary views can deepen learning and lay the groundwork for seeking consensus.

Taking Informed Action	After thoroughly investigating questions, taking informed action means building consensus about possible actions and planning strategically to implement change. Democracy requires citizens to practice discussion, negotiation, coalition-seeking, and peaceful conflict resolution. When appropriate, taking informed action involves creating and/or implementing action plans designed to solve problems and create positive change.

The entire standards document may be viewed at https://www.state.nj.us/education/cccs/2020/2020%20NJSLS-SS.pdf

APPENDIX VII

New Jersey Student Learning Standards for English Language Arts Grades 11-12

Progress Indicators Reading Science and Technical Subjects

RST.11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
RST.11-12.9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
WHST.11-12.9. Draw evidence from informational texts to support analysis, reflection, and research.

The entire standards document can be viewed at http://www.state.nj.us/education/cccs/2016/ela/

APPENDIX VIII

New Jersey Student Learning Standards for Mathematical Practice

SMP1 – Make sense of problems and persevere in solving them
SMP2 – Reason abstractly and quantitatively
SMP3 – Construct viable arguments and critique the reasoning of others
SMP4 – Model with mathematics
SMP5 – Use appropriate tools strategically
SMP6 – Attend to precision
SMP7 – Look for and make use of structure
SMP8 – Look for and express regularity in repeated reasoning.

The entire standards document may be viewed at http://www.state.nj.us/education/aps/cccs/math

APPENDIX IX

Integrated Accommodations and Modifications for Special Education Students, English Language Learners, Students at Risk of School Failure, Gifted and Talented Students, and Students with 504 Plans (N.J.A.C. 6A: 8)

Special Education
ENVIRONMENT
Preferential Seating
Adjust time for completion of assignments when needed
Adjust length of assignments when needed
Allow additional oral response time

Break tasks (including long range assignments) into manageable steps
Provide copies of notes
Reduce the number of problems on a page
Provide assistance with organizing a notebook or folder
Repeat/ clarify directions when needed
Make frequent checks for work/assignment completion.
Modify homework and class work if needed
Extend time on tests/quizzes
Provide study guides for tests
Provide oral component when needed
Modify format when needed- (ex: limit choices, word bank, shortened written responses)
Allow a private workspace when needed (study carrel, separate desk, desk away from the group)
Allow opportunities for movement (e.g., help with supplies, change to different part of room to work, carry messages to office)
Assist the student to keep only the materials required for the lesson on the desktop
Provide a seat away from distractions (or noise)

MATERIAL/BOOKS/EQUIPMENT
Allow use of a calculator
Allow use of a number line
Allow use of counting chips
Modify worksheets
Provide visual aids (pictures, flash cards, etc.)
Provide auditory aids (cues, tapes, etc.)
Use manipulatives
Provide hands-on learning activities
INSTRUCTIONAL STRATEGIES
Check work in progress
Provide immediate feedback
Provide extra drill/practice
Provide review sessions
Provide models
Highlight key words

Provide pictures/charts
Use mnemonics
Support auditory presentations with visuals
Have student restate information
Provide lecture notes/outline
Give oral reminders
Give visual reminders
Review directions
Use graphic organizers
Assign partners
Repeat instructions
Display key vocabulary
Monitor assignments
Provide visual reinforcement
Provide concrete examples
Use vocabulary word bank

ORGANIZATION
Post assignments
Provide a desktop list of tasks
Give one paper at a time
Provide extra space for work
List sequential steps
Provide folders to hold work
Post routines
Use pencil box for tools
Reorganize poorly designed worksheets to create simple, easy-to-follow layouts and formats
Give advance warning when transition is going to take place
Provide structure for success
Provide a contract, timer, etc., for self-monitoring
Give the student a prompt when he/she is off task (e.g., move close to the student, speak to the student, etc.)
TEST/QUIZZES/TIME

Give prior notice of test
Provide oral testing
Provide extra time for written work
Provide modified tests
Rephrase test questions/directions
Preview test procedures
Provide shortened tasks
Provide extra time for tests
Read test to student
Provide test study guides
Limit multiple choice options
Provide extra time for projects
Pace long term projects
Simplify test wording
Provide hands-on projects
Allow extra response time

ENGLISH LANGUAGE LEARNERS
GRADING
Standard Grades vs. Pass/Fail
CONTINUUM OF ENGLISH LANGUAGE DEVELOPMENT
Pre K-K WIDA CAN DO Descriptors
Grades 1-2 WIDA CAN DO Descriptors
Grades 3-5 WIDA CAN DO Descriptors
Grades 6-8 WIDA CAN DO Descriptors
Grades 9-12 WIDA CAN DO Descriptors
SIOP COMPONENTS AND FEATURES
PREPARATION
Write content objectives clearly for students
Write language objectives clearly for students
Choose content concepts appropriate for age and educational background levels of students
Identify supplementary materials to use
Adapt content to all levels of students proficiency

Plan meaningful activities that integrate lesson concepts with language practices opportunities for reading, writing, listening, and/or speaking
BUILDING BACKGROUND
Explicitly link concepts to students' backgrounds and experiences
Explicitly link past learning and new concepts
Emphasize key vocabulary for students
COMPREHENSIBLE INPUT
Use speech appropriate for students' proficiency level
Explain academics tasks clearly
Use a variety of techniques to make content concepts clear (e.g. modeling, visuals, hands-on activities, demonstrations, gestures, body language)
STRATEGIES
Provide ample opportunities for students to use strategies (e.g. problem solving, predicting, organizing, summarizing, categorizing, evaluating, self-monitoring)
Use scaffolding techniques consistently throughout lesson
Use a variety of question types including those that promote higher-order thinking skills throughout the lesson
INTERACTION
Provide frequent opportunities for interaction and discussion between teacher/students and among students about lessons concepts, and encourage elaborated responses

Use group configurations that support language and content objectives of the lesson
Provide sufficient wait time for student responses consistently
Give ample opportunities for students to clarify key concepts in LI as needed with aide, peer, or LI text
PRACTICE/APPLICATION
Provide hands-on materials and/ manipulatives for students to practice using new content knowledge
Provide activities for students to apply content and language knowledge in the classroom
Provide activities that integrate all language skills
LESSON DELIVERY
Support content objectives clearly
Support language objectives clearly
Engage students approximately 90-100% of the period
Pace the lesson appropriately to the students' ability level
REVIEW/EVALUATION
Give a comprehensive review of key vocabulary
Give a comprehensive review of key content concepts
Provide feedback to students regularly on their output

Conduct assessments of students comprehension and learning throughout lesson and all lesson objectives
STUDENTS AT RISK OF SCHOOL FAILURE (I&RS RESOURCE MANUAL)
ACADEMICS
Provide necessary services (Lit Support, Math Support, OT, PT, speech, etc.)
Literacy Support Interventions (Appendix B of IS forms)
Prompt before directions/questions are verbalized with visual cue between teacher and student
Task list laminated and placed on desk for classroom routines and organization
Preferential seating
Provide structure and positive reinforcements
Sustained working time connected to reward (If/Then statement)
Frequently check for understanding
Graphic organizers
Tracker
Slant board
Access to accurate notes
Additional time to complete tasks/long-term projects with adjusted due dates

Limit number of items student is expected to learn at one time
Break down tasks into manageable units
Directions repeated, clarified, or reworded
Frequent breaks during class
Allow verbal rather than written responses
Modify curriculum content based on student's ability level
Reduce readability level of materials
Allow typed rather than handwritten responses
Use of calculator
Use of a math grid
Provide models/organizers to break down independent tasks
Access to electronic text (e.g. Downloaded books)
Provide books on tape, CD, or read aloud computer software
Provide opportunities for using a Chromebook as well as assistive technologies
Provide buddy system
Adjust activity, length of assignment, and/or number of problems, including homework
Provide assessments in a small group setting

Educate/train relevant staff with regards to the signs/symptoms, promote tolerance of needs, and/or providing assistance
Communication with parents
Gradual release of responsibility related to writing prompts (Proximity, Sentence Starter, Attempt independently)
Rubric-based checklist
Target specific number of details and focus on organization with post-its
Accept late work/homework without penalty
Previewing material (access to PowerPoint slides, novels, syllabus, study guides when available)
SOCIAL/EMOTIONAL
Children's books addressing presenting problem
Student jots down presenting problem and erase when it goes away
Meet with guidance counselor
Student jots down presenting problem and erase when it goes away
Attendance plan
Utilize nurse during episodes of presenting problem
Provide short breaks
Attendance plan

Communication with parents
Assign "jobs" to reduce symptoms
Counseling check-ins
Praise whenever possible
ATTENTION/FOCUS
Seat student near front of room
Preferential seating
Monitor on-task performance
Arrange private signal to cue student to off-task behavior
Establish and maintain eye contact when giving oral directions
Stand in proximity to student to focus attention
Provide short breaks when refocusing is needed
Use study carrel
Arrange physical layout to limit distractions
Frequently ask questions to engage student
Refocusing and redirection
Behavior/time management system

Group directions 1 step at a time
Assign "jobs" to reduce symptoms
Arrange physical layout to limit distractions
Frequently ask questions to engage student
Educate/train relevant staff with regards to the signs/symptoms, promote tolerance of needs, and/or providing assistance
Extended time on assignments/assessments
Provide assessments in a small group setting
Provide buddy system
Establish and maintain eye contact when giving oral directions
Permit the use of headphones while working
SCHOOL REFUSAL/ELEVATED ABSENTEEISM
Attendance plan

GIFTED AND TALENTED STUDENTS
CURRICULUM
Acceleration
Compacting

Telescoping
Advanced Placement Courses
INSTRUCTION
Grouping
Independent Study
Differentiated Conferencing
Project-Based Learning
Competitions
Cluster Grouping Model with Flexible Grouping
Differentiated Instruction
Summer Work
Parent Communication

WESTFIELD PUBLIC SCHOOLS

Westfield, New Jersey

Office of Instruction

Course of Study

PHYSICS I: 7441

School .....Westfield High School
Department.....Science
Length of Course.....One Year
Credit.....6.0
Grade Level.....10, 11, 12
Prerequisites.....Chemistry
Date .....

I. RATIONALE, DESCRIPTION AND PURPOSE

Physics I is an introductory physics course designed to provide the learner content mastery, calculation skills, and experimental observations in the basics of physics. The course is broken into three main units: Mechanics, Electricity & Magnetism, Waves and Optics. Students explore the laws of physics through teacher-guided experiments and analyses of laboratory observations and environments. Students are encouraged to develop critical thinking skills to derive equations and laws that govern the universe as well as our daily lives. This pedagogical approach encourages inductive reasoning, and permits the student to answer "How?" and "Why?" by making use of the laws, mathematical relationships, and concepts of physics.

Students are taught that the body of facts and theories that make up physics is itself constantly changing and that in learning the basics of physics they gain access to an understanding of these changes now and in the future. Physics is a fundamental science in that it explores the world on scales that range between the sub-atomic to the whole of the universe. Knowledge of the principles governing the structure and interactions of matter provides students the opportunity to apply the basic physical laws that govern the universe as well as many ordinary daily tasks and observations. Inspiring students' curiosity contributes to their development as life-long learners and informed citizens.

Physics I is a college-prep course providing students the background necessary for success in college/university first year physics and physical science courses.

II. OBJECTIVES

The district objectives are aligned with the New Jersey Student Learning Standards for Science, the New Jersey Student Learning Standards for Mathematics, English Language Arts, Technology, and 21st Century Life and Careers. They are developed sequentially throughout the course.

Science Practices

Students:

A. Demonstrate proper lab technique and safety precautions when working with equipment in a laboratory setting
New Jersey Student Learning Standards for Science: Science and Engineering Practices P3
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2

B. Understand and differentiate between the interdependence of science and technology
New Jersey Student Learning Standards for Science: Science and Engineering Practices P6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP11

C. Utilize acute observation skills to formulate testable questions and hypotheses and then apply logic in interpreting their observations to design and conduct controlled experiments using various laboratory techniques
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1,2,3
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for English Language Arts: Science & Technical Subjects RST.11-12.3
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,6,8

D. Collect qualitative and quantitative data, present it in table and graph form, analyze it and arrive at a conclusion that evaluates the data for sources of error and poses new hypotheses for communication and further study
New Jersey Student Learning Standards for Science: Science and Engineering Practices P4,6,7,8
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for English Language Arts: Science & Technical Subjects RST.11-12.4
New Jersey Student Learning Standards for Mathematical Practice SMP4
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

E. Recognize that scientific knowledge is tentative and predictions or explanations can be revised as new evidence emerges, and evaluate the strength of scientific arguments based on the quality of the data and evidence presented
New Jersey Student Learning Standards for Science: Science and Engineering Practices P4,7,8
New Jersey Student Learning Standards for English Language Arts: Science & Technical Subjects RST.11-12.8
New Jersey Student Learning Standards for Mathematical Practice SMP8

F. Communicate with others to test new ideas, solicit and provide feedback, articulate and evaluate emerging explanations, develop shared representations and models, and reach consensus
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,7,8
New Jersey Student Learning Standards for English Language Arts: Science & Technical Subjects WHST.11-12.1, 11-12.8
New Jersey Student Learning Standards for 21st Century Life and Careers CRP4,8
New Jersey Student Learning Standards for Mathematical Practice SMP3

G. Demonstrate proficiency in the use of laboratory technology including, but not limited to, data collection probe-ware, video analysis software and research microscopes.
New Jersey Student Learning Standards for Science: Science and Engineering Practices P3
New Jersey Student Learning Standards for English Language Arts: Science & Technical Subjects RST.11-12.9
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,11

Physics Practices
Students:

A. Develop investigations using kinematics about an object or system's motion to predict and analyze velocity and acceleration properties through mathematical models and graphical representations
New Jersey Student Learning Standards for Science: HS-PS2-1
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

B. Develop investigations using dynamics involving Newton's second law to determine the relationship between the net force exerted on an object, its mass, and its acceleration
New Jersey Student Learning Standards for Science: HS-PS2-1
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,5,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

C. Use qualitative and quantitative representations to predict the motion of a dynamic system resulting from combination of contact forces and field forces
New Jersey Student Learning Standards for Science: HS-PS2-1
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,4,5,6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

D. Develop investigations to analyze the uniform circular motion of an object using narrative, mathematical, and graphical representations
New Jersey Student Learning Standards for Science: HS-PS2-1
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,5,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,6,8

E. Relate the gravitational force between two objects in a gravitational field to their masses, the distance between their centers, and the Universal Gravitation Constant
New Jersey Student Learning Standards for Science: HS-PS2-4
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,4,5,6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

F. Develop investigations to analyze the mechanical energies (kinetic, gravitational potential, elastic potential, work) of a system using narrative, mathematical, and graphical representations

New Jersey Student Learning Standards for Science: HS-PS3-2
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,5,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,6,8

G. Apply the principles of energy conservation and the Work-Energy Theorem to a system and make predictions about an object's change in mechanical energy (kinetic, gravitational, and elastic energies and work done on the system)

New Jersey Student Learning Standards for Science: HS-PS3-3
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,4,5,6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

H. Apply the principles of momentum and energy conservation to analyze a system and identify elastic, inelastic, and perfectly inelastic collisions using narrative, mathematical, and graphical representations

New Jersey Student Learning Standards for Science: HS-PS2-2, HS-PS2-3
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,4,5,6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

I. Develop investigations to analyze the energy, acceleration, velocity, position, period, and frequency properties of an object in harmonic motion (simple pendulum, spring-mass system) using narrative, mathematical, and graphical representations

New Jersey Student Learning Standards for Science: HS-PS3-2
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,5,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,6,8

J. Develop an investigation to make predictions about the sign and relative quantity of net charge of objects using the conservation of electric charge and the electrical force they apply to other objects

New Jersey Student Learning Standards for Science: HS-PS3-2
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,5,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,6,8

K. Relate net charge and position through Coulomb's Law to electric force and electric field strength with free body diagrams and mathematical models

New Jersey Student Learning Standards for Science: HS-PS2-4
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,4,5,6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

L. Construct schematic diagrams of direct current (DC) resistance circuits to investigate voltage, current, and resistance through Ohm's Law

New Jersey Student Learning Standards for Science: HS-PS2-5
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,4,5,6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

M. Apply Kirchhoff's Loop and Junction Laws to investigate the conservation of charge and energy in series, parallel, and mixed resistance circuits

New Jersey Student Learning Standards for Science: HS-PS3-1
New Jersey Student Learning Standards for Science: Science and Engineering Practices P2,4,5,6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

N. Investigate the relationship between moving electric charge and magnetic fields, and how changing magnetic flux results in the generation and distribution of electric current

New Jersey Student Learning Standards for Science: HS-PS2-5
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

O. Investigate how disturbances in a medium propagate energy and momentum as a traveling wave with quantifiable speed, wavelength, frequency, and amplitude

New Jersey Student Learning Standards for Science: HS-PS4-1
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

P. Design an experiment to investigate the constructive and destructive interference resulting from superposition of wave pulses which result in standing waves and beats

New Jersey Student Learning Standards for Science: HS-PS4-5
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,5,6,7
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,6,8

Q. Investigate the reflection and refraction of light by mirrors and lenses, predict the location of images using ray diagrams and apply Snell’s Law for refraction.

New Jersey Student Learning Standards for Science: HS-PS4-1,3,4
New Jersey Student Learning Standards for Science: Science and Engineering Practices P1-6
New Jersey Student Learning Standards for Mathematical Practice: SMP1,2,4,6
New Jersey Student Learning Standards for Educational Technology 8.1
New Jersey Student Learning Standards for 21st Century Life and Careers CRP2,4,8

III. CONTENT, SCOPE, AND SEQUENCE

Physics principles are universal and the course presents real-life applications that relate to all students. Students are provided with many opportunities to engage in hands-on experiments. The course emphasizes the connection between conceptual and mathematical thinking that both represent real life physics phenomenon. The content, opportunity for student inquiry, applied mathematics, and conceptual reasoning are all important to Physics. The objectives previously listed and the content, scope, and sequence to follow, will provide students with the opportunity to engage in these science practices.

A. 1D Kinematics
   1. Uniform velocity
   2. Uniform acceleration
   3. Vector modeling
   4. Free fall acceleration
   5. Pictorial, graphical, and mathematical representations of motion

B. 2D Kinematics - Projectile Motion
   1. Motion in two dimensions
   2. Independence of perpendicular motion properties
   3. Graphical representation of motion
   4. Vector modeling and vector decomposition
   5. Vector right triangle geometry

C. Dynamics
   1. Newton's three laws of motion
   2. Free body diagrams
   3. Vector modeling
   4. Application of Newton's Laws
   5. Graphical representation of Newton's Laws
   6. Static and kinetic friction
   7. Inclined planes
   8. Multi-mass systems
   9. Static and dynamic equilibrium

D. Circular Motion and Gravitation
   1. Uniform circular motion
   2. Centripetal force
   3. Horizontal circular motion
   4. Vertical circular motion
   5. Conical pendula
   6. Universal Law of Gravitation
   7. Gravitational force and acceleration
   8. Planetary motion and orbital properties
   9. Kepler's Laws

E. Work and Energy
    1. Defining work and energy
        a. Kinetic
        b. Gravitational potential
        c. Elastic potential
        d. Thermal
    2. Law of Conservation of Energy
    3. The Work-Energy Theorem
    4. Power and its relationship to work
    5. Energy transformations
    6. Graphical representation of work and energy

F. Impulse and Momentum
    1. Defining momentum
    2. Defining impulse and the Impulse Momentum Theory
    3. Law of Conservation of Momentum
    4. Types of collisions
        a. Perfectly inelastic
        b. Inelastic
        c. Elastic with conservation of kinetic energy
    5. Linear collisions
    6. Collisions in two dimensions
    7. Vector components and right triangle geometry

G. Simple Harmonic Motion
    1. Motion of a pendulum
    2. Motion of a mass on a spring
    3. Connecting work and energy to simple harmonic motion
    4. Representing simple harmonic motion graphically

H. Electric Charge and Electric Force
    1. Defining the properties of charges
    2. Explaining the behavior of charges in insulators and conductors
    3. Coulomb's Law
    4. Application of Coulomb's Law to equilibrium, net force, and circular motion
    5. Defining and modeling electric fields
    6. Application of electric fields to equilibrium, net field, kinematics, and dynamics

I. DC Circuits
    1. Defining conventional current
    2. Defining voltage, current, and resistance
    3. Ohm's Law and its relationship to flow of charge per unit time and power
    4. Series circuits
    5. Parallel circuits
    6. Complex mixed circuits
    7. Resistance as it relates to resistivity and temperature
    8. Brightness ranking and switches

J. Mechanical Waves and Sound
   1. Wave properties such as period, frequency, wavelength, and velocity
   2. Graphical representation of waves
   3. Transverse vs. longitudinal waves
   4. Superposition as it relates to constructive and destructive interference
   5. Resonance, standing waves, and harmonics
   6. Speed of waves based on medium
   7. Doppler effect
   8. Sound intensity level

L. Magnetism
   1. Force of magnetic fields on moving charges and current carrying wires
   2. Moving charges and their creation of magnetic fields
   3. Associated right hand rules for two items mentioned above
   4. Magnetic flux and Lenz's Law
   5. Electromagnetic induction and induced EMF
   6. Generators and production of alternating current
   7. Transformers and power distribution

M. Optics
   1. Law of Reflection
   2. Snell’s Law and Refraction
   3. Diverging and converging lenses
   4. Diverging and converging mirrors

IV. INSTRUCTIONAL TECHNIQUES

A variety of instructional approaches are employed to engage all students in the learning process and accommodate differences in readiness levels, interests and learning styles. Teaching techniques include, but are not limited to, the following:

A. Teacher-directed, whole-group instruction and modeling of procedures
B. Flexible grouping
C. Differentiated tasks
D. Laboratory activities, demonstrations, and experiments that require collection, organization, representation, and analysis of data
E. Problem-based learning
F. Independent practice
G. Integration of technology into class activities
H. Visual models, animations, and video to illustrate or enhance class discussions
I. For strategies to differentiate for special education students, English Language Learners, Students at Risk of School Failure, Gifted and Talented Students, and Students with 504 Plans, please consult the Accommodations and Modifications appendix in the appendices section of this document.

V. EVALUATION

The assessment tools the teacher employs to measure student mastery of course objectives include, but are not limited to, the following:

A. Baseline and benchmark assessments
B. Written tests and quizzes
C. Cumulative tests
D. Homework
E. Independent projects
F. Research papers
G. Presentations
H. Laboratory assignments and participation
I. Claim-Evidence-Reasoning frameworks.

VI. PROFESSIONAL DEVELOPMENT

Opportunities for professional development include:

A. Teacher workshops, teacher conferences, and conventions
B. Access to professional books and journals
C. Collaboration with other departments to coordinate activities
D. College courses
E. Collaboration with colleagues about homework, unit plans, and assessment
F. Professional organizations
G. Collaboration with colleagues in the science department and interdepartmental areas to discuss and reflect upon unit plans, homework and assessment.

APPENDIX I

New Jersey Student Learning Standards for Science

HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
HS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).
HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

NGSS Appendix F – Science and Engineering Practices
P1 - Asking Questions and Defining Problems
P2 - Developing and Using Models
P3 - Planning and Carrying Out Investigations
P4 - Analyzing and Interpreting Data
P5 - Using Mathematics and Computational Thinking
P6 - Constructing Explanations and Designing Solutions
P7 - Engaging in Argument from Evidence
P8 - Obtaining, Evaluating, and Communicating Information

The entire standards document may be viewed at: http://www.state.nj.us/education/cccs/2016/science/ http://www.nextgenscience.org/next-generation-science-standards.

APPENDIX II

New Jersey Student Learning Standards for Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

The entire standards document may be viewed at: http://www.nj.gov/education/cccs/2014/tech/

APPENDIX III

New Jersey Student Learning Standards for 21st Century Life & Careers

Career Ready Practices
CRP2. Apply appropriate academic and technical skills
CRP4. Communicate clearly and effectively and with reason
CRP6. Demonstrate creativity and innovation
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them
CRP11. Use technology to enhance productivity.

The entire standards document may be viewed at http://www.state.nj.us/education/cccs/

APPENDIX IV

NEW JERSEY STUDENT LEARNING STANDARDS FOR SOCIAL STUDIES

STANDARD 6.1: (U.S. History: America in the World) all students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.

STANDARD 6.2: (World History/Global Studies) all students will acquire the knowledge and skills to think analytically and systematically about how past interactions of people, cultures, and the environment affect issues across time and cultures. Such knowledge and skills enable students to make informed decisions as socially and ethically responsible world citizens in the 21st century.

STANDARD 6.3: (Active Citizenship in the 21st-Century) all students will acquire the knowledge and skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address challenges that are inherent in living in an interconnected world.

The entire standards document may be viewed at https://www.state.nj.us/education/cccs/2020/2020%20NJSLS-SS.pdf

APPENDIX V

New Jersey Student Learning Standards - Social Studies Practices

Social Studies practices are the skills that individuals who work in the field of social sciences use on a regular basis. Because the purpose of social studies is to provide students with the knowledge, skills and attitudes they need to be active, informed, responsible individuals and contributing members of their communities, many of the practices can be applied to daily life.

Practice	Description
Developing Questions and Planning Inquiries	Developing insightful questions and planning effective inquiry involves identifying the purposes of different questions to understand the human experience, which requires addressing real world issues. Inquiries incorporating questions from various social science disciplines build understanding of the past, present and future; these inquiries investigate the complexity and diversity of individuals, groups, and societies.
Gathering and Evaluating Sources	Finding, evaluating and organizing information and evidence from multiple sources and perspectives are the core of inquiry. Effective practice requires evaluating the credibility of primary and secondary sources, assessing the reliability of information, analyzing the context of information, and corroborating evidence across sources. Discerning opinion from fact and interpreting the significance of information requires thinking critically about ourselves and the world.

Seeking Diverse Perspectives	Making sense of research findings requires thinking about what information is included, whether the information answers the question, and what may be missing, often resulting in the need to complete additional research. Developing an understanding of our own and others' perspectives builds understanding about the complexity of each person and the diversity in the world. Exploring diverse perspectives assists students in empathizing with other individuals and groups of people; quantitative and qualitative information provides insights into specific people, places, and events, as well as national, regional, and global trends.
Developing Claims and Using Evidence	Developing claims requires careful consideration of evidence, logical organization of information, self-awareness about biases, application of analysis skills, and a willingness to revise conclusions based on the strength of evidence. Using evidence responsibly means developing claims based on factual evidence, valid reasoning, and a respect for human rights.
Presenting Arguments and Explanations	Using a variety of formats designed for a purpose and an authentic audience forms the basis for clear communication. Strong arguments contain claims with organized evidence and valid reasoning that respects the diversity of the world and the dignity of each person. Writing findings and engaging in civil discussion with an audience provides a key step in the process of thinking critically about conclusions and continued inquiry.
Engaging in Civil Discourse and Critiquing Conclusions	Assessing and refining conclusions through metacognition, further research, and deliberative discussions with diverse perspectives sharpens the conclusions and improves thinking as a vital part of the process of sense making. Responsible citizenship requires respectfully listening to and critiquing claims by analyzing the evidence and reasoning supporting them. Listening to and understanding contrary views can deepen learning and lay the groundwork for seeking consensus.
Taking Informed Action	After thoroughly investigating questions, taking informed action means building consensus about possible actions and planning strategically to implement change. Democracy requires citizens to practice discussion, negotiation, coalition-seeking, and peaceful conflict resolution. When appropriate, taking informed action involves creating and/or implementing action plans designed to solve problems and create positive change.

The entire standards document may be viewed at https://www.state.nj.us/education/cccs/2020/2020%20NJSLS-SS.pdF

APPENDIX VI

New Jersey Student Learning Standards for English Language Arts

Progress Indicators for Reading Science and Technical Subjects

RST.11-12.1. Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
RST.11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
RST.11-12.9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

The entire standards document can be viewed at http://www.state.nj.us/education/cccs/2016/ela/

APPENDIX VII

New Jersey Student Learning Standards for Mathematical Practice

SMP1 – Make sense of problems and persevere in solving them
SMP2 – Reason abstractly and quantitatively
SMP3 – Construct viable arguments and critique the reasoning of others
SMP4 – Model with mathematics
SMP5 – Use appropriate tools strategically
SMP6 – Attend to precision
SMP7 – Look for and make use of structure
SMP8 – Look for and express regularity in repeated reasoning.

The entire standards document may be viewed at http://www.state.nj.us/education/aps/cccs/math

APPENDIX VIII

Instructional Resources and Pacing Guide

Instructional resource: *Physics Principles and Problems*, Glencoe, McGraw-Hill, (2005)

Unit	Approximate number of teaching days
1D Kinematics	20 – 30
2D Kinematics	10 – 15
Dynamics	25 – 30
Circular Motion and Gravitation	10 – 15
Work and Energy	10 – 15
Impulse and Momentum	10 – 15
Simple Harmonic Motion	3 – 5
Torque and Rotational Motion	15 – 20
Electric Charge and Electric Force	15 – 20
DC Circuits	15 – 20
Mechanical Waves and Sound	5 – 10
Magnetism	10 – 15
Optics	5 – 7

APPENDIX IX

Integrated Accommodations and Modifications for Special Education Students, English Language Learners, Students at Risk of School Failure, Gifted and Talented Students, and Students with 504 Plans (N.J.A.C. 6A: 8)

Special Education
ENVIRONMENT
Preferential Seating
Adjust time for completion of assignments when needed

Adjust length of assignments when needed
Allow additional oral response time
Break tasks (including long range assignments) into manageable steps
Provide copies of notes
Reduce the number of problems on a page
Provide assistance with organizing a notebook or folder
Repeat/ clarify directions when needed
Make frequent checks for work/assignment completion.
Modify homework and class work if needed
Extend time on tests/quizzes
Provide study guides for tests
Provide oral component when needed
Modify format when needed- (ex: limit choices, word bank, shortened written responses)
Allow a private workspace when needed (study carrel, separate desk, desk away from the group)
Allow opportunities for movement (e.g., help with supplies, change to different part of room to work, carry messages to office)

Assist the student to keep only the materials required for the lesson on the desktop
Provide a seat away from distractions (or noise)
MATERIAL/BOOKS/EQUIPMENT
Allow use of a calculator
Allow use of a number line
Allow use of counting chips
Modify worksheets
Provide visual aids (pictures, flash cards, etc.)
Provide auditory aids (cues, tapes, etc.)
Use manipulatives
Provide hands-on learning activities
INSTRUCTIONAL STRATEGIES
Check work in progress
Provide immediate feedback
Provide extra drill/practice
Provide review sessions

Provide models
Highlight key words
Provide pictures/charts
Use mnemonics
Support auditory presentations with visuals
Have student restate information
Provide lecture notes/outline
Give oral reminders
Give visual reminders
Review directions
Use graphic organizers
Assign partners
Repeat instructions
Display key vocabulary
Monitor assignments
Provide visual reinforcement

Provide concrete examples
Use vocabulary word bank
ORGANIZATION
Post assignments
Provide a desktop list of tasks
Give one paper at a time
Provide extra space for work
List sequential steps
Provide folders to hold work
Post routines
Use pencil box for tools
Reorganize poorly designed worksheets to create simple, easy-to-follow layouts and formats
Give advance warning when transition is going to take place
Provide structure for success
Provide a contract, timer, etc., for self-monitoring
Give the student a prompt when he/she is off task (e.g., move close to the student, speak to the student, etc.)

TEST/QUIZZES/TIME
Give prior notice of test
Provide oral testing
Provide extra time for written work
Provide modified tests
Rephrase test questions/directions
Preview test procedures
Provide shortened tasks
Provide extra time for tests
Read test to student
Provide test study guides
Limit multiple choice options
Provide extra time for projects
Pace long term projects
Simplify test wording
Provide hands-on projects

Allow extra response time
ENGLISH LANGUAGE LEARNERS
GRADING
Standard Grades vs. Pass/Fail
CONTINUUM OF ENGLISH LANGUAGE DEVELOPMENT
Pre K-K WIDA CAN DO Descriptors
Grades 1-2 WIDA CAN DO Descriptors
Grades 3-5 WIDA CAN DO Descriptors
Grades 6-8 WIDA CAN DO Descriptors
Grades 9-12 WIDA CAN DO Descriptors
SIOP COMPONENTS AND FEATURES
PREPARATION
Write content objectives clearly for students
Write language objectives clearly for students
Choose content concepts appropriate for age and educational background levels of students
Identify supplementary materials to use
Adapt content to all levels of students proficiency
Plan meaningful activities that integrate lesson concepts with language practices opportunities for reading, writing, listening, and/or speaking

BUILDING BACKGROUND
Explicitly link concepts to students' backgrounds and experiences
Explicitly link past learning and new concepts
Emphasize key vocabulary for students
COMPREHENSIBLE INPUT
Use speech appropriate for students' proficiency level
Explain academics tasks clearly
Use a variety of techniques to make content concepts clear (e.g. modeling, visuals, hands-on activities, demonstrations, gestures, body language)
STRATEGIES
Provide ample opportunities for students to use strategies (e.g. problem solving, predicting, organizing, summarizing, categorizing, evaluating, self-monitoring)
Use scaffolding techniques consistently throughout lesson
Use a variety of question types including those that promote higher-order thinking skills throughout the lesson
INTERACTION
Provide frequent opportunities for interaction and discussion between teacher/students and among students about lessons concepts, and encourage elaborated responses
Use group configurations that support language and content objectives of the lesson
Provide sufficient wait time for student responses consistently
Give ample opportunities for students to clarify key concepts in LI as needed with aide, peer, or LI text

PRACTICE/APPLICATION
Provide hands-on materials and/ manipulatives for students to practice using new content knowledge
Provide activities for students to apply content and language knowledge in the classroom
Provide activities that integrate all language skills
LESSON DELIVERY
Support content objectives clearly
Support language objectives clearly
Engage students approximately 90-100% of the period
Pace the lesson appropriately to the students' ability level
REVIEW/EVALUATION
Give a comprehensive review of key vocabulary
Give a comprehensive review of key content concepts
Provide feedback to students regularly on their output
Conduct assessments of students comprehension and learning throughout lesson and all lesson objectives
STUDENTS AT RISK OF SCHOOL FAILURE (I&RS RESOURCE MANUAL)
ACADEMICS
Provide necessary services (Lit Support, Math Support, OT, PT, speech, etc.)

Literacy Support Interventions (Appendix B of IS forms)
Prompt before directions/questions are verbalized with visual cue between teacher and student
Task list laminated and placed on desk for classroom routines and organization
Preferential seating
Provide structure and positive reinforcements
Sustained working time connected to reward (If/Then statement)
Frequently check for understanding
Graphic organizers
Tracker
Slant board
Access to accurate notes
Additional time to complete tasks/long-term projects with adjusted due dates
Limit number of items student is expected to learn at one time
Break down tasks into manageable units
Directions repeated, clarified, or reworded
Frequent breaks during class
Allow verbal rather than written responses
Modify curriculum content based on student's ability level

Reduce readability level of materials
Allow typed rather than handwritten responses
Use of calculator
Use of a math grid
Provide models/organizers to break down independent tasks
Access to electronic text (e.g. Downloaded books)
Provide books on tape, CD, or read aloud computer software
Provide opportunities for using a Chromebook as well as assistive technologies
Provide buddy system
Adjust activity, length of assignment, and/or number of problems, including homework
Provide assessments in a small group setting
Educate/train relevant staff with regards to the signs/symptoms, promote tolerance of needs, and/or providing assistance
Communication with parents
Gradual release of responsibility related to writing prompts (Proximity, Sentence Starter, Attempt independently)
Rubric-based checklist
Target specific number of details and focus on organization with post-its
Accept late work/homework without penalty
Previewing material (access to PowerPoint slides, novels, syllabus, study guides when available)

SOCIAL/EMOTIONAL
Children's books addressing presenting problem
Student jots down presenting problem and erase when it goes away
Meet with guidance counselor
Student jots down presenting problem and erase when it goes away
Attendance plan
Utilize nurse during episodes of presenting problem
Provide short breaks
Attendance plan
Communication with parents
Assign "jobs" to reduce symptoms
Counseling check-ins
Praise whenever possible
ATTENTION/FOCUS
Seat student near front of room
Preferential seating
Monitor on-task performance
Arrange private signal to cue student to off-task behavior

Establish and maintain eye contact when giving oral directions
Stand in proximity to student to focus attention
Provide short breaks when refocusing is needed
Use study carrel
Arrange physical layout to limit distractions
Frequently ask questions to engage student
Refocusing and redirection
Behavior/time management system
Group directions 1 step at a time
Assign "jobs" to reduce symptoms
Arrange physical layout to limit distractions
Frequently ask questions to engage student
Educate/train relevant staff with regards to the signs/symptoms, promote tolerance of needs, and/or providing assistance
Extended time on assignments/assessments
Provide assessments in a small group setting
Provide buddy system
Establish and maintain eye contact when giving oral directions
Permit the use of headphones while working

SCHOOL REFUSAL/ELEVATED ABSENTEEISM
Attendance plan

GIFTED AND TALENTED STUDENTS

CURRICULUM
Acceleration
Compacting
Telescoping
Advanced Placement Courses
INSTRUCTION
Grouping
Independent Study
Differentiated Conferencing
Project-Based Learning
Competitions
Cluster Grouping Model with Flexible Grouping
Differentiated Instruction
Summer Work
Parent Communication