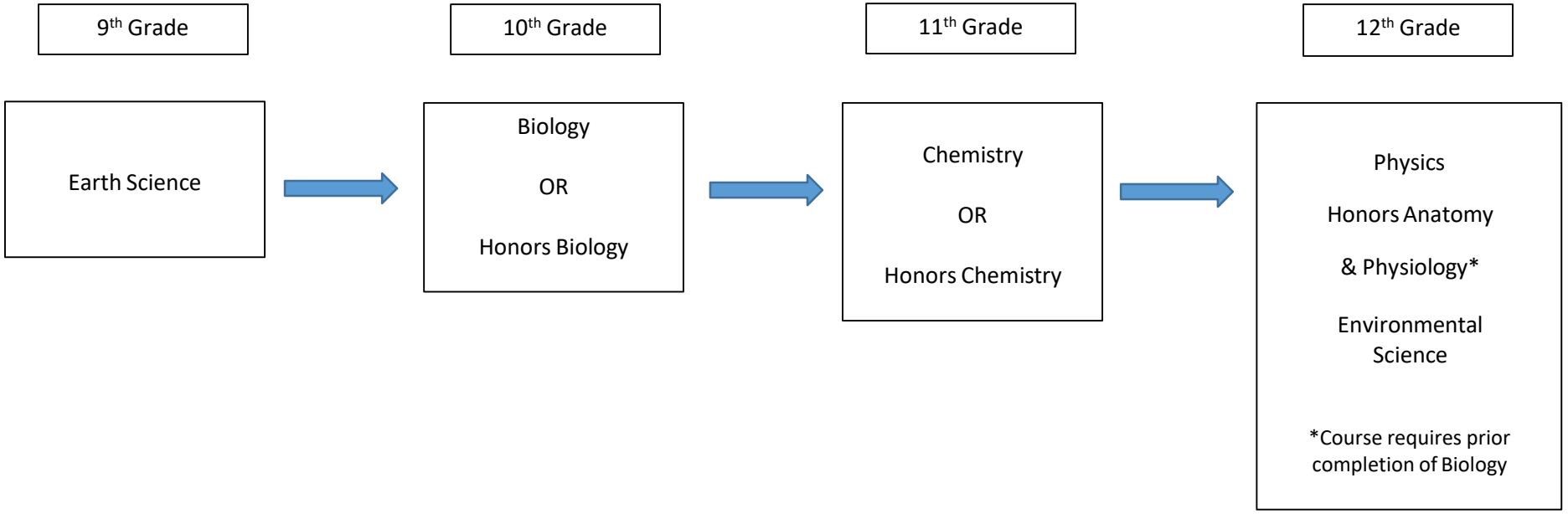
First State Military Academy Science Flow Chart 2018 – 2019

*** 3 years of science are required for graduation including 1 Biology credit.



***We strongly advise that students remain in the recommended science courses throughout the entire school year.

Curriculum

Grade 10: Biology

Overview:

High school Biology will equip students to address the following essential questions as identified within the Next Generation Science Standards:

1. How do organisms live and grow?
2. How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?
3. What evidence shows that different species are related?
4. How and why do organisms interact with their environment, and what are the effects of those interactions?

The learning sequence in Biology is organized around a series of driving questions that provide the context and motivation for learning. While exploring each driving question, students engage in unique learning experiences that allows them to construct their understanding of important concepts. These experiences are carefully sequenced so that students encounter ideas that are developmentally and cognitively appropriate. By the end of the learning experiences, students will be able to meet the NGSS performance expectations and address the driving questions.

Performance Expectations:

The Next Generation Science Standards (NGSS) are very different than previous standards documents. NGSS purposely combines the three dimensions of science learning into single, target statements for student learning known as Performance Expectations (PE). The three dimensions of science learning are: Science and Engineering Practices (SEP), Crosscutting Concepts (CCC), and Disciplinary Core Ideas (DCI).

Earlier science standards treated the three dimensions as separate and distinct. This treatment led to assessment and instruction that emphasized one dimension preferentially over the others. The combination of SEP, CCC, and DCI in each PE is not intended to limit instruction. Instead, the PEs are designed to guide assessment of student learning. The performance expectations for Biology support student learning in four main areas: *From Molecules to Organisms, Heredity, Biological Evolution,* and *Ecosystems.* The performance expectations for high school Biology are listed below:

From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

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 interaction 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.**

Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

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 cyclin of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.**
HS-LS2-6.	**Evaluate 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 evidence for the role of group behavior on individual and species' chances to survive and reproduce.**

Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

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.**

Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

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 individual 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.**

Learning Sequence:

Students will continue to develop their understanding of the four disciplinary core ideas in the biological sciences throughout the school year. The high school performance expectations in Biology allow high school students to explain more in-depth phenomena central not only to the biological sciences, but to Earth and space sciences and the physical sciences as well. These performance expectations blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain ideas across the science disciplines. While the performance expectations shown in high school Biology couple particular practices with specific disciplinary core ideas, instruction will include the use of many science and engineering practices that lead to the performance expectations.

The Biology course is organized into four units:

Unit 1:	Unit 2:	Unit 3:	Unit 4:
From Molecules to Organisms: Structures and Processes	**Heredity: Inheritance and Variation of Traits**	**Biological Evolution: Unity and Diversity**	**Ecosystems: Interactions, Energy, and Dynamics**

Students develop understanding of a wide range of topics in Biology by using the science and engineering practices and crosscutting concepts. In Unit 1: *From Molecules to Organisms*, students will use investigations to gather evidence to support explanations of cell function. They will develop understanding of the role of proteins in cells and living systems. Students will

also use models to explain photosynthesis, respiration, and the cycling of matter and the flow of energy in living systems.

In Unit 2: *Heredity*, students will use science and engineering practices to explain the genetic variation in a population and why individuals of the same species vary in how they look, function, and behave. Students will explain the mechanism of genetic inheritance and describe the environmental and genetic causes of gene mutation and the alteration of gene expressions.

In Unit 3: *Biological Evolution*, students will use the science and engineering practices to explain the processes of natural selection and evolution. They will be able to communicate how multiple lines of evidence support the explanations for these processes. Students will understand the role of genetic variation in natural selection and use probability to explain trends in populations with respect to advantageous heritable traits in specific environments.

In Unit 4: *Ecosystems*, students will use science and engineering practices to demonstrate understanding of fundamental ecological concepts including carrying capacity, biodiversity, the cycling of matter, and the flow of energy in an ecosystem. Students will also develop design solutions for reducing the impact of human activities in the environment and maintaining biodiversity.

Chemistry

Special Note for the 2014-15 School Year: In 2013, the Maryland State Board of Education adopted the *Next Generation Science Standards* (NGSS) that set forth a vision for science education where the Science and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs) of science, and Crosscutting Concepts (CCCs) of science are blended seamlessly into a three dimensional learning environment for all students. The transition to NGSS across Maryland and in HCPSS will be deliberate, and full implementation of NGSS in Maryland is planned for the 2017-18 school year. The shifts required in NGSS implementation are great, and revision of curriculum requires careful consideration of these changes as well as time to develop, pilot, and implement. During this transitional period, resources in support of NGSS are being developed and posted for teachers' use within Alfresco. Additionally, beginning in 2014-15, select schools will pilot project based learning experiences developed by HCPSS curriculum writers. All students in HCPSS high school science courses regardless of the whether the student attends a school that is an early implementer of NGSS or not, will have exposure to the skills and processes and the content included in the Essential Curriculum documents. The order in which students encounter these concepts, however, may differ slightly among schools due to this transition.

G/T Differentiation
Conceptually challenging, in-depth, distinctive, and complex learning experiences should be the hallmark of the G/T Chemistry Course. Students are expected to engage in longer-term investigations where they research complex topics or issues that lead them to create new knowledge or to design original solutions much like professionals within the discipline. Teachers are expected to use a wide array of instructional strategies that encourage creative problem solving appropriate for highly able/high achieving students.

UNIT I: Introduction to Chemistry

Associated Disciplinary Core Ideas (DCIs) from NGSS include:
PS1: Matter and Its Interactions
PS1.A—Structure and Properties of Matter

Essential Question:
How can one explain the structure, properties, and interactions of matter?

Goal 1. The student will be able to describe what chemistry is and its scope.

Objectives - The student will be able to:
a. Define chemistry.
b. Explain that chemistry overlaps many other areas of science.

Goal 2. The student will be able to identify and apply the scientific process.

Objectives - The student will be able to:
a. List and describe the steps of the scientific process.
b. Apply the steps to a real world example.

Goal 3. The student will be able to identify and apply basic safety procedures and identify basic equipment.

Objectives - The student will be able to:

a. Identify appropriate safety procedures.
b. Apply safety procedures to a given situation.
c. Identify basic lab equipment (i.e., beaker, graduated cylinder, balance, Bunsen burner, and thermometer.)

Goal 4. The student will be able to identify and use appropriate units of measurement and the sources and implications of uncertainty in measurements.

Objectives - The student will be able to:

a. Explain what SI Units are and why scientists use them.
b. Measure quantities using appropriate units for measurement (i.e., grams, meters, liter, second, etc.)
c. Utilize scientific notation to express numerical measurements.
d. Explain that all measurements have some amount of error or uncertainty and to compensate for this scientists use significant figures.
e. Distinguish between accurate and precise measurements.
f. Identify the number of significant figures in a measurement and express the measurement properly in scientific notation. **[GT]**
g. Round numbers to the correct number of decimal places or significant figures. **[GT]**
h. When calculating a sum or difference, determine the correct number of decimal places in the answer. **[GT]**
i. When calculating a product or quotient, determine the correct number of significant figures in the answer. **[GT]**

Goal 5. The student will be able to convert among units.

Objectives - The student will be able to:

a. Define a conversion factor.
b. Convert from one unit to another given a conversion factor using dimensional analysis or factor-label method.

UNIT II: Properties of Matter

Associated Disciplinary Core Ideas (DCIs) from NGSS include:
PS1: Matter and Its Interactions
PS1.A—Structure and Properties of Matter

Essential Question:
How can one explain the structure, properties, and interactions of matter?

Goal 1. The student will demonstrate the ability to classify the different kinds of matter.

Objectives - The student will be able to:

a. Differentiate among element, compound, homogenous mixture, or heterogeneous mixture.
b. Identify the smallest part of each pure substance.
c. Determine the number of each kind of atom in a compound, given the chemical formula.
d. Differentiate between physically blended and chemically bonded.

Goal 2. The student will demonstrate the ability to explain how matter may be identified, classified, and changed.

Objectives - The student will be able to:

a. Describe the arrangement and distances among particles in the solid, liquid, and gas state.
b. Relate the physical state of the substance to the temperature at which the substance exists.
c. Distinguish between physical and chemical properties.
d. Contrast physical and chemical changes.
e. Calculate the density of a substance from experimental data.
f. Contrast the properties of inorganic and organic compounds.

Goal 3. The student will demonstrate the ability to summarize and apply the Law of Conservation of Matter and Energy.

Objectives - The student will be able to:

a. Distinguish between reactants and products of a chemical reaction.
b. Use the Law of Conservation of Mass and Energy to prove that the mass remains constant during both physical and chemical changes.

UNIT III: Atomic Structure

Associated Disciplinary Core Ideas (DCIs) from NGSS include:
PS1: Matter and Its Interactions
PS1.A—Structure and Properties of Matter

Essential Question:
How can one explain the structure, properties, and interactions of matter?

Goal 1. The student will demonstrate the ability to trace the history of the development of the modern atomic theory and model.

Objectives - The student will be able to:

a. Explain how science is a developing field where theories are constantly challenged.
b. Contrast the contributions of Dalton, Thomson, Rutherford, Bohr, and Schroedinger in the development of the modern understanding of atomic structure.
c. Contrast the modern understanding of atomic structure with historic understandings.

Goal 2. The student will demonstrate the ability to determine the composition of any atom, ion, or isotope.

Objectives - The student will be able to:

a. Use language appropriate to atomic structure including atom, ion, isotope, subatomic particle, atomic number, mass number, average atomic mass, and atomic mass unit.
b. Identify and calculate the number of protons, neutrons, and electrons in any atom, ion, or isotope given sufficient information.
c. Recognize the existence of smaller particles composing matter, i.e. gluons, quarks, and mesons. **[GT]**
d. Explain the quantum model and photoelectric effect. **[GT]**

Goal 3. The student will demonstrate the ability to analyze the fundamentals of radioactivity.

Objectives - The student will be able to:

a. Explain how some isotopes are made of unstable nuclei, which decay over time emitting particles and energy.
b. Contrast the three kinds of emissions (alpha, beta, and gamma), the composition of the emission, and the material required to shield them.
c. Differentiate between nuclear fission and fusion.
d. Identify the common uses of nuclear fission and fusion.
e. Balance a nuclear equation. **[GT]**
f. Explain how the process of decay can change the isotope's atomic and mass numbers. **[GT]**
g. Compare the relative amounts of energy released from chemical versus nuclear reactions. **[GT]**
h. Calculate average atomic mass from isotopic data. **[GT]**

UNIT IV: Electron Arrangement

Associated Disciplinary Core Ideas (DCIs) from NGSS include:
PS1: Matter and Its Interactions
PS1.A—Structure and Properties of Matter

Essential Question:
How can one explain the structure, properties, and interactions of matter?

Goal 1. The student will demonstrate the ability to explain how electrons are organized around the nucleus.

Objectives - The student will be able to:

a. Distinguish among energy levels, sublevels, and orbitals.
b. Use the Aufbau principle to fill an energy level diagram.
c. Determine both the full and shorthand electron configurations for an atom or ion.
d. Determine the orbital notation for the electron arrangement in an atom or ion using Hund's rule and Pauli's exclusion principle.
e. Determine the quantum numbers associated with an electron. **[GT]**

Goal 2. The student will demonstrate the ability to explain the source and common use of atomic spectra.

Objectives - The student will be able to:

a. Describe the process that creates atomic spectra.
b. Explain the uniqueness of atomic spectra.
c. Provide examples of the common applications of atomic spectra, i.e. analysis of a mixture using atomic spectra.
d. Describe the relative energies of ultraviolet, visible, infrared, microwave, X-ray, radio, and TV waves. **[GT]**
e. Distinguish between absorption (excitation) and emission of energy. **[GT]**
f. Describe the properties of light. (i.e. wavelength, frequency and energy)
g. Calculate the wavelength, frequency and energy for a given electron transition. **[GT]**

UNIT V: The Periodic Table

Associated Disciplinary Core Ideas (DCIs) from NGSS include:
PS1: Matter and Its Interactions
PS1.A—Structure and Properties of Matter

Essential Question:
How can one explain the structure, properties, and interactions of matter?

Goal 1. The student will demonstrate the ability to describe the origin and organization of the modern Periodic Table.

Objectives - The student will be able to:

a. Contrast Dimitri Mendeleev and Henry Mosely's contributions and method of organizing the Periodic Table.

b. Collect and use information on the Periodic Table, including atomic number, atomic mass, family designation, period number, classification of element (metal, nonmetal, semimetal, or metalloid), and the state of the element at room temperature.
c. Identify regions of the periodic table including alkali metals, alkaline earth metals, transition metals, halogens, noble gases, lanthanide, and actinide series.
d. Relate the family or group of elements to their corresponding number of valence electrons.
e. Relate a period of elements to the energy level of valence electrons.

Goal 2. The student will demonstrate the ability to explain periodicity.

Objectives - The student will be able to:

a. Compare ionization energy, electronegativity, and atomic radius; contrast the trends in these properties as one proceeds across a period and down a family of elements on the Periodic Table.
b. Identify an element as belonging to the *s*-, *p*-, *d*-, or *f*-block in the Periodic Table. **[GT]**
c. Explain trends and patterns in the ionic radius, electron affinity, and reactivity within families and periods of representative elements. **[GT]**

UNIT VI: Bonding

Associated Disciplinary Core Ideas (DCIs) from NGSS include:
PS1: Matter and Its Interactions
PS1.A—Structure and Properties of Matter

Essential Question:
How can one explain the structure, properties, and interactions of matter?

Goal 1. The student will demonstrate the ability to distinguish among ionic, polar, and nonpolar covalent bonds.

Objectives - The student will be able to:

a. Determine the number of valence electrons in an atom from its position in the Periodic Table.
b. Describe how atoms interact with one another by transferring and sharing valence electrons.
c. Use electronegativity values to determine whether a compound is ionic, polar or non-polar covalent.
d. Illustrate neutral atoms and ions using electron dot notation.
e. Illustrate ionic and covalent bonds utilizing electron dot notation.
f. Use appropriate materials to build adequate models of simple molecules and polyatomic ions representing the shapes of these species. **[GT]**
g. Describe van der Waals forces (London forces and dipole-dipole forces) and hydrogen bonds. **[GT]**

Goal 2. The student will demonstrate the ability to recognize various shapes that molecules can exhibit.

Objectives - The student will be able to:

a. Identify and differentiate among the linear, bent, and tetrahedral shapes. **[GT]**
b. Predict the shape of a molecule from its chemical formula. **[GT]**
c. Predict the polarity of a molecule given its shape and types of bonds. **[GT]**

Goal 3. The student will demonstrate the ability to differentiate properties of metallic, ionic, and covalent solids.

Objectives - The student will be able to:

a. Describe the properties of metallic, ionic, and covalent solids.
b. Classify a substance as metallic, ionic, or covalent based on data (solubility, melting point, boiling point, conductivity).

UNIT VII: Nomenclature

Goal 1. The student will demonstrate the ability to compose a proper formula for a compound.

Objectives - The student will be able to:

a. Determine the oxidation number of a metal, nonmetal, or polyatomic ion and relate it to the loss or gain of electrons.
b. Combine a cation and an anion such that the sum of the oxidation numbers will equal zero.
c. Use subscripts and parentheses, if needed, and determine the number of atoms represented by the formula.

Goal 2. The student will demonstrate the ability to describe and name ionic compounds (binary or ternary) and covalent compounds (binary).

Objectives - The student will be able to:

a. Differentiate between a binary and ternary compound.
b. Name a binary ionic compound using roman numerals, if needed.
c. Name a ternary ionic compound using roman numerals, if needed.
d. Name binary covalent compounds.
e. Name a binary or ternary ionic compound using the Stock (-ous/-ic) system of nomenclature. **[GT]**

UNIT VIII: Chemical Reactions

Associated Disciplinary Core Ideas (DCIs) from NGSS include:
PS1: Matter and Its Interactions
PS1.B—Chemical Reactions
PS1.C—Nuclear Processes

Essential Question:
How can one explain the structure, properties, and interactions of matter?

Goal 1. The student will demonstrate the ability to write and balance simple equations.

Objectives - The student will be able to:

a. Distinguish between reactants and products in a chemical reaction.
b. Write a word or symbolic equation to represent a chemical reaction.
c. Balance a simple equation.
d. Explain how a balanced chemical equation supports the Law of Conservation of Mass.
e. Compare the amount and kinds of atoms of reactants and products in a chemical reaction.

Goal 2. The student will demonstrate the ability to classify chemical reactions and predict the products.

Objectives - The student will be able to:

a. Categorize the types of chemical reactions based on the nature of observed changes.
b. Identify the type of chemical reactions based on the reactants given.
c. Predict the products of a synthesis, decomposition, single replacement, and double replacement or combustion reaction, for a given combination of reactants. **[GT]**
d. Write net ionic reactions for precipitation reactions. **[GT]**

UNIT IX: Moles and Stoichiometry

Goal 1. The student will demonstrate the ability to explain and do calculations with the mole.

Objectives - The student will be able to:

a. Explain how a balanced chemical equation relates to the law of conservation of mass.
b. Define the mole and describe its importance.
c. Describe how Avogadro's number is related to a mole of any substance.
d. Define and calculate the molar mass of a compound.
e. Convert among the number of particles, mass, moles, and volume of a substance.

Goal 2. The student will demonstrate the ability to determine the percent composition of a compound.

Objectives - The student will be able to:

a. Calculate the percent composition of a substance from its chemical formula.
b. Calculate the percent composition of a substance from experimental data.

Goal 3. The student will demonstrate the ability to determine the empirical and molecular formulas of a compound.

Objectives - The student will be able to:

a. Distinguish between empirical and molecular formulas.
b. Derive the empirical formula for a compound by using experimentally obtained masses of each element.

c. Derive the empirical formula for a compound by using percent composition data.
d. Derive the molecular formula for a compound by using the empirical formula and the molar mass of the compound.

Goal 4. The student will demonstrate the ability to explain the quantitative relationship that exists between reactants and products in a chemical reaction.

Objectives - The student will be able to:

a. Define stoichiometry and describe its importance.
b. Identify stoichiometric ratios from balanced chemical equations.
c. Calculate different types of stoichiometry problems. (i.e. mass-mass, mass-volume, volume-volume)

Goal 5. The student will demonstrate the ability to describe a limiting reactant.

Objectives - The student will be able to:

a. Define limiting reactant.
b. Explain how limiting reactants affect the amount of products formed.
c. Identify the limiting reactant in a reaction and calculate the theoretical yield of product(s) and the quantity of other reactant(s) consumed or un-reacted. **[GT]**

Goal 6. The student will demonstrate the ability to calculate percent yield.

Objectives - The student will be able to:

a. Differentiate between actual yield and expected yield. **[GT]**
b. Determine percent yield based on actual yield and expected yield. **[GT]**

UNIT X: Gases

Goal 1. The student will demonstrate the ability to describe the behavior of gases and relate the behavior to gas properties.

Objectives - The student will be able to:

a. Identify the properties of gases.
b. Differentiate among the behavior of particles in solids, liquids, and gases.
c. Explain the effects of temperature, pressure, and volume changes on the behavior of particles.
d. Define kinetic energy in terms of velocity (or speed) and mass of particles. **[GT]**
e. Relate molecular motion to temperature and molecular collisions to pressure. **[GT]**

Goal 2. The student will demonstrate the ability to identify the volume, temperature, pressure, and amount of a gas.

Objectives - The student will be able to:

a. Explain which equipment and units are used to measure gas quantities.
b. Define standard temperature and pressure.
c. Define kinetic molecular theory and use it to explain differences in real versus ideal gases. **[GT]**
d. Define molar volume. **[GT]**

Goal 3. The student will demonstrate the ability to describe the relationships among the four quantities of a gas and perform calculations based on those relationships.

Objectives - The student will be able to:

a. State the written and mathematical expression of five gas laws (Boyle's Law, Charles' Law, Gay-Lussac's Law, Combined Gas Law, Ideal Gas Law).
b. Apply the gas laws to problems involving the temperature, volume, pressure, and amount of a gaseous substance.
c. Explain how the total pressure in a mixture of gases is equal to the sum of the partial pressures of each gas present.
d. Compare the diffusion rates of two gases.
e. Compare velocities and masses of different gas molecules, measured at the same temperature. **[GT]**
f. Calculate the pressure of a dry gas when collected over water. **[GT]**

UNIT XI: Solutions

Goal 1. The student will demonstrate the ability to describe characteristics of solutions.

Objectives - The student will be able to:

a. Distinguish between homogeneous and heterogeneous mixtures. Explain how dissolving is different from melting.
b. Identify and compare the nine different solute-solvent combinations.
c. Compare solutions, suspensions, and colloids.

d. Define: dilute, concentrated, unsaturated, saturated, and supersaturated.

Goal 2. The student will demonstrate the ability to describe factors affecting solubility.

Objectives - The student will be able to:

a. Explain how stirring, surface area, temperature, and concentration influence the rate of solution formation.
b. Explain how distillation, crystallization, and chromatography are used to separate solutions into their components.
c. Apply "like dissolves like" to everyday events. (i.e. actions of detergents and soap)
d. Interpret a solubility curve.
e. Explain the relationship between equilibrium and solubility. **[GT]**
f. Explain why gases become less soluble at higher temperatures, whereas most solids become more soluble. **[GT]**
g. Explain why a precipitate forms when solutions of two ionic compounds are mixed. **[GT]**

Goal 3. The student will demonstrate the ability to determine molarity.

Objectives - The student will be able to:

a. Calculate the molarity of a solution given the amount of solute and the volume of solvent.
b. Calculate the amount of solute needed to prepare a specific volume of a given molarity.
c. Recognize the difference between concentration and amount, calculating the molarity and molality of a solution and calculations associated with dilutions. **[GT]**
d. Generate a standard curve of molarity versus absorbance using spectrophotometry and then use the curve. **[GT]**

Goal 4. The student will demonstrate the ability to describe colligative properties.

Objectives - The student will be able to:

a. Explain why the boiling point increases and the freezing point decreases when solute particles are dissolved.
b. Give everyday examples of freezing point depression and boiling point elevations.

UNIT XII: Reactions Rates and Equilibrium

Goal 1. The student will demonstrate the ability to describe factors that affect the reaction rate.

Objectives - The student will be able to:

a. Predict the effects of adding a catalyst or changing the temperature, surface area, concentration, or pressure on the rate of a reaction.
b. Interpret a potential energy diagram including activation energy and enthalpy change.
c. Explain the role of activation energy in chemical reactions and its change with the addition of a catalyst.

Goal 2. The student will demonstrate the ability to describe the energy changes occurring during a chemical reaction or process.

Objectives - The student will be able to:

a. Compare endothermic and exothermic reactions using the terminology enthalpy and enthalpy change.
b. Differentiate between heat and temperature.
c. Calculate the change in heat energy in a system using calorimetry. **[GT]**

Goal 3. The student will demonstrate the ability to explain chemical equilibrium.

Objectives - The student will be able to:

a. Explain that some chemical reactions are reversible.
b. Discuss dynamic equilibrium.
c. Calculate the equilibrium constant and use its value to judge whether reactants or products are favored.
d. Use Le Chatelier's Principle to explain how equilibrium systems adjust to stresses such as temperature and concentration changes.
e. Explain the meaning of a reaction mechanism. Identify rate determining step, intermediate, and catalysts. **[GT]**
f. Distinguish a reaction mechanism from the overall equation describing a reaction. **[GT]**
g. Define entropy and free energy and discuss their relationships to chemical reactions. **[GT]**
h. Solve simple equilibrium problems. **[GT]**

UNIT XIII: Acids and Bases

Goal 1. The student will demonstrate the ability to describe and name acids and bases.

Objectives - The student will be able to:

a. Explain that many reactions involve the transfer of hydrogen ions.
b. Compare Arrhenius, Bronsted-Lowry, and Lewis theories of acids and bases.
c. Identify the properties of acids and bases.
d. Name a binary acid.
e. Name a ternary acid.

Goal 2. The student will demonstrate the ability to compare characteristics of strong and weak acids and bases.

Objectives - The student will be able to:

a. Discuss and compare ionization of strong and weak acids and bases.
b. Calculate the hydrogen ion concentration for a strong acid.
c. Use the ionization constant to calculate the hydrogen ion concentration for weak acids.

Goal 3. The student will demonstrate the ability to describe acid-base reactions.

Objectives - The student will be able to:

a. Write a neutralization reaction.
b. List the characteristics of a salt.
c. Discuss the self-ionization of water and utilize K_w to determine hydrogen ion concentrations.
d. Identify the salt product produced in an acid-base reaction. **[GT]**
e. Given a salt, specify the acid and base from which it could be produced. **[GT]**
f. Use the ionization constant to calculate the hydrogen ion concentration for weak acids. **[GT]**

Goal 4. The student will demonstrate the ability to describe and use the pH scale.

Objectives - The student will be able to:

a. Measure acidity levels of common substances using the pH scale.
b. Calculate pH given the hydrogen ion concentration.
c. Calculate pH given the hydroxide ion concentration.
d. Calculate pH for a weak and strong acid solution.

Goal 5. The student will demonstrate the ability to explain how the concept of neutralization applies to titrations.

Objectives - The student will be able to:

a. Perform a titration using an indicator to identify the endpoint.
b. Calculate the molarity of an unknown acid or base from titration data.

UNIT XIV: Organic Chemistry

Goal 1. The student will be able to explain why organic compounds are so numerous and diverse.

Objectives - The student will be able to:

a. Differentiate between properties of inorganic and organic compounds.
b. Differentiate between alkanes, alkenes, alkynes, and cyclic hydrocarbons.
c. Identify, name and draw structural formulas for the first ten alkanes.
d. Recognize that many organic compounds contain functional groups, which determine the properties and uses of that compound.

Collaboration Team Checklist High School

The Team Collaboration Checklist is intended to serve as a useful reminder on the important aspects of team dynamics. It is not a rubric for grading purposes, but rather a reminder for student and adult teams about the key conditions for good collaboration. Teams might regularly refer to the collaboration checklist throughout a project, revisit it in moments when their progress is stuck, or us it to reflect on successes and challenges.

We intend these to be two separate docs that serve different purposes. While the Collaboration rubric would feature regularly in project design, facilitation, and assessment, the checklist is more of a supplemental tool to be used as needed to boost team performance. Given the differences between individual and group behaviors it is best to think of these two resources as complimenting each other rather than being aligned to one another.

New Tech Network Team Collaboration Checklist

Behavior	Description
Equal Participation	Each member is equally engaged in the work of team, as represented by the role each member plays in accomplishing the task and how well each voice is heard during discussion. Established roles allow for equal participation.
Project Management	The team has collaboratively developed a context-specific plan for task completion that is regularly updated to reflect needed adjustments throughout the timeline.
Making Decisions	The team uses a transparent process, or set of processes, for making decisions that impact the entire group.
Physical Disposition	The team members exhibit physical cues that suggest active listening, engagement, and an openness to new ideas. In addition, team meetings are physically organized in ways that best support collaborative and cooperative work.
Creating/Using Norms	The team has established and is using a set of norms that guide the behavior of the team. The team regularly revisits the norms to assess their effectiveness and to determine whether they are an accurate reflection of the team's behavior.
Intellectual Discourse	The team regularly engages in constructive intellectual discourse aimed at deepening the team's understanding of key ideas and individual perspectives related to the task at hand.
Passionate Ownership	The team exhibits shared and passionate ownership over the successful completion of the task. All group members are made to feel valuable, that their contributions are meaningful, and their accomplishments are celebrated.
Conflict Resolution	The team anticipates that conflict may happen, and has a plan for addressing it directly. Group members engage constructively and reference both the plan and their norms when conflict occurs.

Collaboration Rubric High School

Overview

In designing our collaboration rubric, we drew a distinction between individual and group behaviors. While both are important for successful collaboration, distinguishing between the two provides useful guidance for how to support and assess student progress.

The Individual Collaboration Rubric focuses on specific aspects of individual collaboration. The indicators are designed to be simple and accessible to students using the Peer Evaluation Tool as well as instructive to guide group conversations. The number of dimensions (rows) for this rubric makes it unlikely a teacher would use it in its entirety. A teacher might opt to focus on particular rows by project or a school might focus on particular indicators in particular grade levels. Schools may also find opportunities to bring additional collaboration and project management skills to extend this outcome as their students grow as collaborators and we encourage you to do so.

Individual Collaboration – High School

Collaboration involves behaviors under the control of individual group members including effort they put into group tasks, their manner of interacting with others on group, and the quantity and quality of contributions they make to group discussions.

	Emerging	ED	Developing	DP	Proficient	PA	Advanced
Contribution and Development of Ideas	Ideas lack **supporting** reasoning **Limited acknowledgement** of others' thinking		Shares ideas, and **explains** the reasons behind them **Acknowledges** others' thinking		Provides ideas or arguments with **convincing** reasons **Builds on** the thinking of others		Acknowledges the **strengths and limitations** of their ideas Builds on the thinking of others and **checks back for agreement**
Equal Participation	Shares ideas **without listening** or listens **without sharing** ideas		**Allows for** equal participation by both sharing ideas and listening to the ideas of others		**Encourages** equal participation by **asking** clarifying or probing questions, **paraphrasing** ideas, and **synthesizing** group thinking		In addition to proficient, **actively invites** others to participate equitably, promoting divergent and creative perspectives
Group Norms	Follows group norms and processes but **only with modeling and/or reminders**		**Understands and follows** group created norms and processes		Understands and follows group created norms and processes and **helps others do the same**		In addition to proficient**, initiates** the use of norms and group processes in each meeting
Respectful Tone and Style	**At times**, words and tone indicate respectful intent, but not consistently		Words and tone indicate **respectful intent,** but **might not be sensitive** to others		Words and tone indicate **respect and sensitivity** to others		In addition to proficient, provides **gentle feedback about others' words and tone** to foster an environment of respect
Positive Body Language/ Active Listening	**Sporadically** faces speaker, or engages without distraction **some of the time**		**Faces speaker** and is **free of distractions** when others are speaking		When others are speaking, both body language and verbal responses **indicate engagement**		When others are speaking, body language and verbal responses indicate **positive, energetic** engagement
Roles	Knows role, and fulfills it only **some of the time**		**Accepts** role and shows understanding **by fulfilling it**		Knows the roles of **self and others**, and uses the roles to **maximize** group effectiveness		**In addition to proficient**, uses group roles as opportunities to **use strengths or address areas of weakness**
Work Ethic	Completes **only some** assigned tasks Comes to meetings **without evidence** of preparation		Completes **all assigned tasks by deadline** Comes to meetings partially **prepared**		Completes all assigned tasks by deadline; **work is quality, and advances the project** Comes to meetings **fully prepared**		**Models** consistently high standards for timeliness, quality, and ownership of work Preparation for meetings **surpasses** expectations
Team Support	Either **doesn't help**, or occasionally helps, but **must be asked**		Predictably helps **when asked** by others, but only then		**Always** helps when asked, and **sometimes** offers help to others		**Actively checks in** to understand how others are progressing and how they can be of help

FIRST STATE MILITARY ACADEMY
Project Based Learning Curriculum Framework

Course: Earth and Space Science Grade Level: 9th

Standards	Unit	Project Idea & Driving Question/ Authentic Problem or Scenario	Activities/ Experiences within the Project (scaffolding activities, labs, experiments, interviews, etc)	Assessments
M2.01.04		Setting the Stage Project: How can norms impact our lives?	Benchmark 1: Choosing the Norm Benchmark 2: Teaching the Norm Benchmark 3: Sharing the Norm Final Product: Competition	Benchmark 1: Collaborative essay about a particular norm Benchmark 2: Student created and led workshop teaching norm Benchmark 3: Individual poster
ESS1-3 ESS1-1 ESS1-2		Human Survival Project: How can we preserve the human race with the limited lifespan of our sun?	Benchmark 1: The Life Cycle of the Sun Benchmark 2: Nuclear Fusion Benchmark 3: Mock Presentations Final Product: Proposal of solution	Benchmark 1: Analogy of our solar system Benchmark 2: Infographic representing nuclear fusion Benchmark 3: Critical friends protocol and feedback
ESS2-1 ESS2-3		Dynamic Earth Project: How are the dynamics of Earth's layers impacting our future?	Benchmark 1: Formation of Layers Benchmark 2: Convection Currents and Plate Movement Benchmark 3: Progression of Events Final Product: Video	Benchmark 1: Creative poster representation of layers Benchmark 2: Performance assessment - Given a formation or event, represent convection currents and boundary types Benchmark 3: Create a flowchart showing Earths progression and the effects
ESS3-1 ESS3-3 ESS3-5		Human Impact Project: How are we impacting our Earth's future?	Benchmark 1: Deforestation and Pollution Benchmark 2: Renewable and Non-renewable Resources Benchmark 3: Impact on Climate Final Product: Letter to Representative for fund allocation	Benchmark 1: Water Quality Lab Benchmark 2: Renewabean Lab Benchmark 3: Presentation of findings.

Environmental Science

UNIT I: Introduction to Environmental Science

Goal 1. The student will demonstrate the ability to use scientific skills necessary to identify and analyze environmental issues.

Objectives - The student will be able to:

a. Define environmental science as an interdisciplinary science and relate these disciplines to common environmental issues.
b. Identify and discuss values and beliefs inherent in environmental decision-making.

Goal 2. The student will demonstrate the ability to analyze the movement of matter and energy through the biosphere.

Objectives - The student will be able to:

a. Describe the influence of matter and energy cycles on weather, climate, and the environment.
b. Explain how matter cycles between living systems and the physical environment.

UNIT II: Interdependence of Organisms

Goal 1. The student will demonstrate the ability to describe the structure of an ecosystem and the changes it undergoes.

Objectives - The student will be able to:

a. Distinguish between the biotic and abiotic factors in an ecosystem.
b. Examine how interactions between a species and its environment define the species' niche.
c. Discriminate between a species and a population and between a community and an ecosystem.
d. Explain how organisms have adapted to their environments using examples from the diversity of living things.

Goal 2. The student will demonstrate the ability to analyze and recognize the interrelationships in a food chain and a food web.

Objectives - The student will be able to:

a. Trace the flow of energy in a food chain.
b. Recognize the relationship between diversity and stability in ecosystems.
c. Identify the different trophic levels in a food pyramid.
d. Define the term "biomass" and its relationship to a food pyramid.
e. Describe the major types of interactions between species (e.g., competition, predation, symbiotic relationships).

Goal 3. The student will demonstrate the ability to describe the major biomes and the impact of human involvement and disruption of these biomes.

Objectives - The student will be able to:

a. Construct climatograms of major terrestrial biomes.
b. Compare the process of ecological succession in terrestrial and aquatic biomes.
c. Explain how and why some biomes have been intensely exploited.

UNIT III: Populations

Goal 1. The student will demonstrate the ability to explain the growth of populations and factors that influence them.

Objectives - The student will be able to:

a. Describe the factors that limit the growth of a population.
b. Diagram the three phases of an exponential growth curve and indicate carrying capacity.

Goal 2. The student will demonstrate the ability to analyze trends in human population growth.

Objectives - The student will be able to:

a. Define demography.
b. Describe the factors that affect the growth of the human population.
c. Construct age pyramids for an underdeveloped and developed country and analyze population trends.
d. Describe problems resulting from rapid human population growth.
e. Analyze strategies countries may use to reduce population growth.

UNIT IV: Air Water, and Land Recourses

Goal 1. The student will demonstrate the ability to explain the effect of human influences on the atmosphere.

Objectives - The student will be able to:

a. Identify major air pollutants and their sources.
b. Describe the impact of air pollutants on human health.
c. Compare and contrast the effects of acid rain, ozone depletion, and global warming on living and nonliving environments.
d. Describe the problems caused by noise and light pollution.

Goal 2. The student will demonstrate the ability to explain the effect of human influences on water supply.

Objectives - The student will be able to:

a. Trace the water cycle from land (include groundwater) to sea, to atmosphere, etc.
b. Identify how water is used in society and how water use affects ecosystems.
c. List the major water pollutants and their sources and relate them to human and environmental health.
d. Describe environmental conditions and human activities that cause groundwater pollution.
e. Relate the importance of wetlands to the health of aquatic ecosystems, especially estuaries.
f. Discuss the ecological, political, economic, and social issues of the Chesapeake Bay.

Goal 3. The student will demonstrate the ability to explain the effect of human influences on land.

Objectives - The student will be able to:

a. Identify how land is used and how land use affects ecosystems.
b. Summarize the positive and negative effects of urban planning.
c. Explain the negative effects of agriculture on the land and the benefits of sustainable agriculture.
d. Describe the characteristics of soil composition.
e. Identify underlying reasons for solid waste pollution.
f. Compare and contrast biodegradable and nonbiodegradable wastes and their significance in landfills.
g. Identify and explain methods for reducing the volume of waste.

UNIT V: Energy Resources

Goal 1. The student will demonstrate the ability to identify nonrenewable resources and their effect on the environment.

Objectives - The student will be able to:

a. Identify and describe the different types of nonrenewable resources.
b. Describe the most common methods of mining and their environmental consequences.
c. Describe the nuclear fission process.
d. List the advantages and disadvantages of the nuclear fission process including safety concerns and radioactive waste disposal.

Goal 2. The student will demonstrate the ability to identify renewable resources and their effect on the environment.

Objectives - The student will be able to:

a. Compare and contrast the advantages and disadvantages of nonrenewable and renewable resources.
b. List the major types of renewable resources and compare their advantages and disadvantages (solar, wind, water, geothermal, biomass, tidal power, etc.)
c. Summarize the recent advances in alternative fuel research.

UNIT VI: Human Impact on the Environment

Goal 1. The student will demonstrate the ability to identify the negative impacts of humans on the environment.

Objectives - The student will be able to:

a. Explain habitat destruction and the loss of biodiversity, and how they are related to the endangerment of species.
b. Distinguish between the natural rate of extinction and the accelerated rate due to human impact.
c. Identify methods of decreasing the impacts of humans on the rate of extinction.
d. Explain the causes of deforestation and its effects on biodiversity.

Goal 2. The student will demonstrate the ability to explain how citizens can affect environmental policy at each level of government (local, state, and national).

Objectives - The student will be able to:

a. Research the history of environmental legislation in the U.S.
b. Interpret state, federal, and international environmental laws (Clean Air Act, Clean Water Act, Endangered Species Act, Kyoto Protocol, etc.)
c. Recognize impacts of individual choices on the environment.
d. Define principles of sustainable development and how its implementation can maintain the environment.

Goal 3. The student will demonstrate the ability to identify career opportunities in the environmental science field and discuss career information related to the environment.

Objectives - The student will be able to:

a. List several environmental science careers and their positive impact on the environment.
b. Identify background knowledge needed for a career in environmental science.

NTN Agency Rubric, High School

Develop Growth Mindset: *I can grow my intelligence and skills through effort, practice, and challenge. The brain grows bigger with use, like a muscle.*

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED
Use Effort and Practice to Grow	• Does not connect effort or practice to getting better at a skill, improved work quality, or performance		• Superficially connects effort and practice to getting better at a skill, improved work quality, or performance		• Understands how effort and practice relate to getting better at skills, improved work quality, or performance		• Understands that effort and practice improve skills, work quality, and performance and that the process takes patience and time
Seek Challenge	• Rarely takes on academic challenges and risks to pursue learning • Struggles to identify the personal barriers (mindset, beliefs, circumstances) that inhibit taking risks		• With encouragement, sometimes takes on academic challenges and risks to pursue learning • Superficially describes personal barriers (mindset, beliefs, circumstances) that inhibit taking risks		• Seeks academic challenges and takes risks to pursue learning • Analyzes personal barriers (mindset, beliefs, circumstances) that inhibit taking risks		• Strategically and independently seeks academic challenges and takes risks to pursue learning • Analyzes and overcomes personal barriers (mindset, beliefs, circumstances) that could inhibit taking risks
Grow from Setbacks	• Identifies challenges, failures, or setbacks, but does not describe reactions to them (e.g. giving up or trying harder)		• Identifies challenges, failures, or setbacks and describes reactions to them (e.g. giving up or trying harder)		• Identifies challenges, failures, or setbacks and reflects on how reactions to them (e.g. giving up or trying harder) affect process, product, or learning		• Reflects on personal or academic growth from challenges, failures, or setbacks as well as why and how reactions (e.g. giving up or trying harder) affect the process, product, and learning
Build Confidence	• Struggles to identify academic strengths, previous successes, or endurance gained from personal struggle to build confidence in academic success for a new task, project, or class		• Identifies an academic strength, previous success, or endurance gained through personal struggle, but does not use these skills to build confidence in success for a new task, project, or class		• Builds confidence in success (on a new task, project, or class) by knowing and using academic strengths, previous success, or endurance gained through personal struggle		• Consistently confident that success is possible (on a new task, project, or class) by knowing and using academic strengths, previous successes, or endurance gained through personal struggle

Find Personal Relevance	• Rarely, and with significant support, finds personal relevance in the work by connecting it to interests or goals, reflecting on progress towards mastery, or identifying autonomous choices		• With support, sometimes finds personal relevance in the work by connecting it to interests or goals, reflecting on progress towards mastery, or identifying autonomous choices		• Often finds personal relevance in the work by connecting it to interests or goals, reflecting on progress towards mastery, or identifying autonomous choices		• Independently seeks and finds personal relevance in the work by connecting it to interests or goals, reflecting on progress towards mastery, or identifying autonomous choices

Take Ownership Over One's Learning: *I can learn how to learn and monitor progress to be successful on tasks, school, and life.*

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED
Meet Benchmarks	• Completes few benchmarks and class assignments and may resist or struggle to use resources and supports (e.g. study groups, teacher support, workshops, tutorials)		• Completes some benchmarks and class assignments; and, only when forced to, or at the last minute, uses resources and supports (e.g. study groups, teacher support, workshops, tutorials)		• Usually completes polished benchmarks and class assignments by using resources and supports when necessary (e.g. study groups, teacher support, workshops, tutorials)		• Achieves personal best work on almost all benchmarks and class assignments by setting goals, monitoring progress, and using resources and supports (e.g. study groups, teacher support, workshops, tutorials)
Seek Feedback	• Rejects feedback and/or does not revise work		• Sometimes shows evidence of accepting feedback to revise work, but at times may resist when it's difficult		• Consistently shows evidence of accepting and using feedback to revise work to high quality		• Consistently shows evidence of actively seeking, identifying, and using feedback to revise work to high quality
Tackle and Monitor Learning	• For a task or project, superficially identifies what is known, what needs to be learned, and how hard it will be		• For a task or project, identifies what is known, what needs to be learned, and how hard it will be; but may not use a strategy to tackle the task or does not monitor how well the strategy is working		• For a task or project identifies what is known, what needs to be learned, and how hard it will be; uses a strategy and steps to tackle the task; and monitors how well the approach and effort are working		• For a task or project, identifies what is known, what needs to be learned, and how hard it will be; selects an appropriate strategy and takes steps to tackle the task; and monitors and adjusts based on how well the approach and effort are working
Actively Participate	• Stays focused for part of the activity/discussion, team meeting, or independent time but often cannot resist distraction or does not notice when or why a loss of focus happens		• Mostly stays focused on the activity/discussion, team meeting, or independent time and knows when and why disengagement or distraction happens		• Actively participates in the activity/discussion, team meeting, or independent time and has strategies for staying focused and resisting most distraction		• Actively participates and takes initiative on the activity/discussion, team meeting, or independent time and has personal strategies for staying focused

Build Relationships	• Does not build relationships with trusted adults or peers to get back on track as needed or to enhance learning		• Does not initiate building relationships, but has a few trusted adults or peers to get back on track as needed or to enhance learning		• Builds and uses relationships with trusted adults and peers to get back on track as needed and to enhance learning		• Actively builds trusting relationships with adults and peers to pursue goals, enhance learning, and get back on track as needed
Impact Self & Community	• Identifies the ups and downs of the classroom and home community		• Has limited understanding of individual role in the ups and downs of the classroom and home community		• Analyzes individual role in the ups and downs of the classroom and home community		• Monitors and adjusts individual role to positively influence the ups and downs of the classroom and home community

Oral Communication Rubric, High School

Overview

Interpersonal Communication Section - Focuses on the listening and speaking skills exhibited by individual students in a wide variety of informal conversations (e.g. student and teacher, student and student and expert). While there is some unavoidable overlap with the Collaboration Rubric, the Collaboration rubric emphasizes how teammates should talk to one another while collaborating.

Presentation Section - Focuses on the elements of a strong presentation. This section of the rubric could be used in its entirety to describe a complete presentation - though it's often good to focus on a few dimensions (rows), or indicators (bullets). Useful for providing a group grade on a presentation.

Delivery Section - Focuses on the individual aspects of a presentation and can be used to provide individualized grades for a student in a presentation, even in the case of a group presentation.

Interpersonal Communication

The ability to communicate knowledge and thinking through effective informal, pair, and small group conversations.

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT College Ready	P/A	ADVANCED College Level
Listening and Comprehension	After listening, shows recall of **some key details but limited understanding of main points**		After listening, shows recall of **some key details and main points**		After listening, can **synthesize** main points and **reference** key details		After listening, can synthesize main points, reference key details, and **evaluate the strength** or value of the ideas
Clear Presentation of Ideas	Communicates ideas in **an unclear way**; ideas are **difficult to follow**		Communicates ideas **clearly most of the time**, **occasionally** ideas are difficult to follow		Communicates ideas **clearly**		Communicates ideas clearly, **adjusting as needed to enhance clarity for audience**
Asking Questions	Asks questions that **repeat stated details or main points**		Ask questions that **help clarify a topic or a line of reasoning**		Asks **thoughtful** questions that **develop** or **challenge** a topic or line of reasoning		Asks thoughtful questions that develop or challenge a line of reasoning and **explore connections to a larger theme or idea**

PRESENTATION

The ability to communicate knowledge and thinking orally.

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT College Ready	P/A	ADVANCED College Level
Clarity	Central message is **unclear or unstated** **Does not include** alternate perspectives when appropriate		Central message **can be deduced but may not be explicit** **Includes** alternate perspectives when appropriate		Presents a **clear** central message **Addresses alternative** or opposing perspectives when appropriate		Presents a central message that is clear and **original** Addresses alternative or opposing perspectives i**n a way that sharpens** one's own perspective
Evidence	Draws on facts, experience, or research in a **minimal** way Demonstrates **limited** understanding of the topic		Draws on facts, experience, and/or research **inconsistently** Demonstrates an **incomplete or uneven** understanding of the topic		**Draws on** facts, experiences and research to **support a central message** Demonstrates an **understanding** of the topic		Facts, experience and research are **synthesized** to support a central message emonstrate an **in-depth** understanding of the topic
Organization	·A lack of organization and/or transitions **makes it difficult to follow** the presenter's ideas and line of reasoning		**Inconsistencies** in organization and limited use of transitions **detract from** audience understanding of line of reasoning		**Organization** and transitions **reveal** the line of reasoning		Organization and transitions **supports** the line of reasoning
Use of Digital Media / Visual displays	Digital media or visual displays are **confusing, extraneous, or distracting**		Digital media or visual displays are **informative and relevant**		Digital media or visual displays are informative and **support audience engagement and understanding**		Digital media or visual displays are **polished**, informative, and support audience engagement and understanding

DELIVERY

The ability to communicate knowledge and thinking orally.

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT College Ready	P/A	ADVANCED College Level
Language Use	Uses language and style that is **unsuited** to the purpose, audience, and task **Stumbles** over words, interfering with audience understanding		Uses language and style that is **at times** unsuited to the purpose, audience, and task Speaking is fluid **with minor lapses of awkward or incorrect language use that detracts from audience understanding**		Uses **appropriate** language and style that is **suited** to the purpose, audience, and task Speaking is fluid and **easy to follow**		Uses **sophisticated** and **varied** language that is suited to the purpose, audience, and task Speaking is **consistently** fluid and easy to follow
Presentation Skills	Makes **minimal** use of presentation skills: lacks control of body posture; does not make eye contact; voice is unclear and/or inaudible; and pace of presentation is too slow or too rushed Presenter's energy and affect are **unsuitable** for the audience and purpose of the presentation		Demonstrates a **command of some** aspects of presentation skills, including control of body posture and gestures, language fluency, eye contact, clear and audible voice, and appropriate pacing Presenter's energy, and/or affect are **usually appropriate** for the audience and purpose of the presentation, **with minor lapses**		Demonstrates a **command** of presentation skills, including control of body posture and gestures, eye contact, clear and audible voice, and appropriate pacing Presenter's energy and affect are **appropriate** for the audience and **support engagement**		Demonstrates **consistent command** of presentation skills, including control of body posture and gestures, eye contact, clear and audible voice, and appropriate pacing **in a way that keeps the audience engaged** Presenter **maintains a presence and a captivating energy** that is appropriate to the audience and purpose of the presentation
Interaction with Audience	Provides a **vague** response to questions Demonstrates a **minimal command** of the facts or understanding of the topic		Provides an **indirect** or **partial** response to questions; Demonstrates a **partial** command of the facts or understanding of the topic		Provides a **direct** and **complete** response to questions Demonstrates an **adequate** command of the facts and understanding of the topic		Provides a **precise** and **persuasive** response to questions Demonstrates an **in-depth** understanding of the facts and topic

Physics

Special Note for the 2014-15 School Year: In 2013, the Maryland State Board of Education adopted the *Next Generation Science Standards* (NGSS) that set forth a vision for science education where the Science and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs) of science, and Crosscutting Concepts (CCCs) of science are blended seamlessly into a three dimensional learning environment for all students. The transition to NGSS across Maryland and in HCPSS will be deliberate, and full implementation of NGSS in Maryland is planned for the 2017-18 school year. The shifts required in NGSS implementation are great, and revision of curriculum requires careful consideration of these changes as well as time to develop, pilot, and implement. During this transitional period, resources in support of NGSS are being developed and posted for teachers' use within Alfresco.
Additionally, beginning in 2014-15, select schools will pilot project based learning experiences developed by HCPSS curriculum writers. All students in HCPSS high school science courses regardless of the whether the student attends a school that is an early implementer of NGSS or not, will have exposure to the skills and processes and the content included in the Essential Curriculum documents. The order in which students encounter these concepts, however, may differ slightly among schools due to this transition.

G/T Differentiation
Conceptually challenging, in-depth, distinctive, and complex learning experiences should be the hallmark of the G/T Physics Course. Students are expected to engage in longer-term investigations where they research complex topics or issues that lead them to create new knowledge or to design original solutions much like professionals within the discipline. Teachers are expected to use a wide array of instructional strategies that encourage creative problem solving appropriate for highly able/high achieving students. Additionally, teachers of G/T Physics should use the College Board Physics 1-AP Curriculum Framework to guide in planning instruction for students in 2014-15. Students should be encouraged to take the Physics 1-AP examination in May as appropriate.

UNIT I: One Dimensional Motion and Analytical Techniques

Associated Disciplinary Core Ideas (DCIs) from NGSS include:
PS2: Motion and Stability: Forces and Interactions
PS2.A—Forces and Motion

Essential Question
How can one explain and predict interactions between objects and within systems of objects?

Goal 1. The student will demonstrate the ability to carry out effective scientific investigations, analyze data, communicate results, and apply results to explain phenomena occurring outside the laboratory.

Objectives - The student will be able to:

a. Modify or affirm preexisting scientific conceptions through experimentation and using other evidence.

b. Use laboratory equipment properly.
c. Identify the independent and dependent variables in any experiment.
d. Graph data properly using axes labeled with appropriate quantities, appropriate units on axes, axes labeled with appropriate intervals, and an appropriate title.
e. Identify trends and sources of error using class data.
f. Analyze data by re-expressing data to determine the correct proportional relationship among variables, determining the value, units, and physical significance of the slope of the graph, and writing the equation derived from the analysis.
g. Predict and explain everyday phenomena using equations and graphs derived from data.

Goal 2. The student will demonstrate the ability to apply appropriate mathematical processes to solving problems.

Objectives - The student will be able to:

a. Use math skills, including unit conversions, manipulating and solving algebraic equations, scientific notation, and proportional relationships.
b. Use computers or graphing calculators to perform calculations for tables and graphs.
c. Solve problems methodically by making a diagram of the problem, identifying known and unknown quantities, identifying appropriate equations, and judging the reasonableness of an answer.

Goal 3. The student will demonstrate the ability to define, describe, calculate, and differentiate among position, displacement, speed, velocity, and acceleration.

Objectives - The student will be able to:

a. Define position as a signed number relative to an origin.
b. Define and calculate displacement (Δx) as the change in position of an object.
c. Identify the frame of reference used in any problem.
d. Define and calculate speed as the distance traveled divided by the elapsed time.
e. Define and calculate velocity as the change in position divided by the elapsed time.
f. Identify cases where average speed does not equal average velocity.
g. Describe a situation when the velocity is negative.
h. Define and calculate acceleration as the change in velocity divided by the elapsed time.
i. Describe how the physics definition of acceleration differs from the everyday definition of acceleration.
j. Interpret position versus time and velocity versus time graphs for motion at constant velocity and for motion at constant acceleration.
k. Solve motion problems using the equations, $x = x_0 + v_0t + (1/2)at^2$ and $v = v_0 + at$.

UNIT II: Force, Two-Dimensional Motion, and Gravity

Associated Disciplinary Core Ideas (DCIs) from NGSS include:
PS2: Motion and Stability: Forces and Interactions
PS2.A—Forces and Motion

Essential Question

How can one explain and predict interactions between objects and within systems of objects?

Goal 1. The student will demonstrate the ability to state and apply Newton's three laws of motion.

Objectives - The student will be able to:

a. Explain that objects change their motion only when a net force is applied.
b. Apply the relationship, $a = F/m$, to physical situations in order to explain qualitatively and quantitatively how any one variable is affected by a change in another.
c. Use $a = F/m$ in conjunction with motion equations to solve problems involving motion in one dimension.
d. Explain that force is not something that an object "has", but is characteristic of the action between objects.
e. Explain that when one object applies a force to a second object, the second object simultaneously applies an equal and opposite force to the first object.

Goal 2. The student will demonstrate the ability to apply vector concepts and vector math to appropriate physical situations encountered throughout the course.

Objectives - The student will be able to:

a. Identify scalar and vector quantities.
b. Perform vector addition geometrically.
c. Determine the components of a vector using a geometric method.
d. Apply vector concepts to physical situations involving forces, projectile motion, and circular motion.
e. Identify and sketch forces acting on an object and determine the net force on the object using geometric vector addition.

Goal 3. The student will demonstrate the ability to describe the path of a projectile using motion equations and vector components.

Objectives - The student will be able to:

a. Identify a projectile as an object which has been launched and whose motion is affected only by gravity (ignoring air resistance).
b. Analyze the motion of a projectile by breaking its velocity and acceleration vectors into horizontal and vertical components.
c. Use motion equations to solve for a projectile that has been launched

horizontally.

Goal 4. The student will demonstrate the ability to analyze and explain uniform circular motion.

Objectives - The student will be able to:

a. Identify uniform circular motion.
b. Identify the type of force supplying the centripetal force that acts on any object in uniform circular motion.
c. Identify a centrifugal force as a fictitious force and explain how it results from an accelerated frame of reference.
d. Determine the directions of the velocity, acceleration, and net force vectors for an object in uniform circular motion.

Goal 5. The student will demonstrate the ability to describe the law of universal gravitation.

Objectives - The student will be able to:

a. Apply the proportional relationship of the law of universal gravitation, $F = Gm_1m_2/d^2$.
b. Explain why a spaceship in a stable circular orbit is in free fall and why a person in that spaceship experiences weightlessness.
c. Use Newton's second law and the law of universal gravitation to show why all objects near the surface of the earth fall with the same constant acceleration.

UNIT III: Energy and Momentum

Associated Disciplinary Core Ideas (DCIs) from NGSS include:
PS3: Energy
PS3.A—Definitions of Energy
PS3.B—Conservation of Energy and Energy Transfer
PS3.C—Relationship Between Energy and Forces
PS3.D—Energy in Chemical Processes

Essential Question:
How is energy transferred and conserved?

Goal 1. The student will demonstrate the ability to apply the concepts of momentum, impulse, conservation, and system to describe and numerically solve simple collision and explosion problems.

Objectives - The student will be able to:

a. Calculate the momentum ($p = mv$) of an object.
b. Define and calculate impulse ($F\Delta t$) and apply it in the relationship, $F\Delta t = m\Delta v$.
c. Use the concept of impulse to explain and demonstrate mathematically why it is

safer in a collision to take a longer time to come to a stop.

d. Analyze a problem and choose a system to determine if the forces are internal or external to that system.
e. Explain that a conserved quantity is a quantity that remains numerically constant.
f. Define and identify situations involving elastic and inelastic collisions and explosions.
g. State the law of conservation of momentum and use it to solve one - dimensional explosion and collision problems using the equation, $m_1v_1+m_2v_2=m_1v_1'+m_2v_2'$.

Goal 2. The student will demonstrate the ability to explain the relationships between work and energy.

Objectives - The student will be able to:

a. Define energy in terms of work.
b. Calculate work (W = Fd) and illustrate that simple machines do not decrease work, rather, they decrease application force by increasing the distance that the force is applied.
c. Define and calculate kinetic energy ($KE = (1/2)mv^2$), and gravitational potential energy (PE = mgh).
d. State and apply the relationship that work done with no opposing force equals the change in kinetic energy.
e. State and apply the relationship that work done against gravity equals the change in gravitational potential energy.

Goal 3. The student will demonstrate the ability to discuss how energy in a system is transferred from one form to another or from one object to another, and use the conservation of energy to solve simple problems.

Objectives - The student will be able to:

a. Define and calculate mechanical energy as the sum of the kinetic and potential energy.
b. Identify the different forms of energy in simple systems such as a swinging pendulum or a car on a frictionless roller coaster.
c. Describe the law of conservation of energy for a system and apply it to problems where friction and air resistance are ignored.

UNIT IV: Electricity and Magnetism

Associated Disciplinary Core Ideas (DCIs) from NGSS include:
PS4: Waves and Their Applications in Technologies for Information Transfer
PS4.B—Electromagnetic Radiation

Essential Question:

How are waves used to transfer energy and to send and store information?

Goal 1. The student will demonstrate the ability to identify kinds of electric charges, analyze interactions between two charged objects, and describe electric fields.

Objectives - The student will be able to:

a. Identify two kinds of electric charges and describe the interaction of like and unlike charges.

b. Describe the acquisition of net charge in terms of the gain or loss of electrons by friction, conduction, and induction, and explain that connecting objects to the ground discharges them.

c. Explain why an electrically charged object can attract an electrically neutral object. d. Differentiate between conducting and insulating materials in terms of the ease that electrons flow in them.

e Identify and apply the proportional relationships involved in Coulomb's law of electric force. ($F = kq\ q\ /d^2$)

f Explain that the space around a charge is altered by the presence of the charge, producing an electric field in that space.

g Explain that the direction of an electric field at any point is the direction of the net force on a test charge at that point.

h Identify characteristic field line patterns for simple charge configurations, and use the field lines to determine the relative strength and direction of the electric field

Goal 2. The student will demonstrate the ability to describe an analogy between water flowing through pipes and charge flowing through circuits.

Objectives - The student will be able to:

a. Describe the concepts in an electrical circuit including electric potential energy, electric potential, voltage, current, and resistance.

b. Use each concept to explain the flow of charge through a simple circuit and to illustrate the electric circuit/water analogy.

Goal 3. The student will demonstrate the ability to describe the characteristics of simple series and parallel circuits in terms of voltage, current, and resistance.

Objectives - The student will be able to:

a. Use Ohm's law ($V = IR$) to calculate circuit variables.

b. Explain that current is not "used up" in an electric circuit, rather, the electric potential energy of a charge is converted to heat energy as the charge flows through a resistor.

c. Identify the characteristics of simple series circuits including that the total resistance is equal to the sum of the resistances of the resistors ($R_T = R_1 + R_2 +...$), the current is constant throughout the circuit, and the sum of the voltages across the resistors equals the voltage across the voltage source.

d. Identify the characteristics of simple parallel circuits including the inverse of the total resistance is equal to the sum of the inverses of the resistors ($1/R_T = 1/R_1 + 1/R_2...$), the voltage across each resistor is the same as the voltage source, and the sum of the currents in the branches equals the current output by the voltage source.

e. Explain why houses are wired in parallel and describe short circuits and the function of circuit breakers.

Goal 4. The student will demonstrate the ability to apply the concepts of power and energy in analyzing electrical circuits.

Objectives - The student will be able to:

a. Define power as the amount of energy transferred (work) divided by the elapsed time (P = W/t).

b. Define electrical power as the product of voltage and current (P = VI) and apply this to simple circuits.

Goal 5. The student will demonstrate the ability to describe the causes of magnetism, the interaction of magnets, and electromagnetic effects.

Objectives - The student will be able to:

a. Identify the fundamental cause of magnetism as the movement of charged particles with reference to electron spin, magnetic domains, and electric currents.

b. Explain that the space around a magnet is altered by the presence of the magnet producing a magnetic field.

c. Identify the characteristic field lines for simple magnetic configurations and for a current-carrying wire, using the field lines to determine the relative strength and the direction of the magnetic field.

d. Illustrate how a motor works by using a simplified diagram of a motor and describing that a magnetic field exerts a force on a current-carrying wire.

e. Illustrate how a generator works by using a simplified diagram and describing that a changing magnetic field inside a coil of wire induces an electric current in the coil of wire.

UNIT V: Waves

Associated Disciplinary Core Ideas (DCIs) from NGSS include:
PS4: Waves and Their Applications in Technologies for Information Transfer
PS4.A—Wave Properties

Essential Question:
How are waves used to transfer energy and to send and store information?

Goal 1. The student will demonstrate the ability to describe common forms of waves in terms of basic wave characteristics and discuss the transportation and transformation of wave energy.

Objectives - The student will be able to:

a. Describe the motion of the wave and of the wave medium for transverse and longitudinal waves.
b. Define wave characteristics including amplitude, wavelength (λ), and frequency (f).
c. Solve problems using the wave equation ($v = f\lambda$).
d. Cite examples of the transportation of energy in waveform and describe that wave energy can be converted to other forms of energy.

Goal 2: The student will demonstrate the ability to explain wave behavior including reflection, refraction, diffraction, interference, and the Doppler Effect.

Objectives - The student will be able to:

a. Sketch and describe how wave fronts reflect off of plane and concave barriers.
b. Sketch and describe how wave fronts refract when crossing a boundary, how the change in wave speed at the boundary produces refraction, and how refraction is affected by the wavelength of the wave.
c. Sketch and describe how the crests and troughs of two transverse waves can interfere (add or subtract) while passing through one another, and produce a pattern by two in- phase point sources.
d. Sketch and describe how wave fronts are diffracted when traveling through small apertures, and explain how diffraction varies with wavelength.
e. Illustrate that the wavelength of an approaching or receding wave source is different from the wavelength of a stationary wave source (i.e., explain the Doppler Effect).

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Parents and students: Please review this course syllabus carefully. It contains important information about course grades and behavior expectations. Read the syllabus, then please sign and return no later than September 5th, 2017. Thank you!

COURSE DESCRIPTION: Earth Physical Science is a course that investigates the fundamentals of Physics, Chemistry, Astronomy, and Earth Science. Math skills will be called upon as force, motion, and energy are investigated. The properties of matter, atomic structure, and chemical reactions allow the student to acquire an understanding of the world around them at a microscopic level. Electricity, magnetism, and waves will be discussed as the student learns how these are formed and the features that characterize them. The class is a comprehensive incorporation of topics concerning the physical processes on earth, the motion, and characteristics of forces in space.

ACADEMIC EXPECTATIONS: Students enrolled in this course are held to a high academic standard. A major requirement of this course consists of regular and active participation in individual and group activities and students should be prepared to contribute to these discussions and activities on a daily basis. This program is specifically designed to help students develop a wide range of skills which will provide them with the ability to evaluate their own suitability for any career.

CLASSROOM BEHAVIOR: We have a limited amount of time to learn a lot of content. Students must be on task and focused on the activities in order to learn. Students should have an enjoyable time but to ensure that learning takes place, there are certain behaviors that students are expected to exhibit.

When the bell rings (start of class time), all students are expected to:

1) Be sitting quietly at their desk and focused
2) Have class materials ready to use
3) Follow instructions.
4) Snacks and drinks are not permitted in the classroom
5) Be ready to think–participate–learn!
6) Follow the rules, norms, and expectations of First State Military Academy

Materials: A composition book for notes associated with this course and be prepared with a pencil and ink pen (blue or black ink only). A ruler and protractor would also be helpful in class.

Attendance: Attendance in class is an important component to increased student achievement and performance. Please attend school daily!

Tardiness: Tardiness is not acceptable. If you are tardy, please come into class quietly and sit in your assigned seat.

Hall Passes: Students must receive my permission to leave during class time. A hall pass must be used. A parent conference and/or a disciplinary referral will result if students abuse the hall pass privilege, and the privilege may be revoked.

Late work: Students are expected to turn their class work in on the due date. Work turned in after the due date will be marked down 10% for each day the assignment is late. After 5 days the assignment will be marked as a zero.

Makeup work: Students have one school day for each day absent to turn in all makeup work. It is the student's responsibility to get his/her makeup work in a timely fashion. For prearranged absences students may be able to pick up some of their work ahead of time.

COMPUTERS, INTERNET, & E-MAIL: Students must have teacher permission to use the computers or the internet, and will be held strictly accountable for their behavior. There will be no tolerance for unauthorized or inappropriate use of computers, internet or e-mail.

ACADEMIC ASSESSMENT AND EVALUATION: Each school year has four marking periods, a midterm exam and a final exam. See the breakdown for marking period grade and the calculation of the final grade below.

Multi-outcome Scoring (Periods) = Knowledge and Thinking (50%) + Oral Communication (15%) + Written Communication (15%) + Agency (10%) + Collaboration (10%)

Final Grade = MP1 (2) + MP2 (2) + MIDTERM EXAM (1) + MP3 (4) + MP4 (4) + FINAL EXAM (2)

Grading Scale: Grades are calculated as percentages using a scale of: A+ >= 98%, A >=95%, A- >=93%, B+ >= 90%, B>=87%, B- >=85%, C+ >= 82%, C >=79%, C- >=77% ,D+ >= 75%, D >=72%, D- >=70% F <= 69%

PLEASE SIGN

I have read and understand the above course syllabus.

Parent(s)/Guardian signature Date:

_____ _____

Home or Cell Phone Number: Email Address (if available):

_____

Student signature Date:

_____

Universal Design for Learning Guidelines

I. Provide Multiple Means of **Representation**

1: Provide options for perception

1.1 Offer ways of customizing the display of information

1.2 Offer alternatives for auditory information

1.3 Offer alternatives for visual information

2: Provide options for language, mathematical expressions, and symbols

2.1 Clarify vocabulary and symbols

2.2 Clarify syntax and structure

2.3 Support decoding of text, mathematical notation, and symbols

2.4 Promote understanding across languages

2.5 Illustrate through multiple media

3: Provide options for comprehension

3.1 Activate or supply background knowledge

3.2. Highlight patterns, critical features, big ideas, and relationships

3.3 Guide information processing, visualization, and manipulation

3.4 Maximize transfer and generalization

Resourceful, knowledgeable learners

II. Provide Multiple Means of **Action and Expression**

4: Provide options for physical action

4.1 Vary the methods for response and navigation

4.2 Optimize access to tools and assistive technologies

5: Provide options for expression and communication

5.1 Use multiple media for communication

5.2 Use multiple tools for construction and composition

5.3 Build fluencies with graduated levels of support for practice and performance

6: Provide options for executive functions

6.1 Guide appropriate goal-setting

6.2 Support planning and strategy development

6.3 Facilitate managing information and resources

6.4 Enhance capacity for monitoring progress

Strategic, goal-directed learners

III. Provide Multiple Means of **Engagement**

7: Provide options for recruiting interest

7.1 Optimize individual choice and autonomy

7.2 Optimize relevance, value, and authenticity

7.3 Minimize threats and distractions

8: Provide options for sustaining effort and persistence

8.1 Heighten salience of goals and objectives

8.2 Vary demands and resources to optimize challenge

8.3 Foster collaboration and community

8.4 Increase mastery-oriented feedback

9: Provide options for self-regulation

9.1 Promote expectations and beliefs that optimize motivation

9.2 Facilitate personal coping skills and strategies

9.3 Develop self-assessment and reflection

Purposeful, motivated learners

CAST

APA Citation: CAST (2011). *Universal design for learning guidelines version 2.0.* Wakefield, MA: Author.

NTN Written Communication Rubric, Grade 10

The ability to effectively communicate knowledge and thinking through writing by organizing and structuring ideas and using discipline appropriate language and conventions.

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED 12 Grade Proficient
DEVELOPMENT *What is the evidence that the student can develop ideas?*	• **Does not explain** background or context of topic/issue • Controlling idea* is **unclear** or **not evident** throughout the writing • Ideas and evidence are **underdeveloped**		• Provides a **cursory or partial explanation** of background and context of topic/issue • Controlling idea* is **present** but **unevenly addressed** throughout the writing • Ideas and evidence are **somewhat developed**		• **Addresses** appropriate background and context of topic/issue • Controlling idea* is **presented clearly** throughout the writing • Ideas and evidence are **developed**		• **Explains appropriate** background and context of topic/issue • Controlling idea* is **consistently maintained** throughout the writing • Ideas and evidence are **developed**
ORGANIZATION *What is the evidence that the student can organize and structure ideas for effective communication?*	• Ideas and evidence are **disorganized,** making relationships **unclear** • **No** transitions are used, or are used **ineffectively** • Conclusion, when appropriate, is **absent** or **restates** the introduction or prompt		• Ideas and evidence are **loosely sequenced or** organization may be **formulaic** • Transitions **connect ideas** with **some** lapses; may be **repetitive** or **formulaic** • Conclusion, when appropriate, **follows from** the controlling idea		• Ideas and evidence are **sequenced** to **show relationships** • Transitions **connect ideas** • Conclusion, when appropriate, follows from **and supports** the controlling idea		• Ideas and evidence are **logically sequenced** to show **clear** relationships • Transitions are **varied** and connect ideas, **showing clear relationships** • Conclusion, when appropriate, is l**ogical** and **raises important implications**
LANGUAGE AND CONVENTIONS *What is the evidence that the student can use language skillfully to communicate ideas?*	• Language, style, and tone are **inappropriate** to the purpose, task, and audience. • **Uses** norms and conventions of writing that are **inappropriate** to the discipline/genre** • Has an **accumulation** of errors in grammar, usage, and mechanics that **distract or interfere** with meaning • Textual citation is **missing or incorrect,** when appropriate		• Language, style, and tone are mostly **appropriate** to the purpose, task, and audience with **minor** lapses • **Attempts to follow** the norms and conventions of writing in the discipline/genre** with **major** errors • Has some **minor errors** in grammar, usage, and mechanics that **partially** distract or interfere with meaning • Cites textual evidence with **partially or using an incorrect format**, when appropriate		• Language, style, and tone are **appropriate** to the purpose, task, and audience with **minor** lapses • Attempts to follow the norms and conventions of writing in the discipline/genre** with **some** errors • Is **generally free** of **distracting** errors in grammar, usage, and mechanics • Cites textual evidence with **some minor errors**, when appropriate		• Language, style, and tone are **appropriate** to the purpose, task, and audience • **Follows** the norms and conventions of writing in the discipline/genre with **minor** errors** • Is **free** of distracting errors in grammar, usage, and mechanics • Cites textual evidence **consistently and accurately**, when appropriate

***Controlling idea may refer to a thesis, argument, topic, or main idea, depending on the type of writing**
****E.g. accurate use of scientific/technical terms, quantitative data, and visual representations in science; use of multiple representations in math**

NTN Written Communication Rubric, Grade 12

The ability to effectively communicate knowledge and thinking through writing by organizing and structuring ideas and using discipline appropriate language and conventions.

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT College Ready	P/A	ADVANCED College Level
DEVELOPMENT *What is the evidence that the student can develop ideas?*	• **Does not explain** background or context of topic/issue • Controlling idea* is **unclear** or **not evident** throughout the writing • Ideas and evidence are **underdeveloped**		• Provides a **cursory or partial explanation** of background and context of topic/issue • Controlling idea* is **evident** but **unevenly addressed** throughout the writing • Ideas and evidence are **somewhat developed**		• **Explains appropriate** background and context of topic/issue • Controlling idea* is **consistently maintained** throughout the writing • Ideas and evidence are **developed**		• **Thoroughly** explains appropriate background and context of topic/issue • Controlling idea* is **clearly and consistently communicated** throughout the writing • Ideas and evidence are **thoroughly developed and elaborated**
ORGANIZATION *What is the evidence that the student can organize and structure ideas for effective communication?*	• Ideas and evidence are **disorganized** or **loosely** sequenced; relationships are **unclear** • **No** transitions are used, or are used **ineffectively** • Conclusion, when appropriate, is **absent** or **restates** the introduction or prompt		• Ideas and evidence are **somewhat organized** but **not always logically sequenced to show relationships** • Transitions **connect ideas** with **minor** lapses, or may be **repetitive** or **formulaic** • Conclusion, when appropriate, **follows from** the controlling idea		• Ideas and evidence are **logically sequenced** to show **clear** relationships • Transitions are **varied** and connect ideas, **showing clear relationships** • Conclusion, when appropriate, follows from **and supports** the controlling idea		• Ideas are logically sequenced to present a **coherent whole** • Transitions are varied and **clearly orient** the reader in the **development and reasoning of the controlling idea** • Conclusion, when appropriate, is l**ogical** and **raises important implications**
LANGUAGE AND CONVENTIONS *What is the evidence that the student can use language skillfully to communicate ideas?*	• Language, style, and tone are **inappropriate** to the purpose, task, and audience • **Attempts** to follow the norms and conventions of writing in the discipline/genre with **major**, consistent errors • Has an **accumulation** of errors in grammar, usage, and mechanics that **distract or interfere** with meaning • Textual citation is **missing or incorrect,** when appropriate		• Language, style, and tone are **appropriate** to the purpose, task, and audience with **minor** lapses • **Follows** the norms and conventions of writing in the discipline/genre with **consistent** errors • Has some **minor errors** in grammar, usage, and mechanics that **partially** distract or interfere with meaning • Cites textual evidence with **some minor errors**, when appropriate		• Language, style, and tone are **appropriate** to the purpose, task, and audience • **Follows** the norms and conventions of writing in the discipline/genre** with **minor** errors • Is **generally free** of **distracting** errors in grammar, usage, and mechanics • Cites textual evidence **consistently and accurately**, when appropriate		• Language, style, and tone are **tailored** to the purpose, task, and audience • **Consistently follows** the norms and conventions of writing in the discipline/genre • Is **free** of distracting errors in grammar, usage, and mechanics • Cites textual evidence **consistently and accurately**, when appropriate

***Controlling idea may refer to a thesis, argument, topic, or main idea, depending on the type of writing**
****E.g. accurate use of scientific/technical terms, quantitative data, and visual representations in science; use of multiple representations in math**