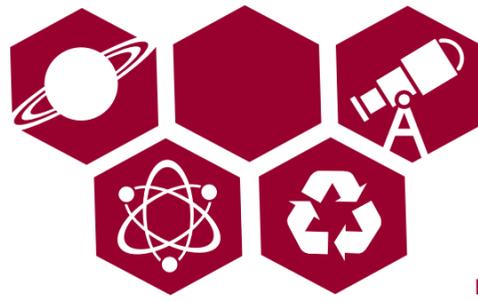


Earth/ Environmental Science



COURSE STRAND NUMBER ESSENTIAL STANDARD NUMBER CLARIFYING OBJECTIVE NUMBER
EEn.2.1.1
High school standards are coded by Course, Strand number, Essential Standard Number and Clarifying Objective Number

Earth in the Universe

EEn.1.1 Explain the Earth's role as a body in space.

- EEn.1.1.1 Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy.
- EEn.1.1.2 Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides.
- EEn.1.1.3 Explain how the Sun produces energy which is transferred to the Earth by radiation.
- EEn.1.1.4 Explain how incoming solar energy makes life possible on Earth.

Earth Systems, Structures and Processes

EEn.2.1 Explain how processes and forces affect the lithosphere.

- EEn.2.1.1 Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes impact the lithosphere.
- EEn.2.1.2 Predict the locations of volcanoes, earthquakes, and faults based on information contained in a variety of maps.
- EEn.2.1.3 Explain how natural actions such as weathering, erosion (wind, water and gravity), and soil formation affect Earth's surface.
- EEn.2.1.4 Explain the probability of and preparation for geohazards such as landslides, avalanches, earthquakes and volcanoes in a particular area based on available data.

EEn.2.2 Understand how human influences impact the lithosphere.

- EEn.2.2.1 Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present.
- EEn.2.2.2 Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and wood).

EEn.2.3 Explain the structure and processes within the hydrosphere.

- EEn.2.3.1 Explain how water is an energy agent (currents and heat transfer).
- EEn.2.3.2 Explain how ground water and surface water interact.

EEn.2.4 Evaluate how humans use water.

- EEn.2.4.1 Evaluate human influences on freshwater availability.
- EEn.2.4.2 Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environments.

EEn.2.5 Understand the structure of and processes within our atmosphere.

- EEn.2.5.1 Summarize the structure and composition of our atmosphere.
- EEn.2.5.2 Explain the formation of typical air masses and the weather systems that result from air mass interactions.
- EEn.2.5.3 Explain how cyclonic storms form based on the interactions of air masses.
- EEn.2.5.4 Predict the weather using available weather maps and data (including surface, upper atmospheric winds, and satellite imagery).
- EEn.2.5.5 Explain how human activities affect air quality.

EEn.2.6 Analyze patterns of global climate change over time.

- EEn.2.6.1 Differentiate between weather and climate.
- EEn.2.6.2 Explain changes in global climate due to natural processes.
- EEn.2.6.3 Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons, greenhouse effect, and deforestation).
- EEn.2.6.4 Attribute changes in Earth systems to global climate change (temperature change, changes in pH of ocean, sea level changes, etc.).

EEn.2.7 Explain how the lithosphere, hydrosphere, and atmosphere individually and collectively affect the biosphere.

- EEn.2.7.1 Explain how abiotic and biotic factors interact to create the various biomes in North Carolina.
- EEn.2.7.2 Explain why biodiversity is important to the biosphere.
- EEn.2.7.3 Explain how human activities impact the biosphere.

EEn.2.8 Evaluate human behaviors in terms of how likely they are to ensure the ability to live sustainably on Earth.

- EEn.2.8.1 Evaluate alternative energy technologies for use in North Carolina.
- EEn.2.8.2 Critique conventional and sustainable agriculture and aquaculture practices in terms of their environmental impacts.
- EEn.2.8.3 Explain the effects of uncontrolled population growth on the Earth's resources.
- EEn.2.8.4 Evaluate the concept of "reduce, reuse, recycle" in terms of impact on natural resources.

Biology



COURSE STRAND NUMBER ESSENTIAL STANDARD NUMBER CLARIFYING OBJECTIVE NUMBER
Bio.2.1.1

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Structures and Functions of Living Organisms

Bio.1.1 Understand the relationship between the structures and functions of cells and their organelles.

- Bio.1.1.1 Summarize the structure and function of organelles in eukaryotic cells (including the nucleus, plasma membrane, cell wall, mitochondria, vacuoles, chloroplasts, and ribosomes) and ways that these organelles interact with each other to perform the function of the cell.
- Bio.1.1.2 Compare prokaryotic and eukaryotic cells in terms of their general structures (plasma membrane and genetic material) and degree of complexity.
- Bio.1.1.3 Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms.

Bio.1.2 Analyze the cell as a living system.

- Bio.1.2.1 Explain how homeostasis is maintained in a cell and within an organism in various environments (including temperature and pH).
- Bio.1.2.2 Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis.
- Bio.1.2.3 Explain how specific adaptations help cells survive in particular environments (focus on unicellular organisms).

Ecosystems

Bio. 2.1 Analyze the interdependence of living organisms within their environments.

- Bio.2.1.1 Analyze the flow of energy and cycling of matter (water, carbon, nitrogen and oxygen) through ecosystems relating the significance of each to maintaining the health and sustainability of an ecosystem.
- Bio.2.1.2 Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations.
- Bio.2.1.3 Explain various ways organisms interact with each other (including predation, competition, parasitism, mutualism) and with their environments resulting in stability within ecosystems.
- Bio.2.1.4 Explain why ecosystems can be relatively stable over hundreds or thousands of years, even though populations may fluctuate (emphasizing availability of food, availability of shelter, number of predators and disease).

Bio.2.2 Understand the impact of human activities on the environment (one generation affects the next).

- Bio.2.2.1 Infer how human activities (including population growth, pollution, global warming, burning of fossil fuels, habitat destruction and introduction of nonnative species) may impact the environment.
- Bio.2.2.2 Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next.

Evolution and Genetics

Bio.3.1 Explain how traits are determined by the structure and function of DNA.

- Bio.3.1.1 Explain the double-stranded, complementary nature of DNA as related to its function in the cell.
- Bio.3.1.2 Explain how DNA and RNA code for proteins and determine traits.
- Bio.3.1.3 Explain how mutations in DNA that result from interactions with the environment (i.e. radiation and chemicals) or new combinations in existing genes lead to changes in function and phenotype.

Bio.3.2 Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits.

- Bio.3.2.1 Explain the role of meiosis in sexual reproduction and genetic variation.
- Bio.3.2.2 Predict offspring ratios based on a variety of inheritance patterns (including dominance, co-dominance, incomplete dominance, multiple alleles, and sex-linked traits).
- Bio.3.2.3 Explain how the environment can influence the expression of genetic traits.

Bio.3.3 Understand the application of DNA technology.

- Bio.3.3.1 Interpret how DNA is used for comparison and identification of organisms.
- Bio.3.3.2 Summarize how transgenic organisms are engineered to benefit society.
- Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology (including cloning, genetically modified organisms, stem cell research, and Human Genome Project).

Bio.3.4 Explain the theory of evolution by natural selection as a mechanism for how species change over time.

- Bio.3.4.1 Explain how fossil, biochemical, and anatomical evidence support the theory of evolution.
- Bio.3.4.2 Explain how natural selection influences the changes in species over time.
- Bio.3.4.3 Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection.

Bio.3.5 Analyze how classification systems are developed based upon speciation.

- Bio.3.5.1 Explain the historical development and changing nature of classification systems.
- Bio.3.5.2 Analyze the classification of organisms according to their evolutionary relationships (including dichotomous keys and phylogenetic trees).

Molecular Biology

Bio.4.1 Understand how biological molecules are essential to the survival of living organisms.

- Bio.4.1.1 Compare the structures and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids) as related to the survival of living organisms.
- Bio.4.1.2 Summarize the relationship among DNA, proteins, and amino acids in carrying out the work of cells and how this is similar among all organisms.
- Bio.4.1.3 Explain how enzymes act as catalysts for biological reactions.

Bio.4.2 Analyze the relationships between biochemical processes and energy use in the cell.

- Bio.4.2.1 Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.
- Bio.4.2.2 Explain ways that organisms use released energy for maintaining homeostasis (active transport).

Physical Science



COURSE STRAND NUMBER ESSENTIAL STANDARD NUMBER CLARIFYING OBJECTIVE NUMBER
PSc.2.1.1
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Forces and Motion

PSc.1.1 Understand motion in terms of speed, velocity, acceleration and momentum.

PSc.1.1.1 Explain motion in terms of frame of reference, distance, and displacement.

PSc.1.1.2 Compare speed, velocity, acceleration, and momentum using investigations, graphing, scalar quantities and vector quantities.

PSc.1.2 Understand the relationship between forces and motion.

PSc.1.2.1 Explain how gravitational force affects the weight of an object and the velocity of an object in freefall.

PSc.1.2.2 Classify frictional forces into one of four types: static, sliding, rolling, and fluid.

PSc.1.2.3 Explain forces using Newton's three laws of motion.

Matter: Properties and Change

PSc.2.1 Understand types, properties, and structure of matter.

PSc.2.1.1 Classify matter as: homogeneous or heterogeneous; pure substance or mixture; element or compound; metals, nonmetals or metalloids; solution, colloid or suspension.

PSc.2.1.2 Explain the phases of matter and the physical changes that matter undergoes.

PSc.2.1.3 Compare physical and chemical properties of various types of matter.

PSc.2.1.4 Interpret data presented in Bohr model diagrams and dot diagrams for atoms and ions of elements 1 through 18.

PSc.2.2 Understand chemical bonding and chemical interactions.

PSc.2.2.1 Infer valence electrons, oxidation number and reactivity of an element based on its location in the periodic table.

PSc.2.2.2 Infer the type of chemical bond that occurs, whether covalent, ionic or metallic, in a given substance.

PSc.2.2.3 Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions.

PSc.2.2.4 Exemplify the law of conservation of mass by balancing chemical equations.

PSc.2.2.5 Classify types of reactions such as synthesis, decomposition, single replacement or double replacement.

PSc.2.2.6 Summarize the characteristics and interactions of acids and bases.

PSc.2.3 Understand the role of the nucleus in radiation and radioactivity.

PSc.2.3.1 Compare nuclear reactions including: alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission.

PSc.2.3.2 Exemplify the radioactive decay of unstable nuclei using the concept of half-life.

Energy: Conservation and Transfer

PSc.3.1 Understand types of energy, conservation of energy and energy transfer.

PSc.3.1.1 Explain thermal energy and its transfer.

PSc.3.1.2 Explain the law of conservation of energy in a mechanical system in terms of kinetic energy, potential energy and heat.

PSc.3.1.3 Explain work in terms of the relationship among the applied force to an object, the resulting displacement of the object and the energy transferred to the object.

PSc.3.1.4 Explain the relationship among work, power and simple machines both qualitatively and quantitatively

PSc.3.2 Understand the nature of waves.

PSc.3.2.1 Explain the relationships among wave frequency, wave period, wave velocity and wavelength through calculation and investigation.

PSc.3.2.2 Compare waves (mechanical, electromagnetic, and surface) using their characteristics.

PSc.3.2.3 Classify waves as transverse or compressional (longitudinal).

PSc.3.2.4 Illustrate the wave interactions of reflection, refraction, diffraction, and interference.

PSc.3.3 Understand electricity and magnetism and their relationship.

PSc.3.3.1 Summarize static and current electricity.

PSc.3.3.2 Explain simple series and parallel DC circuits in terms of Ohm's law.

PSc.3.3.3 Explain how current is affected by changes in composition, length, temperature, and diameter of wire.

PSc.3.3.4 Explain magnetism in terms of domains, interactions of poles, and magnetic fields.

PSc.3.3.5 Explain the practical applications of magnetism.

Chemistry



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Chm.2.1.1
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Matter: Properties and Change

Chm.1.1 Analyze the structure of atoms and ions.

- Chm.1.1.1 Analyze the structure of atoms, isotopes, and ions.
- Chm.1.1.2 Analyze an atom in terms of the location of electrons.
- Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model.
- Chm.1.1.4 Explain the process of radioactive decay by use of nuclear equations and half-life.

Chm.1.2 Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties.

- Chm.1.2.1 Compare (qualitatively) the relative strengths of ionic, covalent, and metallic bonds.
- Chm.1.2.2 Infer the type of bond and chemical formula formed between atoms.
- Chm.1.2.3 Compare inter- and intra- particle forces.
- Chm.1.2.4 Interpret the name and formula of compounds using IUPAC convention.
- Chm.1.2.5 Compare the properties of ionic, covalent, metallic, and network compounds.

Chm.1.3 Understand the physical and chemical properties of atoms based on their position in the periodic table.

- Chm.1.3.1 Classify the components of a periodic table (period, group, metal, metalloid, nonmetal, transition).
- Chm.1.3.2 Infer the physical properties (atomic radius, metallic and nonmetallic characteristics) of an element based on its position on the periodic table.
- Chm.1.3.3 Infer the atomic size, reactivity, electronegativity, and ionization energy of an element from its position in the periodic table.

Energy: Conservation and Transfer

Chm.2.1 Understand the relationship among pressure, temperature, volume, and phase.

- Chm.2.1.1 Explain the energetic nature of phase changes.
- Chm.2.1.2 Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point).
- Chm.2.1.3 Interpret the data presented in phase diagrams.
- Chm.2.1.4 Infer simple calorimetric calculations based on the concepts of heat lost equals heat gained and specific heat.
- Chm.2.1.5 Explain the relationships between pressure, temperature, volume, and quantity of gas, both qualitative and quantitative.

Chm.2.2 Analyze chemical reactions in terms of quantities, product formation, and energy.

- Chm.2.2.1 Explain the energy content of a chemical reaction.
- Chm.2.2.2 Analyze the evidence of chemical change.
- Chm.2.2.3 Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion).
- Chm.2.2.4 Analyze the stoichiometric relationships inherent in a chemical reaction.
- Chm.2.2.5 Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and hydrates).

Interactions of Energy and Matter

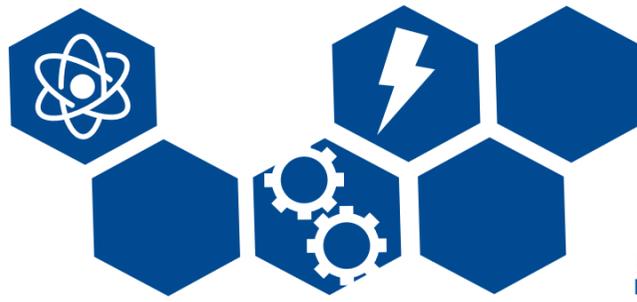
Chm.3.1 Understand the factors affecting rate of reaction and chemical equilibrium.

- Chm.3.1.1 Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst).
- Chm.3.1.2 Explain the conditions of a system at equilibrium.
- Chm.3.1.3 Infer the shift in equilibrium when a stress is applied to a chemical system (Le Châtelier's principle).

Chm.3.2 Understand solutions and the solution process.

- Chm.3.2.1 Classify substances using the hydronium and hydroxide ion concentrations.
- Chm.3.2.2 Summarize the properties of acids and bases.
- Chm.3.2.3 Infer the quantitative nature of a solution (molarity, dilution, and titration with a 1:1 molar ratio).
- Chm.3.2.4 Summarize the properties of solutions.
- Chm.3.2.5 Interpret solubility diagrams.
- Chm.3.2.6 Explain the solution process.

Physics



COURSE STRAND NUMBER ESSENTIAL STANDARD NUMBER CLARIFYING OBJECTIVE NUMBER
Phy.2.1.1
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Forces and Motion

Phy.1.1 Analyze the motion of objects.

- Phy.1.1.1 Analyze motion graphically and numerically using vectors, graphs and calculations.
- Phy.1.1.2 Analyze motion in one dimension using time, distance, displacement, velocity and acceleration.
- Phy.1.1.3 Analyze motion in two dimensions using angle of trajectory, time, distance, displacement, velocity and acceleration.

Phy.1.2 Analyze systems of forces and their interaction with matter.

- Phy.1.2.1 Analyze forces and systems of forces graphically and numerically using vectors, graphs and calculations.
- Phy.1.2.2 Analyze systems of forces in one dimension and two dimensions using free body diagrams.
- Phy.1.2.3 Explain forces using Newton's laws of motion as well as the universal law of gravitation.
- Phy.1.2.4 Explain the effects of forces (including weight, normal, tension, and friction) on objects.
- Phy.1.2.5 Analyze basic forces related to rotation in a circular path (centripetal force).

Phy.1.3 Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy and impulse.

- Phy.1.3.1 Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the principles of conservation of momentum and conservation of energy.
- Phy.1.3.2 Analyze the motion of objects based on the relationship between momentum and impulse.

Energy: Conservation and Transfer

Phy.2.1 Understand the concepts of work, energy and power, as well as, the relationship among them.

- Phy.2.1.1 Interpret data on work and energy presented graphically and numerically.
- Phy.2.1.2 Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of objects.
- Phy.2.1.3 Explain the relationship among work, power and energy.

Phy.2.2 Analyze the behavior of waves.

- Phy.2.2.1 Analyze how energy is transmitted through waves, using the fundamental characteristics of waves: wavelength, period, frequency, amplitude, and wave velocity.
- Phy.2.2.2 Analyze wave behaviors in terms of transmission, reflection, refraction and interference.
- Phy.2.2.3 Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically sound and light).

Phy.2.3 Analyze the nature of moving charges and electric circuits.

- Phy.2.3.1 Explain Ohm's law in relation to electric circuits.
- Phy.2.3.2 Differentiate the behavior of moving charges in conductors and insulators.
- Phy.2.3.3 Compare the general characteristics of AC and DC systems without calculations.
- Phy.2.3.4 Analyze electric systems in terms of their energy and power.
- Phy.2.3.5 Analyze systems with multiple potential differences and resistors connected in series and parallel circuits, both conceptually and mathematically, in terms of voltage, current and resistance.

Interactions of Energy and Matter

Phy.3.1 Explain charges and electrostatic systems.

- Phy.3.1.1 Explain qualitatively the fundamental properties of the interactions of charged objects.
- Phy.3.1.2 Explain the geometries and magnitudes of electric fields.
- Phy.3.1.3 Explain how Coulomb's law relates to the electrostatic interactions among charged objects.
- Phy.3.1.4 Explain the mechanisms for producing electrostatic charges, including charging by friction, conduction, and induction.
- Phy.3.1.5 Explain how differences in electrostatic potentials relate to the potential energy of charged objects.

Phy.3.2 Explain the concept of magnetism.

- Phy.3.2.1 Explain the relationship between magnetic domains and magnetism.
- Phy.3.2.2 Explain how electric currents produce various magnetic fields.
- Phy.3.2.3 Explain how transformers and power distributions are applications of electromagnetism.