Course Syllabus
Science, Biology

Morgan County Curriculum 4.1 High School, Final
Morgan County School District

Students are assessed in Science through the Commonwealth Assessment Testing System (CATS).

The Kentucky Core Content Test (KCCT) in science is given in grade 11 and consists of 38 Multiple-Choice and five (5) Open Response items. The scientific content standards a the high school level are organized around seven "Big Ideas" that are important to the discipline of science. These big ideas are: Structure and Transformation of Matter, Motion and Forces, The Earth and the Universe, Unity and Diversity, Biological Change, Energy Transformations an Interdependence.

Eleventh grade students will also take the American College Test (ACT). The ACT assesses students' general educational development and their ability to complete college-level work. The Science section of the ACT contains 40 Multiple-Choice questions dealing with the following: The Science Reasoning section has seven passages, each of which is followed by five to seven questions. The passages cover material drawn from biology, chemistry, physics, and the physical sciences (including geology, astronomy, and meteorology). All of the passages fall within three basic formats: Data Representation (38%), Experimental Reasoning (45%), and Conflicting Viewpoints (17%). The questions test one's ability to interpret scientific data and fall into three categories: Understanding, Analysis, Generalization.

Tenth grade students will take the PLAN, a curriculum-based assessment program developed by the American College Testing Program (ACT) to help students plan their academic careers and prepare for entry into college or the world of work. The test consists of 30 Multiple-Choice Questions dealing with biology, chemistry, earth/space science and physics content.

Upon reviewing assessment results, the Morgan County High School will help the student and parent to determine what courses their child needs to take during their high school career, utilizing the Individual Learning Plan (ILP)

Biological Science (25%)

- 3.4.1 (DOK 3) ASSESSED
  The learner will be able to explain the role of DNA in protein synthesis. (Cells sore and use information to guide their functions. The genetic information stored in DNA directs the synthesis of the thousands of proteins that each cell requires.).
- 3.4.2 (DOK) Supporting
  The learner will be able to understand that most cell functions involve chemical reactions. Food molecules taken into cells react the same to provide the chemical constituents needed to synthesize other molecules. Both breakdown and synthesis are made possible by a large set of protein catalysts, called enzymes. The breakdown of some of the food molecules enables the cell to store energy in specific chemicals that are used to carry out the many functions of the cell.
- 3.4.3 (DOK 2) ASSESSED
  The learner will be able to describe cell regulation (enzyme function, diffusion, osmosis, homeostasis); Predict consequences of internal/external environmental change on cell function/regulation. (Cell functions are regulated. Regulation occurs both through changes in the activity of the functions performed by proteins and through selective expression of individual genes., This regulation allows cells to respond to their internal and external environments and to control and coordinate cell growth and division.
- 3.4.4 (DOK) Supporting
  The learner will be able to students will understand that plant cells contain chloroplasts, the site of photosynthesis. Plants and many microorganisms (e.g., Euglena) use solar energy to combine molecules of carbon dioxide and water into complex, energy-rich organic compounds and release oxygen to the environment. This process of photosynthesis provides a vital link between the Sun and energy needs of living systems.
- 3.4.5 (DOK 3) ASSESSED
  The learner will be able to explain the relationship between sexual reproduction (meiosis) and the transmission of genetic information; Draw

conclusions/make predictions based on hereditary evidence/data (pedigrees, punnet squares). (Multicellular organisms, including humans, form from cells that contain two copies of each chromosome. This explains many features of heredity. Transmission of genetic information through sexual reproduction to offspring occurs when male and female gametes that contain only one representative from each chromosome pair unite.).

- 3.4.6 (DOK) Supporting
  The learner will be able to understand that in all organisms and viruses, the instructions for specifying the characteristics are carried in nucleic acids. The chemical and structural properties of nucleic acids determine how the genetic information that underlies heredity is both encoded in genes and replicated.
- 3.4.7 (DOK 2) ASSESSED
  The learner will be able to classify organisms into groups based on similarities; Infer relationships based on internal and external structures and chemical processes. (Biological classifications are based on how organisms are related. Organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their relationships. Species is the most fundamental unit of classification. Different species are classified by the comparison and analysis of their internal and external structures and the similarity of their chemical processes.).
- 3.4.8 (DOK) Supporting
  The learner will be able to understand that multicellular animals have nervous systems that generate behavior. Nerve cells communicate with each other by secreting specific molecules. Specialized cells in sense organs detect light, sound, and specific chemicals enabling animals to monitor what is going on in the world around them.
- 3.5.1 (DOK 3) ASSESSED
  The learner will be able to predict the impact on species of changes to (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, or (4) natural selection; Propose solutions to real-world problems of endangered and extinct species. (Species change over time. Biological change over time is the consequence of the interactions of (1) the potential for a species to increase its numbers, (2) the genetic finite of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) natural selection. The finite of change over time provide a scientific explanation for the fossil record of ancient life forms and for the striking molecular similarities observed among the divers species of living organisms. Changes in DNA (mutations) occur spontaneously at low rates. Some of these changes make no difference to the organism, whereas others can change cells and organisms. Only mutations in germ cells have potential to create the variation that changes an organism's future offspring.).
- 3.5.2 (DOK 3) ASSESSED
  The learner will be able to predict the success of patterns of adaptive behaviors based on evidence/data; Justify explanations of organism survival based on scientific understandings of behavior. (The broad patterns of behavior exhibited by organisms have changed over time through natural selection to ensure reproductive success. Organisms often live in unpredictable environments, so their behavioral responses must be flexible enough to deal with organisms and change. Behaviors often have an adaptive logic.

Unifying Ideas (34%)

- 4.6.1 (DOK 3) ASSESSED
  The learner will be able to explain the relationships and connections between matter, energy, living systems, and the physical environment; Give examples of conservation of matter and energy. (As matter and energy flow through different organizational levels (e.g., cells, organs, organisms, communities) and between living systems and the physical environment, chemical elements are recombined in different ways. Each recombination results in storage and dissipation of energy into the environment as heat. Matter and energy are conserved in each change.

- 4.6.4 (DOK 3) Assessed
  The learner will be able to describe the components and reservoirs involved in biogeochemical cycles (water, nitrogen, carbon dioxide, and oxygen); Explain the movement of matter and energy in biogeochemical cycles and related phenomena. (The total energy of the universe is constant. Energy can change forms and/or be transferred in many ways, but it can neither be created nor destroyed. Movement of matter between reservoirs is driven by Earth's internal and external sources of energy. These movements are often accompanied by a change in physical and chemical properties o f the matter. Carbon, for example, occurs in carbonate rocks such as limestone, in the atmosphere as carbon dioxide gas, in water as dissolved carbon dioxide, an in all organisms as complex molecules that control the chemistry of life.
- 4.6.5 (DOK 3) ASSESSED
  The learner will be able to describe and explain the role of carbon-containing molecules and chemical reactions in energy transfer in living systems. (Living systems require a continuous input of energy to maintain their chemical and physical organization since the universal tendency is toward more disorganized states. The energy for life primarily derives from the Sun. Plants capture energy by absorbing light and using it to break weaker bonds in reactants (such as carbon dioxide and water) in chemical reactions that result in the formation of carbon-containing molecules. These molecules can be used to assemble larger molecules (e.g., DNA, proteins, sugars, fats). In addition, the energy released when these molecules react with oxygen to form very strong bonds can be used as sources of energy for life processes.).
- 4.6.10 (DOK 3) ASSESSED
  The learner will be able to identify the components and mechanisms of energy stored and released from food molecules (photosynthesis and respiration); Apply information to real-world situations. (Energy is released when the bonds of food molecules are broken and new compound with lower energy temporarily in the phosphate bonds of ATP. During the process of cellular respiration, some energy is lost as heat.).
- 4.7.1 (DOK 3) ASSESSED
  The learner will be able to analyze relationships and interactions among organisms in organisms; Predict the effects on other organisms of changes to one or more components of the ecosystem. (Organisms both cooperate and compete in ecosystems. Often changes in one component of an ecosystem will have effects on the entire system that are difficult to predict. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years.).
- 4.7.2 (DOK 3) ASSESSED
  The learner will be able to evaluate proposed solutions from multiple perspectives to environmental problems caused by human interaction; Justify positions using evidence/data. (Human beings live within the world's ecosystems. Human activities can deliberately or inadvertently alter the dynamics in ecosystems. These activities can threaten current and future global stability and, if not addressed, stability can be irreversibly affected.
- 4.7.3 (DOK 3) ASSESSED
  The learner will be able to predict the consequences of changes to any component (atmosphere, solid Earth, oceans, living things) of the Earth System; Propose justifiable solutions to global problems. (Interactions among the solid Earth, the oceans, the atmosphere, and living things have resulted in the atmosphere, and living things have resulted in the ongoing development of a changing Earth system.).
- 4.7.4 (DOK) Supporting
  The learner will be able to understand that evidence for one-celled forms of life, the bacteria, extends back more than 3.5 billion years. The changes in life over time caused dramatic changes in the composition of the Earth's atmosphere, which did not originally contain oxygen.).
- 4.7.5 (DOK 3) ASSESSED
  The learner will be able to predict the consequences of changes in resources to a population; Select or defend solutions to real-world problems of population control. (Living organisms have the capacity to produce populations of infinite size. However, behaviors,

environments, and resources influence the size of populations. Models (e.g., mathematical, physical, conceptual) can be used to make predictions about changes in size or rate of growth of a population.).

Physical Science (25%)

- 1.1.1 (DOK 2) ASSESSED
  The learner will be able to classify or make generalizations about elements from data of observed patterns in atomic structure and/or position on the periodic table. (The periodic table is a consequence of the repeating pattern of outermost electrons.).
- 1.1.2 (DOK) Supporting
  The learner will be able to understand that the atom's nucleus is composed of protons and neutrons that are much more massive than electrons; When an element has atoms that differ in the number of neutrons, these atoms are called different isotopes of the element.
- 1.1.3 (DOK) Supporting
  The learner will be able to understand that solids, liquids, and gases differ in the distances between molecules or atoms and therefore the energy that binds them together. In solids, the structure is nearly rigid; in liquids, molecules or atoms move around each other but do not move apart; and in gases, molecules or atoms move almost independently of each other and are relatively far apart.