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**Coal City Unit District #1**  
**Honors Biology**  
**Science Curriculum**

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**SC.HB:1      Students will demonstrate an understanding of the sequence of steps involved for the creation of protein from DNA, while relating it to life's processes. (NGSS HS-LS1-1)**

- SC.HB:1-1      Identify the structure and function of DNA and/or the three main types of RNA.
- SC.HB:1-2      Identify the structure of a protein.
- SC.HB:1-3      List essential life functions.
- SC.HB:1-4      Describe major components of a cell.
- SC.HB:1-5      Differentiate among DNA replication, transcription, and translation.
- SC.HB:1-6      Relate the significance of translation to the construction of proteins.
- SC.HB:1-7      Explain essential life functions dependent upon translation.
- SC.HB:1-8      Concoct a protein model from an initial DNA sequence.
- SC.HB:1-9      Perform DNA 'Dry Lab' and interpret a variety of DNA information.
- SC.HB:1-10     Summarize and type research of DNA/RNA articles.

**SC.HB:2      Students will be able to recognize organism organization and functions starting at a simplistic level and advancing to a complex level. (NGSS HS-LS1-2)**

- SC.HB:2-1      Identify the structural organization/function of simple and complex organisms; including bacteria and viruses.
- SC.HB:2-2      Recall cellular organelles and functions.
- SC.HB:2-3      Analyze cellular transport processes.
- SC.HB:2-4      Analyze various functions of organs and systems.
- SC.HB:2-5      Summarize the significance of unicellular organisms and viruses, as well as complex organs and systems.
- SC.HB:2-6      Research virus articles and write/type a summary.
- SC.HB:2-7      Construct cellular models.
- SC.HB:2-8      Assess the responses of live specimens to various stimuli.

**SC.HB:3 Students will design and perform an experiment to determine if a particular homeostatic process is controlled by a feedback loop and whether that loop is positive or negative in nature. (NGSS HS-LS1-3)**

- SC.HB:3-1 List the steps in designing a scientific investigation.
- SC.HB:3-2 Explain feedback.
- SC.HB:3-3 Identify two major types of feedback.
- SC.HB:3-4 Define homeostasis.
- SC.HB:3-5 Design a scientific investigation to test a preselected homeostatic process.
- SC.HB:3-6 Generate data by performing the investigation.
- SC.HB:3-7 Evaluate the collected data for evidence of a feedback process.
- SC.HB:3-8 Interpret the findings in terms of whether the feedback was positive or negative.

**SC.HB:4 Students will be able to explain the importance of cell division and why cells have specific tasks in order for a complex organism to survive. (NGSS HS-LS1-4)**

- SC.HB:4-1 Recall the levels of organization in a complex organism.
- SC.HB:4-2 Summarize the phases of mitosis.
- SC.HB:4-3 Describe the significance of cellular division.
- SC.HB:4-4 Give examples of differentiation in complex organisms.
- SC.HB:4-5 Analyze the overall process of mitosis.
- SC.HB:4-6 Differentiate the varying phases of mitosis.
- SC.HB:4-7 Summarize that human beings are the ultimate model of cellular division and differentiation in order to maintain homeostasis.

**SC.HB:5 Students will be able to interpret a model and develop an analysis of the energy flow in a photosynthetic system. (NGSS HS-LS1-5)**

- SC.HB:5-1 Generalize the process of photosynthesis.
- SC.HB:5-2 Recognize the difference between energy types; relating to autotrophs and heterotrophs.
- SC.HB:5-3 Interpret from a model/diagram how energy is brought into a photosynthetic system.
- SC.HB:5-4 Determine from a model/diagram how energy is transformed within the system.
- SC.HB:5-5 Interpret from a model/diagram how energy is stored by the systems.
- SC.HB:5-6 Generate a personal explanation of the information gained from the study of the model/diagram.
- SC.HB:5-7 Participate in mini-teaching presentations over photosynthesis.

**SC.HB:6 Students will demonstrate an understanding of the construction of simple organic molecules and how the atoms bond to form the molecular structure. (NGSS HS-LS1-6)**

- SC.HB:6-1 Identify the structures of basic organic molecules.
- SC.HB:6-2 Explain how atoms combine to form molecules and how catalysts/enzymes change these formations.
- SC.HB:6-3 Model the molecular structures of simple organic molecules, noting the manner in which Carbon, Hydrogen, and Oxygen atoms bond to each other.
- SC.HB:6-4 Explain, using observations from the models, how organic molecules are formed.
- SC.HB: 6-5 Differentiate major concepts among carbohydrates, lipids, nucleic acids, proteins, enzymes, acids/bases, and solutions.

**SC.HB:7 Students will be able to explain the process by which cells break down glucose molecules to store the energy contained in them into a usable form. (NGSS HS-LS1-7)**

- SC.HB:7-1 Recognize the difference between molecules and compounds.
- SC.HB:7-2 Define cellular respiration.
- SC.HB:7-3 Explain the difference between matter and energy.
- SC.HB:7-4 Diagram the cellular respiration process.
- SC.HB:7-5 Summarize the steps in the process of respiration.
- SC.HB:7-6 Discriminate at each step between energy, transfer, and chemical bonding.
- SC.HB:7-7 Participate in mini-teaching presentation over cellular respiration.

**SC.HB:8 Students will develop an understanding of the concept of carrying capacity by using charts and graphs to support their understanding. (NGSS HS-LS2-1, NGSS HS-LS2-6)**

- SC.HB:8-1 Define carrying capacity.
- SC.HB:8-2 Evaluate causes that limit population size.
- SC.HB:8-3 Recognize the concept of scale as applied to ecosystems.
- SC.HB:8-4 Analyze the content of a set of graphed or charted data.
- SC.HB:8-5 Compare the data for one factor with the data from another.
- SC.HB:8-6 Analyze how invasive species can affect population sizes.
- SC.HB:8-7 Contrast the effects on population size caused by small scale and cataclysmic events.

**SC.HB:9 Students will demonstrate an understanding of how oxygen plays a role in aerobic and anaerobic processes. (NGSS HS-LS2-3)**

- SC.HB:9-1 Define matter and energy.
- SC.HB:9-2 Define anaerobic and aerobic.
- SC.HB:9-3 Collect evidence of matter cycling and energy flow.
- SC.HB:9-4 Categorize each example in terms of aerobic or anaerobic conditions.
- SC.HB:9-5 Explain how the presence or lack of oxygen affects aerobic and anaerobic processes.

**SC.HB:10 Students will demonstrate an understanding of the cycling of matter and flow of energy among organisms; as well as the significance of the Carbon Cycle. (NGSS HS-LS2-4, NGSS HS LS2-5)**

- SC.HB:10-1 Explain the laws of conservation.
- SC.HB:10-2 Analyze a given ecosystem in terms of types of organisms and numbers of each species.
- SC.HB:10-3 Construct a model/diagram to show how the number of organisms varies from one biotic level to the next.
- SC.HB:10-4 Design a web to illustrate the flow of energy and matter from one level to the next in an ecosystem.
- SC.HB:10-5 Discuss uses of matter in an organism in terms of energy storage, growth, and repair.
- SC.HB:10-6 Model the carbon cycle.
- SC.HB:10-7 Distinguish the various sources of carbon on Earth.
- SC.HB:10-8 Explain the matter and energy cycling during photosynthesis and cellular respiration.

**SC.HB:11 Students will demonstrate an understanding of the relative stability of ecosystems and how changing conditions may affect populations of organisms. (NGSS HS-LS2-6)**

- SC.HB:11-1 Construct a model ecosystem.
- SC.HB:11-2 Predict results of interactions in the model ecosystem.
- SC.HB:11-3 Collect data from the model ecosystem under various conditions.

**SC.HB:12 Students will design and evaluate solutions for reducing the consequences of human activities on the environment/biodiversity. (NGSS HS-LS2-7, NGSS HS-LS 4-6, NGSS HS-LS 2-2, NGSS HS-ESS3-4, NGSS HS-ESS3-6, NGSS HS-LS4-5)**

- SC.HB:12-1 Identify a variety of ways that human activities have negatively impacted the environment.
- SC.HB:12-2 Give specific examples of how the environment has been impacted. (climate change)
- SC.HB:12-3 Analyze published results of scientific computational models to determine how Earth's systems are being modified.
- SC.HB:12-4 Connect the data from published results to the impact of human activities.
- SC.HB:12-5 Predict the environmental consequences if human activities remain the same or increase in a negative nature.
- SC.HB:12-6 Prioritize which human activities are causing the most significant change to Earth's systems.
- SC.HB:12-7 Analyze data on the impacts of human activities on natural systems.
- SC.HB:12-8 Devise possible solutions to reduce the impact of human activities on the environment.
- SC.HB:12-9 Obtain relevant information from credible sources.
- SC.HB:12-10 Evaluate the scientific validity and credibility of information obtained.

**SC.HB:13 Students will demonstrate an understanding of the role of group behaviors and how group behaviors have an effect on the chances of survival. (NGSS HS-LS2-8)**

- SC.HB:13-1 Distinguish between individual and group behaviors.
- SC.HB:13-2 Collect examples of group behavior patterns from various types of organisms.
- SC.HB:13-3 Analyze how each behavior pattern improves an individuals or species survival chances.
- SC.HB:13-4 Evaluate which behavior patterns are most effective.

**SC.HB:14 Students will demonstrate an understanding of the role that DNA and chromosomes play in passing traits from generation to generation. (NGSS HS-LS3-1)**

- SC.HB:14-1 Identify the structures and basic functions of DNA, genes, and chromosomes.
- SC.HB:14-2 Recite the locations of DNA, genes, and chromosomes in relation to one another.
- SC.HB:14-3 Contrast the products of mitosis and meiosis.
- SC.HB:14-4 Describe that offspring receive equal amount of genetic material from biological parents.
- SC.HB:14-5 Define traits, alleles, gametes, segregation, and hybrids.
- SC.HB:14-6 Summarize how Mendel studied inheritance in pea plants.
- SC.HB:14-7 Analyze Mendel's conclusion about inheritance.
- SC.HB:14-8 Summarize the Principle of Dominance.
- SC.HB:14-9 Outline the process of segregation.
- SC.HB:14-10 Compare the roles of karyotypes and pedigrees.

**SC.HB:15 Students will demonstrate an understanding of the various processes that cause genetic diversity. (NGSS HS-LS3-2)**

- SC.HB:15-1 Outline the general process of meiosis.
- SC.HB:15-2 Explain DNA replication.
- SC.HB:15-3 Identify errors that could occur during DNA replication.
- SC.HB:15-4 Describe how mutations can be caused by environmental factors.
- SC.HB:15-5 Define haploid and diploid.
- SC.HB:15-6 Relate the term homologous to chromosome number.
- SC.HB:15-7 Establish how independent assortment accounts for many genetic variations.
- SC.HB:15-8 Connect the concept of crossing-over to the creation of new allele combinations.
- SC.HB:15-9 Determine why errors can occur during replication by considering mutations caused by environmental factors.
- SC.HB:15-10 Project the possible implications/ethics of current research. (e.g. genetic screening, personalized medicine)
- SC.HB:15-11 Participate in an in-depth preparation (articles and T-charts) for a genetic screening debate.
- SC.HB:15-12 Evaluate a genetics case study focusing on personalized medicine.

**SC.HB:16 Students will be able to relate the use of probability in figuring possible traits that are shown in a population. (NGSS HS-LS3-3)**

- SC.HB:16-1 Define probability.
- SC.HB:16-2 Discuss how the principles of probability can be used to predict the outcomes of genetic crosses.
- SC.HB:16-3 Contrast homozygous, heterozygous, genotype, and phenotype.
- SC.HB:16-4 Contrast dominant and recessive traits.
- SC.HB:16-5 Calculate probability problems.
- SC.HB:16-6 Analyze genetic crosses to determine probability outcomes of future generations.
- SC.HB:16-7 Design a monohybrid and a dihybrid genetic cross and summarize results/ratios from the crosses.

**SC.HB:17 Students will be able to provide examples of evidence for evolution. (NGSS HS-LS4-1)**

- SC.HB:17-1 Communicate examples of common ancestry.
- SC.HB:17-2 Define evolution.
- SC.HB:17-3 Describe examples of evidence for evolution.
- SC.HB:17-4 Connect classification concepts to the organisms being classified.
- SC.HB:17-5 Identify portions of the fossil record as evidence for evolution.
- SC.HB:17-6 Evaluate the embryological development of several species.
- SC.HB:17-7 Explain the significance of vestigial organs and homologous body structures.
- SC.HB:17-8 Outline major evolutionary concepts such as descent with modification and convergent evolution.
- SC.HB:17-9 Analyze molecular clocks (DNA) as empirical evidence for evolution.
- SC.HB:17-10 Research a particular topic and write a paper relating the topic to various evolutionary concepts.

**SC.HB:18 Students will provide a scientific explanation as to why and how evolution occurs. (NGSS HS-LS4-2, NGSS HS-LS4-3, NGSS HS-LS4-4)**

- SC.HB:18-1 Identify reasons that may increase or decrease a species numbers.
- SC.HB:18-2 Apply statistics and probability to determine why organisms with certain heritable traits tend to experience population growth.
- SC.HB:18-3 Explain the relationship between competition and limited resources.
- SC.HB:18-4 Compare the effects of natural selection and fitness level on the overall process of evolution.
- SC.HB:18-5 Generate specific examples of how adaptations influence population levels.
- SC.HB:18-6 Design own steps to natural selection lab.