Biology II Honors Curriculum Maps

Unit 1: Scientific Method
Unit 2: Organic Chemistry and Biochemistry
Unit 3: Cellular Energetic
Unit 4: Cells, Cellular Transport, Cellular Communication
Unit 5: Membrane Structure and Function
Unit 6: DNA, RNA, and Protein Synthesis
Unit 7: Genetics
Unit 8: Evolution and Population Genetics
Unit 9: Speciation and Classification
Unit 10: Ecology
Unit 11: Digestive & Respiratory Systems
Unit 12: Circulatory System
Unit 13: Reproduction

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 1: Scientific Method**
Big Idea/Rationale	• Even though the Scientific Method is taught in every science class, it is important to refresh students' memories each year. This unit also provides students with vocabulary and methodology appropriate for an upper level class which they may not have encountered in previous science classes.
Enduring Understanding (Mastery Objective)	• Design a controlled experiment • Carry out the experiment and analyze data
Essential Questions (Instructional Objective)	• How is an experiment designed? • What makes an experiment valid or invalid? • How can data be analyzed? What various methods can be used?

Content (Subject Matter)	• Scientific Method
	• Experimental Design
	• Vocabulary
	  ○ Independent, Dependent, Controlled Variables
	  ○ Experimental and Control Groups
	  ○ Hypothesis and Prediction

Skills/ Benchmarks (CCSS Standards)	• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations. • 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence. • 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. • 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • 5.1.12.C.2: Use data representations and new models to revise predictions and explanations. • 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2: Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams.
Materials and Resources	Lab Packet; Aerobic Steps (borrow from Phys Ed)

Notes	

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 2: Organic Chemistry and Biochemistry**
Big Idea/Rationale	Organic Chemistry and Biochemistry are the foundation for all biological phenomena. It is important for students to have an understanding of the structure of biomolecules so that they can understand how these molecules work together within cells and organisms.
Enduring Understanding (Mastery Objective)	• Explain why carbon is the basis for organic molecules • Define polymer/monomer, dehydration synthesis/hydrolysis • Identify the types of organic molecules • Describe the characteristics of carbohydrates, proteins, lipids and nucleic acids
Essential Questions (Instructional Objective)	• How are organic molecules synthesized and broken down by the cell? • How do we distinguish between carbohydrates, proteins, lipids and nucleic acids? • What properties do carbohydrates, proteins, lipids and nucleic acids have?

Content (Subject Matter)	• Organic vs. Inorganic Molecules
	• Common Functional Groups
	• Properties of Carbohydrates, Proteins, Lipids, Nucleic Acids
	• Identification of Carbohydrates, Proteins, Lipids, Nucleic Acids
	• Vocabulary
	  ○ Organic/Inorganic
	  ○ Dehydration Synthesis/Hydrolysis
	  ○ Monomer/Polymer
	  ○ Functional Groups
	  ○ Monosaccharide/Polysaccharide – starch vs. cellulose
	  ○ Amino Acids/Polypeptide/Proteins
	  ○ Primary, Secondary, Tertiary, Quaternary Structure of Proteins
	  ○ Fats/Phospholipids/Steroids

Skills/ Benchmarks (CCSS Standards)	• 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges. • 5.1.12.C.2: Use data representations and new models to revise predictions and explanations. • 5.2.12.A.1: Use atomic models to predict the behaviors of atoms in interactions. • 5.2.12.B.1: Model how the outermost electrons determine the reactivity of elements and the nature of the chemical bonds they tend to form. • 5.3.12 A.1: Represent and explain the relationship between the structure and function of each class of complex molecules using a variety of models.

Materials and Resources	Projector & Document Camera; Teacher Notes; Dehydration Synthesis/Hydrolysis worksheet; Lab Packets – Testing for Biological Molecules, Protein Modeling, Identifying Organic Molecules; Molecular Model kits; Protein Model kits; Lab apparatus
Notes	

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 3: Cellular Energetics**
Big Idea/Rationale	Cells could not function properly without ATP and enzymes. It is important for students to understand how ATP powers reactions and how enzymes facilitate reactions as this is the underpinning of all cellular processes.
Enduring Understanding (Mastery Objective)	• Distinguish between catabolism and anabolism • Distinguish between endergonic and exergonic reactions • Describe the functioning of ATP • Explain how enzymes lower activation energy
Essential Questions (Instructional Objective)	• What types of reactions occur within the cell? • How does a cell use ATP to power reactions? • Why are enzymes so important? How do they facilitate reactions?

Content (Subject Matter)	• Catabolism vs. Anabolism
	• Endergonic vs. Exergonic
	• ATP/ADP cycle
	• How ATP fuels reactions
	• Enzyme Action
	• Factors affecting Enzymes
	• Vocabulary
	  ○ Catabolism/Anabolism
	  ○ Endergonic/Exergonic
	  ○ Enzymes
	  ○ Competitive/Noncompetitive Inhibition
	  ○ Allosteric Regulation

Skills/ Benchmarks (CCSS Standards)	• 5.2.12.D.5: Model the change in rate of a reaction by changing a factor. • 5.3.12 A.1: Represent and explain the relationship between the structure and function of each class of complex molecules using a variety of models. • 5.3.12.A.2: Demonstrate the properties and functions of enzymes by designing and carrying out an experiment.
Materials and Resources	Projector & Document Camera; Teacher Notes; Enzymes Everywhere Packet, toothpicks
Notes	

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 4: Cells, Cellular Transport, and Cellular Communication**
Big Idea/Rationale	Students must have a fundamental understanding of cells in order to understand the processes we will discuss throughout the year. The processes involved in cellular transport and cellular communication will come up throughout the year as we discuss systems within organisms, so the students need to understand the basic processes at this point.
Enduring Understanding (Mastery Objective)	• Describe the function of cell organelles • Contrast plant and animal cells
Essential Questions (Instructional Objective)	• What are the differences between prokaryotic and eukaryotic cells? • What are the differences between plant and animal cells?
Content (Subject Matter)	• Cell Organelle Functions • Differences between prokaryotic/eukaryotic cells • Differences between plant/animal cells • Vocabulary o Prokaryote/Eukaryote
Skills/ Benchmarks (CCSS Standards)	• 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges. • 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2: Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams • 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare. • 5.3.12.A.6: Describe how a disease is the result of a malfunctioning system, organ, and cell, and relate this to possible treatment interventions (e.g., diabetes, cystic fibrosis, lactose intolerance).
Materials and Resources	Projector & Document Camera; Teacher Notes; Lab Packet – Microscopes & Cells Lab
Notes	

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 5: Membrane Structure and Function**
Big Idea/Rationale	Students must have a fundamental understanding of cells in order to understand the processes we will discuss throughout the year. The processes involved in cellular transport will come up throughout the year as we discuss systems within organisms, so the students need to understand the basic processes at this point.
Enduring Understanding (Mastery Objective)	• Describe the structure of the cell membrane • Explain how molecules move into and out of cells • Explain how solutions of differing concentration affect cells
Essential Questions (Instructional Objective)	• How do cells move materials into and out of the cell?

Content (Subject Matter)	• Cell membrane structure
	• Transport mechanisms
	• Vocabulary
	  ○ Fluid Mosaic model
	  ○ Diffusion
	  ○ Osmosis
	  ○ Facilitated Diffusion
	  ○ Active Transport
	  ○ Endocytosis/Exocytosis
	  ○ Hypertonic/Hypotonic/Isotonic

Skills/ Benchmarks (CCSS Standards)	• 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. • 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence. • 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. • 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • 5.1.12.C.2: Use data representations and new models to revise predictions and explanations. • 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2: Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams • 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and

	knowledge of how to handle animals with respect for their safety and welfare. • 5.3.12.A.3: Predict a cell's response in a given set of environmental conditions. • 5.3.12.A.6: Describe how a disease is the result of a malfunctioning system, organ, and cell, and relate this to possible treatment interventions (e.g., diabetes, cystic fibrosis, lactose intolerance).
Materials and Resources	Projector & Document Camera; Teacher Notes; Lab Packet – Diffusion and Osmosis Lab, Lab Apparatus
Notes	Chapter 7

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 6: DNA, RNA and Protein Synthesis**
Big Idea/Rationale	DNA is the information repository of the cell. It is important for students to understand how information is stored in DNA, and how that information is transmitted to the rest of the cell. In order for students to truly understand genetics and evolution, it is imperative that they have a grasp of DNA, RNA and protein synthesis.
Enduring Understanding (Mastery Objective)	• Describe the scientific experiments that led to the discovery of DNA as the genetic material • Describe the structure of the DNA molecule • Explain how DNA replicates • Describe the structure of the RNA molecule • Explain how a protein is constructed

Essential Questions (Instructional Objective)	• How did scientists determine that DNA was the genetic material?
	• What is a DNA molecule made of?
	• How does DNA replicate?
	  o What enzymes are involved in DNA replication?
	  o How is the leading strand produced?
	  o How is the lagging strand produced?
	• What is an RNA molecule made of?
	• How is an RNA transcript made?
	• How is the RNA transcript translated into a polypeptide?
	• What alterations are made to the pre-RNA to form mRNA?

Content (Subject Matter)	• DNA structure
	• DNA replication
	• RNA structure
	• Transcription
	• RNA processing
	• Translation
	• Differences between prokaryotic and eukaryotic genomes
	• Point mutations
	• Vocabulary
	  o Deoxyribonucleic acid
	  o Nucleotide
	  o DNA Replication
	  o Helicase, DNA polymerase, Topoisomerase, DNA Ligase, Primase
	  o Leading Strand/Lagging Strand
	  o Okazaki Fragments
	  o Telomeres
	  o RNA polymerase, Transcription Factors

	○ Transcription ○ Pre-mRNA/RNA processing ○ Introns/Exons ○ Ribosome – large subunit, small subunit, E/P/A sites ○ tRNA ○ Amino-acyl tRNA synthetase ○ Genetic code ○ Mutations/mutagens
Skills/ Benchmarks (CCSS Standards)	• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations. • 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools. • 5.1.12.C.2: Use data representations and new models to revise predictions and explanations. • 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2: Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams • 5.3.12.A.1: Represent and explain the relationship between the structure and function of each class of complex molecules using a variety of models. • 5.3.12.A.6: Describe how a disease is the result of a malfunctioning system, organ, and cell, and relate this to possible treatment interventions (e.g., diabetes, cystic fibrosis, lactose intolerance). • 5.3.12.D.1: Explain the value and potential applications of genome projects. • 5.3.12.D.2: Predict the potential impact on an organism (no impact, significant impact) given a change in a specific DNA code, and provide specific real world examples of conditions caused by mutations. • 5.3.12.E.1: Account for the appearance of a novel trait that arose in a given population.
Materials and Resources	Projector & Document Camera; Teacher Notes; Lab Packet – Protein Synthesis Modeling, Model Molecules (cut-outs); DVD – "Cracking the Code of Life"
Notes	

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 7: Genetics**
Big Idea/Rationale	An understanding of Genetics is vital for any Biology student. It is important for students to have a grasp on inheritance, so that they can appreciate the processes of natural selection, as natural selection works only in heritable traits. An understanding of Genetics will also be important after students leave high school and embark on their own lives – they need to be aware of the inheritance patterns of genetic disorders and the chances of passing on certain traits to offspring.
Enduring Understanding (Mastery Objective)	• Predict the results of genetics crosses using Punnett squares • Predict the results of genetics crosses using the rules of probability • Solve genetics problems • Determine gene loci based on recombination frequencies • Analyze genetic data and make conclusions regarding offspring genotypes • Construct and analyze karyotypes
Essential Questions (Instructional Objective)	• How did Mendel discern the Laws of Segregation and Independent Assortment? • How do Mendel's Laws of Segregation and Independent Assortment relate to meiosis? • How can genotypes and phenotypes of offspring be determined? • How can genetic disorders be diagnosed?

Content (Subject Matter)	• Mendel's Laws of inheritance
	• Solving genetics problems with Punnett Squares
	• Solving genetics problems with probability
	• Pedigree construction and analysis
	• Gene Linkage & Linkage Maps
	• Karyotype construction and analysis
	• Chromosomal abnormalities
	• X-Inactivation
	• Extranuclear inheritance
	• Vocabulary
	  ○ Mendel's Law of Segregation
	  ○ Mendel's Law of Independent Assortment
	  ○ Punnett Square
	  ○ Rule of Multiplication/Rule of Addition
	  ○ P generation/F_1 generation/F_2 generation
	  ○ Gene/Allele
	  ○ Dominant/Recessive
	  ○ Genotype/Phenotype
	  ○ Incomplete Dominance

	○ Codominance ○ Multiple Alleles ○ Pleiotropy ○ Epistasis ○ Chromosome theory ○ Linked genes ○ Crossing over ○ Recombination Frequency ○ Sex-Linked Traits ○ Autosome/Sex Chromosome ○ Nondisjunction ○ Barr Bodies ○ Aneuploidy
Skills/ Benchmarks (CCSS Standards)	• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations. • 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. • 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence. • 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. • 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools. • 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories. • 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges. • 5.1.12.C.2: Use data representations and new models to revise predictions and explanations. • 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments. • 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2: Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams • 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare. • 5.3.12.D.2 Predict the potential impact on an organism (no impact,

	significant impact) given a change in a specific DNA code, and provide specific real world examples of conditions caused by mutations. • 5.3.12.D.3 Demonstrate through modeling how the sorting and recombination of genes during sexual reproduction has an effect on variation in offspring (meiosis, fertilization).
Materials and Resources	Projector & Document Camera; Teacher Notes; Lab Packet – Human Genetic Traits; Textbook problem sets
Notes	

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 8: Evolution & Population Genetics**
Big Idea/Rationale	Evolution is the overarching theme of all Biology. Every aspect of the course returns to the ideas of evolutionary theory. Students must understand the underlying principles of Evolution, as we apply these principles throughout the course. An understanding of evolution will shed light on all other biological topics.
Enduring Understanding (Mastery Objective)	• List and explain the parts of Darwin's theory of evolution by natural selection • Observe evidence for evolution • Define evolution in terms of changes in a gene pool • Solve problems involving Hardy-Weinberg equilibrium
Essential Questions (Instructional Objective)	• Describe the scientists who preceded Darwin • List and explain the parts of Darwin's theory of evolution by natural selection • Observe evidence for evolution • Define evolution in terms of changes in a gene pool • Calculate changes in allele frequency in a fictional population • List and describe conditions necessary for maintenance of Hardy-Weinberg equilibrium • Simulate several generations of a population with and without natural selection

Content (Subject Matter)	• Darwin's voyage & observations
	• Darwin's Theory
	• Evidence for Evolution
	• Population Genetics
	• Hardy-Weinberg Equilibrium
	• Calculation of Allele Frequencies
	• Vocabulary
	  ○ "Descent with Modification"
	  ○ Natural Selection
	  ○ Artificial Selection
	  ○ Differential Reproductive Success
	  ○ Homologous Structures
	  ○ Vestigial Organs
	  ○ Population Genetics
	  ○ Hardy-Weinberg Theorem
	  ○ Allele Frequency
	  ○ $p + q = 1$
	  ○ $p^2 + 2pq + q^2 = 1$
	  ○ Mutation

	○ Random Mating/Non-Random Mating ○ Genetic Drift/Bottleneck Effect/Founder Effect ○ Gene Flow ○ Fitness/Relative Fitness ○ Heterozygote Advantage ○ Sexual Selection
Skills/ Benchmarks (CCSS Standards)	• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations. • 5.1.12.A.2 Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. • 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence. • 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. • 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools. • 5.1.12.B.3 Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories. • 5.1.12.B.4 Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges. • 5.1.12.C.2: Use data representations and new models to revise predictions and explanations. • 5.1.12.C.3 Consider alternative theories to interpret and evaluate evidence-based arguments. • 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2 Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams. • 5.3.12.C.1 Analyze the interrelationships and interdependencies among different organisms, and explain how these relationships contribute to the stability of the ecosystem. • 5.3.12.C.2 Model how natural and human-made changes in the environment will affect individual organisms and the dynamics of populations. • 5.3.12.D.2 Predict the potential impact on an organism (no impact, significant impact) given a change in a specific DNA code, and provide specific real world examples of conditions caused by mutations. • 5.3.12.D.3 Demonstrate through modeling how the sorting and recombination of genes during sexual reproduction has an effect on

	variation in offspring (meiosis, fertilization). • 5.3.12.E.1 Account for the appearance of a novel trait that arose in a given population. • 5.3.12.E.2 Estimate how closely related species are, based on scientific evidence (e.g., anatomical similarities, similarities of DNA base and/or amino acid sequence). • 5.3.12.E.4 Account for the evolution of a species by citing specific evidence of biological mechanisms.
Materials and Resources	Projector & Document Camera; Teacher Notes; Video – "Voyage to the Galapagos"; Lab Packet and pop beads for the Population Genetics Lab; Hardy-Weinberg Problem Set
Notes	

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 9: Speciation & Classification**
Big Idea/Rationale	Evolution is the overarching theme of all Biology. Every aspect of the course returns to the ideas of evolutionary theory. Students must understand the underlying principles of Evolution, as we apply these principles throughout the course. An understanding of evolution will shed light on all other biological topics. Students will apply their understanding of evolution to the construction of phylogenies.
Enduring Understanding (Mastery Objective)	• Construct and interpret cladograms • Explore current research in Evolutionary Biology
Essential Questions (Instructional Objective)	• Construct a cladogram • Construct a phylogenetic tree • Present to the class regarding a non-fiction book in the field of Evolutionary Biology

Content (Subject Matter)	• Interpreting Phylogenies
	• Constructing Phylogenies
	• **Vocabulary**
	  ○ Biological Species Concept
	  ○ Speciation
	  ○ Anagenesis/Cladogenesis
	  ○ Reproductive Isolation
	  ○ Prezygotic Barriers/Postzygotic Barriers
	  ○ Allopatric Speciation/Sympatric Speciation
	  ○ Adaptive Radiation
	  ○ Gradualism/Punctuated Equilibrium
	  ○ Phylogeny
	  ○ Systematics
	  ○ Homology/Analogy
	  ○ Taxonomy
	  ○ Cladogram

Skills/ Benchmarks (CCSS Standards)	• **5.1.12.A.1**: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations. • **5.1.12.C.1:** Reflect on and revise understandings as new evidence emerges. • **5.1.12.C.**3 Consider alternative theories to interpret and evaluate evidence-based arguments. • **5.1.12.D.1:** Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and

	experiences. • **5.1.12.D.2** Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams. • **5.3.12.C.1** Analyze the interrelationships and interdependencies among different organisms, and explain how these relationships contribute to the stability of the ecosystem. • **5.3.12.D.2** Predict the potential impact on an organism (no impact, significant impact) given a change in a specific DNA code, and provide specific real world examples of conditions caused by mutations. • **5.3.12.E.1** Account for the appearance of a novel trait that arose in a given population. • **5.3.12.E.4** Account for the evolution of a species by citing specific evidence of biological mechanisms. • **5.4.12.B.3** Account for the evolution of species by citing specific absolute-dating evidence of fossil samples
Materials and Resources	Projector & Document Camera; Teacher Notes; Caminalcules cutouts and large paper; "Constructing a Cladogram" handout
Notes	Chapter 24 and 25

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 10: Ecology**
Big Idea/Rationale	A study of ecology will enable students to tie together all the topics from the course into the "Big Picture". They will relate cellular processes to organisms' survival, and organisms' survival to the larger community and ecosystem health. This unit will allow students to see how all living things affect and interact with each other.
Enduring Understanding (Mastery Objective)	• Describe commonly seen patterns of population growth • Contrast species interactions within a community • Describe nutrient cycling in an ecosystem
Essential Questions (Instructional Objective)	• Describe differences in population density and dispersal • Compare exponential and logistic growth of populations • Describe limiting factors that affect population growth • Analyze human demographic data • Contrast species interactions within a community • Explain the likely outcome of each type of species interaction • Describe the competitive exclusion principle • Explain why there are fewer organisms at higher trophic levels • Describe nutrient cycling in an ecosystem

Content (Subject Matter)	• Construction of a Life Table and Survivorship Curve
	• Life History Strategies
	• Exponential vs. Logistic Growth
	• Limiting Factors
	• Age Structure Pyramids
	• Competitive Exclusion Principle
	• Interspecific Interactions
	• Feeding Interactions
	• Limits on Food Chain Length
	• 10% Rule
	• Biogeochemical Cycles
	• Vocabulary
	  ○ Ecology
	  ○ Biotic/Abiotic
	  ○ Population/Community/Ecosystem/Biome/Biosphere
	  ○ Population Density/Dispersal
	  ○ Life Table
	  ○ Life History
	  ○ Semelparity/Iteroparity
	  ○ Exponential Population Growth & J-Curve
	  ○ Logistic Population Growth & S-Curve

	○ Carrying Capacity ○ K-Selection/r-Selection ○ Density-Dependent & Density-Independent population regulation ○ Niche – Fundamental vs. Realized ○ Competitive Exclusion ○ Resource Partitioning ○ Competition/Predation/Parasitism/Mutualism/Commensalism ○ Trophic Level ○ Pyramids of Net Production, Energy, Numbers, and Biomass
Skills/ Benchmarks (CCSS Standards)	• 5.1.12.A.1 Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations • 5.1.12.A.2 Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. • 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence. • 5.1.12.B.1 Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. • 5.1.12.B.4 Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • 5.1.12.C.2 Use data representations and new models to revise predictions and explanations. • 5.1.12.D.1 Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2 Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams. • 5.1.12.D.3 Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare. • 5.3.12.B.1 Cite evidence that the transfer and transformation of matter and energy links organisms to one another and to their physical setting. • 5.3.12.B.3 Predict what would happen to an ecosystem if an energy source was removed. • 5.3.12.B.4 Explain how environmental factors (such as temperature, light intensity, and the amount of water available) can affect photosynthesis as an energy storing process. • 5.3.12.C.1 Analyze the interrelationships and interdependencies among different organisms, and explain how these relationships contribute to the stability of the ecosystem. • 5.3.12.C.2 Model how natural and human-made changes in the environment will affect individual organisms and the dynamics of populations.

Materials and Resources	Projector & Document Camera; Teacher Notes; Human Demography Handout; "Forks & Beans" Handout, beans, knives/forks/spoons
Notes	

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 11: Digestive & Respiratory Systems**
Big Idea/Rationale	A study of the human body systems will tie together many of the previous units and allow students to see the complexity of living systems. We will revisit concepts such as biochemistry, cell transport, cellular respiration and cell communication as we study the body systems.
Enduring Understanding (Mastery Objective)	• Identify structures of the cardiovascular system • Describe the flow of blood through the heart • Identify structures of the respiratory system
Essential Questions (Instructional Objective)	• Describe the processes involved in digestion • Describe the processes involved in respiration • Identify organs of the digestive system • Identify organs of the respiratory system

Content (Subject Matter)	• Animal feeding mechanisms
	• Organs of the human digestive system
	• Processes involved in human digestion
	• Enzymes involved in human digestion
	• Countercurrent exchange system
	• Organs of the human respiratory system
	• Ventilation of lungs
	• **Vocabulary**
	  ○ Herbivore/Carnivore/Omnivore
	  ○ Alimentary canal/Accessory Organs
	  ○ Mechanical Digestion/Chemical Digestion
	  ○ Bolus/Chyme
	  ○ Villi/Microvilli
	  ○ Atria/Ventricles
	  ○ SA Node/AV Node
	  ○ Systole/Diastole
	  ○ Systolic Pressure/Diastolic Pressure
	  ○ Erythrocytes/Lymphocytes/Platelets
	  ○ Negative pressure breathing

Skills/ Benchmarks (CCSS Standards)	• 5.1.12.D.2 Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams. • 5.3.12.A.6 Describe how a disease is the result of a malfunctioning system, organ, and cell, and relate this to possible treatment interventions (e.g., diabetes, cystic fibrosis, lactose intolerance). • 5.3.12.B.2 Use mathematical formulas to justify the concept of an efficient diet.

Materials and Resources	• Projector & Document Camera; Teacher Notes; Coloring Pages
Notes	Chapters 41 and 42

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 12: Circulatory System**
Big Idea/Rationale	A study of the human body systems will tie together many of the previous units and allow students to see the complexity of living systems. We will revisit concepts such as biochemistry, cell transport, cellular respiration and cell communication as we study the body systems.
Enduring Understanding (Mastery Objective)	• Identify structures of the cardiovascular system • Describe the flow of blood through the heart
Essential Questions (Instructional Objective)	• Identify structures of the cardiovascular system • Describe the flow of blood through the heart • Describe the flow of blood through blood vessels • Directly observe the structure of the mammalian heart • Observe prepared slides of human blood

Content (Subject Matter)	• Open vs. Closed circulatory system
	• Variety of vertebrate heart anatomy
	• Anatomy of the human heart
	• Path of blood flow through the human circulatory system
	• The cardiac cycle
	• Artery/Vein/Capillary anatomy
	• Blood Pressure
	• Vocabulary
	  ○ Atria/Ventricles
	  ○ SA Node/AV Node
	  ○ Systole/Diastole
	  ○ Systolic Pressure/Diastolic Pressure
	  ○ Erythrocytes/Lymphocytes/Platelets

Skills/ Benchmarks (CCSS Standards)	• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations. • 5.1.12.A.2 Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. • 5.1.12.A.3 Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence. • 5.1.12.B.1 Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. • 5.1.12.B.2 Build, refine, and represent evidence-based models using mathematical, physical, and computational tools. • 5.1.12.B.3 Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge,

	models, and theories. • 5.1.12.B.4 Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • 5.1.12.D.1 Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2 Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams. • 5.1.12.D.3 Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare. • 5.3.12.A.6 Describe how a disease is the result of a malfunctioning system, organ, and cell, and relate this to possible treatment interventions (e.g., diabetes, cystic fibrosis, lactose intolerance).
Materials and Resources	Projector & Document Camera; Teacher Notes; Preserved Sheep Hearts, and Dissection Handout; Microscopes and prepared slides of human blood, Blood Lab handout
Notes	Chapter 42

Grade: 11 and 12 **Subject:** Biology II Honors	**Unit 13: Reproduction**
Big Idea/Rationale	A study of the human body systems will tie together many of the previous units and allow students to see the complexity of living systems. We will revisit concepts such as biochemistry, cell transport, cellular respiration and cell communication as we study the body systems.
Enduring Understanding (Mastery Objective)	• Identify structures of the human reproductive system • Explain the female hormonal cycle • Describe the processes involved in fertilization and early development
Essential Questions (Instructional Objective)	• Identify structures of the human reproductive system • Explain the female hormonal cycle • Describe the processes involved in fertilization and early development

Content (Subject Matter)	• Asexual vs. Sexual Reproduction
	• Internal vs. External Fertilization
	• Oogenesis vs. Spermatogenesis
	• Female Hormonal Cycle
	• Human Development
	• Fertilization
	• **Vocabulary**
	  ○ Budding/Fragmentation
	  ○ Hermaphroditism and Serial Hermaphroditism
	  ○ Gametogenesis – Oogenesis, Spermatogenesis
	  ○ Menstrual Cycle/Estrous Cycle
	  ○ Gonadotropin Releasing Hormone (GnRH), Follicle Stimulating Hormone (FSH), Luteinizing Hormone (LH)

Skills/ Benchmarks (CCSS Standards)	• 5.3.12.A.4 Distinguish between the processes of cellular growth (cell division) and development (differentiation). • 5.3.12.A.5 Describe modern applications of the regulation of cell differentiation and analyze the benefits and risks (e.g., stem cells, sex determination). • 5.3.12.A.6 Describe how a disease is the result of a malfunctioning system, organ, and cell, and relate this to possible treatment interventions (e.g., diabetes, cystic fibrosis, lactose intolerance). • 5.3.12.D.2 Predict the potential impact on an organism (no impact, significant impact) given a change in a specific DNA code, and provide specific real world examples of conditions caused by mutations.
Materials and Resources	Projector & Document Camera; Teacher Notes; Diagrams of Female Reproductive Cycle; DVD – “In the Womb”

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