

**CKSD Curriculum  
Biology - Grade 10  
Suggested Length of Unit – 12 Days  
Instructor: Michaela Gresko**

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**Biology in the 21<sup>st</sup> Century**

- This unit will cover the study of life, unifying themes of biology, and scientific thinking and process. We will also focus on biologists' tools and technology, biology and your future.
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**Major Academic Standards Addressed**

- Standard - 3.1.10.A1 Explain the characteristics of life common to all organisms.
  - 5306.210Standard - 3.1.B.A1 Describe the common characteristics of life.
  - Standard - 3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture
  - Standard - 3.2.10.A6  
Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Explain the importance of accuracy and precision in making valid measurements.
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**Concepts – Content —What students should know**

- Students will explore scientific thinking, methods, equipment, and experimentation.
  - Biologists study life in all forms, including Earth's incredible diversity of life.
  - All organisms share certain characteristics.
  - Unifying themes connect concepts from many fields of biology.
  - Science is a way of thinking, questioning, and gathering data.
  - Technology continually changes the way biologists work.
  - Understand biology can help make informed decisions in the future.
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**Objectives – also called competencies in the SAS**

**What students should be able to do as a result of the instruction**

- Define and give examples of Earth's biodiversity.
- Summarize the characteristics that all living things share.
- Summarize four major unifying themes of biology.
- Give an example of each of the themes of biology.

- Identify the different elements of scientific theory
  - Differentiate between theories and hypotheses.
  - Describe the usefulness of modern imaging technologies, especially computer models.
  - Evaluate the importance of biology in making informed decisions.
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Essential Questions – meant to challenge study to ponder, question and query

- What is homeostasis and why is it important?
  - How might your study of biology help inform you about your lifestyle choices?
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Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Lab
- Homework
- Quizzes/Tests
- Projects

\*All are subject to change at instructor's discretions

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Best Instructional Practice(s): Best practices will change year to year with the students' needs. Hands on assignments like labs will be provided as well as individual and group instruction, tests, quizzes, and projects.

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**Chemistry of Life**

- The unit will be an introduction to chemistry. It will compare and relate chemistry to the study of life. The main topics will include: Atoms, Ions, and Molecules, the Properties of Water, pH, Carbon-based Molecules, Chemical Reactions and Enzymes
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### Major Academic Standards Addressed

- Standard - 3.1.10.A2 Explain cell processes in terms of chemical reactions and energy changes.
  - Standard - 3.1.B.A2 Explain the importance of enzymes as catalysts in cell reactions. Identify how factors such as pH and temperature may affect enzyme function.
  - Standard - 3.2.10.A1 Predict properties of elements using trends of the periodic table. Identify properties of matter that depend on sample size. Explain the unique properties of water (polarity, high boiling point, forms hydrogen bonds, high specific heat) that support life on Earth.
  - Standard - 3.2.10.A2 Compare and contrast different bond types that result in the formation of molecules and compounds. Explain why compounds are composed of integer ratios of elements.
  - Standard - 3.2.10.A3 Describe phases of matter according to the kinetic molecular theory.
  - Standard - 3.2.10.A4 Describe chemical reactions in terms of atomic rearrangement and/or electron transfer. Predict the amounts of products and reactants in a chemical reaction using mole relationships. Explain the difference between endothermic and exothermic reactions. Identify the factors that affect the rates of reactions.
  - Standard - 3.2.10.A5 Describe the historical development of models of the atom and how they contributed to modern atomic theory. Apply the mole concept to determine number of particles and molar mass for elements and compounds.
  - Standard - 3.2.10.B3 Explain how heat energy will move from a higher temperature to a lower temperature until equilibrium is reached. Analyze the processes of convection, conduction, and radiation between objects or regions that are at different temperatures.
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### Concepts – Content — **What students should know**

- All living things are based on atoms and their interactions.
  - Water's unique properties allow life to exist on Earth.
  - Carbon based molecules are the foundation of life.
  - Life depends on chemical reactions; chemical reactions release or absorb energy.
  - Enzymes are catalysts for chemical reactions of living things; enzymes allow chemical reactions to occur under tightly controlled conditions.
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### Objectives – also called competencies in the SAS

#### **What students should be able to do as a result of the instruction**

- Identify elements common to living things.
- Describe how ions form, and compare ionic and covalent bonds.
- Recognize the importance of hydrogen bonding.

- Explain why many compounds dissolve in water.
  - Compare acids and bases.
  - Describe the bonding properties of carbon atoms.
  - Compare carbohydrates, lipids, proteins, and nucleic acids.
  - Describe how bonds break and reform during chemical reactions.
  - Explain why chemical reactions release or absorb energy.
  - Explain the effect of a catalyst on activation energy.
  - Describe how enzymes regulate chemical reactions.
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Essential Questions – meant to challenge study to ponder, question and query

- Describe the relationship between the H<sup>+</sup> concentration and the pH value.
  - How do endothermic and exothermic reactions differ?
  - How does a catalyst affect the activation energy of a chemical reaction?
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Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Lab
- Homework
- Quizzes/Tests
- Projects

\*All are subject to change at instructor's discretions

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**Cell Structure and Function**

- This unit will combine many topics all focused around the history of the cell and the function of cells. The discovery and history of cells will be covered first with the Cell Theory. Then the types of cells and their structures including the cell organelles. Lastly, we will focus on the unique properties of the cell membrane including; passive transport, diffusion, osmosis, active transport, endocytosis, and exocytosis.

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### Major Academic Standards Addressed

- Standard - 3.1.10.A5 Relate life processes to sub-cellular and cellular structures to their functions.
  - Standard - 3.1.10.A6 Identify the advantages of multi-cellularity in organisms.
  - Standard - 3.1.10.A7 Describe the relationship between the structure of organic molecules and the function they serve in living organisms. Explain how cells store and use information to guide their functions.
  - Standard - 3.1.B.A1 Describe the common characteristics of life. Compare and contrast the cellular structures and degrees of complexity of prokaryotic and eukaryotic organisms. Explain that some structures in eukaryotic cells developed from early prokaryotic cells (e.g., mitochondria, chloroplasts)
  - Standard - 3.1.B.A5 Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc). Explain the role of water in cell metabolism. Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell. Describe transport mechanisms across the plasma membrane.
  - Standard - 3.1.B.A6 Explain how cells differentiate in multicellular organisms.
  - Standard - 3.1.B.A7 Analyze the importance of carbon to the structure of biological macromolecules. Compare and contrast the functions and structures of proteins, lipids, carbohydrates, and nucleic acids. Explain the consequences of extreme changes in pH and temperature on cell proteins.
  - Standard - 3.1.B.A8 Recognize that systems within cells and multicellular organisms interact to maintain homeostasis. Demonstrate the repeating patterns that occur in biological polymers. Describe how the unique properties of water support life.
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### Concepts – Content — **What students should know**

- Cells are the basic unit of life; early studies led to development of the cell theory.
  - Prokaryotic cells lack a nucleus and most internal structures of eukaryotic cells.
  - Eukaryotic cells have many similarities; including their internal structures and organelle functions.
  - The cell membrane is a barrier, made up of a phospholipid bilayer, that chemical signals are transmitted across, that separates a cell from the external environment.
  - Materials move across membranes because of concentration differences.
  - Cells use energy to transport materials that cannot diffuse across a membrane.
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### Objectives – also called competencies in the SAS

#### **What students should be able to do as a result of the instruction**

- Describe the developments that led to the cell theory.

- Differentiate between eukaryotic and prokaryotic cells.
  - Describe the internal structures of eukaryotic cells.
  - Summarize the functions of organelles in plant and animal cells.
  - Describe the structure of the cell membrane.
  - Summarize how chemical signals are transmitted across the cell membrane.
  - Describe passive transport and distinguish between osmosis, diffusion and facilitated transport.
  - Describe active transport and distinguish among endocytosis, phagocytosis, and exocytosis.
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Essential Questions – meant to challenge study to ponder, question and query

- What are the three major principles of cell theory?
  - Explain the structure and function of the cell wall, nucleus, and mitochondria.
  - Compare the differences between isotonic, hypertonic, and hypotonic solutions.
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Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Lab
- Homework
- Quizzes/Tests
- Projects

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**Cell Growth and Division: Mitosis**

- The Cell Cycle
  - Mitosis and Cytokinesis
  - Regulation of the Cell Cycle
  - Asexual Reproduction
  - Multicellular Life
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### Major Academic Standards Addressed

- Standard - 3.1.10.A2 Explain cell processes in terms of chemical reactions and energy changes.
- Standard - 3.1.10.A3 Compare and contrast the life cycles of different organisms.
- Standard - 3.1.10.A4 Describe the cell cycle and the process and significance of mitosis.
- Standard - 3.1.10.A5 Relate life processes to sub-cellular and cellular structures to their functions.
- Standard - 3.1.10.A6 Identify the advantages of multi-cellularity in organisms.
- Standard - 3.1.10.A7 Describe the relationship between the structure of organic molecules and the function they serve in living organisms. Explain how cells store and use information to guide their functions.
- Standard - 3.1.10.A8 Investigate the spatial relationships of organisms' anatomical features using specimens, models, or computer programs.
- Standard - 3.1.B.A1 Describe the common characteristics of life. Compare and contrast the cellular structures and degrees of complexity of prokaryotic and eukaryotic organisms. Explain that some structures in eukaryotic cells developed from early prokaryotic cells (e.g., mitochondria, chloroplasts)
- Standard - 3.1.B.A3 Explain how all organisms begin their life cycles as a single cell and that in multicellular organisms, successive generations of embryonic cells form by cell division.
- Standard - 3.1.B.A4 Summarize the stages of the cell cycle. Examine how interactions among the different molecules in the cell cause the distinct stages of the cell cycle which can also be influenced by other signaling molecules. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. Compare and contrast a virus and a cell. Relate the stages of viral cycles to the cell cycle.
- Standard - 3.1.B.A5 Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc). Explain the role of water in cell metabolism. Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell. Describe transport mechanisms across the plasma membrane.
- Standard - 3.1.B.A6 Explain how cells differentiate in multicellular organisms.
- Standard - 3.1.10.B1 Describe how genetic information is inherited and expressed.
- Standard - 3.1.10.B2 Explain the process of meiosis resulting in the formation of gametes. Compare and contrast the function of mitosis and meiosis.

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### Concepts – Content — **What students should know**

- Cells have distinct phases of growth, reproduction, and normal functions.
  - Cells divide during mitosis and cytokinesis.
  - Cell cycle regulation is necessary for healthy growth.
  - Many organisms reproduce by cell division
  - Cells work together to carry out complex functions.
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Objectives – also called competencies in the SAS

**What students should be able to do as a result of the instruction**

- Describe the stages of the cell cycle.
- Compare rates of division in different cell types.
- Identify factors that limit cell size.
- Describe the structure of a chromosome.
- Follow chromosomes through the processes of mitosis and cytokinesis.
- Identify internal and external factors that regulate cell division.
- Explain cancer in terms of the cell cycle.
- Compare and contrast binary fission and mitosis.
- Describe how some eukaryotes reproduce through mitosis.
- Describe the specialization in multicellular organisms.
- Identify different types of stem cells.

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Essential Questions – meant to challenge study to ponder, question and query

- How many chromosomes does a cell have at the start of mitosis? How many does it have after cytokinesis?
- Explain how cancer cells differ from healthy cells.
- Analyze why cell differentiation is an important part of the development of a multicellular organism.

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Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Lab
- Homework
- Quizzes/Tests
- Projects

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**CKSD Curriculum  
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Suggested Length of Unit – 11 Days  
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**Meiosis**

- Chromosomes and Meiosis
  - Process of Meiosis
  - Meiosis and Genetic Variation
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**Major Academic Standards Addressed**

- Standard - 3.1.10.A2 Explain cell processes in terms of chemical reactions and energy changes.
- Standard - 3.1.10.A3 Compare and contrast the life cycles of different organisms.
- Standard - 3.1.10.A4 Describe the cell cycle and the process and significance of mitosis.
- Standard - 3.1.10.A5 Relate life processes to sub-cellular and cellular structures to their functions.
- Standard - 3.1.10.A6 Identify the advantages of multi-cellularity in organisms.
- Standard - 3.1.10.A7 Describe the relationship between the structure of organic molecules and the function they serve in living organisms. Explain how cells store and use information to guide their functions.
- Standard - 3.1.10.A8 Investigate the spatial relationships of organisms' anatomical features using specimens, models, or computer programs.
- Standard - 3.1.B.A1 Describe the common characteristics of life. Compare and contrast the cellular structures and degrees of complexity of prokaryotic and eukaryotic organisms. Explain that some structures in eukaryotic cells developed from early prokaryotic cells (e.g., mitochondria, chloroplasts)
- Standard - 3.1.B.A3 Explain how all organisms begin their life cycles as a single cell and that in multicellular organisms, successive generations of embryonic cells form by cell division.
- Standard - 3.1.B.A4 Summarize the stages of the cell cycle. Examine how interactions among the different molecules in the cell cause the distinct stages of the cell cycle which can also be influenced by other signaling molecules. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. Compare and contrast a virus and a cell. Relate the stages of viral cycles to the cell cycle.
- Standard - 3.1.B.A5 Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc). Explain the role of water in cell metabolism. Explain how the cell membrane

functions as a regulatory structure and protective barrier for the cell. Describe transport mechanisms across the plasma membrane.

- Standard - 3.1.B.A6 Explain how cells differentiate in multicellular organisms.
  - Standard - 3.1.10.B1 Describe how genetic information is inherited and expressed.
  - Standard - 3.1.10.B2 Explain the process of meiosis resulting in the formation of gametes. Compare and contrast the function of mitosis and meiosis.
  - Standard - 3.1.10.B3 Describe the basic structure of DNA and its function in genetic inheritance. Describe the role of DNA in protein synthesis as it relates to gene expression.
  - Standard - 3.1.B.B2 Describe how the process of meiosis results in the formation of haploid gametes and analyze the importance of meiosis in sexual reproduction. Compare and contrast the function of mitosis and meiosis. Illustrate that the sorting and recombining of genes in sexual reproduction results in a great variety of possible gene combinations in offspring.
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#### Concepts – Content — **What students should know**

- Gametes have half the number of chromosomes that body cells have.
  - During meiosis, diploid cells undergo two cell divisions that result in haploid cells.
  - Independent assortment and crossing over during meiosis result in genetic diversity.
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#### Objectives – also called competencies in the SAS

##### **What students should be able to do as a result of the instruction**

- Differentiate between body cells and gametes.
  - Compare and contrast autosomes and sex chromosomes.
  - Compare and contrast the two rounds of division in meiosis.
  - Describe how haploid cells develop into mature gametes.
  - Describe how sexual reproduction creates unique gene combinations
  - Explain how crossing over during meiosis increases genetic diversity.
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#### Essential Questions – meant to challenge study to ponder, question and query

- Describe the process of meiosis.
  - Does mitosis or meiosis occur more frequently in your body?
  - How does crossing over contribute to genetic diversity?
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Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Lab
- Homework
- Quizzes/Tests
- Projects

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**CKSD Curriculum  
Biology - Grade 10  
Suggested Length of Unit – 25 Days  
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**Bioenergetics**

- Chemical Energy and ATP
- Overview of Photosynthesis
- Photosynthesis in Detail
- Overview of Cellular Respiration
- Cellular Respiration in Detail
- Fermentation

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**Major Academic Standards Addressed**

- Standard - 3.1.10.A2 Explain cell processes in terms of chemical reactions and energy changes.
- Standard - 3.1.10.A5 Relate life processes to sub-cellular and cellular structures to their functions.
- Standard - 3.1.B.A2 Identify the initial reactants, final products, and general purposes of photosynthesis and cellular respiration. Explain the important role of ATP in cell metabolism. Describe the relationship between photosynthesis and cellular respiration in photosynthetic organisms. Explain why many biological macromolecules such as ATP and lipids contain high energy bonds. Explain the importance of enzymes as catalysts in cell reactions. Identify how factors such as pH and temperature may affect enzyme function.
- Standard - 3.1.B.A5 Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc). Explain the role of water in cell metabolism. Explain how the cell membrane

functions as a regulatory structure and protective barrier for the cell. Describe transport mechanisms across the plasma membrane.

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**Concepts – Content —What students should know**

- All cells need chemical energy, which is carried by ATP.
- The overall process of photosynthesis produces sugars that store chemical energy.
- Photosynthesis requires a series of chemical reactions.
- The overall process of cellular respiration converts sugar into ATP using oxygen.
- Cellular respiration is an aerobic process with two main stages.
- Fermentation allows the production of a small amount of ATP without oxygen.

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Objectives – also called competencies in the SAS

**What students should be able to do as a result of the instruction**

- Recognize the importance of ATP an energy-carrying molecule.
- Identify energy sources used by organisms.
- Relate producers to photosynthesis.
- Describe the process of photosynthesis.
- Describe the light-dependent reactions in which energy is captured.
- Describe the light-independent reactions in which sugar is produced.
- Describe the process of cellular respiration
- Compare cellular respiration to photosynthesis.
- Describe the process of glycolysis.
- Describe the details of the Krebs cycle and the electron transport chain.
- Describe the process of fermentation.
- Summarize the importance of fermentation.

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Essential Questions – meant to challenge study to ponder, question and query

- Describe how you get energy indirectly from the food you eat.
- Explain how energy from sunlight is transferred to ATP and NADPH.
- What is the function of cellular respiration?

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Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Lab
- Homework
- Quizzes/Tests
- Projects

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**CKSD Curriculum  
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Suggested Length of Unit – 15 Days  
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**Genetics (Mendel) and Extending Mendelian Genetics**

- Mendel and Heredity
  - Traits, Genes, and Alleles
  - Traits and Probability
  - Chromosomes and Phenotype
  - Complex Patterns of Inheritance
  - Gene Linkage and Mapping
  - Human Genetics and Pedigrees
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**Major Academic Standards Addressed**

- Standard - 3.1.10.B1 Describe how genetic information is inherited and expressed.
- Standard - 3.1.10.B2 Explain the process of meiosis resulting in the formation of gametes. Compare and contrast the function of mitosis and meiosis.
- Standard - 3.1.10.B3 Describe the basic structure of DNA and its function in genetic inheritance. Describe the role of DNA in protein synthesis as it relates to gene expression.
- Standard - 3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture.
- Standard - 3.1.10.B5 Use models to demonstrate patterns in biomacromolecules. Compare and contrast Mendelian and non-Medalian patterns of inheritance.
- Standard - 3.1.B.B5 Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance. Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, codominant, sex-linked, polygenic, incomplete dominance, multiple alleles). Explain how the processes of replication, transcription, and translation are similar in all organisms. Explain how gene actions, patterns of heredity, and reproduction of cells and organisms account for the continuity of life. Demonstrate how inherited characteristics can be observed at the molecular, cellular, and organism levels.

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Concepts – Content — **What students should know**

- Mendel's research showed that traits are inherited as discrete units.
- Genes encode proteins that produce a diverse range of traits.
- The inheritance of traits follows the rules of probability.
- The chromosomes on which genes are located can affect the expression of traits.
- Phenotype is affected by many different factors.
- Genes can be mapped to specific locations on chromosomes.
- A combination of methods is used to study human genetics.

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Objectives – also called competencies in the SAS

**What students should be able to do as a result of the instruction**

- Describe the patterns of inheritance that Mendel's data revealed.
- Summarize Mendel's law of segregation.
- Explain how there can be many versions of one gene.
- Describe how genes influence the development of traits.
- Describe monohybrid and dihybrid crosses.
- Explain how heredity can be illustrated mathematically.
- Relate dominant-recessive patterns of inheritance in autosomal chromosomes to genetic disorders.
- Describe different types of allele interactions.
- Describe polygenic traits and the effect of environmental factors on phenotype.
- Describe the discovery of gene linkage.
- Explain how linkage maps can be used to estimate distances between genes.
- Examine patterns of inheritance in humans.
- Describe how a pedigree is used.
- Identify several methods for mapping human chromosomes.
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Essential Questions – meant to challenge study to ponder, question and query

- Explain the difference between genotype and phenotype.
  - Explain how Mendel's laws relate to probability.
  - Explain how interactions between genes and the environment can affect phenotype.
  - How is a linkage map related to cross-overs that take place during meiosis?
  - Why must a combination of methods be used to study human genetics?
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Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Lab
- Homework
- Quizzes/Tests
- Projects

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**From DNA to Proteins**

- Identifying DNA as the Genetic Material
- Structure of DNA and DNA Replication
- Transcription and Translation
- Gene Expression and Regulation
- Mutations

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**Major Academic Standards Addressed**

- Standard - 3.1.10.B1 Describe how genetic information is inherited and expressed.
- Standard - 3.1.10.B3 Describe the basic structure of DNA and its function in genetic inheritance. Describe the role of DNA in protein synthesis as it relates to gene expression.
- Standard - 3.1.10.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture.
- Standard - 3.1.B.B1 Explain that the information passed from parents to offspring is transmitted by means of genes which are coded in DNA molecules. Explain the basic process of DNA replication. Describe the basic processes of transcription and translation. Explain how crossing over, jumping genes, and deletion and

duplication of genes results in genetic variation. Explain how mutations can alter genetic information and the possible consequences on resultant cells.

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**Concepts – Content —What students should know**

- DNA was identified as the genetic material through a series of experiments.
  - DNA structure is the same in all organisms.
  - DNA replication copies the genetic information of a cell.
  - Transcription converts a gene into a single stranded RNA molecule.
  - Translation converts an mRNA message into a polypeptide, or protein.
  - Gene expression is carefully regulated in both prokaryotic and eukaryotic cells.
  - Mutations are changes in DNA that may or may not affect phenotypes.
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Objectives – also called competencies in the SAS

**What students should be able to do as a result of the instruction**

- Describe Griffith's discovery of a transforming principle.
  - Explain how Avery identified DNA as the transforming principle.
  - Summarize the experiments of Hershey and Chase that confirmed DNA as genetic material.
  - Describe the interaction of the four nucleotides that make up DNA.
  - Describe the three- dimensional structure of DNA.
  - Summarize the process of DNA replication.
  - Describe the role of enzymes in DNA replication.
  - Describe the relationship between RNA and DNA.
  - Identify the three kinds RNA and their functions.
  - Compare transcription and replication.
  - Describe how mRNA codons are translated into amino acids.
  - Summarize the process of protein synthesis.
  - Describe how prokaryotes turn genes on and off.
  - Explain how gene expression is regulated in eukaryotic cells.
  - Distinguish between different types of mutations.
  - Explain why mutations may or may not affect phenotypes.
  - List some factors that cause mutations.
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Essential Questions – meant to challenge study to ponder, question and query

- How many types of DNA nucleotides are there and how do they align in a double helix model?
- What are the three main steps in DNA replication?
- Describe three ways mutations can occur.

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- Lab
- Homework
- Quizzes/Tests
- Projects

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**Principles of Evolution**

- Early Ideas about Evolution
- Darwin's Observations
- Theory of Natural Selection
- Evidence of Evolution
- Evolutionary Biology Today

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**Major Academic Standards Addressed**

- Standard - 3.1.10.A3 Compare and contrast the life cycles of different organisms.
- Standard - 3.1.10.C1 Explain the mechanisms of biological evolution.
- Standard - 3.1.10.C2 Explain the role of mutations and gene recombination in changing a population of organisms.
- Standard - 3.1.10.C3 Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution.
- Standard - 3.1.B.C1 Describe species as reproductively distinct groups of organisms. Analyze the role that geographic isolation can play in speciation. Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a

population. Describe how the degree of kinship between species can be inferred from the similarity in their DNA sequences.

- Standard - 3.1.B.C2 Describe the theory suggesting that life on Earth arose as a single, primitive prokaryote about 4 billion years ago and that for the next 2 billion years, a huge diversity of single-celled organisms evolved. Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed. Describe how mutations in sex cells may be passed on to successive generations and that the resulting phenotype may help, harm, or have little or no effect on the offspring's success in its environment. Describe the relationship between environmental changes and changes in the gene pool of a population
- Standard - 3.1.B.C3 Compare and contrast various theories of evolution. Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution. Discuss the implications of a universal genetic code for evolution.
- Standard - 3.3.10.B1 Explain how gravity is responsible for planetary orbits. Explain what caused the sun, Earth, and most of the other planets to form between 4 and 5 billion years ago. Provide evidence to suggest the Big Bang Theory. Describe the basic nuclear processes involved in energy production in a star.

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#### Concepts – Content — **What students should know**

- There were theories of biological and geological change before Darwin.
- Darwin's voyage provided insights into evolution.
- Darwin proposed natural selection as a mechanism for evolution.
- Evidence of common ancestry among species comes from many sources.
- New technology is furthering our understanding of evolution.

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#### Objectives – also called competencies in the SAS

#### **What students should be able to do as a result of the instruction**

- Examine early ideas about evolution.
  - Identify three geological theories that influenced scientific debate.
  - Describe how Darwin arrived at his idea about species variation.
  - Recognize how Darwin's discoveries supported Lyell's Ancient-Earth theory.
  - Compare artificial selection to natural selection.
  - Examine the factors Darwin considered in forming his theory of natural selection.
  - Summarize the four principles of natural selection.
  - Recognize the major sources of evidence for evolution.
  - Examine the pattern of features that reveal the history of a species.
  - Summarize different types of evidence that support evolution.
  - Recognize the importance of evolution in unifying all branches of biological study.
-

Essential Questions – meant to challenge study to ponder, question and query

- What accounts for variations and adaptations?
  - What are the four principles of natural selection?
  - Compare and contrast natural selection and artificial selection.
- 

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Lab
- Homework
- Quizzes/Tests
- Projects

\*All are subject to change at instructor's discretions

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Best Instructional Practice(s): Best practices will change year to year with the students' needs. Hands on assignments like labs will be provided as well as individual and group instruction, tests, quizzes, and projects.

**CKSD Curriculum  
Biology - Grade 10  
Suggested Length of Unit – 12 Days  
Instructor: Michaela Gresko**

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**The Evolution of Populations**

- Genetic Variation Within Populations
  - Natural Selection in Populations
  - Other Mechanisms of Evolution
  - Hardy-Weinberg Equilibrium
  - Speciation Through Isolation
  - Patterns in Evolution
- 

**Major Academic Standards Addressed**

- Standard - 3.1.10.A3 Compare and contrast the life cycles of different organisms.
- Standard - 3.1.10.C1 Explain the mechanisms of biological evolution.
- Standard - 3.1.10.C2 Explain the role of mutations and gene recombination in changing a population of organisms.
- Standard - 3.1.10.C3 Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution.

- Standard - 3.1.B.C1 Describe species as reproductively distinct groups of organisms. Analyze the role that geographic isolation can play in speciation. Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population. Describe how the degree of kinship between species can be inferred from the similarity in their DNA sequences.
  - Standard - 3.1.B.C2 Describe the theory suggesting that life on Earth arose as a single, primitive prokaryote about 4 billion years ago and that for the next 2 billion years, a huge diversity of single-celled organisms evolved. Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed. Describe how mutations in sex cells may be passed on to successive generations and that the resulting phenotype may help, harm, or have little or no effect on the offspring's success in its environment. Describe the relationship between environmental changes and changes in the gene pool of a population
  - Standard - 3.1.B.C3 Compare and contrast various theories of evolution. Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution. Discuss the implications of a universal genetic code for evolution.
- 

Concepts – Content — **What students should know**

- A population shares a common gene pool.
  - Populations, not individuals, evolve.
  - Natural selection is not the only mechanism through which populations evolve.
  - Hardy-Weinberg equilibrium provides a framework for understanding how populations evolve.
  - New species can arise when populations are isolated.
  - Evolution occurs in patterns.
- 

Objectives – also called competencies in the SAS

**What students should be able to do as a result of the instruction**

- Describe the significance of genetic variation within a population.
- Identify sources of genetic variation.
- Describe how natural selection acts on the distribution of traits in a population.
- Explain three ways natural selection can change the distribution of a trait in a population.
- Explain how gene flow, genetic drift, and sexual selection can lead to the evolution of populations.
- Identify the conditions that define Hardy-Weinberg equilibrium.
- Explain the predictive value of the Hardy-Weinberg equation.
- Explain how isolation of populations can lead to speciation.
- Describe how populations can become isolated.

- Describe different types and rates of evolution.
  - Compare different types and rates of extinction.
- 

Essential Questions – meant to challenge study to ponder, question and query

- In terms of phenotypes, describe what is meant by the phrase “distribution of traits”.
  - How does gene flow affect neighboring populations?
  - What are the three types of barriers that can lead to reproductive isolation?
- 

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Lab
- Homework
- Quizzes/Tests
- Projects

\*All are subject to change at instructor’s discretions

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Best Instructional Practice(s): Best practices will change year to year with the students’ needs. Hands on assignments like labs will be provided as well as individual and group instruction, tests, quizzes, and projects.

## BEGIN REVIEW FROM 9TH GRADE

**CKSD Curriculum  
Biology - Grade 10  
Suggested Length of Unit – 5 Days  
Instructor: Michaela Gresko**

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### Principles of Ecology

- Ecologists Study Relationships
- Biotic and Abiotic Factors
- Energy in Ecosystems
- Food Chains and Food Webs
- Cycling of Matter
- Pyramid Models

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### Major Academic Standards Addressed

- Standard - 3.2.10.B2 Explain how the overall energy flowing through a system remains constant. Describe the work-energy theorem. Explain the relationships between work and power.
- Standard - 3.2.10.B3 Explain how heat energy will move from a higher temperature to a lower temperature until equilibrium is reached. Analyze the processes of convection, conduction, and radiation between objects or regions that are at different temperatures.
- Standard - 3.3.10.A1 Relate plate tectonics to both slow and rapid changes in the earth's surface. Describe the rock cycle and the processes that are responsible for the formation of igneous, sedimentary, and metamorphic rocks. Relate geochemical cycles to the conservation of matter. Explain how the Earth is composed of a number of dynamic, interacting systems exchanging energy or matter.
- Standard - 3.3.10.A2 Analyze the effects on the environment and the carbon cycle of using both renewable and nonrenewable sources of energy.
- Standard - 3.3.10.A3 Explain how the evolution of Earth has been driven by interactions between the lithosphere, hydrosphere, atmosphere, and biosphere.
- Standard - 3.3.10.A4 Relate geochemical cycles to conservation of matter. Explain how the Earth's systems and its various cycles are driven by energy.
- Standard - 3.3.10.A5 Explain how there is only one ocean. Explain the processes of the hydrologic cycle. Explain the dynamics of oceanic currents and their relationship to global circulation within the marine environment.
- Standard - 3.3.10.A6 Interpret meteorological data to describe and/or predict weather. Explain the phenomena that cause global atmospheric processes such as storms, currents, and wind patterns.
- Standard - 3.3.10.A7 Interpret and create models of the Earth's physical features in various mapping representations. Relate constancy and change to the hydrologic and geochemical cycles. Apply an appropriate scale to illustrate major events throughout geologic time. Describe factors that contribute to global climate change.
- Standard - 3.3.10.B1 Explain how gravity is responsible for planetary orbits. Explain what caused the sun, Earth, and most of the other planets to form between 4 and 5 billion years ago. Provide evidence to suggest the Big Bang Theory. Describe the basic nuclear processes involved in energy production in a star.
- Standard - 3.3.10.B2 Explain how scientists obtain information about the universe by using technology to detect electromagnetic radiation that is emitted, reflected, or absorbed by stars and other objects. Describe changes in the universe over billions of years. Explain the scale used to measure the sizes of stars and galaxies and the distances between them

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### Concepts – Content — **What students should know**

- Ecology is the study of the relationship among organisms and their environment.

- Every ecosystem includes both living and nonliving factors.
  - Life in an ecosystem requires a source of energy.
  - Food chains and food webs model the flow of energy in an ecosystem.
  - Matter cycles in and out of an ecosystem.
  - Pyramids model the distribution of energy and matter in an ecosystem.
- 

Objectives – also called competencies in the SAS

**What students should be able to do as a result of the instruction**

- Summarize the levels of organization that ecologists study.
  - Describe research methods ecologists use to study the environment.
  - Identify biotic and abiotic factors in an ecosystem.
  - Describe how a change in one factor in an ecosystem can affect others.
  - Describe the roles of producers and consumers in ecosystems.
  - Compare photosynthesis to chemosynthesis.
  - Describe the structure of a food chain.
  - Explain how food chains and trophic levels are related.
  - Analyze feeding relationships in a food web.
  - Summarize Earth’s hydrologic and biogeochemical cycles.
  - Relate cycling of matter of ecosystems.
  - Trace the flow of energy through an ecosystem, using an energy pyramid.
  - Relate energy pyramids to food chains and trophic levels.
  - Compare and contrast a biomass pyramid and a pyramid of numbers.
- 

Essential Questions – meant to challenge study to ponder, question and query

- What are the levels of organization in order?
  - How would the removal of a keystone species affect the ecosystem’s biodiversity?
  - What happens to energy as it flows through a food web?
  - What are the four elements that cycle through ecosystems, and why are they important?
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Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Lab
- Homework
- Quizzes/Tests
- Projects

\*All are subject to change at instructor’s discretions

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Best Instructional Practice(s): Best practices will change year to year with the students' needs. Hands on assignments like labs will be provided as well as individual and group instruction, tests, quizzes, and projects.

**CKSD Curriculum  
Biology - Grade 10  
Suggested Length of Unit – 5 Days  
Instructor: Michaela Gresko**

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**Interactions in Ecosystems**

- Habitat and Niche
  - Community Interactions
  - Population Density and Distribution
  - Population Growth Patterns
  - Ecological Succession
- 

**Major Academic Standards Addressed**

- Standard - 3.2.10.B2 Explain how the overall energy flowing through a system remains constant. Describe the work-energy theorem. Explain the relationships between work and power.
  - Standard - 3.2.10.B3 Explain how heat energy will move from a higher temperature to a lower temperature until equilibrium is reached. Analyze the processes of convection, conduction, and radiation between objects or regions that are at different temperatures.
  - Standard - 3.3.10.A2 Analyze the effects on the environment and the carbon cycle of using both renewable and nonrenewable sources of energy.
- 

**Concepts – Content —What students should know**

- Every organism has a habitat and niche.
  - Organisms interact ad individuals.
  - Each population has a density, a dispersion, and a reproductive strategy.
  - Populations grow in predictable patterns.
  - Ecological succession is a process of change in the species that make up a community.
- 

**Objectives – also called competencies in the SAS**

**What students should be able to do as a result of the instruction**

- Differentiate between habitat and niche.
- Differentiate between competitive exclusion and ecological equivalent.

- Compare and contrast interspecific and intraspecific competition.
  - Describe three types of symbiosis.
  - Consider density and geographic dispersal and characteristics of populations.
  - Describe three basic types of survivorship curves in relation to reproductive strategies.
  - Describe four factors that affect population size.
  - Compare exponential and logistic population growth.
  - Identify factors that limit population growth.
  - Describe the process of primary succession.
  - Explain the difference between primary and secondary succession.
- 

Essential Questions – meant to challenge study to ponder, question and query

- What are the three parts of an organism's ecological niche?
  - When a population is declining, what two factors are likely outpacing what other two factors?
  - What is the difference between primary and secondary succession?
  - Why are pioneer species so important for primary succession?
- 

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Lab
- Homework
- Quizzes/Tests
- Projects

\*All are subject to change at instructor's discretions

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Best Instructional Practice(s): Best practices will change year to year with the students' needs. Hands on assignments like labs will be provided as well as individual and group instruction, tests, quizzes, and projects.

**CKSD Curriculum  
Biology - Grade 10  
Suggested Length of Unit – 3 Days  
Instructor: Michaela Gresko**

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### The Tree of Life

- The Linnaean System of Classification

- Classification Based on Evolutionary Relationships
  - Molecular Clocks
  - Domains and Kingdoms
- 

### Major Academic Standards Addressed

- Standard - 3.1.10.A3 Compare and contrast the life cycles of different organisms.
  - Standard - 3.1.10.C1 Explain the mechanisms of biological evolution.
  - Standard - 3.1.10.C2 Explain the role of mutations and gene recombination in changing a population of organisms.
  - Standard - 3.1.10.C3 Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution.
  - Standard - 3.1.B.C1 Describe species as reproductively distinct groups of organisms. Analyze the role that geographic isolation can play in speciation. Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population. Describe how the degree of kinship between species can be inferred from the similarity in their DNA sequences.
  - Standard - 3.1.B.C2 Describe the theory suggesting that life on Earth arose as a single, primitive prokaryote about 4 billion years ago and that for the next 2 billion years, a huge diversity of single-celled organisms evolved. Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed. Describe how mutations in sex cells may be passed on to successive generations and that the resulting phenotype may help, harm, or have little or no effect on the offspring's success in its environment. Describe the relationship between environmental changes and changes in the gene pool of a population
  - Standard - 3.1.B.C3 Compare and contrast various theories of evolution. Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the
- 

### Concepts – Content — **What students should know**

- Organisms can be classified based on physical similarities.
  - Modern classification is based on evolutionary relationships.
  - Molecular clocks provide clues to evolutionary history.
  - The current tree of life has three domains: Bacteria, Archaea, and Eukarya.
- 

### Objectives – also called competencies in the SAS

#### **What students should be able to do as a result of the instruction**

- Examine the scientific naming system developed by Linnaeus.
- Identify the limitations of the Linnaean System.
- Describe classification by cladistics.
- Summarize how molecular evidence reveals species' relatedness.

- Explain how molecular clocks work.
  - Describe two types of molecular clocks: mitochondrial DNA and ribosomal RNA.
  - Describe classification and work in progress.
  - Identify the three domains in the tree of life as; Bacteria, Archaea, and Eukarya.
- 

Essential Questions – meant to challenge study to ponder, question and query

- What are the taxons in order of most general to most specific?
  - What is the difference between a clade and a taxon?
  - What kingdoms are included in each of the three domains in the modern three of life?
- 

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Lab
- Homework
- Quizzes/Tests
- Projects

\*All are subject to change at instructor's discretions

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Best Instructional Practice(s): Best practices will change year to year with the students' needs. Hands on assignments like labs will be provided as well as individual and group instruction, tests, quizzes, and projects.

**CKSD Curriculum  
Biology - Grade 10  
Suggested Length of Unit –25 Days  
Instructor: Michaela Gresko**

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**Review Concepts for Keystone Biology Exam**

- Throughout this unit we will review all major concepts in preparation for the Keystone test
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**Major Academic Standards Addressed**

- All tested standards listed previously of 10<sup>th</sup> and 9<sup>th</sup> grade.
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**Concepts – Content —What students should know**

- Review of all content and concepts in previous units of 10<sup>th</sup> and 9<sup>th</sup> grade.
-

Objectives – also called competencies in the SAS

**What students should be able to do as a result of the instruction**

- Review of all objectives covered in previous units of 10<sup>th</sup> and 9<sup>th</sup>.
- 

Essential Questions – meant to challenge study to ponder, question and query

- Review of all essential questions covered in previous units
- 

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Keystone Practice book sections
- Sample content quizzes
- Test Prep assignments
- Keystone Exam

\*All are subject to change at instructor's discretions

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Best Instructional Practice(s): Best practices will change year to year with the students' needs. Hands on assignments like labs will be provided as well as individual and group instruction, tests, quizzes, and projects.