

# FLINT RIVER ACADEMY SCIENCE STANDARDS

## BIOLOGY

### 1. Cell Biology

- a. Recall the basic tenants of the cell theory
- b. Relate cell parts/organelles (plasma membrane, nuclear envelope, nucleus, nucleolus, cytoplasm, mitochondrion, endoplasmic reticulum, golgi apparatus, lysosome, vacuole, cell wall, plastids, cytoskeleton, centriole) to their functions
- c. Explain how active, passive, and facilitated transport serves to maintain homeostasis of the cell
- d. Compare and contrast prokaryotic cell and eukaryotic cells
- e. Explain the interrelated nature of photosynthesis and cellular respiration in the cells of photosynthetic organisms. Identify the reactants, products and basic purposes of photosynthesis and respiration. Recognize ATP as the source of cellular energy
- f. Explain how living things are constructed of the matter of which the earth is made
- g. Compare and contrast organic and inorganic compounds. Explain the general structure and primary functions of the four organic compounds
- h. Describe how dehydration synthesis and hydrolysis relate to organic compounds
- i. Explain the factors that affect the rates of biochemical reactions (including pH, temperature, and the role of enzymes as catalysts)
- j. Explain why cell reproduction is necessary
- k. Summarize the characteristics of the cell cycle
- l. Summarize the make-up of a chromosome
- m. Summarize how cell regulation controls and coordinates cell growth and division and allows cells to respond to the environment. Recognize the consequences of uncontrolled cell division

### 2. Genetics

- a. Discuss the advantage and disadvantages of sexual reproduction and asexual reproduction
- b. Differentiate between dominant, recessive, codominant, polygenic and sex-linked traits
- c. Summarize the chromosome theory of inheritance and relate that to the theory of Gregor Mendel's Principles of Genetics
- d. Explain that the information passed from parents to offspring is transmitted by means of genes that are coded in DNA molecules  
These genes contain the information for the production of proteins
- e. Explain the genetic basis for Mendel's Law's of Segregation, dominance and independent assortment
- f. Determine the genotype and phenotype of monohybrid and dihybrid crosses using a punnett square
- g. Summarize the events of meiosis I and meiosis II

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- h. Correlate how crossing-over percentages allow scientists to map chromosomes
- i. Discuss how probability provides scientists a way to analyze genetic hypotheses
- j. Predict possible combinations of alleles in a zygote from the genetic information of the parents
- k. Students will know the role of chromosomes in determining an individual's sex

## 3. Evolution and Biodiversity

- a. Summarize the major concepts of natural selection
- b. Explain how natural selection provides an explanation for the fossil record of ancient forms, as well as the striking molecular similarities observed among diverse species of living things
- c. Describe how natural selection provides the mechanisms for evolution
- d. Explain how diversity within a species increases the chances of its survival
- e. Illustrate how genetic variation is preserved or eliminated from a population through evolution resulting in biodiversity
- f. Explain how natural selection acts on individuals, but it is populations that evolve. Relate genetic mutations and genetic variety produced by sexual reproduction to diversity within a given population
- g. Describe each of the 6 kingdoms with respect to cell type, complexity, habitat, benefits/harms to humans, nutrition mode, examples, etc.
- h. Compare Linnaean classification to modern classification
- i. Describe the overall proposed evolutionary order in which the kingdoms appeared on earth and discuss the basis for these ideas
- j. Use a phylogenetic tree to identify the evolutionary relationships among different groups of organisms

## 4. Ecology

- a. Explain how birth, death, immigration, and emigration influence population size
- b. Analyze changes in population size and biodiversity (speciation and extinction) that result from natural causes and human disturbances
- c. Use a food web to identify and distinguish producers, consumers, and decomposers, and explain the transfer of energy through trophic levels. Predict what would be the result if one or more components of the food web were removed
- d. Describe how community interactions among organisms (predation, parasitism, competition, commensalisms, and mutualism) affect communities
- e. Explain how populations are affected by limiting factors (including density dependent, density independent, abiotic, and biotic factors)
- f. Distinguish between primary and secondary succession within an ecosystem

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- g. Explain how water, carbon, and nitrogen cycle between abiotic resources and organic matter in an ecosystem, and how oxygen cycles through photosynthesis and respiration

## Investigation and Experimentation

1. Make observations, raise questions and formulate hypotheses
  - a. Observe the world from a scientific perspective
  - b. Pose questions and form hypotheses based on personal observations, scientific articles, experiments and knowledge
  - c. Read, interpret, and examine credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories
  - d. Recognize that science is a progressive endeavor that reevaluates and extends what is already accepted
2. Design and conduct scientific investigations.
  - a. Articulate and explain the major concepts being investigated and the purpose of an investigation
  - b. Select required materials, equipment, and conditions for conducting an experiment
  - c. Identify independent and dependent variables
  - d. Write procedures that are clear and replicable
  - e. Employ appropriate methods for accurately and consistently making observations, making and recording measurements at appropriate levels of precision and collecting evidence or data in an organized way
  - f. Properly use instruments, equipment, and materials (scales, balances, meter sticks, probeware, microscopes, computers, etc...) including set up, calibration, technique, maintenance, and storage
  - g. Follow safety guidelines
3. Analyze and interpret results of scientific investigations.
  - a. Present relationships between and among variables in appropriate forms using charts, graphs, appropriate technology (graphing software) and other tools
  - b. Use mathematical operations to analyze and interpret data results
  - c. Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrollable conditions
  - d. Recognize, analyze, and evaluate alternative explanations for the same set of observations
  - e. Use results of an experiment to develop a conclusion to an investigation that addresses the initial questions and supports or refutes the stated hypothesis
  - f. State questions raised by an experiment that may require further investigation
4. Communicate and apply the results of scientific investigations.
  - a. Develop descriptions of explanations for scientific concepts that were a focus of one or more investigations

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- b. Review information, explain statistical analysis and summarize data collected and analyzed as the result of the investigation
- c. Explain diagrams and charts that represent relationships between variables
- d. Construct a reasoned argument and respond appropriately to critical comments and questions
- e. Use language and vocabulary appropriately, speak clearly and logically, and use appropriate technology and other tools to present findings
- f. Use and refine scientific models that stimulate physical processes or phenomena

### Application of Mathematical Skills

- a. Construct and use tables and graphs to interpret data sets.
- b. Solve simple algebraic expressions
- c. Perform basic statistical procedures to analyze the center and spread of data
- d. Measure with accuracy and precision (length, volume, mass, temperature, time)
- e. Convert within a unit
- f. Use common prefixes such as milli, centi, and kilo
- g. Use scientific notation, where appropriate
- h. Use ratio and proportions to solve problems
- i. Translate data into the correct units and dimensions using conversion factors and scientific notation
- j. Determine the correct number of significant figures
- k. Determine percent error from experimental and accepted values
- l. Use appropriate metric/standard international (SI) units of measurement
- m. Use the Celsius and Kelvin scales

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## Flint River Academy Biology

### Year Curriculum Map

Year Curriculum Map											
1 <sup>st</sup> Nine Weeks			2 <sup>nd</sup> Nine Weeks			3 <sup>rd</sup> Nine Weeks			4 <sup>th</sup> Nine Weeks		
Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12
Introduction of Biology and Scientific Method	Biochemistry	Cell Structure and Function	Cell Transport	Cell Cycle and Asexual Reproduction	Cell Cycle and Sexual Reproduction	Mendelian Genetics	Taxonomy	Natural Selection	Ecology	Populations	Viruses and Bacteria
3 weeks	5 weeks	3 weeks	3 weeks	4 weeks	2 weeks	4 weeks	3 weeks	2 weeks	2 weeks	2 weeks	3 weeks

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