

## Rumson-Fair Haven Regional High School

**Course:** *Biology Honors*

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### **Section I: Course Description**

*Biology Honors* is an activity-driven course that covers the same basic topics as Biology but in greater depth and a faster pace. Out-of-class preparation is a vital component of this course along with the students' ability to apply their critical thinking skills. Instruction will include inquiry-based learning along with traditional learning styles—these types of lessons require students to challenge themselves to discover applications of the topics. The curriculum emphasizes genetics, evolution, cell biology, ecology, energetics, and basic chemistry. The rigorous nature of the material being taught at this level requires students to be both highly motivated and self-directed. Since this course goes into greater detail than Biology, it will be reflected in the nature of the assessments and will also require students to acquire a greater understanding of the concepts to be successful. Students are expected to conduct an independent research project as the course progresses throughout the year. Labs will run once every four-day schedule rotation.

### **Section II: NJSL: New Jersey Student Learning Standards/Learning Objectives:**

1. **2020 New Jersey Student Learning Standards – Science:**
  - “Scientific and technological advances have proliferated and now permeate most aspects of life in the 21st century. It is increasingly important that all members of our society develop an understanding of scientific and engineering concepts and processes. Learning how to construct scientific explanations and how to design evidence-based solutions provides students with tools to think critically about personal and societal issues and needs. Students can then contribute meaningfully to decision-making processes, such as discussions about climate change, new approaches to health care, and innovative solutions to local and global problems.”
2. **2023 New Jersey Student Learning Standards – Mathematics:**

“A New Jersey education in Mathematics builds quantitatively and analytically literate citizens prepared to meet the demands of college and career, and to engage productively in an information-driven society; ...[A] high-quality mathematics education [] fosters a population that...leverages data in decision-making and as a lens for discussing, analyzing, and responding to practical questions, persists to make sense of and model problems arising in everyday life, society, and the workplace, thinks critically and strategically to assess quantitative relationships and to solutions to complex problems, employs precise reasoning and constructs viable arguments to deduce conclusions, recognize false statements and assess peers' reasoning, interprets, evaluates and critiques the mathematics embedded in social, scientific and commercial systems, as well as the claims made in the private and public sectors, communicates precisely when conveying, representing, and justifying both qualitative and quantitative perspectives.”
3. **2023 New Jersey Student Learning Standards English Language Arts:**

A New Jersey education in English Language Arts builds readers, writers, and communicators prepared to meet the demands of college and career and to engage as productive American citizens with global responsibilities. ...Students will [d]evelop the necessary skills in reading, writing, speaking, and listening that are the foundations for creative and purposeful expression in language[; r]ead rich, challenging texts that build their knowledge of the world, grow their confidence and identities as readers, and develop critical thinking skills and vocabulary necessary for long-term success[; e]ngage in regular, meaningful, writing authentic tasks, exploring valued topics, writing for impact and expression, and sharing their work with others (including authentic audiences)[; l]everage complex texts and digital media to develop comprehension, active listening, and discussion skills[; g]round daily writing and discussion in evidence, fostering an ability to read critically, build arguments, cite evidence, and communicate ideas to contribute meaningfully as productive citizens[; e]valuate the reliability, credibility, and perspective of authors and speakers across all forms of media[; e]xpress ideas and knowledge through a variety of modalities and media, and serve as effective communicators who purposefully read, write, and speak across multiple disciplines [and l]earn to persist in reading complex texts, establishing lifelong habits to read voluntarily for pleasure, for further education, for information on public policy, and for advancement in the workplace.
4. **Standard 8.1 (Computer Science) and 8.2 (Design Thinking) of the 2020 NJSL:**
  - “The ‘Intent and Spirit of the Computer Science and Design Thinking Standards’ is to focus on deep understanding of concepts that enable students to think critically and systematically about leveraging technology to solve local and global issues. Authentic learning experiences that enable students to apply content knowledge, integrate concepts across disciplines, develop computational thinking skills, acquire and incorporate varied perspectives, and communicate with diverse audiences about the use and effects of computing prepares New Jersey students for college and careers.”

5. **Standard 9.4 (Life Literacies and Key Skills) of the 2020 NJSL:**
  - o “This standard outlines key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy that are critical for students to develop to live and work in an interconnected global economy.”
    - \***Climate Change:** The state of New Jersey has mandated instruction in, “Climate Change across all content areas, leveraging the passion students have shown for this critical issue and providing them opportunities to develop a deep understanding of the science behind the changes and to explore the solutions our world desperately needs.”
6. **\*Amistad Law: N.J.S.A. 18A 52:16A-88:**
  - o The inclusion of lessons and resources/texts dealing with the African slave trade, slavery in America, the vestiges of slavery in this country and the contributions of African-Americans to our society will be implemented in English and Social Studies courses in accordance with state law: “Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.”
7. **\*Holocaust Law: N.J.S.A. 18A 35-28:**
  - o The inclusion of lessons and resources/texts that enable pupils to identify and analyze applicable theories concerning human nature and behavior; to understand that genocide is a consequence of prejudice and discrimination; and to understand that issues of moral dilemma and conscience have a profound impact on life will be implemented in English and Social Studies courses in accordance with state law: “Every board of education shall include instruction on the Holocaust and genocides in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.”
8. **\*LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35:**
  - o A transformative approach to the inclusion of lessons and resources/texts on the contributions and issues concerning the LGBTQ+ population and people with disabilities will be implemented across all core subjects in accordance with state law: “A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district’s implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36). A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.”
9. **\*Asian American and Pacific Islanders Legislation: N.J.S.A 4021/A6100:**
  - o The inclusion of lessons and resources/texts on the history and contributions of Asian Americans and Pacific Islanders, will enable New Jersey’s schools to provide a curriculum that reflects the diversity of our state. In accordance with state law: “A board of education shall include instruction on the history and contributions of Asian Americans and Pacific Islanders in an appropriate place in the curriculum of students in grades kindergarten through as part of the school district’s implementation of the New Jersey Student Learning Standards in Social Studies.”
10. Acquisition/development/refinement of the higher-order critical thinking skills aligned with the *Revised Bloom’s Taxonomy of Cognitive Objectives*

### **Section III: Curriculum Modifications**

The *Biology Honors* curriculum is subject to case-by-case modifications to support/advance the needs of all students, including special education students, English language learners, gifted students and those at risk of school failure. These modifications are based on Individualized Learning Programs (IEPs), recommendations made by the district’s English Language Learners (ELL) coordinator, feedback from members of the Intervention & Referral Services Team (*I&RS*) for at-risk students, and 504 Plans.

Coursework and assessments will be modified on an individual basis for students when necessary. Modifications may include but are not limited to those outlined on the [Modifications/Accommodations for Science Courses](#) chart.

### **Section IV: Preparation for Standardized Testing**

Instruction in *Biology Honors* is aligned with the requirements of state and national standardized assessments, including the *NJGPA*, *NJSLA*, the *ACT*, the *PSAT* and the *SAT*.

### **Section V: Curriculum Pacing Guide**

Curriculum Pacing Guide	
Course Title: <i>Biology Honors</i>	Grade Level: 11th
Unit I: Foundations	Weeks 1-8
Unit II: Cell Biology	Weeks 9-20
Unit III: Mechanisms of Heredity & Biotechnology	Weeks 21-31
Unit IV: Evolution: Products & Patterns of Change	Weeks 32-36
Unit V: Ecology	Weeks 37-40

### **Section VI: Primary Texts and Year-Long Instructional Resources**

The following texts and instructional resources are employed for all students in *Biology Honors*:

- Google Classroom
- *Common Sense Education* ([www.commonsense.org](http://www.commonsense.org))
- YouTube
- Pivot Interactives
- EdPuzzle
- Kahoot
- Quizizz
- [HHMI Biointeractive](#)
- [OpenStax](#)
- RFH Biology Lib guides
- Supplemental Text- [BSCS Human Approach \(2016\)](#), Kendall Hunt Publishing (2016)
- Supplemental Text- Postlethwait, John H. and Janet L. Hopson. [Modern Biology](#). Holt, Rinehart, and Winston, Inc., New York, 2006.
- Biological Sciences Curriculum Study. [\\*Biology: A Human Approach](#). Kendall/Hunt Publishing Company, Iowa, 1997. (\*subject to change)
- Suggested videos:
  - Planet Earth Series (for biomes and evolution)
  - Life Series (for biomes and evolution)
  - Of Human Origins
  - Mysteries of Mankind
  - Nova- The Universe Within
  - The Rotten World Around Us
  - Darwin's Dangerous Idea
  - Race for the Double Helix
  - Walking with Cavemen/Walking with Monsters
  - Monsters Inside Me
  - GATTACA

- Extraordinary Measures
- Cracking the Code
- The Immortal Life of Henrietta Lacks

### **Section VII: Grading Formula and Assessment Modes**

Marking period grades in *Biology Honors* are determined via a percentage weighting model. The specific grading categories and weightings of each will be determined before the start of each academic year and will be published in the posted/distributed course syllabi.

Assessments in *Biology Honors* vary greatly in format, scope/content/skills assessed, and alternative assessments, differentiation in assessments and choice will be incorporated as appropriate. Preliminary assessments of each format will be used as benchmarks and summative assessments will be created/revised collaboratively each year and planned by members of the *Dance* instructional team to inform future learning and to measure student growth.

### **Section VIII: Unit Templates**

The following unit templates have been established for the *Biology Honors* curriculum by the *Biology Honors* instructional team:

<b>Unit I: Foundations</b>	
<b>Unit Summary</b>	
<p>In this unit, students will be able to develop proper techniques for working in a laboratory setting including proper safety techniques, use of appropriate laboratory equipment, and gain a working knowledge of the metric system. Students will be introduced to the components of the scientific method and through firsthand experimentation they will demonstrate their ability to incorporate the scientific method into experimental design. Students will conduct an inquiry-based experiment in which they will design an experiment, analyze data, and present their findings. Students will understand the structure and function of the four organic molecules (carbohydrates, proteins, lipids, nucleic acids) and investigate how these molecules are important for living organisms. Students will begin to understand how reactions in cells are controlled through direct observation of enzyme properties. Students will understand the properties of water that make it essential for life processes.</p>	
<b>Standards/Core Ideas/Performance Expectations/Progress Indicators</b>	
<p>The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in <i>Biology Honors</i>:</p> <ul style="list-style-type: none"> <li>● 2020 <i>New Jersey Student Learning Standards: Science</i> <ul style="list-style-type: none"> <li>○ HS-LS2.1 &amp; 7, HS-LS4.1, 5-6</li> <li>○ HS-ESS1.2, HS-ESS2.4, 6-7, HS-ESS3-1</li> <li>○ HS-ETS1.4</li> </ul> </li> <li>● 2023 <i>New Jersey Student Learning Standards: Mathematics</i> <ul style="list-style-type: none"> <li>○ N.Q.A.1, S.ID.A.1, S.ID.C.9, S.IC.B.6</li> </ul> </li> <li>● 2023 <i>New Jersey Student Learning Standards: English Language Arts 11-12</i> <ul style="list-style-type: none"> <li>○ RI.CR.11–12.1., RI.CI.11–12.2., W.WR.11-12.5, W.WP.11–12.4, W.SE.11–12.6, SL.PI.11-12.4</li> </ul> </li> <li>● 2020 <i>New Jersey Student Learning Standards: Computer Science and Design Thinking</i> <ul style="list-style-type: none"> <li>○ 8.1.12.DA.5</li> <li>○ 8.2.12.ED.1, 8.2.12.ITH.1</li> </ul> </li> <li>● 2020 <i>New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills</i> <ul style="list-style-type: none"> <li>○ 9.4.12.CI.1-2, 9.4.12.CT.2, 9.4.12.TL.2, 9.4.12.IML.2</li> </ul> </li> </ul>	
<b>Unit Essential Questions</b>	<b>Unit Enduring Understandings</b>
<ul style="list-style-type: none"> <li>● How can science be utilized and applied to rationalize discovery?</li> <li>● How can the scientific process be used to investigate natural phenomena?</li> <li>● What constitutes useful scientific evidence? (Common Sense Media)*</li> <li>● How is scientific knowledge constructed?</li> <li>● How does structure relate to</li> </ul>	<ul style="list-style-type: none"> <li>● Science can be utilized and applied in various ways to rationalize discovery through the scientific method, by using rigorous, evidence-based approaches, by the use of advanced technologies to gather data, and through collaboration with fellow scientists across multiple disciplines.</li> <li>● The scientific process is a systematic way of investigating natural phenomena.</li> <li>● Scientific evidence should be relevant, use sound experimental design, be reproducible, be precise and accurate, and undergo peer review to enhance credibility. (Common Sense Media)*</li> <li>● Scientific knowledge is constructed through a repetitive process</li> </ul>

<p>function in living systems from the organismal to the cellular level?</p> <ul style="list-style-type: none"> <li>• How do the variations of biological molecules influence the structure and function of organism dynamics?</li> <li>• How are the properties of water essential for life?</li> <li>• What is the role of enzymes in biological processes?</li> <li>• How do environmental factors affect biological processes?</li> </ul>	<p>that involves observation, experimentation, analysis, and validation.</p> <ul style="list-style-type: none"> <li>• The form and organization of biological components are directly related to their specific roles and activities within an organism.</li> <li>• Variations in biological molecules, such as carbohydrates, proteins, nucleic acids, and lipids, play a crucial role in influencing the structure and function of organism dynamics.</li> <li>• Water is essential for life on Earth, playing a critical role in supporting various biological processes and maintaining the stability of living organisms.</li> <li>• Enzymes serve as catalysts for living organisms.</li> <li>• Environmental factors can have a profound impact on biological processes at various levels of organization, influencing the behavior, development, and survival of living organisms.</li> </ul>
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### Evidence of Learning

<p><b>Formative &amp; Alternative Assessments:</b></p> <ul style="list-style-type: none"> <li>• Lab safety review</li> <li>• Metric system and measurement review</li> <li>• Scientific method &amp; graphing review</li> <li>• Modeling Molecules Activity</li> <li>• Pattern Matching Activity</li> <li>• Topic Study Guides</li> <li>• Kahoot/Quizizz Review</li> <li>• Experimental Design Observational Study Activity</li> <li>• Identifying Macromolecules in Food Lab</li> <li>• Measurement Lab</li> <li>• Properties of Water Lab</li> <li>• Enzyme Lab</li> <li>• Individual student check-ins with teacher</li> </ul>	<p><b>Benchmark &amp; Summative Assessments:</b></p> <ul style="list-style-type: none"> <li>• “Thinking As A Scientist” Test (Benchmark)</li> <li>• Animal Inquiry Activity Poster and Presentation</li> <li>• Properties of Water Lab Assessment (Benchmark)</li> <li>• Enzyme Lab CER</li> <li>• Chemistry of Life Quiz</li> <li>• Biochemistry Test</li> <li>• Summative Assessment #1</li> </ul>	<p><b>Resources Needed:</b></p> <ul style="list-style-type: none"> <li>• Common Sense Media - Clicks for Cash Lesson (appropriate resources)*</li> <li>• Respective materials for each cooperative and lab activity</li> <li>• OpenStax Biology Textbook - Sections 2.1-2.3</li> <li>• Trendy Science Teacher Resources</li> <li>• Biology Corner Resources</li> <li>• POGIL</li> <li>• San Diego Zoo Animal Cameras <a href="https://zoo.sandiegozoo.org/live-cameras">https://zoo.sandiegozoo.org/live-cameras</a></li> <li>• Kahoot</li> </ul>
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## Unit II: Cell Biology

### Unit Summary

In this unit, students will have a basic understanding of cell structure and function in terms of how organelles carry out specific tasks. They will understand cell theory and how cells maintain homeostasis, obtain and utilize energy, and how they reproduce. Students will distinguish between active and passive transport through the plasma membrane and direct experimentation will observe how tonicity affects the flow of water into and out of the cell. Students will be able to explain how energy enters the living world, how it is stored, and how it is made available for the metabolic needs of the cell, through the study of cellular respiration and photosynthesis. Students will be able to describe the relationship between organisms with respect to the way energy and matter flow through communities. Students will describe the process of cell division and how the disruption of cell division is connected to cancer. Students will also design a research project that will be completed over 6-8 weeks. Students will present their research in class and some of the projects will be selected to enter the Jersey Shore Science Fair at Stockton University.

### Standards/Core Ideas/Performance Expectations/Progress Indicators

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *Biology Honors*:

- *2020 New Jersey Student Learning Standards: Science*
  - HS-LS1.2-7, HS-LS2.3-5
  - HS-ETS1.4
- *2023 New Jersey Student Learning Standards: Mathematics*
  - N.Q.A.1, S.ID.C.9, S.IC.B.6
- *2023 New Jersey Student Learning Standards: English Language Arts 11-12*

<ul style="list-style-type: none"> <li>○ RI.CR.11–12.1., RI.CI.11–12.2., W.WR.11-12.5, W.WP.11–12.4, W.SE.11–12.6, SL.PI.11-12.4</li> <li>● <i>2020 New Jersey Student Learning Standards: Computer Science and Design Thinking</i> <ul style="list-style-type: none"> <li>○ 8.1.12.DA.5</li> <li>○ 8.2.12.ED.1, 8.2.12.ITH.1</li> </ul> </li> <li>● <i>2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills</i> <ul style="list-style-type: none"> <li>○ 9.4.12.CI.1-2, 9.4.12.CT.2, 9.4.12.TL.2, 9.4.12.IML.2</li> </ul> </li> </ul>		
Unit Essential Questions	Unit Enduring Understandings	
<ul style="list-style-type: none"> <li>● How do prokaryotic and eukaryotic cells differ?</li> <li>● How do cell structures enable cells to carry out life processes?</li> <li>● How does a cell maintain homeostasis both in itself and as a multicellular organism?</li> <li>● How do cells regulate the movement of substances?</li> <li>● How does the tonicity of an environment affect living organisms?</li> <li>● How is matter transferred and energy transferred/transformed in living systems?</li> <li>● How and why do cells divide?</li> <li>● How does the disruption of cell division lead to cancer?</li> </ul>	<ul style="list-style-type: none"> <li>● Prokaryotic and eukaryotic cells differ in structure, complexity, and organization.</li> <li>● By having specialized structures, cells can carry out processes such as nutrient uptake, energy production, protein synthesis, waste removal, communication, and reproduction.</li> <li>● Cells maintain homeostasis by regulating their internal environment to keep it stable and balanced. They do this through processes such as the intake of nutrients, elimination of waste, and maintaining the right balance of ions and other molecules.</li> <li>● Cells regulate the movement of substances through various processes, such as passive and active transport mechanisms.</li> <li>● The tonicity of the environment is crucial for maintaining cellular homeostasis and ensuring proper cell function. Cells need to regulate the movement of water and solutes to prevent swelling or shrinking, which can disrupt cellular processes.</li> <li>● The transfer and transformation of matter and energy in living systems are essential for growth, maintenance, reproduction, and survival. These processes, including cellular respiration and photosynthesis, enable organisms to respond to their environment, adapt to changing conditions, and carry out the diverse functions necessary for life.</li> <li>● Cells divide through the process of cell division to support growth, repair, maintenance, and reproduction in living organisms. This process ensures that the genetic material is accurately replicated and distributed to daughter cells.</li> <li>● Disruptions in cell division can promote the development of cancer by enabling uncontrolled cell proliferation, genetic instability, tumor formation, metastasis, immune evasion, and resistance to cell death.</li> </ul>	
Evidence of Learning		
<b>Formative &amp; Alternative Assessments:</b> <ul style="list-style-type: none"> <li>● Cell Theory Timeline</li> <li>● Organelle Malfunction Research</li> <li>● Cell Defense Interactive</li> <li>● Water Bear Activity</li> <li>● Food Web Activity</li> <li>● ATP Activity</li> <li>● Leaf Pigments Activity</li> <li>● The Immortal Life of Henrietta Lacks Podcast and Movie Questions</li> <li>● Topic Study Guides</li> <li>● Kahoot/Quizizz Review</li> <li>● Campaign for an Organelle Activity</li> <li>● Microscope Activity</li> <li>● Limits on Cell Size Lab</li> <li>● Bubble Lab</li> <li>● Stop Motion Cell Transport Video</li> <li>● Biogeochemical Cycle Poster Presentation</li> </ul>	<b>Benchmark &amp; Summative Assessments:</b> <ul style="list-style-type: none"> <li>● Cells and Microscopes Quiz</li> <li>● Cell Transport Quiz</li> <li>● Cellular Structure and Function Test</li> <li>● Cellular Respiration Quiz</li> <li>● Energy Transfer Test</li> <li>● Cell Cycle and Mitosis Quiz</li> </ul>	<b>Resources Needed:</b> <ul style="list-style-type: none"> <li>● Respective materials for each cooperative and lab activity</li> <li>● OpenStax Biology Textbook - Sections 3.1-6.4, 20.1-20.2</li> <li>● Pivot Interactives</li> <li>● Trendy Science Teacher Resources</li> <li>● Biology Corner Resources</li> <li>● POGIL</li> <li>● Kahoot</li> </ul>

<ul style="list-style-type: none"> <li>• Muscle Fatigue Lab</li> <li>• Photosynthesis Lab</li> <li>• Individual student check-in with teacher</li> </ul>		
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### Unit III: Mechanisms of Heredity & Biotechnology

#### Unit Summary

In this unit, students will understand how genetic continuity is maintained from one generation to the next. They will understand the significance of DNA as it relates to carrying genetic information and how this chemical information is transcribed into RNA and then translated by the cell to make proteins that regulate the activities of cells. Students will also understand the basic patterns of inheritance and will be able to solve genetic crosses. Students will be able to explain some of the modern-day applications of genetics as they relate to biotechnology and understand its implications for humankind. Students will analyze the data from their research projects and explain their results based on this analysis. Students will then conclude their research projects with a presentation in which they will create a digital poster to summarize their research.

#### Standards/Core Ideas/Performance Expectations/Progress Indicators

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *Biology Honors*:

- *2020 New Jersey Student Learning Standards: Science*
  - HS-LS1-1, HS-LS3.1- 3, HS-ETS1.4
- *2023 New Jersey Student Learning Standards: Mathematics*
  - N.Q.A.1, S.ID.C.9, S.IC.B.6
- *2023 New Jersey Student Learning Standards: English Language Arts 11-12*
  - RI.CR.11–12.1., RI.CI.11–12.2., W.WR.11-12.5, W.WP.11–12.4, W.SE.11–12.6, SL.PI.11-12.4
- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.DA.5
  - 8.2.12.ED.1, 8.2.12.ITH.1, 8.2.12.EC.3
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills*
  - 9.4.12.CI.1-2, 9.4.12.CT.2, 9.4.12.TL.2, 9.4.12.IML.2, 9.4.12.DC.4

#### Unit Essential Questions

- How is genetic information passed through generations?
- What are genes and which important biological molecule is contained within a gene?
- How is the fidelity of genetic information contained in DNA maintained?
- How does the structure of DNA function in inheritance?
- What is the central dogma of biology?
- How does the understanding and manipulation of genetics affect the quality of human life?
- How do mutations alter the genetic code?
- How are biotechnologies used to study and alter genes?
- \*What are some of the ethical, social, legal, and public policy issues associated with genetics and biotechnology?

#### Unit Enduring Understandings

- Hereditary information is stored in DNA and is organized into genes and chromosomes. A cell's DNA replicates before cell division. In sexual reproduction, genes are passed to offspring through reproductive cells, which are created during the process of meiosis.
- Genes are the basic unit of heredity and are composed of DNA.
- There are several mechanisms to ensure the accurate transmission of genetic material from one generation to the next including proofreading, DNA repair, and checkpoint mechanisms.
- DNA's double helix structure provides a stable and efficient way to store and replicate genetic information.
- The central dogma of biology describes the flow of genetic information from DNA to RNA to protein. It emphasizes the sequential process of DNA replication, transcription, and translation that are essential for gene expression and protein synthesis in living organisms.
- Mutations can alter the genetic code by changing the nucleotide bases in DNA. The effects of mutations on gene expression and protein function depend on the type, location, and consequences of the mutation in the genetic code.
- Biotechnologies provide powerful tools for studying and altering genes by enabling precise manipulation, analysis, and engineering of genetic material.
- \*There is a wide array of ethical, legal, sociological, and public policy issues that continue to arise as knowledge of biotechnology and genetics advances.

Evidence of Learning		
<b>Formative &amp; Alternative Assessments:</b> <ul style="list-style-type: none"> <li>● Karyotyping Activity</li> <li>● Genetics Practice Problems</li> <li>● Investigating Inheritance</li> <li>● Extraordinary Measures Movie Questions</li> <li>● DNA Structure Activity</li> <li>● Protein Synthesis Activity</li> <li>● Gattaca Video Questions</li> <li>● Biotechnology Stations</li> <li>● Topic Study Guides</li> <li>● Kahoot/Quizizz Review</li> <li>● Meiosis SRY Case</li> <li>● Monster Mates and Babies Activity</li> <li>● The Blue Fugates of Troublesome Creek Case Study</li> <li>● DNA Extraction Activity</li> <li>● DNA Replication Stop Motion Video</li> <li>● CHNOPS Monster Lab</li> <li>● DNA to Disease Activity</li> <li>● Shark Attack Electrophoresis Lab</li> <li>● Individual student check-ins with teacher</li> </ul>	<b>Benchmark &amp; Summative Assessments:</b> <ul style="list-style-type: none"> <li>● Cell Division Test</li> <li>● Mendelian Genetics Quiz</li> <li>● Heredity Unit Test</li> <li>● DNA Quiz</li> <li>● Protein Synthesis Quiz</li> <li>● Molecular Genetics Unit Test</li> <li>● Summative Assessment #2</li> </ul>	<b>Resources Needed:</b> <ul style="list-style-type: none"> <li>● Respective materials for each cooperative and lab activity</li> <li>● OpenStax Biology Textbook - Sections 7.1-10.3</li> <li>● Pivot Interactives</li> <li>● Trendy Science Teacher Resources</li> <li>● Biology Corner Resources</li> <li>● POGIL</li> <li>● HHMI</li> <li>● Kahoot</li> <li>● Gattaca movie</li> <li>● Extraordinary Measures movie</li> </ul>

Unit IV: Evolution: Products and Patterns of Change	
<b>Unit Summary</b>	
<p>In this unit, students will understand that organisms change over time and will relate certain aspects to changes in the earth over time. Students will understand how the process of Darwin's theory of natural selection and the influence of selective pressure lead to speciation and ultimately to the range of biodiversity that we experience on planet Earth. Students will also understand that there is a direct relationship between genetic variation and the evolution of new species. Students will understand the Hardy-Weinberg Equilibrium and how to use it to predict allele frequencies in the population. Through activities, students will understand how organisms are classified using the modern system of taxonomy. The unit will culminate in student projects in which they will create novel species that will demonstrate an understanding of the major tenets of natural selection.</p>	
<b>Standards/Core Ideas/Performance Expectations/Progress Indicators</b>	
<p>The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in <i>Biology Honors</i>:</p> <ul style="list-style-type: none"> <li>● <i>2020 New Jersey Student Learning Standards: Science</i> <ul style="list-style-type: none"> <li>○ HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS4-4, HS-LS4-5, HS-LS4-6</li> </ul> </li> <li>● <i>2023 New Jersey Student Learning Standards: Mathematics</i> <ul style="list-style-type: none"> <li>○ N.Q.A.1, S.ID.A.1, S.ID.C.9, S.IC.B.6</li> </ul> </li> <li>● <i>2023 New Jersey Student Learning Standards: English Language Arts 11-12</i> <ul style="list-style-type: none"> <li>○ RI.CR.11–12.1., RI.CI.11–12.2., W.WR.11-12.5, W.WP.11–12.4, W.SE.11–12.6, SL.PI.11-12.4</li> </ul> </li> <li>● <i>2020 New Jersey Student Learning Standards: Computer Science and Design Thinking</i> <ul style="list-style-type: none"> <li>○ 8.1.12.1C.1, 8.2.12.ITH.1-3, 8.2.12.ETW.1, 8.2.12.ETW.4, 8.2.12.EC.1</li> </ul> </li> <li>● <i>2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills</i> <ul style="list-style-type: none"> <li>○ 9.4.12.CT.1-4, 9.4.12.IML.2, 7-9</li> </ul> </li> </ul>	
<b>Unit Essential Questions</b>	<b>Unit Enduring Understandings</b>

<ul style="list-style-type: none"> <li>• How does natural selection encourage inter and intra-specific diversity over time?</li> <li>• What are the supporting factors of scientific evidence to support the theory of evolution by natural selection?</li> <li>• How do different branches of science contribute evidence to support the theory of evolution?</li> <li>• How do selective pressures from a changing Earth promote the evolution of a species?</li> <li>• What is evolution and how does it occur?</li> <li>• How do we use evidence from multiple sources to understand the evolutionary history of life on Earth?</li> <li>• What are the mechanisms that drive the evolution of populations over time?</li> <li>• How does understanding evolution contribute to our knowledge of modern biology and medicine?</li> </ul>	<ul style="list-style-type: none"> <li>• The diversity and changing of life forms over many generations is the result of natural selection, in which organisms with advantageous traits survive, reproduce, and pass those traits to offspring. Species alive today have evolved from ancient common ancestors.</li> <li>• Fossil records, vestigial structures, common ancestry, Homologous Structures, Embryology, and DNA coding can all be utilized to show the descent with modification of a species.</li> <li>• Evolution is a process that happens over a long period and affects many different organisms of the evolution of modern-day species.</li> <li>• Stressors for reproductive drive, survivability, and even a changing climate can create conditions suitable for the evolutionary process.</li> <li>• Evolution is a fundamental and unifying concept in biology that explains the diversity of life on Earth.</li> <li>• Natural selection is a key mechanism of evolution that results in the adaptation of organisms to their environment.</li> <li>• Genetic variation within a population is essential for the process of evolution.</li> <li>• Evolutionary processes can be observed and studied in both the fossil record and in living organisms.</li> <li>• Understanding evolution has practical applications in fields such as medicine, agriculture, and conservation.</li> </ul>
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#### Evidence of Learning

<p><b>Formative &amp; Alternative Assessments:</b></p> <ul style="list-style-type: none"> <li>• Planet Earth Writing Assignment</li> <li>• Population Genetics Practice</li> <li>• Bloodsucker Speciation</li> <li>• Convergent/ Divergent Activity</li> <li>• Classification Practice</li> <li>• Evolution Evidence Board</li> <li>• Peppered Moth Activity</li> <li>• Stick Bug Lab</li> <li>• Hardy-Weinberg Population Activity</li> <li>• Island Biogeography Virtual Simulation Lab</li> <li>• Anole Lizard Case Study</li> <li>• Candy Phylogeny</li> <li>• Individual student check-ins with teacher</li> </ul>	<p><b>Benchmark &amp; Summative Assessments:</b></p> <ul style="list-style-type: none"> <li>• Classification Quiz</li> <li>• Natural Selection Unit Assessment</li> </ul>	<p><b>Resources Needed:</b></p> <ul style="list-style-type: none"> <li>• Respective materials for each cooperative and lab activity</li> <li>• OpenStax Biology Textbook - Sections 18.1-20.3</li> <li>• Pivot Interactives</li> <li>• Trendy Science Teacher Resources</li> <li>• Biology Corner Resources</li> <li>• POGIL</li> <li>• Planet Earth Videos</li> <li>• HHMI's Making of a Theory Video</li> <li>• Kahoot</li> </ul>
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### Unit V: Ecology

#### Unit Summary

In this unit, students will understand that all living things are interdependent with other organisms and that organisms interact with one another on many levels. Students will realize that much of the interdependence of organisms is based on the need for energy as it flows through ecosystems. Students will accomplish the above goals by creating food webs based on various ecosystems. They will also appreciate that there is a delicate balance in an ecosystem that must be maintained for an ecosystem to remain viable. This will be demonstrated by an activity where students observe how small changes in the environment may have overreaching effects on an entire ecosystem. They will be able to explain the impact of humans on the environment and explain the role of human behavior in maintaining the integrity of the biosphere. The effects of Climate Change will be discussed and examined. Through the use of the *Planet Earth and Life* video series, students will gain an appreciation of the different biomes around the world.

### Standards/Core Ideas/Performance Expectations/Progress Indicators

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *Biology Honors*:

- 2020 *New Jersey Student Learning Standards: Science*
  - HS-ESS2-1, HS-ESS2-2, HS-ESS2-3, HS-ESS2-4, HS-ESS2-6, HS-ESS2-7
- 2023 *New Jersey Student Learning Standards: Mathematics*
  - N.Q.A.1, A.CED.A.1&2, S.ID.A.1, S.ID.C.9., S.IC.A.1., S.IC.B.6, S.CP.B.6
- 2023 *New Jersey Student Learning Standards: English Language Arts 11-12*
  - RI.CR.11–12.1., RI.CI.11–12.2., W.WR.11-12.5, W.WP.11–12.4, W.SE.11–12.6, SL.PI.11-12.4
- 2020 *New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - HS-LS2-7, HS-ESS3-1, HS-LS4.4-6, HS-ESS1.2, HS-ESS3.1, 3-4, HS-ETS1.3-4
- 2020 *New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.4.12.CT.3, 9.4.12.GCA.1, 9.4.12.IML.2, 9.4.12.IML.5, 9.4.12.IML.7, 9.4.12.IML.8

#### Unit Essential Questions

- What are the relationships between organisms and their environments?
- How do energy and matter flow through ecosystems?
- How do ecosystems change over time?
- \*What are the impacts of human activities, including climate change, on ecosystems and biodiversity?
- \*How do ecosystems provide services and benefits to humans?

#### Unit Enduring Understandings

- Organisms interact with both biotic (living) and abiotic (non-living) components of their environment. These interactions include relationships like predation, competition, mutualism, commensalism, and parasitism, which influence the structure and dynamics of ecosystems.
- Energy flows through ecosystems in a one-way stream, from primary producers (autotrophs) to various consumers (herbivores, carnivores, omnivores) and finally to decomposers. Matter, in contrast, cycles within ecosystems through biogeochemical cycles such as the carbon, nitrogen, and water cycles, ensuring the continuous availability of essential nutrients.
- Ecosystems change over time through ecological succession, a process where different communities of organisms replace one another in a relatively predictable sequence following a disturbance or initial colonization. Both natural disturbances (e.g., fires, floods) and human activities (e.g., deforestation, urbanization) can drive these changes.
- \*Human activities, such as pollution, habitat destruction, overexploitation, introduction of invasive species, and climate change, can significantly harm ecosystems and reduce biodiversity. These impacts can lead to habitat loss, species extinction, and degradation of ecosystem services, necessitating conservation and sustainable practices to mitigate these effects.
- \*Ecosystems provide a variety of services essential to human well-being, including provisioning services (e.g., food, water), regulating services (e.g., climate regulation, water purification), supporting services (e.g., nutrient cycling, soil formation), and cultural services (e.g., recreational, spiritual). Healthy ecosystems enhance these services, which support economic activities and improve quality of life.

#### Evidence of Learning

##### Formative & Alternative Assessments:

- \*Nature Journaling
- Kahoot Quizzes
- EdPuzzle Reviews
- Study Guides
- Activity Logs
- Calculating Biodiversity Samples
- Population Assessment Activity
- Carrying Capacity
- Field Sampling Practice
- Calculating Biodiversity Activity

##### Benchmark & Summative Assessments:

- Population Ecology Quiz
- Ecology Research Project
- Biomes Quiz
- Summative Assessment #3

##### Resources Needed:

- Respective materials for each cooperative and lab activity
- OpenStax Biology Textbook - Sections
- Pivot Interactives
- Trendy Science Teacher Resources
- Biology Corner Resources
- POGIL
- Field Sampling Equipment
- Kahoot
- EdPuzzle

<ul style="list-style-type: none"> <li>• Developing Non-biased Data Lab</li> <li>• Individual check-ins with teacher</li> </ul>		
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### **Section IX: Unit Reflection**

The *Biology Honors* instructional team must confer upon the completion of each instructional unit in the *Biology Honors* curriculum and rate the degrees to which the instructional units meet performance criteria established by the New Jersey Department of Education using the Unit Reflection Form. Completed unit reflection forms must be submitted to the Department Supervisor for approval upon completion of curriculum implementation with a complementing list of suggested modifications to the *Biology Honors* curriculum.

<b>Unit Reflection Form: <i>Biology Honors</i></b>			
<b>Lesson Activities:</b>	<b>Strongly</b>	<b>Moderately</b>	<b>Weakly</b>
Foster student use of technology as a tool to develop critical thinking, creativity, and innovation skills;			
Are challenging and require higher-order thinking and problem-solving skills;			
Allow for student choice;			
Provide scaffolding for acquiring targeted knowledge/skills;			
Integrate modern, global perspectives, especially those regarding diversity, genocide, global issues, and historical ones regarding racial relations;			
Integrate 21 <sup>st</sup> century skills;			
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills;			
Are varied to address different student learning styles and preferences;			
Are differentiated based on student needs;			
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process;			
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives;			
Provide opportunities for student reflection and self-assessment;			
Provide data to inform and adjust instruction to better meet the varying needs of learners.			

Writing instruction should happen across the RFH Community. Writing across the curriculum is a philosophy that advances the belief that writing is a method of learning. Since all departments are committed to helping students learn, writing must be used as a methodology to advance student learning.

Each academic discipline has its own unique conventions, formats and structures. It is the responsibility of each department to agree upon domain-specific writing praxes, model them for students, and require them to utilize them on a consistent basis. Students must understand that acceptable writing in one domain may not be acceptable writing in another area. The development of domain-specific writing skills supports the overall development of the student writer because all writing is grounded in the writing situation: audience, context, purpose, subject, and writer. Representatives from the academic disciplines must share their domain-specific writing praxes with each other, identify intersections, and determine how to address perceived gaps that limit student learning.

Students must experience writing situations that help them learn how to think creatively and critically and communicate effectively in the academic disciplines. Writing instruction, regardless of the academic discipline, must always reinforce student understanding of the writing situation. When students experience writing situations, they must study examples of domain-specific writing in order to understand how writers communicate in discipline-related contexts. This does not mean information embedded in textbooks. Domain-specific writing is writing that is used to inform and influence readers as it draws them into an established circle of discourse. Students must use these non-fiction texts to develop the close reading skills that will shape their own writing. Focused engagement with domain-specific writing should not be limited to basic reading comprehension and topical understanding. It must also include the analysis of the writing situation that is represented in the text: audience, context, purpose, subject, and writer. The close reading of well-written texts—regardless of the domain—will show students the importance of writing mechanics, diction, and syntax. The development of close reading skills will also help the students grow in terms of their ability to construct and advance independent and original claims that are well-supported by evidence. Domain-specific writing is grounded in positioning of claims and the effective use of evidence.

The final written product is important; nevertheless, the learning that results in this production must not be devalued. The writing process is not limited to the basic steps of planning, drafting, revising, and editing/proofreading. It is a complex sequence of critical and creative thinking and writing that leads to the production of a text that provides evidence of learning and understanding. Students must ultimately develop the ability to self-assess the effectiveness of their writing as a representation of the writing situation. Without the use of models that evidence learning and understanding, students will not develop the ability to self-assess their own work—the true outcome of the writing process.

### **What types of writing situations should RFH students engage in?**

RFH students should engage in writing situations across the curriculum that require them to:

- write to improve mechanical proficiency, diction usage, and syntactical sophistication
- write to narrate, describe, and reflect
- write to summarize and report
- write to classify and define
- write to explain how process leads to an outcome
- write to compare, contrast and evaluate
- write to speculate on cause and effect
- write to propose solutions and solve problems
- write to analyze

These writing situations should be positioned in a coordinated, developmental sequence that extends across the academic disciplines.

Upon Completion of Grade 12, RFH students must be ready to transition to the following writing situations:

- write to analyze
- write to persuade (argument)

The core foci of first-year college writing courses are analysis and argument. These courses orient the students to the demands and expectations of writing for the academic culture of college. At colleges/universities with carefully coordinated writing programs, students must demonstrate proficiency in analysis and argument before they transition to upper level courses that require them to engage in the following writing situation:

- write to investigate (research)