HUDSONALPHA
INSTITUTE FOR BIOTECHNOLOGY

TENNESSEE BIOLOGY ALIGNMENT RESOURCES

■ Text Resources ■ Digital Resources ■ Classroom Kits (Available from Carolina Biological)

BIO1.LS1: From Molecules to Organisms: Structures and Processes

2 Evaluate comparative models of various cell types with a focus on organic molecules that make up cellular structures.

- ■ **iCell®**
- ■ **Guidebook:** Foundational Concepts and Applications: DNA Sequencing, RNA and Protein Analyses, Recombinant DNA and Genetic Engineering, Synthetic Biology, Pharmacogenomics

3 Integrate evidence to develop a structural model of a DNA molecule. Using the model, develop and communicate an explanation for how DNA serves as a template for self-replication and encodes biological information.

- ■ **Guidebook:** Foundational Concepts and Applications: DNA Sequencing, Recombinant DNA and Genetic Engineering, Synthetic Biology, RNA and Protein Analyses, Gene Therapy and RNAi, Stem Cells; Therapeutic Approaches: Gene Therapy, Copy Number Variation, Personal Genome Analysis

4 Demonstrate how DNA sequence information is decoded through transcriptional and translational processes within the cell in order to synthesize proteins. Examine the relationship of structure and function of various types of RNA and the importance of this relationship in these processes.

- ■ **Genes and ConSEQUENCES®**

5 Research examples that demonstrate the functional variety of proteins and construct an argument based on evidence for the importance of the molecular structure to its function. Plan and carry out a controlled investigation to test predictions about factors, which should cause an effect on the structure and function of a protein.

- ■ **Enzymes to Go!™**

  (to purchase, contact edoutreach@hudsonalpha.org)

- ■ **Making Sense of Uncertainty®**

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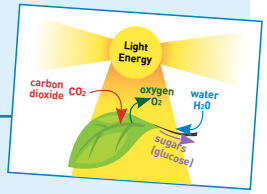
6 Create a model for the major events of the eukaryotic cell cycle, including mitosis. Compare and contrast the rates of cell division in various eukaryotic cell types in multicellular organisms.

- Collecting Cancer-Causing Changes®
- Chromosocks®
- Modeling Mendel's Laws®
- Chromosock Mitosis Protocol https://hudsonalpha.org/compendium-resources

7 Utilize a model of a cell plasma membrane to compare the various types of cellular transport and test predictions about the movement of molecules into or out of a cell based on the homeostasis of energy and matter in cells.

- BioBeads: Modeling Cell Processes https://hudsonalpha.org/compendium-resources



8 Create a model of photosynthesis demonstrating the net flow of matter and energy into a cell. Use the model to explain energy transfer from light energy into stored chemical energy in the product.

- **Guidebook:** Genetics, Plant Growth and Photosynthesis *(pgs. 20-21)*

BIO1.LS3: Heredity: Inheritance and Variation of Traits

1 Model chromosome progression through meiosis and fertilization in order to argue how the processes of sexual reproduction lead to both genetic similarities and variation in diploid organisms. Compare and contrast the processes of sexual and asexual reproduction, identifying the advantages and disadvantages of each.

- Chromosocks®
- HudsonAlpha Meiosis video https://www.youtube/watch?v=9sJU9-ellrs
- **Guidebook:** Foundational Concepts and Applications: Diagnosing Chromosome Disorders, Epigenetics, Noninvasive Prenatal Diagnosis

2 Explain how protein formation results in phenotypic variation and discuss how changes in DNA can lead to somatic or germ line mutations.

- Making Sense of Uncertainty®
- Disorder Detectives®
- **Guidebook:** Foundational Concepts and Applications: Diagnosing Chromosome Disorders, Personal Genome Analysis, Noninvasive Prenatal Diagnosis
- ShareableScience Blog: "What do the Genetic Pieces of ADHD Look Like?"

3 Through pedigree analysis, identify patterns of trait inheritance to predict family member genotypes. Use mathematical thinking to predict the likelihood of various types of trait transmission.

- HNPCC®
- Touching Triton®
- HG Helix®

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BIO1.LS4: Biological Change: Unity and Diversity

1 Evaluate scientific data collected from analysis of molecular sequences, fossil records, biogeography, and embryology. Identify chronological patterns of change and communicate that biological evolution is supported by multiple lines of empirical evidence that identify similarities inherited from a common ancestor (homologies).

- **Guidebook:** Foundational Concepts and Applications: Comparative Genomics, Studying the Genome to Understand the Sequence

2 Using a model that demonstrates the change in allele frequencies resulting in evolution of a population over many generations, identify causative agents of change.

- **Guidebook:** Foundational Concepts and Applications: Comparative Genomics Shareable Science: Genetic Ancestry: What Tests Can Really Tell Us" "Human Genome Diversity Project"

BIO1.ETS2: Links Among Engineering, Technology, Science, and Society

1 Obtain, evaluate, and communicate information on how molecular biotechnology may be used in a variety of fields

- **Progress of Science: Biotechnology Timeline™**

2 Investigate the means by which karyotypes are utilized in diagnostic medicine.

- **Disorder Detectives®**

3 Analyze scientific and ethical arguments to support the pros and cons of application of a specific biotechnology technique such as stem cell usage, in vitro fertilization, or genetically modified organisms.

- **Progress of Science: Biotechnology Timeline™**
- **ShareableScience Blog:** "The Ethics of DNA Testing: Ancestry and Crime" "Understanding RNAi: First-of-its-kind Genetic Treatment Approved" "Gene Therapies bring Genomic Research to Patients in Life-Changing Ways" "What you Need to Know about the First Claim of a Genetically Edited Baby" "Scientists Showcase Hachimoji, an Expanded Genetic Language"
- **Guidebook:** Foundational Concepts and Applications: Recombinant DNA and Genetic Engineering, Studying the Genome to Understand the Sequence, Therapeutic Approaches: Gene Therapy and RNAi, Stem Cells, Synthetic Biology, Genome Editing, Criminal Justice and Forensics