Course Title - Human Biology

Implement start year: 2018-2019

Revision Committee Members:

Dana Matusov, **dmatusov@lrhsd.org**, ext. 8461

Katie Morgan **kmorgan@lrhsd.org**, ext. 8756

John Dell'angelo **jdellangelo@lrhsd.org** ext. 8303

Caroline Krisciunas **ckrsiciunas@lrhsd.org** ext. 8598

Unit # 1 - Advanced Cellular Processes

Transfer Goal –

Students will be able to independently use their learning to…

- develop and use a model based on evidence to illustrate the relationships between structures and their function in a system.
- critically evaluate information provided by the scientific community and analyze issues to verify the credibility of the source, data, and/or methodology.

Stage 1 – Desired Results

Established Goals	**21st Century Themes**
New Jersey Student Learning Standards (NJSLS)-Science **http://www.state.nj.us/education/cccs/2016/science/** HS-LS1-1.Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.	**(www.21stcenturyskills.org)** _x__ Global Awareness ___Financial, Economic, Business and Entrepreneurial Literacy _x__Civic Literacy _x__Health Literacy _x__Environmental Literacy

HS-LS1-2.Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-4.Use a model to illustrate the role of cellular division (mitosis/meiosis) and differentiation in producing and maintaining complex organisms. HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. HS-PS2-6. Communicate scientific and technical information about why the molecular level structure is important in the functioning of designed materials	**21st Century Skills** *Learning and Innovation Skills:* ___Creativity and Innovation ___Critical Thinking and Problem Solving ___Communication and Collaboration *Information, Media and Technology Skills:* _x__Information Literacy _x__Media Literacy _x__ICT (Information, Communications and Technology) Literacy *Life and Career Skills:* _x_Flexibility and Adaptability ___Initiative and Self-Direction _x__Social and Cross-Cultural Skills _x__Productivity and Accountability _x__Leadership and Responsibility
Enduring Understandings: *Students will understand that . . .* *EU 1* living systems, from the organism to the cellular level, demonstrate the complementary nature of structure and function. *EU 2* the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells. *EU 3* normal cell reproduction is essential for growth and development in organisms.	**Essential Questions:** *EU 1* • How does structure relate to function in living systems from the organism to the cellular level? • How does the formation and function of molecules depend on chemical bonding between atoms? • How are water, salts and enzymes important to maintaining body homeostasis? • How do the roles relate to the functions of the four major macromolecules ? • What are the implications for the possible commercial applications of the major macromolecules? *EU 2* • How do biologists use microscopes and the tools of biochemistry to study the building blocks of life? • How does information flow from DNA to RNA to direct the synthesis of proteins?

	• How do errors in cell division lead to abnormalities in cellular processes? *EU 3* • What role does meiosis play in sexual reproduction? • How do stem cells lead to cell specialization and how does this allow the body to function in sophisticated ways? • After fertilization, how does embryonic development proceed through cleavage, gastrulation, and organogenesis?
Knowledge: *Students will know . . .* *EU1* • that systems of specialized cells within organisms help them perform the essential functions of life. • that the formation and function of molecules depends on chemical bonding in atoms. • basic elements such as Carbon, Hydrogen, Oxygen, Sulfur and Phosphorus are building blocks of organic molecules. • water, salts, and enzymes maintain body homeostasis. • each major macromolecule has a function related to its structure. • the implications for the possible commercial applications of the major macromolecules. *EU2* • how to use microscopes and the tools of biochemistry to study the building blocks of life. • that information flows from DNA to RNA to direct the synthesis of proteins • errors in cell division lead to abnormalities in cellular processes. *EU3* • meiosis is the basic process for sexual reproduction. • stem cells lead to cell specialization and allow for the body to function in sophisticated ways.	**Skills:** *Students will be able to . . .* *EU1* • describe the relationship between structure and function in a cell. • model the formation of molecules based upon the chemical bonding rules in atoms. • use models to demonstrate dehydration synthesis and hydrolysis. • demonstrate how water, salts, and enzymes maintain body homeostasis by designing and carrying out an experiment. • analyze each macromolecule and predict its function as it relates to its structure. • discuss the possible implications for the possible commercial applications for macromolecules. • develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. *EU2* • use microscopes and the tools of biochemistry to study the building blocks of life. • model how information flows from DNA to RNA to direct the synthesis of proteins • design investigations, collect evidence, analyze data and evaluate evidence to determine how errors in cell division lead to abnormalities in cellular processes. *EU3* • model how meiosis is the basic process for sexual reproduction.

• after fertilization, embryonic development proceeds through cleavage, gastrulation, and organogenesis.	• design a model to demonstrate how stem cells lead to cell specialization which allows for the body to function in sophisticated ways. • represent ideas using literal representations such as a concept map or diagram of embryonic development.

Stage 2 – Assessment Evidence

Other Recommended Evidence:

- Laboratory activities
- Lab reports and notebooks
- Quizzes and tests
- Concept maps, graphic organizers, charts, tables, and graphs
- Presentations
- Class discussion

Stage 3 – Learning Plan

Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: *A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.*

- Discussion on the chemistry of life, to include bonding, water, pH (acids, bases, buffers) -A
- Use micropipetting to transfer small volumes of fluid -M
- Use a spectrophotometer to analyze fluids -M
- Discussion on the 4 major macromolecules (carbohydrates, lipids, proteins, nucleic acid) -A
- Run a Gel Electrophoresis for Proteins -M, T
- Use model kits to show dehydration synthesis and hydrolysis -M
- Experiment to show enzymatic activity -M, T
- Discussion of Cell Transport - passive and active -A
- Experiment to show cellular transport -M
- Discussion on the stages of the cell cycle - normal vs abnormal -A
- The Cell Cycle POGIL -A, M
- hhmi The Eukaryotic Cell Cycle and Cancer Click and Learn http://media.hhmi.org/biointeractive/click/cellcycle/?_ga=2.138903728.228014891.1498139177-37658674.1498139177
- EDVOTEK Cancer Gene Detection experiment 115 -M, T
- EDVOTEK Morphology of Cancer Cells #990 -M,T
- Discussion on DNA, RNA and protein synthesis - gene expression -A
- Develop a model to demonstrate DNA replication -A, M
- Create a Model to display DNA, RNA and protein synthesis (poster project - one-on-one oral presentation / act it out) -A, M
- DNA to Protein online interactive module https://concord.org/stem-resources/dna-protein
- Cheek cell DNA Extraction -M
- Estimate the mass of DNA - standard curve -A, M,
- Polymerase Chain Reaction - D1S80 -M, T
- DNA Goes to the Races activity for restriction enzymes -M
- Discuss Meiosis, oogenesis, spermatogenesis, fertilization -A
- Use model kits to demonstrate meiosis; Cut and Paste review of the steps of meiosis; Bead lab; One-on-one oral presentation -A, M
- Discuss stem cells, embryological development -A
- hhmi Classroom Activities: Stem Cells and Diabetes - M, T http://www.hhmi.org/biointeractive/classroom-activities-stem-cells-and-diabetes
- Compare the stages of embryological development -A
- Compare/Contrast the types of stem cells - embryonic, pluripotent, mesenchymal - A
- Explore research in current technologies in stem cells including cutting edge technology/regenerative medicine -A, T
- Create a public service announcement on stem cells -where do they come from, what are they, how are they being used? -T