Unit 04: Cellular Reproduction

Content Area: **Science**
Course(s):
Time Period: **Marking Period 3**
Length: **4-5 weeks**
Status: **Published**

Summary

The focus of this unit is the growth, division, and reproduction of cells. The concepts of the cell cycle, mitosis, cell cycle regulation, cell differentiation and specialization, as well as meiosis will be studied. The various stages of cell division in various plant and animal cells will be investigated using microscopy. The roles of specialized cells for maintenance and growth will be highlighted.

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	Career planning requires purposeful planning based on research, self-knowledge, and informed choices.
MA.S-IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies
	Digital tools can be used to display data in various ways.
LA.W.9-10.1.A	Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence.
LA.W.9-10.1.E	Provide a concluding paragraph or section that supports the argument presented.
LA.W.9-10.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
LA.W.9-10.2.A	Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
MA.S-MD.A	Calculate expected values and use them to solve problems
LA.W.9-10.2.B	Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
LA.W.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.W.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation (MLA or APA Style Manuals).
LA.W.9-10.9	Draw evidence from literary or nonfiction informational texts to support analysis, reflection, and research.

HS-LS1	From Molecules to Organisms: Structures and Processes
HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis. Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Use a model based on evidence to illustrate the relationships between systems or between components of a system.
LS1.B	Growth and Development of Organisms In multicellular organisms, individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. Systems and System Models Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.
LA.9-10.W.9-10.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence.

Essential Questions / Enduring Understandings

Essential Questions:

Why are the cells that make up organisms microscopic?

Why do certain organisms reproduce asexually or sexual and how does this occur?

Why do cells undergo the cell cycle and how does this differ in prokaryotic vs. eukaryotic?

What is the role of chromosomes during prokaryotic and eukaryotic cell division?

Why do some cells undergo apoptosis?

How do cancer cells differ from all other types of cells, how can they be identified and treated?

How can stem cells be used in the treatment of disease what are the controversies/ethical issues surrounding the use of stem cells and stem cell research?

How does gamete formation differ between males and females?

Enduring Understandings:

Cell division is important and beneficial to organisms.

The cell cycle allows the formation of new cells and thus the development of an organism.

Cells become specialized for different functions in organisms.

Objectives

Students will know Key Vocabulary: surface area, volume, ratio, cell division, asexual reproduction, sexual reproduction, cell cycle, mitosis, interphase, prophase, metaphase, anaphase, telophase, parent cell, daughter cell, chromosome, duplicated chromosome, chromatin, sister chromatid, spindle, centriole, centromere, cytokinesis, apoptosis, cancer, differentiation, specialization, stem cell, gene, homologous chromosome, somatic (body) cell, gamete (sex cell), fertilization, meiosis, crossing over, genetic variation.

Students will know the limitations of cells as they grow.

Students will know what cell division is and why it is important and beneficial to organisms.

Students will know which cells undergo asexual reproduction through the process of mitosis.

Students will know which cells undergo sexual reproduction through the process of meiosis.

Students will know what happens to old and/or damaged cells.

Students will know the stages of the prokaryotic vs. eukaryotic cell cycle and what happens during each stage.

Students will know how the cell cycle is regulated.

Students will know what apoptosis is and its significance in regulating the cell cycle.

Students will know how cancer cells differ from other cells.

Students will know how cancer can be caused, diagnosed, and treated.

Students will know what stem cells are and their possible benefits and drawbacks.

Students will know the stages of meiosis and what happens during each stage.

Students will be skilled at explaining why cells are microscopic and relating their size to surface area and volume.

Students will be skilled at calculating surface area, volume, and surface area-to-volume ratio.

Students will be skilled at differentiating between asexual and sexual reproduction.

Students will be skilled at describing the role of chromosomes during prokaryotic and eukaryotic cell division.

Students will be skilled at identifying the phases of mitosis in plant and animal cells under a compound light microscope.

Students will be skilled at relating abnormal cell cycles to cancer and the potential of tumor growth.

Students will be skilled at expressing how cells become specialized for different functions.

Students will be skilled at breaking down the controversies and ethical issues surrounding stem cells and stem cell research.

Students will be skilled at comparing and contrasting mitosis and meiosis.

Students will be skilled at summarizing how meiosis leads to genetic variation in organisms.

Students will be skilled at differentiating between gamete formation in males and females.

Learning Plan

Unit Notes: Students will keep detailed notes in a specific notebook as the questions guiding the unit learning goals are answered through lectures and various activities.

CER Practice: Students will continue to practice making claims based on observations and inferences and providing the evidence and appropriate reasoning to support those claims.

Who's Got The Highest Surface Area:Volume Ratio?!: Students will use everyday cube-shaped objects to mimic cells and calculate Surface Area, Volume, and Surface Area-to-Volume Ratio.

Plant and Animal Reproduction Highlights: Students will read a Newsela article and make their own notes in their notebook to highlight the similarities and differences between reproduction in plants and animals.

Onion Root Tip Cell Cycle Lab: Students will use digital images and prepared microscope slides to observe and identify cells found in onion root tips for each stage of mitosis. They will also calculate the percentage of cells found in each stage to determine which stage is the longest and most important.

Mitosis vs. Meiosis in Various Organisms: Students will compare and contrast mitosis and meiosis (asexual and sexual reproduction) in various types of organisms using real scientific data.

Stem Cell Research Assignment: Students will be assigned a stem cell type - adult, embryonic, induced pluripotent - and complete a mini research assignment on the history, importance, pros/cons, and ethical issues surrounding it, as well as argue for/against it using research evidence and appropriate reasoning.

Assessment

Formative:

Do Now Questions

Exit Ticket Questions

Whole Class Discussion Participation

Small Group Discussion Participation

Think-Pair-Share Participation

Individual Student Questions/Responses

Independent Tasks (*Who's Got The Highest Surface Area:Volume Ratio?!; Plant and Animal Reproduction; Mitosis vs. Meiosis in Various Organisms*)

Lab Experiments (*The Onion Root Tip Cell Cycle*)

Quizzes (*The Cell Cycle*)

Summative:

Formal Lab Report (*The Onion Root Tip Cell Cycle*)

Unit Test

Benchmark:

CP Biology Final Exam

Alternative Assessments:

Guided Formal Lab Report

Unit Study Guide/Guided Test

Materials

Textbook: *Biology* (Glencoe Science) by Alton Biggs

Unit Learning Goals Sheet

Technology: computers for student and teacher, SmartBoard projector

Teacher Slide Presentations

Amoeba Sisters Videos

Whiteboard + Accessories

Guided Notes/Worksheets

Study Guide

Lab Outline

Personal Protective Equipment: safety glasses, gloves

Lab Equipment: prepared onion root tip mitosis slides, microscopes

Colored pencils/markers

Integrated Accommodations and Modifications

See attached document.
https://docs.google.com/spreadsheets/d/1uDlwQcgdvbrOcLnMAKouOe1gQph5rWDWxM74UFeuACM/edit?usp=sharing