APS Science Curriculum Unit Planner

Grade Level/Subject	Biology – Cell Division
Stage 1: Desired Results	
Enduring Understanding	
Organisms grow, reproduce, and maintain themselves through cell division.	
Correlations	
Unifying Understanding	(3) Form and composition are related to function. (8) Living things have survival needs.
VA SOL	BIO.3 The student will investigate and understand relationships between cell structure and function. Key concepts include e) the impact of surface area to volume ratio on cell division, material transport, and other life processes. BIO.5 The student will investigate and understand common mechanisms of inheritance and protein synthesis. Key concepts include a) cell growth and division; b) gamete formation; c) cell specialization;
NSES (grade level)	UCP.1 Systems, order, and organization UCP.2 Evidence, models, and explanation C.1.3 Cells store and use information to guide their functions. C.1.4 Cell functions are regulated. Regulation occurs both through changes in the activity of the functions performed by proteins and through the selective expression of individual genes. C.1.6 Cells can differentiate, and complex multicellular organisms are formed as highly organized arrangement or differentiated cells. C.2.1 In all organisms, the instructions for specifying the characteristics of the organism is carried in the DNA, a large polymer formed from subunits of four kinds (A, G, C, and T). C.2.2 Most of the cells in a human contain two copies of each of 22 different chromosomes. C.3.1 Species evolve over time Science as Inquiry: A.1.1, A.1.3, A.1.4, A.1.6, A.2.4
AAAS Atlas	• In addition to the basic cellular functions common to all cells, most cells in multicellular organisms perform some special functions that others do not. 5C/H2b • Before a cell divides, the instructions are duplicated so that each of the two new cells gets all the necessary information for carrying on. 5C/H4c • Complex interactions among the different kinds of molecules in the cell cause distinct cycles of activities, such as

	growth and division. Cell behavior can also be affected by molecules from other parts of the organism or even other organisms. 5C/H5 • Gene mutation in a cell can result in uncontrolled division called cancer. Exposure of cells to certain chemicals and radiation increases mutations and thus the chance of cancer. 5C/H6

Essential Questions

- How large can cells grow?
- Why do cells divide?
- How are form and function related in cells?
- If we are made of specialized cells, how do they work together to maintain homeostasis?
- How do cells become specialized for different functions?
- How is cell division related to cancer?
- Is cancer inevitable?
- Why are stem cells controversial?

Knowledge and Skills

Students should know:

- 5.1 Cells have distinct phases of growth, reproduction, and normal functions. Before a cell divides, the instructions (DNA) are duplicated so that each of the new cells get all the necessary information for carrying on life processes. Cell size is limited.
- 5.2 Cells divide during mitosis and cytokinesis. Mitosis produces two identical daughter cells.
- 5.3 Cell cycle regulation is necessary for normal growth. Cell division is uncontrolled in cancer.
- 5.4 Many organisms reproduce by cell division. Asexual reproduction produces identical offspring.
- 5.5 Cells work together to carry out complex functions. Groups of cells work together to maintain homeostasis. Specialized cells (cells that go through differentiation) perform specific functions. Stem cells can develop into different cell types.

Students should be able to:

- Describe why cell size can not be infinite and identify factors that limit their cell size.
- Describe the structure of the chromosome.
- Recognize which stage of mitosis a cell is in by viewing its chromosomes.
- Describe the stages of the cell cycle.
- Model mitosis.
- Identify internal and external factors that regulate cell division.
- Explain cancer in terms of cell cycle.
- Describe how stem cells are harvested and their importance as a treatment for incurable diseases.
- Compare and contrast binary fission and mitosis.
- Compare embryonic stem cells and adult stem cells.

Stage 2: Assessment Evidence

Prior Knowledge and Skills

- Review vocabulary: homeostasis, cell membrane, nucleus, and centrosome (centromere)
- Cell theory (All living things are composed of cells, cells come from other cells, and cells are the basic unit of structure and function).

- Administer Ch 5 Diagnostic Test (Assessment Book pp. 85-86).

Formative Assessment	Summative Assessment
• Create a flip chart or concept map of the cell cycle. • Manipulate models to show all stages of mitosis. • Prepare and stain onion root tip cells to view and identify stages of mitosis in cells (or do an online onion lab.) • Research and discuss benefits and problems with stem cells. • Section quizzes	• Webquest: Skin Cancer • Possible Performance Task: Student could take on the role as an advocate of stem cell research (example: scientist, researcher, person with an incurable disease, politician, etc.) requesting funding. Students use the information found on pp. 162-164 and explain how stem cells are harvested, why they are important, and how they can help treat incurable diseases. Or, create a counter-argument to the funding of stem cells. Include justification. • Unit Test

Stage 3: Learning Plan

References to Adopted Materials

- Ch 5 Cell Growth and Division pp. 132-164.
- Use Lesson Plan pp. 34-40 for daily plan and suggestions for differentiation both by level and by interest.
- The Lab Binder Unit 2: Cells offers paper and electronic versions of investigations, mini-labs and practice sheets.

Suggested Investigations

By section:

- 5.1 Modeling Cell Surface Area-to-Volume Ratio - Options for Inquiry p. 156 (Lab Binder pp. 33-34).
- 5.2 Prepare and stain onion root tip to view different stages of mitosis (or use a prepared slide). Online: http://www.biology.arizona.edu/Cell_BIO/activities/cell_cycle/cell_cycle.html Students can review independently online using Animated Biology: Mitosis Matching Game.
- 5.3 Webquest: Skin Cancer @Classzone.com Students learn what happens when the cell cycle breaks down by exploring skin cancer and how best to prevent it. Webquest key and background information is located in Teacher Tool Kit under CH 5 Resources.
- 5.4 Virtual Lab: Investigating Bacterial Growth.
- 5.5 Stem Cell Research. Article in text and in Biozine. In addition, a great online resource: http://www.childrenshospital.org/research/Site2029/mainpageS2029P23sublevel39.html

Outdoor Education Applications

- N/A

Resources

Web Sites

- Online Biology at ClassZone.com Resources available after creating a login and password. Under Ch 5:
    - Animated Biology: view mitosis, binary fission, and a mitosis stage matching game
    - Virtual Lab: Investigating Bacterial Growth
    - Reviews
    - Quizzes
    - Webquest: Skin Cancer
    - SciLinks

On the main page is a link to Biozine and students can post their comments on the article about Stem Cell Research (article online is the same as in the text but it has updated links to recent stories.)

- Biozine: Stem Cell Research

Videos
• None
Online clips
"Cell Division" (19:00) The main focus of this program is on cell division. The role of chromosomes and genes and how they affect hereditary characteristics is explained, as well as the differences between asexual and sexual reproduction, and terms of cell division. Students will understand how cells divide, or reproduce, through mitosis, and how sex cells divide through meiosis. Cell differentiation is also explained. (Discovery Streaming)
Field Trips
• None
Other
• None