**Unit 4 Cell Function KUDS**

The student will KNOW:

* What stem cells are, where they are found and what they’re used for
* What happens during cell division
* Cancer is a disorder related to cell division
* Plant adaptations for photosynthesis
* Cellular adaptations for photosynthesis and respiration
* Difference between aerobic and anaerobic respiration
* The relationship between ATP and ADP

The student will UNDERSTAND:

* That all of our body’s cells came from a single stem cell at conception.
* That cells perform specialized jobs that contribute to the function of organisms
* That cell division is a necessary part of a cell’s life
* That when the cell cycle is not properly regulated, the health of the organism is threatened
* That Photosynthesis and Respiration are related metabolic processes
* That Photosynthesis makes life on earth possible
* That organisms have specific adaptations that help them carry out photosynthesis and respiration
* That energy in cells is recycled through photosynthesis and respiration
* That the energy produced by cellular respiration helps organisms to carry out their life functions.

The student will be able to:

* Identify Cellular structures that allow specialized cells to survive
* Describe the role of cell communication in cell specialization/differentiation
* Describe the role of DNA regulation in cell specialization/differentiation
* Compare specialized cells to relate their structures to their functions
* Put diagrams of the steps of mitosis in order
* Identify the parts of the leaf and their role in photosynthesis
* Compare the energetic input and output of photosynthesis and respiration
* Compare and evaluate the net energy gains of aerobic and anaerobic respiration with an eye toward efficiency
* Distinguish between the overall balanced equations for photosynthesis and respiration
* Identify reactants and products of photosynthesis and respiration

**From the NC Essential Standards**

**Bio.1.1.3**

• Compare a variety of specialized cells and understand how the functions of these cells vary. (Possible examples could include nerve cells, muscle cells, blood cells, and sperm cells.)

• Explain that multicellular organisms begin as undifferentiated masses of cells and that variation in DNA expression and gene activity determines the differentiation of cells and ultimately their specialization.

▪ During the process of differentiation, only specific parts of the DNA are activated; the parts of the DNA that are activated determine the function and specialized structure of a cell.

▪ Because all cells contain the same DNA, all cells initially have the potential to become any type of cell; however, once a cell differentiates, the process cannot be reversed.

▪ Nearly all of the cells of a multicellular organism have exactly the same chromosomes and DNA.

▪ Different parts of the genetic instructions are used in different types of cells, influenced by the cell's environment and past history.

• Recall that chemical signals may be released by one cell to influence the development and activity of another cell.

• Identify stem cells as unspecialized cells that continually reproduce themselves and have, under appropriate conditions, the ability to differentiate into one or more types of specialized cells.

▪ Embryonic cells which have not yet differentiated into various cell types are called embryonic stem cells.

▪ Stem cells found in organisms, for instance in bone marrow, are called adult stem cells.

▪ Scientists have recently demonstrated that stem cells, both embryonic and adult, with the right laboratory culture conditions, differentiate into specialized cells.

**Bio.1.2.2**

• Outline the cell cycle – Growth1, Synthesis, Growth2, Mitosis, and Cytokinesis.

• Recognize mitosis as a part of asexual reproduction. (middle school review)

• Organize diagrams of mitotic phases and describe what is occurring throughout the process

**Bio.1.2.3**

• Explain how various structures of unicellular organisms help that organism survive. Emphasis is on contractile vacuoles, cilia, flagella, pseudopods, and eyespots.

• Summarize adaptive behaviors – examples include chemotaxis and phototaxis.

**Bio 3.1.1**

Replication occurs during the S phase of the cell cycle and allows daughter cells to have an exact copy of parental DNA.

▪ Cells respond to their environments by producing different types and amounts of protein.

▪ With few exceptions, all cells of an organism have the same DNA but differ based on the expression of genes.

• Infer the advantages (injury repair) and disadvantages (cancer) of the overproduction, underproduction or production of proteins at the incorrect times

**Bio.4.2.1**

• Analyze overall reactions including reactants and products for photosynthesis and cellular respiration and factors which affect their rates (amounts of reactants, temperature, pH, light, etc.).

• Compare these processes with regard to efficiency of ATP formation, the types of organisms using these processes, and the organelles involved. (Anaerobic respiration should include lactic acid and alcoholic fermentation.)

Note: (1) Instruction should include the comparison of anaerobic and aerobic organisms. (2) Glycolysis, Kreb’s Cycle, and Electron Transport Chain are not addressed.

**Bio 4.2.2**

Conclude that energy production by organisms is vital for maintaining homeostasis and that maintenance of homeostasis is necessary for life. Examples: Active transport of needed molecules or to rid the cell of toxins; movement to avoid danger or to find food, water, and or mates; synthesizing needed molecules.