**Midterm Objectives:**

**Scientific Method**

* Explain how to design an experiment.
  + Identify the independent variable, dependent variable, control group, experimental groups and constants of an experiment.
  + Write a formal hypothesis that includes the independent and dependent variables.
  + Interpret charts and graphs to devise the meaning of the data displayed.
  + Analyze quantitative and qualitative data to form a conclusion and accept or reject a hypothesis.
  + Recognize the changing nature of science and the benefits of scientific collaboration.

**Characteristics of Life**

* Explain how living organisms carry out the RAREHOGG life processes.
  + Define, describe and provide examples of each of the RAREHOGG life processes.

**Biochemistry**

* Explain how homeostasis is maintained in a cell and within an organism in various environments (including temperature and pH).
  + Explain how cells use buffers to regulate cell pH.
* Compare the structure and function of each of the major biological molecules (carbohydrates, proteins, lipids and nucleic acids) as related to the survival of living organisms.
* Explain how enzymes act as catalysts for biological reactions.
  + Develop a cause and effect model for specificity of enzymes – the folding produces a 3D shape that is linked to the protein function, enzyme are proteins that speed up chemical reactions by lowering the activation energy, are re-usable and specific, and are affect by factors such as pH and temperature.
  + Enzyme are necessary for all biochemical reactions.

**Cell Types & Structures**

* Compare prokaryotic and eukaryotic cells in terms of their general structure (plasma membrane and genetic material) and degree of complexity (presence or absence of organelles, ribosomes, structure of DNA/plasmids and cell size).
* Summarize the structure and function of organelles in eukaryotic cells (including the nucleus, plasma membrane, cell wall, mitochondria, vacuoles, chloroplasts, and ribosomes) and ways that these organelles interact with each other to perform the function of the cell.
  + Identify these organelles in diagrams.
  + Explain how the structure of the organelle determines its function.

**Cell Specialization**

* Explain how instruction in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms.
  + Different parts of genetic instruction are used in different types of cells and are influenced by the cell’s environment and past history.
* Explain how specific cell adaptations help cells survive in particular environments.
  + Compare a variety of specialized cells and understand how the functions of these cells vary (i.e. nerve cells, muscle cells, blood cells, sperm cells…).

**Cell Division**

* Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis.
* Organize diagrams of mitotic & meiotic phases and describe what is occurring throughout the process.
* Explain the role of meiosis in sexual reproduction and genetic variation (independent assortment, crossing over, random assortment of chromosomes, gene mutations, non-disjunction and fertilization).
* Compare mitosis and meiosis including type of reproduction, replication and separation of DNA and cellular material, changes in chromosome number, number of cell divisions, and number of cells produced in a complete cycle.

**Cell Transport**

* Explain how homeostasis is maintained in a cell and within an organism in various environments (including temperature, pH, glucose levels and water balance).
  + Compare active vs. passive transport (diffusion and osmosis).
  + Conclude how the plasma membrane structure functions.
  + Explain changes in osmotic pressure that occurs when cells are placed in solutions of differing concentrations.
* Explain ways that organisms use released energy for maintaining homeostasis.

**Photosynthesis & Respiration**

* Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.
  + Analyze overall reactions including reactants and products for photosynthesis and cellular respiration and factors which affect their rates (amount 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.)
  + Compare and contrast aerobic and anaerobic respirations and organisms who use these systems.