A Planned Course of Study

for

Applied Biochemistry

ASHS Course # 0415

Abington School District

Abington, Pennsylvania

September, 2016

PLANNED COURSE OF STUDY – Applied Biochemistry

I. Objectives

Students will demonstrate the appropriate level of proficiency in each of the following areas:

Keystone Biology Anchors

BioA1. Basic Biological Principles
BioA2. The Chemical Basis for Life
BioA3. Bioenergetics
BioA4. Transport and Homeostasis
BioB1. Cell Growth and Division and Reproduction
BioB2. Genetics
BioB3. Evolution
BioB4. Ecology

Chemistry Standards

3.2.A.1 Properties of Matter
3.2.A.3 Matter and Energy
3.2.A.4 Reactions
3.2.A.5 Unifying Themes

II. Major Concepts

Students will demonstrate the appropriate level of proficiency in each of the following areas:

A1. Basic Biological Principles

A. Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms
B. Compare cellular structures and their function in prokaryotic and eukaryotic organisms
C. Describe and interpret relationships between structure and function at the various levels of biological organization (organelles, cells, tissues, organs, organisms)
D. Define, describe and give examples of the various types of cells – prokaryotic vs. eukaryotic, plant vs. animal

A2.The Chemical Basis for Life

A. Describe how the unique properties of water support life on Earth.
B. Explain how carbon is uniquely suited to form biological macromolecules.
C. Describe how biological macromolecules for from monomers.
D. Compare the structure and function of carbohydrates, lipids, proteins and nucleic acids in organisms.
E. Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.
F. Explain how factors such as pH, temperature and concentration levels can affect enzyme function.

A3. Bioenergetics

A. Describe the role of ATP in biochemical reactions.
B. Describe the fundamental roles of chloroplasts and mitochondria in energy transformations.
C. Compare the basic transformation of energy during photosynthesis and cellular respiration.

A4. Transport and Homeostasis

A. Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.
B. Compare the mechanisms that transport materials across the plasma membrane.
C. Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments.
D. Identify and describe the cell structures involved in the transport of materials throughout a cell.

B1. Cell Growth and Division

A. Describe the events that occur during 3 stages of the cell cycle: interphase, nuclear division, cytokinesis.
B. Compare and contrast processes and outcomes of mitosis and meiosis.
C. Explain how genetic information is inherited.
D. Explain the functional relationships between DNA, genes, alleles and chromosomes and their roles in inheritance.

B2. Genetics

A. Compare Mendelian and non-Mendelian patterns of inheritance.
B. Describe and/ or predict observed patterns of inheritance i.e. dominant, recessive, co-dominant, incomplete dominance, sex- linked, polygenic and multiple alleles.
C. Describe the structure and function of DNA.
D. Describe how the process of DNA replication results in the transmission and/or conservation of genetic material.
E. Explain the process of protein synthesis.
F. Describe how the process of transcription and translation are similar in all organisms.
G. Describe the role of ribosomes, endoplasmic reticulum, Golgi and the nucleus in the production of proteins.
H. Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (silent, nonsense, frame-shift).
I. Describe the processes that can alter composition or number of chromosomes (crossing over, nondisjunction, duplication, translocation, deletion, insertion and inversion).

B3. Evolution

A. Explain how natural selection can impact allele frequencies of a population.
B. Describe the factors that can contribute to the development of new species (e.g., isolating mechanisms, genetic drift, founder effect, migration).
C. Explain how genetic mutations may result in genotypic and phenotypic variations within a population.
D. Interpret evidence supporting the theory of evolution (i.e., fossil, anatomical, physiological, embryological, biochemical, and universal genetic code.)
E. Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.

B4. Ecology

A. Describe ecological levels of organization in the biosphere.
B. Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
C. Describe interactions and relationships in an ecosystem.
D. Describe how energy flows and matter recycles through an ecosystem.
E. Describe how ecosystems change in response to natural and human disturbances.

3.2.A.1 Properties of Matter

A. Differentiate between physical properties and chemical properties.
B. Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures.

3.2.A.3 Matter and Energy

A. Describe the three normal states of matter in terms of energy, particle motion, and phase transitions.
B. Identify the three main types of radioactive decay and compare their properties.
C. Describe the process of radioactive decay by using nuclear equations and explain the concept of half-life for an isotope.

3.2.A.4 Reactions

A. Predict how combinations of substances can result in physical and/or chemical changes.
B. Balance chemical equations by applying the laws of conservation of mass.
C. Classify chemical reactions.

3.2.A.5 Unifying Themes

A. Recognize discoveries from Dalton, Thomson, Rutherford, and Bohr; and understand how each discovery leads to modern theory.
B. Identify the major components of the nuclear atom and explain how they interact.

III. Instruction

A. Course Schedule

a. 5 days a week
b. 47 minute classes

B. Pacing

a. Marking Period 1
    i. BioA.1 Basic Biological Principles
    ii. Bio A.4 Homeostasis and Transport
    iii. Bio A.2 Chemical Basis for Life
    iv. Bio A.3 Bioenergetics
b. Marking Period 2
    i. Bio B.1 Cell Growth and Division
    ii. Bio B.2 Genetics
    iii. Bio B.3 Evolution
    iv. Bio B.4 Ecology
c. Marking Period 3
    i. 3.2.A.5 Unifying Themes
    ii. 3.2.A.1 Properties of Matter
d. Marking Period 4
    i. 3.2.A.3 Matter and Energy
    ii. 3.2.A.4 Reactions

C. Methods

a. Lecture
b. Cooperative learning activities will be employed, including laboratory experiences
c. Writing experiences will be used throughout the course

D. Technology

a. Use of computers will be incorporated into the course
    i. Google Classroom
    ii. Teacher Websites
b. Websites will be utilized as a source of e-text, virtual activities, and other online student resources connected to the course concepts.

E. Resources

a. Miller, Kenneth R., and Levine, Joseph S. Biology. Boston, Massachusetts: Pearson, 2010.
b. Wilbraham, Antony C., Dennis D. Staley, Michael S. Matta, and Edward l. Waterman. Chemistry. Menlo Park, California: Addison Wesley, 2000.

IV. Assessment

A. Procedures for Evaluation

a. Summative assessments
    i. A departmental common assessment will be administered at the end of each unit.
    ii. A departmental common assessment will be administered at the end of the course.
b. Formative assessments will be administered in a variety of formats.
c. Accommodations aligned with those permitted for the PSSA/Keystone Exams and included in IEP's will be provided for Special Education students who are enrolled in this course.

B. Expected Levels of Achievement

Students are expected to achieve at least a minimum level of proficiency. Proficiency and related grades are defined as follows:

A……..90 – 100%
B……..80 - 89%
C……..70 - 79%
D……..60 - 69%