Murrieta Valley Unified School District **Board Submission: 2018**
HIGH SCHOOL COURSE OUTLINE

Course Title: AP Biology

Department: Science

Course Number: 3031

Grade Level/s: 10-12

Length of Course: 1 Year

Prerequisite/s: B or better in Biology and Chemistry

UC/CSU (A-G) Req: (D) Laboratory Science

Brief Course Description: This course meets UC/CSU laboratory and District graduation requirements for life science. Advanced Placement Biology is a rigorous course designed to be the equivalent of a college introductory Biology course usually taken by Biology majors in their first year of college. The aim of the course is to provide students with the conceptual framework, factual knowledge and analytical skills necessary to deal critically with the rapidly changing science of Biology. Students cultivate their understanding of biology through inquiry-based investigations as they explore the following topics: evolution, cellular processes — energy and communication, genetics, information transfer, ecology, and interactions.

The course is designed to prepare students to take the Advanced Placement Biology examination. Colleges may give advanced placement and/or college credit based on the result of the examination. A minimum of 20% of class time will be spent on laboratory experiences. *All Students are expected to take the AP/IB test. If students choose not to test, an alternate assessment will be assigned by the teacher.

Student fees are allowable for Advanced Placement examinations for the possibility of college credit, so long as (1) taking the exam is not a course requirement; (2) the exam results have no impact on a pupil's grade or credit in a course; and (3) eligible economically disadvantaged high school pupils who receive school district funding towards the exam fee shall pay the required AP reduced fees.

Course Title: AP Biology

I. GOALS

The student will:

A. Use representations and models to communicate scientific phenomena and solve scientific problems (SEP 2).
B. Use mathematics appropriately (SEP 5).
C. Engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course (SEP 1).
D. Plan and implement data collection strategies in relation to a particular scientific question (SEP 3 & 4).
E. Perform data analysis and evaluation of evidence (SEP 4 & 7).
F. Work with scientific explanations and theories (SEP 6).
G. Connect and relate knowledge across various scales, concepts, and representations in and across domains.

II. OUTLINE OF CONTENT FOR MAJOR AREAS OF STUDY

Semester 1

A. Biochemistry and Introduction to Cells
   1. The impact of carbon as the "backbone of life"
   2. How monomers build polymers, including roles of nucleic acids
   3. Examples of organelles that are membrane bound to compartmentalize their function
   4. Membrane structure and function
   5. Movement of molecules across the phospholipid bilayer – active vs. passive

B. Cellular Energy and Related Processes
   1. Metabolic pathways
   2. Laws of energy transformation
   3. How ATP powers cellular work
   4. Enzyme structure and function
   5. Harvesting chemical energy: glycolysis, citric acid cycle, oxidative phosphorylation
   6. Light reactions and the Calvin cycle
   7. Evolution of alternative mechanisms of carbon fixation

C. Cell Communication and The Cell Cycle
   1. Evolution of cell signaling
   2. Reception, transduction, response
   3. Apoptosis
   4. How mitosis produces genetically identical daughter cells
   5. Evolution of mitosis
   6. How the eukaryotic cell cycle is regulated by a molecular control system
   7. Origin of cell communication

D. Genetic Basis of Life
   1. Genes are passed from parents to offspring by the inheritance of chromosomes

2. How meiosis reduces the number of chromosomes (diploid to haploid)
3. Evolutionary significance of genetic variation that results from sexual life cycles
4. Concepts of Mendelian genetics (laws of probability, inheritance patterns)
5. Genes are located along chromosomes (concepts of gene linkage, mapping distance between genes, causes of genetic disorders)

E. Gene Activity and Biotechnology
1. DNA is the genetic material (historical experiments, DNA structure and function, DNA replication)
2. Flow of genetic information (genetic code, role of other polymers, transcription, translation)
3. Mutations
4. Gene expressions (operon systems in prokaryotes, eukaryotic gene expression)
5. Virus structure and activity
6. Restriction enzymes, plasmids, transformation
7. DNA technology (how gel electrophoresis works and applications of this technology)

Semester 2

A. Evolution and Phylogeny
1. How natural selection serves as a mechanism for evolution
2. Scientific evidence supporting evolution
3. Hardy-Weinberg concept
4. How allele frequencies can be altered in a population
5. Concepts of speciation
6. Origin of Life; Fossil Record
7. Events in the "history of life" (origin of single-celled and multicellular organisms; mass extinctions; adaptive radiation)

B. Diversity in the Biological World: Organism Form and Function
1. Basic Principles of Animal Form and Function
2. The Immune System
3. Neurons, Synapses and Signaling
4. The Vertebrate Brain

C. Ecology
1. Aspects of animal behavior
2. Aspects of biomes
3. Models describing population growth
4. Regulation of population growth
5. Community interactions
6. Species diversity and composition
7. Community biodiversity
8. Energy flow and chemical cycling in ecosystems
9. Primary productivity
10. Energy transfer between trophic levels
11. Human activities that threaten biodiversity

D. Exam Review
1. Sample AP Biology multiple choice exams
2. Practice outlining free-response questions
3. Examine & practice grading past students' answers
4. Re-examine AP laboratory practices and topics
5. Test-taking strategies

III. ACCOUNTABILITY DETERMINANTS

A. Key Assignments – 13 Investigative Labs from College Board:
1. Artificial Selection
2. Mathematical Modeling (Hardy-Weinberg)
3. Comparing DNA Sequences
4. Diffusion and Osmosis
5. Photosynthesis
6. Cellular Respiration
7. Cell Division: Mitosis & Meiosis
8. Biotechnology: Bacterial Transformation
9. Biotechnology: Restriction Enzyme and Analysis of DNA
10. Energy Dynamics
11. Transpiration
12. Fruit Fly Behavior
13. Enzyme Activity

B. Assessment Methods
1. Classwork/Homework
2. Laboratory work
3. Projects
4. Presentations
5. Quizzes
6. Free-Response Questions
7. End of Unit Exams
8. Semester Final Exams

IV. INSTRUCTIONAL MATERIALS AND METHODOLOGIES

A. Required Textbook(s)
1. Title: Campbell's Biology AP Edition
ISBN: 9780134433691
Format: Print
Author: Urry, Cain, et al.
Publisher: Pearson
Year: 2017 (11th ed.)
Additional Info: NA

B. Supplementary Materials
1. Lab Manual – Teacher Edition from College Board

2. Lab Manual for students (a printed copy for each student)
   Title: AP Biology Investigative Labs: An Inquiry-Based Approach
   Student Manual
   ISBN: Print
   Author(s): College Board
   Year: 2012
   Additional Info: Supplemental material

C. Instructional Methodologies
1. Teacher lectures/direct instruction
2. Class discussions
3. Cooperative learning
4. Guided Inquiry
5. Simulation activities
6. Laboratory work
7. Collaborative peer review
8. Teacher and student lead inquiry
9. Group project/presentations