

AP BIOLOGY SYLLABUS

Teacher: Ms. Whitney Rooney

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***Text REQUIRED: Biology 7th Edition, Campbell and Reece**

***Lab Manual REQUIRED: AP Biology Lab Manual**

Graphing paper composition Book (provided by student)

COURSE DESCRIPTION

Welcome! AP biology is a college level course for able and motivated students. The course content follows the suggested outline for a typical college biology course. This AP biology course will cover main biological principals and processes as enumerated in the FOUR BIG IDEAS BIG IDEAS:

- 1) The process of evolution drives the diversity and unity of life.**
- 2) Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis.**
- 3) Living systems store, retrieve, transmit, and respond to information essential to life processes.**
- 4) Biological systems interact, and these systems and their interactions possess complex properties.**

These Big Ideas will be introduced during the first week of school and will be more specifically discussed as the class progresses. Understanding how and where each of the above themes are integrated throughout the course will enable the student to be successful in this challenging course. AP Biology aims to provide students with the conceptual framework and analytical skills necessary to understand and assess the rapidly growing science of biology. This is a laboratory course in which students will collect and analyze data, then write complete scientific lab reports. Labs are essential to understanding the scientific method and communicating results.

In addition to course and lab work, I expect students to come away from this course with a firm understanding of the importance of biology in addressing societal and global issues as well as the ability to communicate their knowledge to a wide range of audiences. We will develop this understanding through readings and small group work.

COMMITMENT

1. *AP biology students need to understand and accept the fact that AP biology will make unusually heavy demands on their time and energy. **THIS IS A VERY FAST PACED, INTENSE COURSE.** Students report spending an average of 7-10 hours of study time outside of class each week.*
2. **AP biology labs take at least 25% of the in-class hours.** The lab times do not always conform to a ringing school bell. Please understand that some labs will require the students to prep between 7:30 to 8:00 am, continue unfinished labs at lunch, and sometimes stay after school between 3:00 to 3:30 pm on the day of longer labs.
3. This is a college level class and **responsible conduct** is an expectation without exception. I cannot get through all of the material and lab content if I have to deal with problems.

EVALUATION

1. Students can expect a **weekly quiz** and a **test every two to three weeks**. The tests will cover multiple chapters and each exam has both multiple choice and essay questions. Chapter/unit exams will cover only the content in that unit/chapter, however semester exams **WILL BE CUMMULITIVE**.
2. Course grades are determined by total points a student earns on all assigned work, relative to the total possible number of points. Tests and exams may be curved at the teacher's discretion.
3. There are three main components to the course grade:

Daily/Homework: Chapter Outlines, Self-Quizzes, Worksheets, etc.	25%
Lab Reports and Activities/Presentations, Etc.	35%
Quizzes, Tests and Semester Exams	40%

IMPORTANT: note that these percentages are approximate and may shift slightly as the year progresses.

4. The **AP Exam does not have an effect on your course grade**. The exam is based on a 1-5 point scale and most colleges give credit for 3, 4, or 5. Although it is worthy to note that a few private colleges will only give credit for 4 or 5. Keep in mind that even if you score high on the exam, you may elect not to exempt introductory biology in college.

REQUIRED MATERIALS (students must provide)

In order to be prepared for this course, each student must have the following materials in addition to the text and lab manual provided by NPA:

1. Three ring binder with **College-rule** notebook paper
2. Lab/composition book with graphing paper
3. Blue or black ink pens – all labs and essays must be written in ink.

CONTENT TO BE COVERED MAY VARY BUT THE GENERAL OUTLINE IS BELOW*

Unit 1-The Chemistry of Life and Cell Activity

Overall Topics	Chapters	Detailed Concepts	Activities
Basic Chem, Water, and Organic Compounds	2-4	<ul style="list-style-type: none"> · Structure of atoms, isotopes, compounds · Acids/Bases and Buffers · Properties of Water....polarity, heat of fusion/vaporization/etc · Carbons role in molecular diversity · Biogeochemical Cycles 	<p>Acid/Base/Buffer Lab</p> <p>Adhesion/Cohesion Lab with varying macromolecules</p> <p>Specific Heat of Water Inquiry Lab</p> <p>Biogeochem. Flip Books</p>
Macromolecules	5	<ul style="list-style-type: none"> · Monomers, polymers, and rxn involved in building/breaking · Polar/Nonpolar Interactions · Levels of structures and Identity of structures · Connection to Nutrition 	<p>Using kits to build macromolecules</p> <p>Current Event on Macromolecules</p>
Enzymes	6	<ul style="list-style-type: none"> · Activation NRG · Special Protein · Factors affecting Enzyme Activity 	Catalase Lab

History of Life: Theories of how macro-molecules joined to support life	26-28	<ul style="list-style-type: none"> · Age of Earth · Miller-Urey Experiment · RNA 1st Genetic Material · Major Domains, Origins of Prokaryotes vs. Eukaryotes · Identify Kingdoms 	<p>NPR listening and summary</p> <p>Cartoon explaining the theories of origin of life</p>
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Unit 2 – The Cell (3 Weeks)

Overall Topics	Chapters	Detailed Concepts	Activities
Cells	7, 27-28, 31	<ul style="list-style-type: none"> · Types of Cells: Prokaryotes and Eukaryotes · Cell Size, Surface area to Volume Ratio · Structure and Function, Similarities and Differences between 2 major types · Kingdoms and Identification of cells, Symbiotic Relationships · NRG Synthesis for different types of cells 	<p>Clay Models and Student Presentations with Current Events</p> <p>Applied A&P Examples of Surface Area to Volume ratio</p> <p>Microscope Mystery Cell Observations</p>
Cell Membrane and Communication	8, 11	<ul style="list-style-type: none"> · Structure and Function · Types of Transport · Cell communication, signal transduction pathway · Relate Specific Disease caused by defective Signaling pathway <ul style="list-style-type: none"> · Internal and External Signals for Fungi, protists, and bacteria to 	<p>Diffusion and Osmosis Lab (#4)</p> <p>Lab Simulation for Cell Communication</p> <p>Construction paper models of G-protein receptors</p> <p>Research Drugs affecting Signal-Transduction Pathway</p>

		regulate responses(Quorum Sensing in Bacteria) · Levels of cAMP regulate gene expression in bacteria	
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Unit 3 – Cell Energy (3 weeks)

Overall Topics	Chapters	Detailed Concepts	Activities
Metabolism and Cellular Respiration	9	<ul style="list-style-type: none"> · Free NRG and Entropy, NRG Synthesis · ATP structure and Function · Cellular Respiration glycolysis, citric acid cycle, e- transport chain · Chemiosmosis 	Cellular Respiration Lab Fermentation in Yeast Lab/Bean Brew
Photosynthesis	10, 29	<ul style="list-style-type: none"> · Intro to how plants colonized land · Photosyn. Mechanisms and Types of Rxn · Compare/Contract Cell. Respir. to Photosyn. 	Photosynthesis Lab Inquiry Based

Unit 4 – From Gene to Protein (9 weeks)

Overall Topics	Chapters	Detailed Concepts	Activities
Mitosis and Meiosis	12,13	<ul style="list-style-type: none"> · Cell Cycle mechanism and control · Chromosomes · Cell Regulation and Cancer Cells · Sexual vs. Asexual reproduction 	Mitosis and Meiosis Lab #7 Karyotyping Exercise Immortal Life of HeLa Cells

		<p>and Evolutionary Advantages</p> <ul style="list-style-type: none"> · Stages of Meiosis · Genetic Variation in offspring, mechanisms and impact of evolution · Investigating genetics: environmental influences · Apoptosis 	
Mendelian Genetics	14,15	<ul style="list-style-type: none"> · Patterns of Inheritance · Predicting genetic outcomes · Chi Squared Data Tables · Sex Linked genes · SYR gene on Y chromosome · Gene linkage and mapping · Mutations 	Sex Linked Fruit Fly Lab Wisconsin Fast Plants (START AT EARLIER DATE) A Day in the Life: story, poem song, etc to describe affliction with gene disorder
Molecular Basis of Inheritance	16, 17, 19	<ul style="list-style-type: none"> · DNA history of discovery, structure and replication · RNA structure · Protein Synthesis, Transcription and Translation · Mutations, · RNA regulation, miRNA and siRNA · Control/Regulation of Gene Expression · Morphogenesis of fingers/toes 	DNA Models and extraction Comparing DNA sequences for computer database
	18, 20-21	<ul style="list-style-type: none"> · Viruses 	Transformation Lab,

Molecular Genetics		<ul style="list-style-type: none"> · Gene expression in bacteria · DNA technology (GMO), Recombinant DNA, PCR, Gel Electrophoresis · Analysis of Genomes · Comparing Genomic sequences in relation to Evolution (Ch 21) and Differential Gene Expression · Morphogens stimulate cell differentiation · HOX gene (homeobox) 	<p>Paper Model of lac and tryp operons,</p> <p>DNA detectives Lab, TGEN Field Trip ,</p> <p>Current Events in Biotechnology,</p> <p>Diagrams to distinguish products of embryonic vs adult stem cells</p>
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Unit 5 – Evolutionary Biology (6 weeks)

Overall Topics	Chapters	Detailed Concepts	Activities
Evolutionary Biology	22-25	<ul style="list-style-type: none"> · Darwin’s Exploration and Theory of descent with modification and Natural selection · Evidence for evolution and Galapagos islands · Phylogeny and systematics, Taxonomy and classification, use of cladograms (Tree of Life) · Evolutions of Populations · Hardy-Weinberg law · Barriers to Evolution <ul style="list-style-type: none"> · Speciation and Origins of Species · Environmental Influences 	<p>Lab #2 Mathematical Modeling</p> <p>Artificial Selection Inquiry Lab (7 Weeks w/ Wisconsin Fast Plants)</p> <p>News week article on Epigenetics</p> <p>Population Genetics Lab Current Events</p>

Early Life and Evolution Revisited	27-34	<ul style="list-style-type: none"> · Examples of diversity and unity in organisms · Normal Development and Differentiation 	
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Unit 6 – Biodiversity and Ecology (10 weeks)

Overall Topics	Chapters	Detailed Concepts	Activities
Animal Diversity	32-34 40-49	Characteristics of body plans and systems of Invertebrates <ul style="list-style-type: none"> · Homeostasis, Positive and Negative Feedback · Endotherms and ectotherms, metabolic rate and body mass · Basic A&P principles...FORM FITS FUNCTION · Digestive, Circulatory, Respiratory, Excretory/Osmoregulation, Muscular...FOCUS ON IMMUNE, ENDOCRINE, NERVOUS · Diabetes, ADH, Graves' Disease (hyperthyroid), Blood Clotting, circadian rhythms, Brain regions, Seasonal reproduction, etc. 	Cardiac Lab, Circulation and Blood Pressure Dissections: Star fish, Nematoda, Cnidarian, Cricket, Perch, Fetal Pig Blood Type Lab
Plants and their Diversity	27-33 37-39	<ul style="list-style-type: none"> · How plants colonized land · Evolution of Seed plants · Structure, growth, development, and function of different types of plants · Alternation of Generation 	Transpiration Lab (#11) Flower Dissection Plant Growth under various conditions lab

		<ul style="list-style-type: none"> · Transport in Vascular Plants · Plant Responses to Internal and External stimuli, Photoperiodism · Plant Nutrition and Defense · Angiosperm Reproduction 	
Ecology	50-55	<ul style="list-style-type: none"> · Ecological Interactions, biotic vs abiotic, Trophic levels · Terrestrial/Aquatic Biomes descriptions and plant/animal adaptations · Changes in free NRG and results on population size · Behavior: hibernation, migration, taxis and kinesis, circadian rhythms · Population Dynamics, growth and regulations, density...Growth Model $dN/dt=rN$ · Community Relationships and Ecosystems · NRG levels, NRG flows, cycles · Symbiosis and impact on Evolution · Human Influences & Impacts 	<p>Succession Lab Fruit Fly/pill bug Behavior Lab</p> <p>DO lab and Aquatic Primary Productivity</p>

Student Signature _____ Date _____

Parent Signature _____ Date _____