AP Biology Year at A Glance

	Title	Content	# Days	Chapters	Labs	FRQs	Activities
Unit 1	Origins of Life and Taxonomy (+ Scientific Method)	**I. The History of Life on Earth** A. Experimental Design B. Origin of Life C. Miller Urey D. Protobionts E. Endosymbiotic Theory F. Fossil Record G. RNA Theory **II. Phylogeny and the Tree of Life** A. Classification B. Homology/Analogy C. Cladograms/Phylogenetic Trees D. Main Characteristics of Kingdoms **III. Bacteria and Archaea** A. Bacteria Characteristics and Ecological Roles **IV. Protists, Plants, Fungi and Animal** A. Protist Characteristics and Roles B. Four Types of Plants and Characteristics, Seeds C. Fungi General Characteristics and Symbiotic Relationships/Ecological Roles D. General Animal Characteristics E. Animal Development F. Symmetry G. Tissues H. Protostome/Deuterostome I. Body Cavity (Coelom) J. Chordate Characteristics	9	CH 25.1-25.3 CH 26.1-26.3, 26.6 CH 27.1-27.2, 27.4-27.6 CH 28.1 CH 29.1, 30.1, 32.1 CH 32.1, 32.3, 34.1	Origins of Life	Phylogeny; Prokaryotes in the biosphere	Designing a Controlled Experiment
2	Evolution	**I. Descent with Modification** A. Common Ancestor B. Darwin C. LaMarck D. Variation E. Mutations F. Artificial Selection G. Natural Selection H. Evidence for Evolution 1. Direct Observations 2. Homologies (Molecular and Anatomical) 3. Convergent Evolution and Analogous Structures 4. Fossil Record 5. Biogeography	5	Chapter 22 Chapter 23 Chapter 24	Hardy Weinberg Lab		Rock Pocket Mouse; Evolution Games Project

		II. The Evolution of Populations A. Forces of Evolution 1. Genetic Drift – Founder Effect/Bottleneck 2. Non-Random Mating (Sexual Selection) 3. Mutations 4. Gene Flow 5. Natural Selection B. Types of Selection 1. Disruptive 2. Stabilizing 3. Directional C. Heterozygote Advantage D. Hardy Weinberg Equilibrium **III. The Origin of Species** A. Biological Concept of a Species B. Reproductive Isolation 1. Temporal 2. Geographic (allopatric speciation) 3. Behavioral 4. Mechanical 5. Gametic 6. Reduced hybrid fertility 7. Hybrid Breakdown C. Speciation 1. Gradualism 2. Punctuated Equilibrium					
3	Chemistry of Life	**I. Water and Life** A. Properties of Water 1. Polarity and Hydrogen Bonding a) Cohesion b) Adhesion c) High specific heat d) Universal solvent B. pH C. Solution – Solvent, Solute D. Hydrophobic/Hydrophilic E. Polar/Non-polar **II. Carbon and the Molecular Diversity of LIfe** A. Organic compounds B. Functional Groups – Hydroxyl, Carbonyl, Carboxyl, Amino, Methyl, Sulfhydryl, Phosphate **III. The Structure and Function of Large Biological Molecules** A. Macromolecules 1. Carbohydrates 2. Lipids	6	Chapter 3 Chapter 4 Chapter 5 Chapter 8	Math and Stats Review Lab; Evolving Enzymes	Water	Molecules of Life

		3. Proteins 4. Nucleic Acids B. Dehydration Synthesis C. Condensation/Hydrolysis Reaction D. Names of Monomers and Polymers, Functions, Structures E. Saturated vs. Unsaturated Fats F. Peptide Bonds G. Protein Structure – Primary, Secondary, Tertiary, Quaternary H. Nucleotide Types – DNA and RNA **IV. Introduction to Metabolism** A. ATP Structure B. Enzymes C. Chemical Reactions 1. Endergonic 2. Exergonic D. Enzymes 1. Activation Energy 2. Catalyst 3. Substrate 4. Product 5. Active Site 6. Inhibitors 7. Enzyme Naming 8. Induced Fit 9. Factors That Affect Enzyme Function					
4	The Cell and Cell Processes	**I. A Tour of the Cell** A. Plant and Animal Cell Organelles and their Functions **II. Membrane Structure and Function** A. Cell Membrane Composition and Permeability B. Passive Transport- Osmosis, Simple Diffusion, Facilitated Diffusion C. Active Transport- Protein Pumps, Endocytosis, Exocytosis, Managing Water Balance in Hypertonic, Isotonic, Hypotonic Solutions **III. Cell to Cell Communication** A. Reception 1. G-protein linked receptors 2. Tyrosine kinase receptors 3. Ligand-gated ion channels 4. Hormones – intracellular receptors B. Transduction 1. Signal amplification/Signal Cascade 2. Protein Kinase – phosphorylation – activation of signal 3. Protein Phosphatase - deactivation	7	Chapter 6.2 -6.5 Chapter 7 Chapter 11 Chapter 48 Chapter 9.1-9.5 Chapter 10.1-10.3	Diffusion/Osmosis Lab; Cell Respiration Lab	Cell Communication	Sweet Beets

		4. Second Messengers – camp, Calcium C. Response 1. Cellular response 2. Nuclear Response **IV. Neuron Signaling** A. Neuron Structure B. Action Potentials- Resting Potential, Threshold Potential, Depolarization, Repolarization C. Voltage Gated Channels - Sodium and Potassium D. Sodium-Potassium Pump E. Synapse F. Neurotransmitters **V. Cellular Respiration and Fermentation** A. Cellular Respiration (follow the flow of electrons) - Equation 1. General Process and Locations a) Glycolysis b) Kreb's Cycle c) Electron Transport Chain 2. Electron Carriers – NADH and FADH2 B. Substrate Level Phosphorylation compared to Oxidative phosphorylation C. Chemiosmosis – Proton gradient that drives ATP production D. Fermentation – Alcohol and Lactic Acid Fermentation **VI. Photosynthesis** A. Photosynthesis (follow the flow of electrons) - Equation 1. General Process and Locations a) Light Reactions (1) Electron Transport Chain b) Calvin Cycle 2. Electron Carrier - NADPH 3. Structure of Leaves and Chloroplasts B. Pigments and Light Absorption					
5	Homeostasis	**I. Resource Acquisition and Transport in Vascular Plants** A. Transpiration B. Xylem and Phloem C. Gas Exchange D. Stomatal Control (K+ ions) **II. Plant Responses to Internal and External Signals** A. Plant Hormones- Auxin, Gibberellins, Abscisic acid, Ethylene	8	Ch 36.2-36.4 Ch 39.2-39.5 Ch 40 Ch 45.1-45.2	Transpiration Inquiry Lab	Transpiration FRQ	A Song of Host and Pathogen

		B. Tropisms- Phototropism, Gravitropism, Thigmotropism C. Seed Germination Triggers D. Fruit Ripening E. Apoptosis (Leaf dropping) F. Photoperiodism and Flowering **III. Basic Principles of Animal Form and Function** A. Exchange with environment B. Tissue Structure and Function- Epithelial, Connective, Muscle, Nervous C. Feedback Loops- Positive and Negative D. Homeostasis E. Thermoregulation- Endotherms, Ectotherms, Metabolic rate **IV. Examples of Homeostasis** A. Circulatory System B. Digestive System C. ADH – Kidneys **V. Endocrine System** A. Hormones B. Protein and Lipid Hormones – Signal Transduction C. Blood Sugar Regulation – Insulin/Glucagon D. Metabolism Regulation **VI. Immune System and Lymphatic System** A. Types of Blood Cells B. Lines of Defense (Nonspecific) - Inflammatory Response, Macrophages, Natural Killer Cells, Perforin C. Lines of Defense (Specific) - B Cells, T Cells, Memory Cells, Antibodies, Antigens D. Humoral Response E. Cell-mediated Response F. Acquired – Active Immunity G. Passive Immunity					
6	Nucleic Acids and Proteins	**I. The Molecular Basis of Inheritance** A. DNA History 1. Griffith, Avery, Hershey and Chase, Chargaff, Watson and Crick, Franklin B. DNA Structure 1. DNA Directionality (5'-3') 2. Hydrogen Bonding 3. Base Pairing (purines and pyrimidines) C. DNA Replication 1. Semiconservative model 2. Enzymes involved in the process (DNA polymerase I and III,	5	Chapter 16 CHapter 12 Chapter 17 Chapter 18	Onion Root Tip Lab;		When A Gene Turned Off is a Matter of Life and Death

topoisomerase, SSB, primase, ligase, helicase)
3. Leading and Lagging Strand, Okazaki Fragments
4. Proofreading and Repair
5. Replicating the end of DNA molecules

D. DNA Packaging

II. Cell Cycle

A. Cellular Organization of the Genetic Material
1. Sister chromatids, homologous chromosomes

B. Phases of the Cell Cycle
1. Interphase
2. Mitotic Phase

C. Cell Cycle Regulation
1. Checkpoints
2. Cyclins/cdks
3. External signals
4. Growth factors

D. Cancer

III. From Gene to Protein

A. Central Dogma

B. Basic Principles of Transcription and Translation
1. Template strand
2. Coding strand

C. The Genetic Code
1. Codons
2. Reading frame

D. RNA – structure, types, differences from DNA

E. Transcription
1. Steps, enzymes, regulation
2. Binding and Initiation of Transcription
   a) Promoter Region and TATA Box
3. Elongation of the RNA Strand
4. Termination of Transcription

F. RNA Processing in Eukaryotic Cells
1. Alteration of mRNA Ends
2. Split Genes and RNA Splicing
3. Ribozymes

G. Translation
1. Steps, enzymes, regulation
2. Structure and Function of Transfer RNA
3. Ribosomes
4. Building a Polypeptide
   a) Ribosome Association and Initiation of Translation

		b) Elongation of the Polypeptide Chain c) Termination of Translation d) Polyribosomes 5. Completing and Targeting the Functional Protein H. Mutations – point mutations and frameshift mutations I. Codons, read the codon chart, anticodon J. Protein synthesis in eukaryotes vs. prokaryotes **IV. Regulation of Gene Expression** A. Opens: The Basic Concept B. Repressible and Inducible Operons (Negative Control) C. Positive Gene Regulation' D. Regulation of Eukaryotic Gene Expression 1. Differential Gene Expression 2. Regulation of Chromatin Structure a) Histone Modifications (histone acetylation) b) DNA Methylation c) Epigenetic Inheritance 3. Regulation of Transcription Initiation a) Transcription Factors b) Enhancer Regions 4. Mechanisms of Post-Transcriptional Regulation a) RNA Processing b) mRNA Degradation c) Initiation of Translation d) Protein Processing and Degradation E. Non-Coding RNAs 1. microRNAs, RNAi, siRNAs F. Cytoplasmic Determinants G. Sequential Regulation of Gene Expression During Cellular Differentiation H. Genes associated with cancer 1. Proto-oncogenes 2. Tumor suppressors genes 3. Interference with Normal Cell-Signaling Pathways					
7	Biotechnology	**I. Viruses** A. Structure B. Replicative Cycles - Lytic Cycle and lysogenic Cycle C. Retroviruses **II. Biotechnology**	8	20.1-20.2 19.1-19.2 27.1-27.2- Review Bacteria	Restriction Enzyme Analysis of DNA; Bacterial Transformation	Biotechnology	Who Will You Stand With?

		A. DNA Cloning: Preview 1. Restriction Enzymes to Make Recombinant DNA 2. Cloning Eukaryotic Genes in a Bacterial Plasmid a) Producing Clones b) Storing Clones c) Screening Library for Clones 3. Expressing Clones Genes a) Bacterial Expression b) Eukaryotic Expression 4. Amplification of DNA - PCR B. Studying the Sequence, Expression, and Functions of Genes 1. Gel Electrophoresis and Southern Blot 2. DNA Sequencing 3. Analyzing Expression a) Single Gene b) Interacting Genes 4. Determining Gene Function C. Cloning and Applications 1. Cloning a) Plants b) Animals c) Stem Cells 2. Applications a) Medical b) Forensics c) Environmental Cleanup d) Agricultural **III. Genomes** A. Linkage map B. Transposable elements C. Transposons D. Retrotransposons E. STRs		Chapter 21.2, 21.4-21.5			
8	Reproduction and Genetics	**I. Meiosis and Sexual Life Cycles** A. Meiosis Comparison with Mitosis B. Genetic Variation in Meiosis– Crossing over and Independent assortment C. Oogenesis, Spermatogenesis **II. Animal Development** A. Fertilization B. Cleavage C. Gastrulation D. Cytoplasmic Determinants E. Cell Differentiation **III. Angiosperm Reproduction**	8	Chapter 13 Chapter 47 Chapter 38.1 Chapter 14 Chapter 15	Fruit Fly Cross		Genes and ConSequences; Flower and Fruit Dissections

		A. Flower Structure B. Fertilization C. Fruit Formation **IV. Mendel and the Gene Idea** A. Mendel B. Law of Segregation C. Law of Independent Assortment D. Probability E. Monohybrid and Dihybrid Crosses F. Pedigree Analysis G. Genetic Diseases H. Inheritance Patterns - Recessive, Dominant, Codominance, Incomplete Dominance, Polygenic Traits, Pleiotropy, Epistasis **V. The Chromosomal Basis of Inheritance** A. Sex Linkage B. X-inactivation C. Linkage and Genetic Recombination D. Polyploidy, Trisomy, Monosomy, Nondisjunction E. Chromosomal Mutations and Disorders F. Genomic Imprinting					
9	Ecology	**I. Animal Behavior** A. Innate vs. Learned Behavior B. Fixed Action Pattern C. Operant Conditioning D. Classical Conditioning E. Habituation F. Altruism **II. Introduction to Ecology and the Biosphere** A. Levels of Organization B. Biomes **III. Population Ecology** A. Abiotic Factors and Biotic Factors B. Survivorship Curves - K-selected and R-selected species C. Growth Rate, Exponential and Logistic Growth Patterns D. Carrying Capacity – Limiting Factors, Density Dependent, Density Independent E. Invasive Species **IV. Community Ecology** A. Niche B. Competitive Exclusion C. Symbiotic Relationships D. Predation, Defense Mechanisms – Batesian Mimicry, Mullerian Mimicry E. Coevolution F. Keystone Species	7	Chapter 51 Chapter 52.4 Chapter 53 Chapter 54 Chapter 55 Chapter 56.1	Animal Behavior; Energy Dynamics		Crazy About Cryptids; The Field Guide to Fantastic Beasts

		G. Succession, Primary and Secondary, Climax Forest **V. Ecosystems and Restoration Ecology** A. Nutrient Cycling – Carbon, Nitrogen, Phosphorous, Water B. Energy Flow, Food Chains/Webs C. Trophic Levels and Structure D. Ecological Pyramid E. Production Efficiency - 10% Rule **VI. Conservation Biology and Global Change** A. Biodiversity and Human Impacts					
10	AP Test Review		11				

Textbook: Campbell Biology, 9th edition

Mastering Biology online textbook link: http://www.k12pearson.com/PH/rqstAccess/default.cfm