

# Fast-Paced High School Biology (BIOL)

## Center for Talented Youth

	SESSION	WHAT/CONTENT (concepts, topics, objectives)	HOW/FORMAT (labs, readings, activities)	CHAPTER / Vocabulary
<b>DAY 0 – Pre-test</b>				
<b>DAY 0</b>	evening	Pre-test		
<b>DAY 1 – Life and the Scientific Method</b>				
<b>DAY 1</b>	morning	<p>Introductions</p> <ul style="list-style-type: none"> <li>- Lab Safety</li> <li>- Class Policies and Procedures</li> <li>- Syllabus and Course Outline</li> <li>- Icebreaker *sit in circle with 10 pennies – I have never...</li> <li>- Brief Autobiography (Instructor and TA)</li> <li>- Themes in Biology</li> </ul> <p>Characteristics of Life</p> <ul style="list-style-type: none"> <li>- Alive worksheet</li> <li>- Definition of Life</li> </ul> <p>Scientific Method:</p> <ul style="list-style-type: none"> <li>- Cell Phone Discussion</li> <li>- Definitions of Scientific Method Terms</li> <li>- Penny Lab</li> </ul>	<p><u>Icebreaker</u></p> <p>\$2 in pennies split into plastic bags of 10</p> <p>-save pennies for Genetics</p> <p><u>Penny Lab</u></p> <p>10 eye droppers</p> <p>Liquid detergent</p>	<p>Chapter: 1</p> <p><u>Vocabulary:</u></p> <p>Observation</p> <p>Data</p> <p>Inference</p> <p>Hypothesis</p> <p>Controlled</p> <p>Manipulated</p> <p>Theory</p> <p>Asexual</p> <p>Stimulus</p> <p>Metric</p> <p>Biology</p> <p>Microscope</p> <p>Cell</p> <p>Homeostasis</p> <p>Metabolism</p> <p>Cell Culture</p> <p>Surface Tension</p>
	afternoon	<p>Periodic Table Discussion</p> <ul style="list-style-type: none"> <li>- Basic Chemical Properties &amp; Terminology</li> <li>- Periodic Table Scavenger Hunt</li> </ul> <p>Water and Its Properties</p> <ul style="list-style-type: none"> <li>- Adhesion</li> <li>- Oil</li> </ul>	<p><u>Periodic Table Discussion</u></p> <p>20 minutes</p> <p><u>Water and Its Properties</u></p> <p>Paper Cups</p> <p>Paper Clips</p> <p>Salt</p> <p>Vegetable Oil</p> <p>Rubber Bands</p> <p>10 Petri dishes</p> <p>½ teaspoon</p> <p>20 pieces of graph paper</p>	

late afternoon / evening study session	Article: "Are Viruses Alive?" by Luis P Villarreal, <i>Scientific American</i>  Scientific Method Poem  Reading: Chemistry	Article Printout Reading Questions
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**DAY 2 – Chemistry and Macromolecules**

DAY 2	morning	Discussion of Article  Discussion of Chemistry - Atomic Structure - Bonding - pH  Macromolecules - Definition of Macromolecules - Presentations – Groups of 4-5 Lipids Proteins Nucleic Acid Carbohydrates - Macromolecule Chart	<u>Macromolecules</u> <u>Presentation</u> 4 Poster Boards Markers  <u>Macromolecule Chart</u>	Chapter: 2 & 7 <u>Vocabulary:</u> Chemical Reaction Reactant Product Base Acid Proton Neutron Electron Compound Ion Nucleus Isotope Isomer Monomer Polymer Covalent bond Ionic bond Hydrogen bond
	afternoon	Pineapple Lab - Lab Report Explaining Potential Problem  Food Nutrient Analysis Lab - Follow-up Questions  Enzyme Discussion - What are enzymes and what do they do?	<u>Pineapple Lab</u> Jell-O Clear Cups Canned Pineapple Fresh Pineapple *make Jell-O in cups the night before  <u>Food Nutrient Analysis Kit</u> 696102 – Carolina Biological  Hot Water Bath	
	late afternoon / evening study session	Day Two: Articles  Reading: Macromolecules and Enzymes		

### DAY 3 – Enzymes, Cells and Transport

<b>DAY 3</b>	morning	<p>Quiz – Multiple Choice</p> <p>Enzymes - Review Reaction Rate Graph</p> <p>Cells - Cell Theory - Surface area to volume - Organelles (Analogy Project)</p> <p>Membrane Transport - Active vs. Passive Transport - Osmosis vs. Diffusion - Rate</p>	<p><u>Cell Analogy Project</u> Poster Board (Cut in Half) Markers</p>	<p>Chapter: 7 <u>Vocabulary:</u> Mitochondrion Ribosome Endoplasmic Reticulum Golgi Apparatus Lysosome Chloroplast Prokaryotes Eukaryotes Cytoplasm Cell Membrane Diffusion Osmosis Active Transport Passive Transport Hypertonic Hypotonic Endocytosis Phagocytosis Facilitated Diffusion Vacuole Cell Wall</p>
	afternoon	<p>Diffusion – Osmosis Lab</p> <p>Hypertonic, Hypotonic &amp; Isotonic Diagrams</p>	<p><u>Diffusion – Osmosis Lab</u> 684260 – Carolina Biological</p> <p><u>Diagrams</u> 9 Graph Papers</p>	
	late afternoon / evening study session	<p>Cell Analogy Project Presentations</p> <p>Plant vs. Animal vs. Bacterial Cells Drawings and Differences</p>	<p><u>Drawings</u> Computer Paper</p> <p><u>Cell Organelle Research</u> Textbook</p>	

### DAY 4 – Cellular Energy – Photosynthesis & Cell Respiration

<b>DAY 4</b>	morning	<p>Slides of Cells – Label Five Differences you see</p> <p>Cell Energy / Thermodynamics - Laws of Thermodynamics - Endergonic &amp; Exergonic Reactions - Cellular Respiration - Photosynthesis- discuss plant structure</p> <p>Start Cell Respiration &amp; Photosynthesis Chart</p>	<p><u>Slides of Cells</u> 292112 (Qt.2) – Carolina Biological</p> <p>Need 10 Microscopes</p>	<p>Chapter: 8 &amp; 9 <u>Vocabulary:</u> Photosynthesis Chlorophyll Pigment Adenosine Triphosphate Thylakoid Photosystem Stroma Grana NADP+ Calvin Cycle Light-dependent reactions Heterotroph Autotroph Energy Glycolysis Cellular Respiration NAD+ Fermentation Anaerobic Aerobic</p>
	afternoon	<p>Lactic Acid Test</p> <p>Nova Video – Marathon Challenge (1 hour)</p>	<p><u>The Beauty of Wall Sits</u></p> <p><u>Marathon Challenge</u> Connection to Internet and Projector</p>	

late afternoon / evening study session	Article, "The Effects of Smoking." Finish Cell Respiration/Photosynthesis Chart - diagram pictures with labels		Krebs Cycle Electron Transport Chain
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**DAY 5 – DNA, Chromosomes & Mitosis/Meiosis**

DAY 5	morning	Quiz – Multiple Choice Discussion on Article Review of Cell Respiration & Photosynthesis Lecture: DNA and Chromosome - DNA and Chromosome Structure Activity: DNA Model Pipe Cleaner Product  - Autosomes vs. Sex Chromosomes - Karyotypes and Genetic Disorders Activity: Chromosome Magnetic Kit  - Cell Cycle (Pie Graph) - Mitosis and Meiosis	<u>DNA Model</u> 50 black pipe cleaners 50 red pipe cleaners 50 green pipe cleaners 50 yellow pipe cleaners 50 blue pipe cleaners  <u>Chromosome Magnetic</u> 173837 – Carolina Biological	Chapter: 10 & 12 <u>Vocabulary:</u> Cytokinesis Telophase Mitosis Meiosis Metaphase Chromatids Prophase Anaphase Cell Division Centriole Cancer Centromere Cyclin Cell Cycle Spindle Interphase G1 Phase G0 Phase S Phase G2 Phase DNA RNA
	afternoon	Finish Mitosis/Meiosis Discussion  Strawberry DNA Extraction	<u>Mitosis</u> 171520 – Carolina Biological  <u>DNA Extraction</u> 211338 – Carolina Biological  Need Strawberries	Base Pairing Nucleotide Histone Transcription Intron Exon Translation Replication Karyotype Autosomes
	late afternoon / evening study session	Partner Test – Week One  Cancer Article		

**DAY 6 – The Central Dogma**

DAY 6	morning	The Central Dogma - Role - DNA Replication - Protein Synthesis  Map of The Central Dogma - students will make maps in pairs	<u>The Central Dogma Poster</u> Poster Board Markers	Chapter: <u>Vocabulary:</u> Transfer RNA Messenger RNA Central Dogma Ribosomal RNA Replication Promoter
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afternoon	DNA, Replication, and Transcription Set Name Project – Register Tape	<u>DNA Replication Set</u> 211119 – Carolina Biological <u>Register Name</u> Register Tape Markers Worksheet for Project	Mutation Polyploidy Operon DNA polymerase RNA polymerase Codon Point mutations Hox genes
late afternoon / evening study session	Enzyme Job Worksheet Read: Mendel's Autobiography		

**DAY 7 – Mendelian Genetics**

DAY 7	morning	Lecture: - Mendel's Laws – Discussion on Story - Determining Heredity  Punnett Square Practice Worksheet - Monohybrid and Dihybrid		Chapter: 11 <u>Vocabulary:</u> Heterozygous Homozygous F1 Generation F2 Generation P Generation Dominance Recessive Allele Phenotype Gamete Genetics Probability Haploid Gene Map Gene
	afternoon	Penny Flip Probability Corn Genetics  Pedigrees Practice	<u>Penny Flip</u> Worksheet Pennies  <u>Corn Genetics</u> 176360 – Carolina Biological	Trait Hybrids Independent Assortment Random Segregation
	late afternoon / evening study session	Purple People Eater Assignment Article: "Is Intelligence a Gene?" Discussion on Implications of this article		

**DAY 8 – Genetic Engineering**

DAY 8	morning	Quiz – Multiple Choice  Lecture: - Transgenic Biotechnology - Recombinant DNA Technology - Polymerase Chain Reaction - DNA Fingerprinting - Restriction Fragment Length Polymorphism  Recombinant DNA and Plasmid Activity	<u>Recombinant DNA</u> <u>Plasmids Activity</u> Scissors Tape  <a href="http://www.ebbep.org/docs/re/paperplasmids.pdf">http://www.ebbep.org/docs/re/paperplasmids.pdf</a>	Chapter: 13 <u>Vocabulary:</u> Selective Breeding Inbreeding Genetic Engineering Gel Electrophoresis Recombinant DNA Polymerase Chain Reaction Plasmid Genetic Marker Transgenic Clone Hybridization
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afternoon	Criminal DNA Fingerprinting How to Clone A Gene Map	<u>Criminal DNA Fingerprinting</u> 211040 – Carolina Biological	Restriction Enzymes Transformation
late afternoon / evening study session	Genetic Engineering Research Project Genetic Engineering Article Reading: Evolution		

**DAY 9 – Evolution**

DAY 9	morning	Lecture: - The theory of evolution - Origin of Life - Darwin and Natural Selection - Evidence for Evolution - Patterns of Evolution - Gradualism vs. Punctuated Equilibrium - Six Kingdoms - Human Evolution  Evolution – Great Transformations Video - Transformation Worksheet	<u>Great Transformations Video</u> Connection to Internet and Projector	Chapter: 16 & 17 <u>Vocabulary:</u> Evolution Lamarck Darwin Stabilizing Selection Directional Selection Disruptive Selection Population Reproductive Isolation Geographic Isolation Temporal Isolation Gradualism Punctuated Equilibrium Natural Selection Fitness Taxonomy Binomial Nomenclature Coevolution Divergent Evolution Convergent Evolution Homologous Structures Vestigial Structures Cladogram
	afternoon	Tree of Life – Design your own cladogram		
	late afternoon / evening study session	Human Evolution Article “Are we still evolving?” Opinion Essay – one page “What makes us human?”  Reading: Ecology		

**DAY 11 – Plant, Fungi, Bacteria, and Viruses**

DAY 11	morning	Plants: - structures - functions - reproduction Angiosperms vs. Gymnosperms  Dicots vs. Monocots  Photosynthesis Lab	<u>Angiosperms vs. Gymnosperms</u> Worksheet  <u>Dicots vs. Monocots</u> Worksheet  <u>Photosynthesis</u> 206000 – Carolina Biological	Chapter: 22 - 25 <u>Vocabulary:</u> Sporophyte Gametophyte Gymnosperm Angiosperm Flowers Pollination Seed Fruit Monocot Dicot
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<p>afternoon</p>	<p>Bacteria vs. Virus T/F Quiz</p> <p>Bacteria</p> <ul style="list-style-type: none"> <li>- structure</li> <li>- function</li> <li>- gram positive vs. gram negative</li> <li>- binary fission</li> </ul> <p>Bacteria Drawing</p> <p>Virus</p> <ul style="list-style-type: none"> <li>- structure</li> <li>- function</li> <li>- harm</li> <li>- lytic vs. lysogenic</li> </ul> <p>Virus Drawing</p> <p>Bacteriophage</p> <p>Fungi</p> <ul style="list-style-type: none"> <li>-structure</li> <li>-function</li> </ul> <p>Presence of Bacteria Lab</p>	<p><u>Environment Sampling Kit</u> 154601 – Carolina Biological</p>	<p>Annuals Dicot Apical Meristem Differentiation Bud Mesophyll Transpiration Adhesion Capillary action Vascular tissue Nonvascular tissue Stigma Anther Germination</p> <p>Chapter: 19 <u>Vocabulary:</u> Bacteria Eubacteria Virus Lysogenic Infection Chemoautotroph Toxin Prion Bacteriophage Antibiotic Prokaryote Spirillum Prophage Endospore Bacillus Binary fission Obligate anaerobe Vaccine</p>
<p>late afternoon / evening study session</p>	<p>Ecology</p> <p>Population ecology</p> <ul style="list-style-type: none"> <li>-Density and distribution</li> <li>-Demography, growth, and survivorship</li> <li>-Regulation</li> </ul> <p>Community ecology</p> <ul style="list-style-type: none"> <li>-Interactions</li> <li>-Diversity</li> <li>-Structure: invasive and keystone</li> </ul> <p>Ecosystem ecology</p> <ul style="list-style-type: none"> <li>-Energy flow and pyramids</li> </ul>	<p>Invasive species article</p>	<p>Chapter: 3 and 4 <u>Vocabulary:</u> Biosphere Species Population Community Ecosystem Trophic Level Limiting nutrient Primary Productivity Niche Biotic factors Symbiosis Mutualism Commensalism Parasitism Ecological succession Population density Logistic growth Carrying capacity Density dependent/independent factors</p>

**DAY 12 – Animal Kingdom**

<b>DAY 12</b>	morning	Invertebrate Discussion: - common characteristics - class organization  Earthworm Dissection Lab	<u>Earthworm Dissection</u> <u>BioKit</u> 221410- Carolina Biological	Chapter: 29 - 32 <u>Vocabulary:</u> Vertebrate Cartilage Atrium Ventricle Cerebrum Cerebellum Ectotherms Endotherms Subcutaneous plants Diaphragm Marsupial Placenta Binocular vision Anthropoids Prehensile Bipedal Opposable thumb Retina Iris Lens Rods Cones Semicircular canals Tympanum
	afternoon	Vertebrate Discussion: - common characteristics - class organization - vertebrates vs. invertebrates		
	late afternoon / evening study session	Human Anatomy- comparing to invertebrates/vertebrates- Senses Sense Lab		

**DAY 13 – Comparative Anatomy**

<b>DAY 12</b>	morning	Human Anatomy- comparing to invertebrates/vertebrates - Nervous, Muscular, Integumentary  Reflex Lab		Chapter: 35 – 40 <u>Vocabulary:</u> Epithelial Connective Nervous Muscle Neuron Axon Dendrite Dermis Epidermis Actin Myosin Immunity Digestion Metabolism Catabolism Anabolism Aorta Ventricle Atrium
	afternoon	Human Anatomy- comparing to invertebrates/vertebrates - Digestive and Circulatory  Prepare for Heart Dissection		
	late afternoon / evening study session	Heart Dissection – Comparative Anatomy: Hearts of Pig, Sheep and Cow	<u>Comparative Heart Dissection</u> 221493 – Carolina Biological *Need dissecting trays and tools	

**DAY 14 – The Human Body**

<b>DAY 14</b>	morning	Human Body Systems T-shirts		
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	late afternoon / evening study session	Post-Test	Post-Test	
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**DAY 15 – Wrap Up**

<b>DAY 15</b>	morning	Movie – “The Human Body”	<u>The Human Body</u> – Discovery Connection to Internet and Projector	
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