## Term 1
### UNIT 1
**Weeks 1-2**

### TOPIC: Chemistry, Photosynthesis, Cellular Respiration

1. **6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.**

2. **5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.**

3. **7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.**

4. **3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.**

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### ELA

1. **[CCSS] ELA-LITERACY.L.9-10.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9-10 reading and content, choosing flexibly from a range of strategies.**

2. **[CCSS] ELA-LITERACY.W.9-10.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.**

3. **[CCSS] ELA-LITERACY.L.9-10.2.C Spell correctly.**

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### Learning Objectives

1. Be able to build a space-filling model of an atom based on its chemical structure

2. Know basic inputs & outputs of photosynthesis and cellular respiration

3. Understand organelles & structures involved

4. Understand transfer of energy

5. Understand how photosynthesis and cellular respiration are (inter)related

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### Academic Vocabulary

- Atom
- Molecule
- Energy
- Pigment
- Thylakoid
- Membrane
- Chloroplast
- Electron Transport Chain
- Enzyme
- Glucose
- Mitochondria
- ATP
- Hydrogen atom
- Concentration gradient

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### Resources/Texts

- **Textbook:**
  - pg 97-103 (photosynthesis)
  - pg 502 stomata
  - pg 542 case study
  - pg104-107 (cellular respiration)
  - pg 65 mitochondria
  - pg 37 (ATP)

- **Other Resources:**
  - Richard Feynman “Fire” (video)
  - Amanda Ooten “The simple story of photosynthesis and food” (video)
  - Leslie Samuel “What ATP is and How it Works” (video)

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<td><strong>Term 1 Semester 1</strong>&lt;br&gt;UNIT 2&lt;br&gt;Weeks 3-4</td>
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<td><strong>TOPIC: Protein Synthesis</strong></td>
<td>HS-LS-1.1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.</td>
<td><strong>ELA</strong>&lt;sup&gt;[2]&lt;/sup&gt; ELA-LITERACY.W.9-10.2.D</td>
<td>1) Know basic structure of DNA 2) Know basically how transcription and translation work 3) Understand some of the ways you can get errors and the implications some can have. Why would the mutations be ‘silent’? 4) Relationship between structure and function of different parts</td>
<td>● Base  ● Backbone  ● Nucleotide (sugar)  ● Base Pair  ● Double helix  ● Base pairing rules  ● mRNA  ● polymerase  ● ribosome  ● tRNA  ● protein  ● peptide bond</td>
<td><strong>Textbook:</strong>  - pg 62 (nucleus)  - pg 194 (DNA structure)  - pg 209-211 (Protein synthesis)  <strong>Other Resources:</strong>  - NOVA science NOW “RNAi” (video)  - Gizmo “Building DNA” (virtual lab resource)  - Walter and Eliza Hall Institute of Medical Research “Molecular Visualizations of DNA” (video)  - Gizmo “RNA and Protein Synthesis” (virtual lab resource)</td>
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<td>3.2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.</td>
<td><strong>ELA</strong>&lt;sup&gt;[3]&lt;/sup&gt; ELA-LITERACY.W.9-10.7</td>
<td>1) Understand that all cells of an organism contain the same DNA, but are using it differently. 2) Understand that the body is organized hierarchically 3) Understand what homeostasis is 4) Relate form to function 5) Understand the role of enzymes in chemical reactions in the body 6) Explain how any body system relates to homeostasis. 7) Build a model of an organ &amp; explain its parts to the class.</td>
<td>● Homeostasis  ● Cell  ● Tissue  ● Organ  ● Organ System  (other specific terminology varies with body system)</td>
<td><strong>Textbook:</strong>  - pg 846 (body structure)  - Ch 37-43 depending on individual research project  <strong>Other Resources:</strong>  - NPR.org “The Invisible Universe of the Human Microbiome” (video)</td>
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<td><strong>Term 1 Semester 1</strong>&lt;br&gt;UNIT 3/4&lt;br&gt;Weeks 5-6</td>
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<td><strong>TOPIC: Human Body</strong></td>
<td>1.4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. 1.2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.</td>
<td><strong>ELA</strong>&lt;sup&gt;[3]&lt;/sup&gt; ELA-LITERACY.W.9-10.7</td>
<td>Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. CCSS.ELA-LITERACY.RST.9-10.7</td>
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<td>1.3 Plan and conduct an investigation to provide evidence that <strong>feedback mechanisms</strong> maintain <strong>homeostasis</strong>.</td>
<td>Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. <strong>MATH</strong>[4]<strong>[MS]</strong> CCSS.MATH.CONTENT.HSS.IC.B.6</td>
<td>Evaluate reports based on data.</td>
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<td>- Gizmo “Human Homeostasis” (virtual lab resource) - Nathan Strong “The 2000-Meter Row: A Case in Homeostasis” (article) - Don’t tell teacher “Enzymes – a fun introduction” (video) - TOPS (Teachers and Occidental Partnering in Science) “Kinetics” (multi-day lab)</td>
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<td>UNITS 5</td>
<td>TOPIC: forensics, crime scene, (DBQ)</td>
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<td>Weeks 7-9</td>
<td>3.1 Ask questions to clarify relationships about the role of <strong>DNA and chromosomes</strong> in coding the instructions for characteristic <strong>traits</strong> passed from parents to <strong>offspring</strong>.</td>
<td><strong>ELA</strong> CCSS.ELA-LITERACY.RI.11-12.7 Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.</td>
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<td>3.2 Make and defend a claim based on evidence that <strong>inheritable genetic variations</strong> may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.</td>
<td><strong>CCSS.ELA-LITERACY.RST.9-10.3</strong> Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.</td>
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<td>1) Understand why every human has different DNA 2) Understand the role of restriction enzymes in digesting DNA 3) Use equipment (micropipettes &amp; gel electrophoresis) to separate pieces of DNA and explain which sample matches that which was found at the scene of the crime 4) Follow specific lab protocol 5) Understand the value of precise measuring and sterile technique</td>
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<td>● Micropipette ● Gel Electrophoresis ● Concentration ● Restriction enzyme ● Lane ● Well ● Band</td>
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<td>Textbook: pg 688-9 Biotech application Amgen Biotechnology Experience Lab Materials – as modified by teacher</td>
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| **UNIT 6**        | **TOPIC**: Biodiversity | - MATH | CCSS.MATH.CONTENT.HSN.Q.A.3 | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | ● ecosystem  
● species  
● biodiversity  
● carrying capacity  
● invasive species  
● endemic  
● native  
● food chain/web | **Textbook:**  
- Ch 16.1-2  
- Ch 17.1, 3  
- p490: relationships  
- pg 804-5 grizzly bears  
- Excerpts from ch 22-34 according to student projects  
**Other Resources:**  
- Gizmo “Forest Ecosystem” (virtual lab resource)  
- Gizmo “Coral Reefs 2” (virtual lab resource)  
- National Geographic Wild “Venomous Cane Toads” (video)  
- Entomological Society of America “Invasive Species” (video)  
- Global Invasive Species Database |
|                   |                | - ELA | CCSS.ELA-LITERACY.W.9-10.7 | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. | 1) Understand the flow of energy through a food chain/food web.  
2) Be able to explain how an increase or decrease in the population of one species impacts other species in the ecosystem.  
3) Explain the effects of invasive species on native populations of other species.  
4) Develop a plan for reducing this impact (case study: invasive coffee plant in Costa Rica Rain forest) |                |
|                   |                |                | CCSS.ELA-LITERACY.RST.9-10.7 | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |                |
|                   |                |                | MATH | CCSS.MATH.CONTENT.HSN.Q.A.2 | Define appropriate quantities for the purpose of descriptive modeling |                |
|                   |                |                | | CCSS.MATH.CONTENT.HSF.LE.B.5 | Interpret the parameters in a linear or section that follows from and supports the argument presented. |                |
|                   |                |                | |                             |                             |                |
|                   |                |                |                             |                             |                |
|                   |                |                |                             |                             |                |
|                   |                |                |                             |                             |                |

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| UNIT 7 Weeks 12-13 | TOPIC: Carbon Cycle | 2.4 Use mathematical representations to support claims for the *cycling of matter* and flow of *energy* among organisms in an *ecosystem*.  
2.5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the *cycling of carbon* among the biosphere, atmosphere, hydrosphere, and geosphere. | **ELA**  
CCSS.ELA-LITERACY.W.11-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.  
**MATH**  
CCSS.MATH.CONTENT.HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling  
CCSS.MATH.CONTENT.HSF.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context. | 1) Understand Einstein’s equation, and the relationship between matter and energy  
2) Explain how carbon is moved between biotic and abiotic factors in the ecosystem.  
3) Explain the affects of human activity on the carbon cycle. | ● biosphere  
● geosphere  
● hydrosphere  
● atmosphere  
● carbon  
● hydrogen  
● carbon dioxide  
● photosynthesis  
● cellular respiration  
● energy  
● matter | Textbook:  
- ch 16.3  
- pg 651, 654-5: earthworms  
Other Resources:  
- CA Education and the Environment Initiative “The Life and Times of Carbon” (Activity Guide)  
- TOPS (Teachers and Occidental Partnering in Science) “Water Quality” (multi-day lab and readings) |
| UNIT 8/9 Weeks 14-15 | TOPIC: Evolution | 2.8 Evaluate the evidence for the role of group behavior on individual and species’ chances to **survive** and reproduce.  
3.3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.  
4.2 Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to **increase in number**, (2) the heritable genetic variation of individuals in a species due | **ELA**  
CCSS.ELA-LITERACY.W.11-12.1.E Provide a concluding statement or section that follows from and supports the argument presented.  
CCSS.ELA-LITERACY.RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.  
CCSS.ELA-LITERACY.RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex | 1) Create a cartoon showing the speciation of a fictitious population, applying scientific concepts of variation, adaptation and natural selection.  
2) Describe real and fictitious fossil records in terms of periods of gradualism and punctuated equilibrium  
3) Draw reasonable conclusions based on evidence to explain other, current biological phenomena, as relating to modern organisms. | ● Biological Species Concept  
● Reproduction  
● Variation  
● Adaptation  
● Natural Selection  
● Environment  
● Selection Pressures  
● Speciation  
● Fossils  
● Analogous  
● DNA Evidence  
● Embryo  
● Embryology  
● Evolution  
● Extinction | Textbook:  
- Ch 13  
- Ch 9  
- Ch 15.2  
- pg 474 malaria  
- pg 710 fossil  
- pg 714-18 fish  
- pg 753 lateral line  
- pg 791 bird adaptations  
- pg 835 sexual selection  
Other Resources:  
- Khan Academy “What is a Species?” (video)  
- Crash Course “Natural Selection” |
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| to mutation and sexual reproduction, (3) **competition** for limited resources, and (4) the **proliferation** of those organisms that are better able to survive and reproduce in the environment.  
4.3 Apply concepts of statistics and probability to support explanations that organisms with an **advantageous heritable trait** tend to **increase** in proportion to organisms lacking this trait.  
4.4 Construct an explanation based on evidence for how **natural selection leads to adaptation** of populations.  
4.5 Evaluate the evidence supporting claims that changes in environmental **conditions** may result in: (1) **increases** in the number of individuals of some species, (2) the **emergence** of new species over time, and (3) the **extinction** of other species.  
4.1 Communicate scientific information that **common ancestry** and biological **evolution** are supported by multiple lines of empirical **evidence** | process, phenomenon, or concept; provide an accurate summary of the text.  
**MATH**  
CCSS.MATH.CONTENT.HSN.Q.A.2  
Define appropriate quantities for the purpose of descriptive modeling | ● Fertile  
● Fossil  
● Gradualism  
● Haeckel’s Drawings  
● Homologous  
● Hybrid  
● Inbreeding  
● Infertile  
● Missing Link  
● Morphology  
● Natural Selection  
● Offspring  
● Parthenogenesis  
● Phylogeny  
● Punctuated Equilibrium  
● Reproductive Isolation  
● Sexual Selection  
● Speciation  
● Species  
● Variation  
● Vestigial | (Video)  
- Lab of Ornithology “Natural Selection & Sexual Selection”(video)  
- Kim B. Foglia “Anatomical Evidence of Evolution” (Dry Lab)  
- PBS “Guess the Embryo” (website interactive)  
- Randall Niles “Evolution – Evidence from Embryology” (video)  
- Teacher assembled “Embryology” (article)  
**ELA**  
CCSS.ELA-LITERACY.RST.9-10.3  
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in | 1) Demonstrate the processes of waste water treatment used in LACSD.  
2) Explain the chemical and biological consequences of human waste interfacing with natural environment.  
3) Create a proposal for affordable, | ● pH  
● Acid/Base  
● Turbidity  
● Nitrogen  
● Bacteria  
● Contamination  
● Filtration  
● Sediment  
● Sedimentation | LACSD Sewer Science Curriculum, as modified by teacher.  
HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.  
TOPIC: Waste Treatment  
**ELA**  
CCSS.ELA-LITERACY.RST.9-10.3  
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in | 1) Demonstrate the processes of waste water treatment used in LACSD.  
2) Explain the chemical and biological consequences of human waste interfacing with natural environment.  
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● Acid/Base  
● Turbidity  
● Nitrogen  
● Bacteria  
● Contamination  
● Filtration  
● Sediment  
● Sedimentation | (Video)  
- Lab of Ornithology “Natural Selection & Sexual Selection”(video)  
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<td>HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering</td>
<td></td>
<td>the text.</td>
<td>● Waste water</td>
<td>● Effluent management</td>
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<td>HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.</td>
<td></td>
<td>CCSS.ELA-LITERACY.W.11-12.2.A Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</td>
<td>● Aerobic</td>
<td>● Anaerobic</td>
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<td>HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.</td>
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<td>CCSS.ELA-LITERACY.W.11-12.2.B Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.</td>
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<td>CCSS.MATH.CONTENT.HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</td>
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<td>CCSS.MATH.CONTENT.HSA.CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.</td>
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