CDE Agricultural Biology Honors

Course designed to meet UC “d” Admissions Requirement

I. Course Information

Course Title:	CDE Agricultural Biology Honors
Course Abbreviation:	CDE Ag. Bio. Honors
Subject:	Laboratory Science – Biology
Career Technical Ed:	Yes
Credits:	10 Units
Unit Value:	1.0
Grade Points Earned:	A= 5 Grade Points, B= 4 Grade Points & C= 2 Grade Points
Length of Course:	1 Year (2 consecutive semesters)
Grade Level:	Freshmen & Sophomores
Prerequisites:	Successful completion of previous years science course (grade points earned 3 or 4) and successful completion of “Summer Assignments” Student must have successfully completed or have concurrent enrollment in Algebra I or equivalent
Target Group:	Incoming ninth grade students with honors or GATE who plan to enroll in Advanced Placement Biology and/or enroll in a college or university with a major declared within the fields of agriculture and/or natural resources. Tenth grade students with honors or GATE who plan to enroll in Advanced Placement Biology and/or enroll in a college or university with a major declared within the fields of agriculture and/or natural resources.

II. Course Goals

A. Agricultural Biology Honors Description:
Agricultural biology honors has been designed for college and university – bound, motivated high school freshmen and sophomores interested in pursuing the fields of agriculture and natural resources. Agricultural biology honors will introduce students to the world of science and technology from an agricultural and natural resources perspective and will emphasize detailed knowledge of the biological principles of the following areas: molecular and cellular aspects of living things and systems, structure and function of plants and animals, genetics, physiology, plant and animal diversity, and principles of classification, ecological relationships, and animal behavior. Students will be offered the opportunity to experience agricultural science first hand and develop laboratory and management skills by raising plants and animals. Students will utilize the on-site orchard, greenhouse, and animal laboratories for research and observations. All students, as concurrent members of the FFA, participate in leadership activities, career exploration, and community service.

B. Agricultural Biology Honors Unifying Goals:
1. The diversity and unity of life are driven by the process of evolution which is readily observable when investigating the industry practices within the fields of agriculture and natural resources.
2. Biological systems are abundant within the fields of agriculture and natural resources and these 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 which is readily observable when investigating the fields within agriculture and natural resources.
4. Biological systems which are abundant within the fields of agriculture and natural resources interact, and these systems and their interactions possess complex properties.

C. Agricultural Biology Honors Encompassing Course Objectives:
A course objective is a way to coordinate knowledge and skills in order to accomplish a goal or task. These objectives enable students to establish lines of evidence and use them to develop and refine testable explanations and predictions of natural phenomena. These objectives capture important aspects of the work that scientists engage in, at the level of competence expected of agricultural biology honors students.

Encompassing Objective 1: The student can use representations and models to communicate scientific phenomena and solve scientific problems.

1. The student can *create representations* and *models* of natural or man-made phenomena and systems in the domain.
2. The student can *describe representations* and *models* of natural or man-made phenomena and systems in the domain.
3. The student can *refine representations* and *models* of natural or man-made phenomena and systems in the domain.
4. The student can *use representations* and *models* to analyze situations or solve problems qualitatively and quantitatively.
5. The student can *reexpress* key elements of natural phenomena across multiple representations in the domain.

Encompassing Objective 2: The student can use mathematics appropriately.

1. The student can *justify the selection of a mathematical routine* to solve problems.
2. The student can apply *mathematical routines* to quantities that describe natural phenomena.
3. The student *estimate numerically* quantities that describe natural phenomena.

Encompassing Objective 3: The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the agricultural biology honors course.

1. The student can *pose scientific questions.*
2. The student can *refine scientific questions.*
3. The student can *evaluate scientific questions.*

Encompassing Objective 4: The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the agricultural biology honors course.

1. The student can *justify* the selection of the kind of data needed to answer a particular scientific question.
2. The student can *design a plan* for collecting data to answer a particular scientific question.
3. The student can *collect data* to answer a particular scientific question.
4. The student can *evaluate sources of data* to answer a particular scientific question.

Encompassing Objective 5: The student can perform data analysis and evaluation of evidence.

1. The student can *analyze data* to identify patterns or relationships.
2. The student can *refine observations* and *measurements* based on data analysis.
3. The student can *evaluate the evidence provided by the data sets* in relation to a particular scientific question.

Encompassing Objective 6: The student can work with scientific explanations and theories.

1. The student can *justify claims with evidence.*
2. The student can *construct explanations of phenomena based on evidence* produced through scientific practices.
3. The student can *articulate the reasons that scientific explanations and theories are not refined or replaced*.
4. The student can *make claims and predictions about natural phenomena* based on scientific theories and models.
5. The student can *evaluate* alternative scientific explanations.

Encompassing Objective 7: The student is able to connect and relate knowledge across various scales, concepts, and representations in and across domains.

1. The student can *connect phenomena and models* across spatial and temporal scales.
2. The student can *connect concepts* in and across domain(s) to generalize or extrapolate in and/or across enduring understanding and/or big ideas.

III. Course Objective Standards

Students enrolled in the course Agricultural Biology Honors will be expected to rise to the coursework's rigor with creativity and a well-ordered ability to adhere to detail. The coursework's curriculum accommodates different learning styles, knowledge bases, and abilities, while providing depth of content and opportunities for students to demonstrate mastery of science practices along with conceptual understandings of course topics while abiding to the adopted standards set forth by the state of California.

A. Common Core Standards

Key Ideas and Details

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 process, phenomenon, or concept; provide an accurate summary of the text.

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 the text.

Craft and Structure

CCSS.ELA-Literacy.RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.

CCSS.ELA-Literacy.RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).

CCSS.ELA-Literacy.RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas

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.

CCSS.ELA-Literacy.RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

CCSS.ELA-Literacy.RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity

CCSS.ELA-Literacy.RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Text Types and Purposes

CCSS.ELA-Literacy.WHST.9-10.1 Write arguments focused on *discipline-specific content*.

CCSS.ELA-Literacy.WHST.9-10.1a Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.

CCSS.ELA-Literacy.WHST.9-10.1b Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.

CCSS.ELA-Literacy.WHST.9-10.1c Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

CCSS.ELA-Literacy.WHST.9-10.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.WHST.9-10.1e Provide a concluding statement or section that follows from or supports the argument presented.

CCSS.ELA-Literacy.WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

CCSS.ELA-Literacy.WHST.9-10.2a Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

CCSS.ELA-Literacy.WHST.9-10.2b Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

CCSS.ELA-Literacy.WHST.9-10.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

CCSS.ELA-Literacy.WHST.9-10.2d Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

CCSS.ELA-Literacy.WHST.9-10.2e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.WHST.9-10.2f Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Production and Distribution of Writing

CCSS.ELA-Literacy.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCSS.ELA-Literacy.WHST.9-10.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

CCSS.ELA-Literacy.WHST.9-10.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Research to Build and Present Knowledge

CCSS.ELA-Literacy.WHST.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.

CCSS.ELA-Literacy.WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

CCSS.ELA-Literacy.WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

CCSS.ELA-Literacy.WHST.9-10.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

B. Next Generation Science Standards

HS-LS1 From Molecules to Organisms: Structures and Processes

HS-LS1-1.	**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.**
HS-LS1-2.	**Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.** [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.]
HS-LS1-3.	**Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.**[Clarification Statement: Examples of

	investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.]
HS-LS1-4.	**Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.**
HS-LS1-5.	**Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.** [Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.]
HS-LS1-6.	**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.**[Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.]
HS-LS1-7.	**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.**[Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.]

HS-LS2 Ecosystems: Interactions, Energy, and Dynamics

HS-LS2-1.	**Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.** [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.]
HS-LS2-2.	**Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.** [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.]
HS-LS2-3.	**Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.** [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.]
HS-LS2-4.	**Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.** [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.]
HS-LS2-5.	**Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.** [Clarification Statement: Examples of models could include simulations and mathematical models.]

HS-LS2-6.	**Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.** [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]
HS-LS2-7.	**Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*** [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]
HS-LS2-8.	**Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.**[Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.]

HS-LS3 Heredity: Inheritance and Variation of Traits

HS-LS3-1.	**Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.**
HS-LS3-2.	**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.** [Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.]
HS-LS3-3.	**Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.** [Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.]

HS-LS4 Biological Evolution: Unity and Diversity

HS-LS4-1.	**Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.** [Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]
HS-LS4-2.	**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 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.** [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.]

HS-LS4-3.	**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.** [Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.]
HS-LS4-4.	**Construct an explanation based on evidence for how natural selection leads to adaptation of populations.**[Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.]
HS-LS4-5.	**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.** [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]
HS-LS4-6.	**Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.***[Clarification Statement: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.]

C. Career & Technical Education Agriculture & Natural Resources Standards

Agriscience Pathway

The Agriscience pathway helps students acquire a broad understanding of a variety of agricultural areas, develop an awareness of the many career opportunities in agriculture, participate in occupationally relevant experiences, and work cooperatively with a group to develop and expand leadership abilities. Students study California agriculture, agricultural business, agricultural technologies, natural resources, and animal, plant, and soil sciences.

C2.0 Examine the interrelationship between agriculture and the environment.

- C2.1 Identify important agricultural environmental impacts on soil, water, and air.
- C2.2 Explain current environmental challenges related to agriculture.
- C2.3 Summarize how natural resources are used in agriculture.
- C2.4 Compare and contrast practices for conserving renewable and nonrenewable resources.
- C2.5 Research how new energy sources are developed from agricultural products (e.g., gas-cogeneration and ethanol).

C3.0 Analyze the effects of technology on agriculture.

- C3.1 Describe how technology affects the logistics of moving an agricultural commodity from producer to consumer.
- C3.2 Understand how technology influences factors such as labor, efficiency, diversity,

availability, mechanization, and communication.

C3.3 Communicate public concern for technological advancements in agriculture, such as genetically modified organisms.

C3.4 Research the laws and regulations concerning biotechnology.

C3.5 Integrate the use of technology when collecting and analyzing data.

C4.0 Determine the importance of animals, the domestication of animals, and the role of animals in modern society.

C4.1 Understand the evolution and roles of domesticated animals in society.

C4.2 Differentiate between domestication and natural selection.

C4.3 Compile the modern-day uses of animals and animal by-products.

C4.4 Defend various points of view regarding the use of animals.

C4.5 Research unique and alternative uses of animals (e.g., therapeutic riding programs and companion animals).

C5.0 Compare the structure and function of plants, animals, bacteria, and viruses.

C5.1 Identify the function of cells.

C5.2 Analyze the anatomy and physiology of cells.

C5.3 Understand various cell actions, such as osmosis and cell division.

C5.4 Compare and contrast plant and animal cells, bacteria, and viruses.

C6.0 Explore animal anatomy and systems.

C6.1 State the names, and find the locations, of the external anatomy of animals.

C6.2 Explain the anatomy and major functions of vertebrate systems, including digestive, reproductive, circulatory, nervous, muscular, skeletal, respiratory, and endocrine systems.

C7.0 Comprehend basic animal genetics.

C7.1 Differentiate between genotype and phenotype and describe how dominant and recessive genes function.

C7.2 Compare genetic characteristics among cattle, sheep, swine, and horse breeds.

C7.3 Predict phenotype and genotype ratios by using a Punnett Square.

C7.4 Explain the fertilization process.

C7.5 Distinguish between the purpose and processes of mitosis and meiosis.

C8.0 Understand fundamental animal nutrition and feeding.

C8.1 Identify types of nutrients required by farm animals (e.g., proteins, minerals, vitamins, carbohydrates, fats/oils, water).

C8.2 Analyze suitable common feed ingredients, including forages, roughages, concentrates, and supplements for ruminant, monogastric, equine, and avian digestive systems.

C8.3 Understand basic animal feeding guidelines and evaluate sample feeding programs for various species, including space requirements and economic considerations.

C9.0 Evaluate basic animal health.

C9.1 Assess the appearance and behavior of a normal, healthy animal.

C9.2 Explain the ways in which housing, sanitation, and nutrition influence animal health and behavior.

C9.3 Analyze the causes and controls of common animal diseases.

C9.4 Summarize effective techniques for controlling parasites and explain why controlling parasites is important.

C9.5 Research the legal requirements for the procurement, storage, methods of application, and withdrawal times of animal medications, and know proper equipment handling and disposal techniques.

C10.0 Explain soil science principles.

C10.1 Recognize the major soil components and types.

C10.2 Summarize how soil texture, structure, pH, and salinity affect plant growth.

C10.3 Assess water delivery and irrigation system options.

C10.4 Differentiate among the types, uses, and applications of amendments and fertilizers.

C11.0 Analyze plant growth and development.

C11.1 Understand the anatomy and functions of plant systems and structures.

C11.2 Identify plant growth requirements.

C11.3 Discern between annual, biennial, and perennial life cycles.

C11.4 Examine sexual and asexual reproduction in plants.

C11.5 Understand photosynthesis and the roles of the sun, chlorophyll, sugar, oxygen, carbon dioxide, and water in the process.

C11.6 Summarize the respiration process in the breakdown of food and organic matter.

C12.0 Understand fundamental pest management.

C12.1 Classify agricultural pests (e.g., insects, weeds, disease, and vertebrates).

C12.2 Compare chemical, mechanical, cultural, and biological methods of plant pest control.

C12.3 Analyze the major principles, advantages, and disadvantages of integrated pest management.

C13.0 Design agricultural experiments using the scientific method.

C13.1 State the steps of the scientific method.

C13.2 Analyze an agricultural problem and devise a solution based on the scientific method.

IV. Course Outline

A. Introduction to Agricultural Biology Honors – about 2 weeks

Essential Questions: ✓ How is biology directly related and applied to the field of agriculture and natural resources? ✓ How do the principles and practices of the scientific methods unfold in agricultural biology? ✓ How can stewardship of our planet and its living and nonliving organisms be understood within the agricultural biology honors classroom and then applied within the students environment?	
Learning Objectives	**Materials**
Describe agricultural biology and its importance within the fields of agriculture and natural resources. Identify research uses for agricultural biology within current industry sector practices.	Campbell & Reece, Ch.1 Osborn, FFA Chs.
Identify the steps of the scientific methods. Distinguish between qualitative observations and data collecting and quantitative observations and data collection. Select and use appropriate tools and technology to perform tests and collect data.	Campbell & Reece, Ch.1 Osborn, FFA Chs.
Formulate explanations by using logic and evidence. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings.	Campbell & Reece, Ch.1 Osborn, FFA Chs.

B. Unit 1: The Chemistry of Life – about 3 weeks

Essential Questions: ✓ How are biological molecules necessary for organisms to grow, to reproduce, and to maintain organization? ✓ How do the subcomponents of biological molecules determine the properties of that molecule?	
Learning Objectives	**Materials**
Justify the selection of data regarding the types of molecules that an animal, plant, or bacterium will take up as necessary building blocks and excrete as waste products.	Campbell & Reece, Ch.2: "The Chemical Context of Life"; Ch.3: "Water and the Fitness of the Environment"; Ch.4 "Carbon and the Molecular Diversity of Life"
Explain the connection between the sequence and the subcomponents of a biological polymer and its properties. Construct explanations based on evidence of how variation in molecular units provides cells with a wider range of functions. Represent graphically or model quantitatively the exchange of molecules between an organism and its environment, and the subsequent uses of these molecules to build new molecules that facilitate dynamic homeostasis, growth, and reproduction.	Campbell & Reece, Ch.5: "The Structure and Function of Macromolecules" Molecular model kits or alternative (e.g., foam balls and toothpicks)

Refine representations and models to explain how the subcomponents of a biological polymer and their sequence determine the properties of that polymer. Use models to predict and justify that changes in the subcomponents of a biological polymer affect the functionality of the molecule. Analyze data to identify how molecular interactions affect structure and function.	Campbell & Reece, Ch.8: "An Introduction to Metabolism", pp.149-158 *AP Biology Investigation Labs* (2012), Investigation 13: Enzyme Activity Waterman and Stanley, *Biological Inquiry: A Workbook of Investigative Cases*, "Picture Perfect"

C. Unit 2: The Cell – about 3 weeks

Essential Questions:

- ✓ How do shared conserved cellular processes support the idea that all organisms are linked by lines of descent from common ancestry?
- ✓ How do cells create and maintain internal environments that are different from their external environments?
- ✓ How do structure and function of subcellular components and their interactions provide essential cellular processes?
- ✓ How do cells maintain dynamic homeostasis by movement of molecules across membranes?

Learning Objectives	Materials
Use calculated surface are-to-volume ratios to predict which cell(s) might eliminate wastes or produce nutrients faster by diffusion. Explain how cell size and shape affect the overall rate of nutrient intake and the rate of waste elimination.	Campbell & Reece, Ch.6: "A Tour of the Cell"; Ch. 27: "Prokaryotes" *AP Biology Investigation Labs* (2012), Investigation 4: Diffusion and Osmosis, Procedure 1: Surface Area and Cell Size **Multimedia** *The Domains of Life: Life's Three Great Branches: Archaea, Bacteria, and Eukarya*
Explain how internal membranes and organelles contribute to cell functions. Use representations and models to describe differences in prokaryotic and eukaryotic cells. Make a prediction about the interactions of subcellular organelles. Construct explanations bases on scientific evidence as to how interactions of subcellular structures provide essential functions. Use representations and models to analyze situations qualitatively to describe how interactions of subcellular structures, which possess specialized functions, provide essential functions.	Campbell & Reece, Ch.6: "A Tour of the Cell"

Use representations and models to pose scientific questions about the properties of cell membranes and selective permeability based on molecular structure. Construct models that connect the movement of molecules across membranes with membrane structure and function. Use representations and models to analyze situations or solve problems qualitatively or quantitatively to investigate whether dynamic homeostasis is maintained by active movement of molecules across membranes.	Campbell & Reece, Ch.7: "Membrane Structure and Function" *AP Biology Investigation Labs* (2012), Investigation 4: Diffusion and Osmosis
Justify the scientific claim that organisms share many conserved core processes and features that evolved and are widely distributed among organisms today. Pose scientific questions that correctly identify essential properties of shared, core life processes that provide insight into the history of life on Earth.	Campbell & Reece, Ch.6: "A Tour of the Cell"; Ch. 25: "Phylogeny and Systematics"; Ch. 26: "The Tree of Life: An Introduction to Biological Diversity," pp.523-526 Chen, "The Emergence of Cells During the Origin of Life" **Multimedia** *The Domains of Life: The Eukaryotic Cell Evolves*

D. Unit 3: Cell Processes: Energy and Communication – about 4 weeks

Essential Questions:

- ✓ How do biological systems utilize free energy to grow, to reproduce, and to maintain homeostasis?
- ✓ How do organisms capture, use, and store free energy?
- ✓ How are external signals converted into cellular responses?

Learning Objectives	Materials
Explain how biological systems use free energy based on empirical data that all organisms require constant energy input to maintain organization, to grow, and to reproduce. Justify a scientific claim that free energy is required for living systems to maintain organization, to grow, and to reproduce, but that multiple strategies exist in different living systems. Predict how changes in free energy availability affect organisms, populations, and ecosystems. Use representations and model to analyze how cooperative interactions within organisms promote efficiency in the use of energy and matter Use representations and models to pose scientific questions about what mechanisms and structural features allow organisms to capture, store, and use free energy. Construct explanations of the mechanisms and structural features of cells that allow organisms to capture, store, and use free energy. Describe specific examples of conserved core biological processes and	Campbell & Reece, Ch.8: "An Introduction to Metabolism," pp. 141-149; Ch. 9: "Cellular Respiration: Harvesting Chemical Energy"; and Ch.10: "Photosynthesis," pp. 181-191 Waterman and Stanley, "Bean Brew" Redding and Masterman, *Biology with Vernier*, "Respiration of Sugar by Yeast" *AP Biology Investigative Labs* (2012), Investigation 6: Cellular Respiration *AP Biology Investigative Labs* (2012), Investigation 5: Photosynthesis

features shared by all domains or within one domain of life, and how these shared, conserved core processes and features support the concept of common ancestry for all organisms.	
Cell Communication/Signaling Describe basic chemical processes for cell communications shared across evolutionary lines of decent. Generate scientific questions involving cell communication as it relates to the processes of evolution. Use representation(s) and appropriate models to describe features of a cell signaling pathway. Construct explanations of cell communications through cell-to-cell direct contact or through chemical signaling. Create representation(s) that depict how cell-to-cell communication occurs by direct contact or from a distance through chemical signaling. Describe a model that expresses the key elements of signal transduction pathways by which a signal is converted to a cellular response. Justify claims based on scientific evidence that changes in signal transduction pathways can alter cellular response. Describe a model that expresses key elements to show how change in signal transduction can alter cellular response. Construct an explanation of how certain drugs affect signal reception and, consequently, signal transduction pathways.	Campbell & Reece, Ch.11: "Cell Communication," pp. 201-205, 208-209, 212-214

E. Unit 4: From Gene to Protein – about 9 weeks

Essential Questions:

- ✓ How do living systems store, retrieve, and transmit genetic information critical to life processes?
- ✓ How does the expression of genetic material control cell products which in turn, determine the metabolism and nature of the cell?
- ✓ What is the relationship between changes in genotype and phenotype and evolution?
- ✓ How can humans use genetic engineering techniques to manipulate genetic information? What are ethical issues raised by the application of these techniques?

Learning Objectives	Materials
The Cell Cycle, Mitosis, and Meiosis Make predictions about natural phenomena occurring during the cell cycle. Describe the events that occur in the cell cycle. Construct an explanation, using visual representations or narratives, as to how DNA in chromosomes is transmitted to the next generation via mitosis, or meiosis followed by fertilization. Represent the connection between meiosis and increased genetic diversity	Campbell & Reece, Ch.12: "The Cell Cycle"; Ch. 13: "Meiosis and Sexual Life Cycles"; and Ch. 19: "Eukaryotic Genomes: Organization, Regulation, and Evolution," PP. 359-361 *AP Biology Investigative Labs* (2012), Investigation 7: Mitosis and Meiosis

necessary for evolution. Evaluate evidence provided by data sets to support the claim that heritable information is passed from one generation to another through mitosis, or meiosis followed by fertilization.	Skloot, *The Immortal Life of Henrietta Lacks*
Mendel's Model Construct a representation that connects the process of meiosis to the passages of traits from parent to offspring. Pose questions about the ethical, social, or medical issues surrounding human genetic disorders. Apply mathematical routines to determine Mendelian patterns of inheritance provided by data sets. Explain deviations from Mendel's model of the inheritance of traits. Explain how the inheritance patterns of many traits cannot be accounted for by Mendelian genetics. Describe representations of an appropriate example of inheritance patterns that cannot be explained by Mendel's model of the inheritance of traits. Construct explanations of the influence of environmental factors on the phenotype of an organism. Use evidence to justify a claim that a variety of phenotypic responses to a single environmental factor can result from different genotypes within the population.	Campbell & Reece, Ch.14: "Mendel and the Gene Idea"; and Ch. 15: "The Chromosomal Basis of Inheritance" **Web** "Who's the Father?"
Gene to Protein Construct scientific explanations that use the structures and mechanisms of DNA and RNA to support the claim that DNA and, in some cases, that RNA are the primary sources of heritable information. Justify the selection of data from historical investigations that support the claim that DNA is the source of heritable information. Describe representations and models that illustrate how genetic information is copied for transmission between generations. Describe representations and models illustrating how genetic information is copied for transmission between generations. Create visual representation to illustrate how changes in a DNA nucleotide sequence can result in a change in the polypeptide produced. Predict how a change in a specific DNA or RNA sequence can result in change in gene expression.	Campbell & Reece, Ch.16: "The Molecular Basic of Inheritance"; and Ch. 17: "From Gene to Protein" **Video** Cracking the Code of Life **Web** DNA Necklace Kit, Carolina Biological Supply Company

Gene Expression Describe the connection between the regulation of gene expression and observed differences between different kinds of organisms. Describe the connection between the regulation of gene expression and observed differences between individuals in a population. Explain how the regulation of gene expression is essential for the processes and structures that support efficient cell function. Use representations to describe how gene regulation influences cell products and function. Refine representations to illustrate how interactions between external stimuli and gene expression result in specialization of cells, tissues, and organs. Justify a claim made about the effect(s) on a biological system at the molecular, physiological, or organismal level when given a scenario in which one or more components within a negative regulatory system is altered. Explain how signal pathways mediate gene expression, including how this process can affect protein production. Use representations to describe mechanisms of the regulation of gene expression. Connect concepts in and across domains to show that the timing and coordination of specific events are necessary for normal development in an organism and that these events are regulated by multiple mechanisms. Use a graph or a diagram to analyze situations or to solve problems (quantitatively or qualitatively) that involve timing and coordination of events necessary for normal development in an organism. Justify scientific claims with scientific evidence to show that timing and coordination of several events are necessary for normal development in an organism and that these events are regulated by multiple mechanisms. Describe the role of programmed cell death in development and differentiation, the reuse of molecules, and the maintenance of dynamic homeostasis.	Campbell & Reece, Ch.18: "The Genetics of Viruses and Bacteria," pp. 352-356; Ch. 19: "Eukaryotic Genomes: Organization, Regulation, and Evolution," pp. 362-370, 371-373, 374-381; Ch. 21: "The Genetic Basis of Development," pp. 411-428 Waterman and Stanley, "Shh: Silencing the Hedgehog Pathway," Parts I and III
Genetic Engineering Justify the claim the humans can manipulate heritable information by identifying *at least two* commonly used technologies. Predict how a change in genotype, when expressed as a phenotype, provides a variation that can be subject to natural selection. Explain the connection between genetic variations in organisms and phenotypic variations in populations.	Campbell & Reece, Ch.20: "DNA Technology and Genomics," pp. 384-394, 402-408 *AP Biology Investigative Labs* (2012), Investigation 8: Biotechnology: Bacterial Transformation

Predict the effects of a change in an environmental factor on the genotypic expression of the phenotype.	*AP Biology Investigative Labs* (2012), Investigation 9: Biotechnology: Restriction Enzyme Analysis of DNA **Video** Gattaca

F. Unit 5: Evolution – about 6 weeks

Essential Questions:

- ✓ How does evolution by natural selection drive diversity and unity of life?
- ✓ What scientific evidence from many disciplines, including mathematics, supports models about the origin of life on Earth and biological evolution?
- ✓ How can phylogenetic trees and cladograms be used to graphically model evolutionary history among species?

Learning Objectives	Materials
Populations Genetics Convert a data set from a table of numbers that reflect a change in the genetic makeup of a population over time and apply mathematical methods and conceptual understandings to investigate the cause(s) and effect(s) of this change. Evaluate evidence provided by the data to qualitatively and quantitatively investigate the role of natural selection in evolution. Analyze data to support the claim that responses to information and communication of information affect natural selection. Apply mathematical methods to data from a real or simulated population to predict what will happen to the population in the future. Evaluate data-based evidence that describes evolutionary changes in the genetic makeup of a population over time. Connect evolutionary changes in a population over time to a change in the environment. Use data from mathematical models based on the Hardy-Weinberg equilibrium to analyze genetic drift and effects of selection in the evolution of species populations. Justify data from mathematical models based on the Hardy-Weinberg equilibrium to analyze genetic drift and effects of selection in the evolution of species populations. Use theories and models to make scientific claims and/or predictions about the effects of variation within populations on survival and fitness. Make predictions about the effects of genetic drift, migration, and artificial selection on the genetic makeup of a population.	Campbell & Reece, Ch. 22: "Descent with Modification: A Darwinian View of Life," pp. 438-448; Ch. 23: "The Evolution of Populations" *AP Biology Investigative Labs* (2012), Investigation 2: Mathematical Modeling: Hardy-Weinberg *AP Biology Investigative Labs* (2012), Investigation 1: Artificial Selection Leslie, "Kidney Disease is Parasite-Slaying Protein's Downside" Genovese, et al., "Association of Trypanolytic ApoL1 Variants with Kidney Diseases in African Americans"

Evidence for Evolution Evaluate evidence provided by data from many scientific disciplines to support biological evolution. Refine evidence based on data from many scientific disciplines to support biological evolution. Design a plan to answer scientific questions regarding how organisms have changed over time using information from morphology, biochemistry, and geology. Connect scientific evidence from many scientific disciplines to support the modern concept of evolution.	Campbell & Reece, Ch. 22: "Descent with Modification: A Darwinian View of Life," pp. 448-452 Weiner, The Beak of the Finch: A Story of Evolution in Our Time **Web** "Lesson 3: What is the Evidence for Evolution? Activity 1: Evolution and Time" **Video** Beyond Genesis: *The Origin of Species*
Construct and/or justify mathematical models, diagrams, or simulations that represent processes of biological evolution. Pose scientific questions about a group of organisms whose relatedness is described by a phylogenetic tree or cladogram in order to (1) identify shared characteristics, (2) make inferences about the evolutionary history of the group, and (3) identify character data that could extend or improve the phylogenetic tree. Construct explanations based on scientific evidence that homeostatic mechanisms reflect continuity due to common ancestry and/or divergence due to adaptations in different environments.	Campbell & Reece, Ch. 25: "Phylogeny and Systematics" Waterman and Stanley, "Tree Thinking" *AP Biology Investigative Labs* (2012), Investigation 3: Comparing DNA Sequences to Understand Evolutionary Relationships with BLAST
Origin of Species Analyze data related to questions of speciation and extinction throughout the Earth's history. Design a plan for collecting data to investigate the scientific claim that speciation and extinction have occurred throughout the Earth's history. Use data from real or simulated population(s), based on graphs or models of types of selection, to predict what will happen to the population in the future. Justify the selection of data that addresses questions related to reproductive isolation and speciation. Describe speciation in an isolated population and connect it to change in gene frequency, change in environment, natural selection, and/or genetic drift. Describe a model that represents evolution within a population. Evaluate given data sets that illustrate evolution as an ongoing process. .	Campbell & Reece, Ch. 24: "The Origin of Species"

G. Unit 6: Biodiversity and Ecology – about 10 weeks

Essential Questions:

- ✓ How are growth and homeostasis of a biological system influenced by the system's environment?
- ✓ How do interactions among living systems and with their environment result in the movement of matter and energy?
- ✓ How do interactions between and within populations influence patterns of species distribution and abundance?
- ✓ How does human activity affect the biodiversity of ecosystems?

Learning Objectives	Materials
Origin of Life Describe a scientific hypothesis about the origin of life on Earth. Evaluate scientific questions based on hypotheses about the origin of life on Earth. Describe the reasons for revisions of scientific hypotheses about the origin of life on Earth. Evaluate scientific hypotheses about the origin of life on Earth. Evaluate the accuracy and legitimacy of data to answer scientific questions about the origin of life on Earth. Justify the selection of geological, physical, and chemical data that reveal early Earth conditions.	Campbell & Reece, Ch. 26: "The Tree of Life: An Introduction to Biological Diversity," pp. 512-520
Viruses versus Cells Construct an explanation of how viruses introduce genetic variation in host organisms. Use representations and appropriate models to describe how viral replication introduces genetic variation in the viral population.	Campbell & Reece, Ch. 18: "The Genetics of Viruses and Bacteria," pp. 334-345 Waterman and Stanley, "The Donor's Dilemma"
Maintaining Homeostasis Connect how organisms use negative feedback to maintain their internal environments. Evaluate data that show the effect(s) of changes in concentrations of key molecules on negative feedback mechanisms. Make predictions about how organisms use negative feedback mechanisms to maintain their internal environment. Make predictions about how positive feedback mechanisms amplify activities and processes in organisms based on scientific theories and models. Justify that positive feedback mechanisms amplify responses in organisms. Justify the selection of the kind of data needed to answer scientific	Campbell & Reece, Ch. 1: "Introduction: Exploring Life," pp. 9-12; Ch. 39: "Plants Responses to Internal and External Signals," pp. 791-812; Ch. 40: " Basic Principles of Animal Form and Function," pp. 832-841; Ch. 45: "Chemical Signals in Animals"; Ch. 54: "Ecosystems" Heitz and Griffen, *Practicing Biology: A Student Workbook*, Activity 45.1 **Video** *Life*, Programme 9: "Plants"

questions about the relevant mechanism that organisms use to respond to changes in their external environment. Design a plan for collecting data to support the scientific claim that the timing and coordination of physiological events involve regulation. Justify scientific claims with evidence to show how timing and coordination of physiological events involve regulation. Use representations or models to analyze quantitatively and qualitatively the effects of disruptions to dynamic homeostasis in biological systems. Explain how the distribution of ecosystems changes over time by identifying large-scale events that have resulted in these changes in the past. Analyze data to identify phylogenetic patterns or relationships, showing that homeostatic mechanisms reflect both continuity due to common ancestry and change due to evolution in different environments. Connect differences in the environment with the evolution of homeostatic mechanisms.	
Interactions with Environment Refine scientific models and questions about the effect of complex biotic and abiotic interactions on all biological systems, from cells and organisms to populations, communities, and ecosystems. Design a plan for collecting data to show that all biological systems (cells, organisms, populations, communities, and ecosystems) are affected by complex biotic and abiotic interactions. Analyze data to identify possible patterns and relationships between systems (cells, organisms, populations, communities, and ecosystems).	Campbell & Reece, Ch. 50: "An Introduction to Ecology and the Biosphere"; Ch. 36: "Transport in Vascular Plants" *AP Biology Investigative Labs* (2012), Investigation 11: Transpiration **Web** "Mathbiology: How to Model a Disease"
Behavior Justify scientific claims, using evidence, to describe how timing and coordination of behavioral events in organisms are regulated by several mechanisms. Connect concepts in and across domain(s) to predict how environmental factors affect responses to information and change behavior. Analyze data that indicate how organisms exchange information in response to internal changes and external cues, and which can change behavior. Create a representation that describes how organisms exchange information in response to internal changes and external cues, and which can result in changes in behavior. Describe how organisms exchange information in response to internal changes or environmental cues.	Campbell & Reece, Ch. 51: "Animal Behavior and Behavioral Ecology" Heitz and Giffen, Activity 51.1 *AP Biology Investigative Labs* (2012), Investigation 12: Fruit Fly Behavior **Video** *March of the Penguins*

Response and Defenses Create representations and models to describe immune responses. Create representations and models to describe nonspecific immune defenses in plants and animals. Construct an explanation, based on scientific theories and models, about how nervous systems detect external and internal signals, transmit and integrate information, and produce responses. Describe how nervous systems detect external and internal signals. Describe how nervous systems transmit information. Describe how the vertebrate brain integrates information to produce a response. Create a visual representation of complex nervous systems to describe/explain how these systems detect external and internal signal, transmit and integrate information, and produce responses. Create a visual representation to describe how nervous systems detect external and internal signals. Create a visual representation to describe how nervous systems transmit information. Create a visual representation to describe how the vertebrate brain integrates information to produce a response.	Campbell & Reece, Ch. 39: "Plant Responses to Internal and External Signals," pp. 812-814; Ch. 43: "The Immune System"; Ch. 48: "Nervous System" Heitz and Giffen, Activity 43.1 ABO-Rh Blood Typing with Synthetic Blood Kit, Carolina Biological Supply Company Waterman and Stanley, "Shh: Silencing the Hedgehog Pathway," Part IV **Video** *Life*, Programme 1: "The Challenges of Life" *Stimulus Response*
Living Together Evaluate scientific questions concerning organisms that exhibit complex properties due to the interaction of their constituent parts. Predict the effects of a change in a component(s) of a biological system on the functionality of an organism(s). Refine representations and models to illustrate biocomplexity due to interactions of the constituent parts. Justify the selection of the kind of data needed to answer scientific questions about the interaction of populations within communities. Apply mathematical routines to quantities that describe communities composed of populations of organisms that interact in complex ways. Predict the effects of a change in the community's population on the community. Predict the effects of a change of matter or energy availability on communities. Use data analysis to refine observations and measurements regarding the effect of population interactions on patterns of species distribution and	Campbell & Reece, Ch. 52: "Population Ecology"; Ch. 53: "Community Ecology"; Ch. 54: "Ecosystems"; Ch. 40 "Basic Principles of Animal Form and Function," pp. 828-831; Ch. 55: "Conservation Biology and Restoration Ecology" Heitz and Giffen, Activities 53.1 and 53.2 **Video** *Life*, Programme 7: "Hunters and Hunted"

abundance. Predict consequences of human actions on both local and global ecosystems. Make scientific claims and predictions about how species diversity within an ecosystem influences ecosystem stability.	

Each of the essential questions for each unit will be answered through the lens of agriculture and natural resources.

V. Required Textbooks & Instructional Materials

A. Campbell, Neil A., and Jane B. Reece. *Biology*. 7th ed. San Francisco: Pearson Benjamin Cummings, 2005.
B. *AP Biology Investigative Labs: An Inquiry-Based Approach*. New York: The College Board, 2012.
C. *AP Biology Lab Manual*. New York: The College Board, 2012.
D. *Biological Science Applications in Agriculture*. Osborne, 1999.
E. *Agricultural Biology Lab Manual Revised*. Fullerton, 1999.

VI. Key Assignments

A. Summer Assignments
B. Leadership Development Activities with Oral and Written Components
C. Weekly Reading(s) and Weekly Writing Assignments
D. Cumulative Science Notebook
E. Weekly Laboratories with Lab Write-Ups
F. Portfolio of Laboratory Investigations and Activities
G. Agriscience/Science Fair Project with Research Paper and Student Presentation
H. Supervised Agricultural Experience Project with Record Book
I. Student Seminar Presentations of Relevant Agricultural Biology

VII. Instructional Methods

A. Lectures
B. Demonstrations
C. Direct instruction
D. A variety of instructional materials and resources
E. Self-directed, cooperative, and collaborative learning opportunities

VIII. Assessment Methods

A. Assessments

Summative Evaluations –

Tests, Exams, Midterms, Finals, and Projects are all examples of what would constitute a Summative Evaluation. Tests and or Exams are often given at the end of a chapter or at the end of a unit of study. Tests and or Exams are often comprised of: matching, multiple choice, fill in the blanks, and short answer questions. Midterms are given in the middle of each semester and cover all material that has been taught up to that point. Finals are given at the end of each semester and cover all material that has been taught from the beginning of the semester to the end of the semester. **Special Note – The majority of major Tests, Exams, Midterms, and or Finals are accompanied by a Study Guide which requires the student to obtain a parent or guardians signature. All study guides are due at the beginning of the class period on the day of the test.*

Projects will be assigned throughout each semester and may require group work, homework, or may be completed during class time, depending on the type of project assigned. Student will be required to complete a research paper, an agriscience fair project, and an SAE project – more information regarding these projects will be given as the semester progresses.

Formative Evaluations –

Quizzes, Lab Assignments, and Group Activities are all examples of what is represented within Formative Evaluations. Quizzes are often given at the end of a section or in the middle of a concept in order to access student understanding. Quizzes generally include 5 matching questions and 5 multiple choice questions. However, a quiz may also be comprised of fill in the blanks and short answer questions. Most quizzes are generally intended to be short, quick assessments therefore are rarely prepared with more than 20 questions, and are often timed.

Group activities and Lab work will be assigned throughout each semester and will require students to work collaboratively with other students as well as keep their notes and work organized and current within their science notebooks.

Classwork & Homework –

Classwork is any work that is assigned during class time for a grade. All work should be properly labeled and placed into the designated area before leaving the classroom in order to receive credit for the assignment. Homework will be assigned on an as needed basis and it may also be necessary to complete any Classwork or missing assignments. Students are expected to keep an up to date Record Book. Record books will be completed in class as well as assigned as homework. All work should be properly labeled and placed into the designated area before leaving the classroom in order to receive credit for the assignment.

Citizenship & Participation–

Students are expected to arrive to class on time and prepared. Students are expected to complete all assignments in a timely manner and to do so respectfully. The Science Thoughts are also included in this category and are graded every two weeks. The Participation calendar is graded at the end of each month and provides a score for student's preparedness for the class on a daily basis. Participation may be to join in, to take part, to involve oneself, to share or share in the opportunity to be actively involved and engaged in the learning process.

Diagnostic Assessments–

Students will be given throughout the semesters diagnostic exams to assess their prior knowledge as well as create a baseline to measure students' individual progress for specific learning objectives.

B. Grading

Grades will be calculated as an ***average of total points earned over points possible***. Grades are determined by points earned on the following types of assignments. ***Percentages given are estimates***.

Type	Average
Summative Evaluations	40%
Formative Evaluations	30%
Classwork & Homework	20%
Citizenship & Participation	10%
Diagnostic Assessments	0%

Grading Scale:

100 – 95%	A
94 – 85%	B
84 – 75%	C
74 – 65%	D
≤64%	F