Perris Union High School District
Course of Study

A. COURSE INFORMATION

Course Title:
(limited to 34 characters with spaces in Infinite Campus)

AP Biology

- ☐ New
- ☑ Revised

If revised, the previous course name if there was a change

Transcript Course Code/Number:

354131, 354132

(To be assigned by Educational Services if it's a new course)

CREDIT TYPE EARNED: Science

CALPADS CODE: 9350

Subject Area:

- ☐ Social Science
- ☐ English
- ☐ Mathematics
- ☑ Laboratory Science
- ☐ World Languages
- ☐ Visual or Performing Arts
- ☐ College Prep Elective
- ☐ Other

Is this classified as a Career Technical Education course?

- ☐ Yes
- ☑ No

If yes, which pathway does this course align to?
Pathway Name:

CTE CDE Code:

Grade Level(s)

- ☐ MS
- ☑ HS
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10
- ☐ 11
- ☐ 12

Was this course *previously approved by UC* for PUHSD?

- ☑ Yes
- ☐ No

(Will be verified by Ed Services)

Which A-G Requirement does/will this course meet?

D ☐ Pending

Credential Required to teach this course:
To be completed by Human Resources only.

Single Subject: Science: Biological Sciences

Signature 3/15/2024 Date

Submitted by: Julie Harris
Site: SSC
Date: 03/05/2024
Email: julie.harris@puhsd.org

Unit Value/Length of Course:

- ☐ 0.5 (half-year or semester equivalent)
- ☑ 1.0 (one-year equivalent)
- ☐ 2.0 (two-year equivalent)
- ☐ Other:

Approvals	Name/Signature	Date
Director of Curriculum & Instruction		03/18/24
Asst. Superintendent of Educational Services	Kindylee Mackenzie	3/21/24
Governing Board		

Prerequisite(s) (REQUIRED):
It is recommended that students have successfully completed high school courses in biology and chemistry.
Corequisite(s) (REQUIRED):
None
Brief Course Description (REQUIRED):
AP Biology is an introductory college-level biology course. Students cultivate their understanding of biology through inquiry-based investigations as they explore the following topics: evolution, cellular processes, energy and communication, genetics, information transfer, ecology, and interactions. The AP Biology course is equivalent to a two-semester college introductory biology course for biology majors.

B. COURSE CONTENT

Course Purpose (REQUIRED):
What is the purpose of this course? Please provide a brief description of the goals and expected outcomes. Note: More specificity than a simple recitation of the State Standards is needed.

Given the speed with which scientific discoveries and research continuously expand scientific knowledge, many educators are faced with the challenge of balancing breadth of content coverage with depth of understanding. The AP Biology course outlined in this framework embraces this challenge by deemphasizing a traditional "content coverage" model of instruction in favor of one that focuses on enduring, conceptual understandings and the content that supports them. This approach enables students to spend less time on factual recall and more time on inquiry-based learning of essential concepts, helping them develop the reasoning skills necessary to engage in the science practices used throughout their study of AP Biology.

To foster this deeper level of learning, the breadth of content coverage in AP Biology is defined in a way that distinguishes content essential to support the enduring understandings from the many examples or applications that can overburden the course. Illustrative examples are provided that offer you a variety of

optional instructional contexts to help your students achieve deeper understanding. Content that is outside the scope of the course and exam is also identified.
This framework encourages student development of inquiry and reasoning skills, such as designing a plan for collecting data, analyzing data, applying mathematical routines, and justifying arguments using evidence. The result will be readiness for the study of advanced topics in subsequent college courses—a goal of every AP course.

Course Outline (REQUIRED):
Detailed description of topics covered. All historical knowledge is expected to be empirically based, give examples. Show examples of how the text is incorporated into the topics covered.

Unit 1: Chemistry of Life

Developing Understanding:
This first unit sets the foundation for students to understand the chemical basis of life, which is needed for mastery of future areas of focus and provides students with a survey of the elements necessary for carbon-based systems to function. Students learn that water and the properties of water play a vital role in the survival of individuals and biological systems. They also learn that living systems exist in a highly complex organization that requires input of energy and the exchange of macromolecules. This unit also addresses in detail how and in what conformations molecules called monomers bond together to form polymers. The structure of monomers and polymers determines their function. In the units that follow, students will need to understand and explain the interaction and bonding of atoms to form molecules.

Writing Assignments:
Surface Tension Activity- Students determine how many drops of water can fit onto a penny. Various substances (e.g., salt, sugar, vinegar) can be added to the water to determine how the surface tension of the water is affected. Students then graph their data, calculate descriptive statistics and draw conclusions.

Formal Lab Report for Transpiration Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Assessment: AP Classroom Unit 1 Progress Check

Lab:
Transpiration (Investigation 11): What factors, including environmental variables, affect the rate of transpiration in plants?
- Explain how the behavioral responses of organisms affect their overall fitness and may contribute to the success of the population.
- Explain how the behavioral and/or physiological response of an organism is related to changes in internal or external environment.
- Explain how the density of a population affects and is determined by resource availability in the

environment.

Unit 2: Cell Structure and Function

Developing Understanding:
The cell is the basic unit of life. Cells contribute to the organization of life and provide the environment in which organelles function. Organelles in turn provide compartmentalization and organize cellular products for dispersal and waste for disposal. Cells have membranes that allow them to establish and maintain an internal environment. These membranes also control the exchange of material with the cell's external environment—an important, foundational concept. The maintenance of the internal and external conditions of a cell is called homeostasis. Student understanding of these concepts will be necessary in later units when the focus of instruction shifts to cellular products and by-products and when students learn why cellular exchange of energy and materials matters.

Writing Assignments:
Osmosis Case Study- Before teaching the topic, have students read a case study about osmosis and answer questions (either those given with the case study or those you create) about the scenario. Ask students to draw what they think is occurring on the cellular level. Then, teach the topic in the way that best fits your classroom. Once students have demonstrated an understanding of the topic, have them revisit their answers to the questions in the case study as well as their drawings.

Formal Lab Report for Diffusion and Osmosis Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Assessment: AP Classroom Unit 2 Progress Check

Lab:
Diffusion and Osmosis (Investigation 4): What causes my plants to wilt if I forget to water them?
- Explain the effect of surface area-to-volume ratios on the exchange of materials between cells or organisms and the environment.
- Explain how specialized structures and strategies are used for the efficient exchange of molecules to the environment.
- Explain how concentration gradients affect the movement of molecules across membranes

Unit 3: Cellular Energetics

Developing Understanding:
In Unit 3, students build on knowledge gained in Unit 2 about the structure and function of cells, focusing on cellular energetics. Living systems are complex in their organization and require constant energy input. This unit will provide students with the knowledge necessary to master the concepts of energy capture and use. Students work through enzyme structure and function, learning the ways in which the environment plays a role in how enzymes perform their function(s). Students gain a deeper understanding of the

processes of photosynthesis and cellular respiration, knowledge they will use in Unit 6 while studying how cells use energy to fuel life processes.

Writing Assignments:

Toothpickase Activity- Perform the "toothpickase" activity, in which students use their fingers to break as many as 100 toothpicks in 10-second intervals (without looking) onto a paper towel. All broken toothpicks must remain mixed with the unbroken. Broken toothpicks should not be removed from the pile, and each toothpick can only be broken once. Continue breaking toothpicks for these total time intervals (60, 120, and 180 seconds). Students then graph the number of toothpicks broken versus time (10, 20, 30, 60, 120, and 180 seconds). Students will draw conclusions about their findings.

Formal Lab Report for Photosynthesis Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Assessment: AP Classroom Unit 3 Progress Check

Lab:

Photosynthesis (Investigation 5): What factors affect the rate of photosynthesis in living leaves?

- Describe the photosynthetic processes that allow organisms to capture and store energy.
- Explain how cells capture energy from light and transfer it to biological molecules for storage and use.

Cellular Respiration (Investigation 6): What factors affect the rate of cellular respiration in multicellular organisms?

- Describe the processes that allow organisms to use energy stored in biological macromolecules.
- Explain how cells obtain energy from biological macromolecules in order to power cellular functions.

Enzyme Activity (Investigation 13): How do abiotic or biotic factors influence the rates of enzymatic reactions?

- Explain how changes to the structure of an enzyme may affect its function.
- Explain how the cellular environment affects enzyme activity.
- Explain the connection between variation in the number and types of molecules within cells to the ability of the organism to survive and/or reproduce in different environments.

Unit 4: Cell Communication and Cell Cycle

Developing Understanding:

In Unit 4, students continue to learn about the role of cells, focusing on how cells use energy and information transmission to communicate and replicate. Through systems of complex transduction pathways, cells can communicate with one another. Cells can also generate and receive signals, coordinate mechanisms for growth, and respond to environmental cues. To maintain homeostasis, cells respond to their environment. They can also replicate and regulate replication as part of the cell cycle that provides for the continuity of life. In Unit 5, students will move on to learn about heredity.

Writing Assignments:
Cell Communication Essay- Have students do research online (provide reputable websites for them to use) to learn about diseases that result from a breakdown in cell communication. Assign students a one-minute essay with a prompt that allows the formative assessment of their understanding, such as, "Describe an example of communication between two cells."

Formal Lab Report for Cell Cycle Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Assessment: AP Classroom Unit 4 Progress Check

Lab:
Cell Division: Mitosis and Meiosis (Investigation 7): How do eukaryotic cells divide to produce genetically identical cells or to produce gametes with half the normal DNA?

- Describe the events that occur in the cell cycle.
- Explain how mitosis results in the transmission of chromosomes from one generation to the next.
- Explain how meiosis results in the transmission of chromosomes from one generation to the next.
- Describe similarities and/or differences between the phases and outcomes of mitosis and meiosis.

Unit 5: Heredity

Developing Understanding:
Unit 5 focuses on heredity and the biological concepts and processes involved in ensuring the continuity of life. Students learn that the storage and transmission of genetic information via chromosomes from one generation to the next occur through meiosis. Meiotic division ensures genetic diversity, which is crucial to the survival of a species. In this unit, students gain a deeper understanding of Mendelian genetics and learning how non-Mendelian genetics describes those patterns of inheritance that seem to violate Mendel's laws. This unit also teaches the role played by chromosomal inheritance, environmental factors, and nondisjunction on an individual's phenotype. In Unit 6, students move on to learn about gene expression and regulation.

Writing Assignments:
Chi-square Test Argument- Students can use genetic corn to apply the chi-square test to a dihybrid cross. First, students calculate the expected genotypic and phenotypic ratios using a Punnett square. They then formulate null hypotheses for the cross and perform a chi-square test. They conclude by stating whether they should reject or fail to reject the null hypothesis and justify their reasoning.

Evolution of Skin Color Case Study- Students can read a case study about the genetics and evolution of skin color, then answer any questions that may accompany the case study.

Assessment: AP Classroom Unit 5 Progress Check

Lab:
Wisconsin Fast Plants 72-Hour Dihybrid Genetics (Carolina Lab Kit): How do parents and offspring express the same or different traits and how do siblings express the same or different traits?

- Observe the inheritance of a phenotypic trait in three generations of seedlings to obtain evidence of how variation can occur between parents and offspring
- Analyze and interpret observational data that is evidence of variation in inherited traits
- Develop a claim that includes the idea that inheritable genetic variation may result from new genetic combinations through meiosis
- Compare predicted results with results from experimental data to construct explanations of the variations of traits observed
- Engage in argument in evidence to support or refute explanation given for the variation of traits that occurs between parental and offspring populations

Unit 6: Gene Expression and Regulation

Developing Understanding:
Progressing from the continuity of life to gene expression, in Unit 6 students gain in-depth knowledge about nucleic acids and their role in gene expression. Students receive a finer focus on the comparison between the structures of DNA and RNA. This unit highlights how an individual's genotype is physically expressed through that individual's phenotype. Understanding protein synthesis (transcription and translation) is vital to answering essential questions about gene expression. Regulation of gene expression and cell specialization are instrumental in ensuring survival within an individual and across populations. Unit 7 moves on to cover natural selection.

Writing Assignments:
Transcription Modeling Activity- Students build a model of transcription using pool noodles that can be purchased at a dollar store. Using everyday materials, such as tape, colored paper, yarn (or string), and markers, they identify the promoter region, TATA box, transcription start site, and terminal sequence. Afterwards, they provide a written description of the process of transcription from the initial binding of the transcription factors to the production of the transcript.

Formal Lab Report for Bacterial Transformation Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Assessment: AP Classroom Unit 6 Progress Check

Lab:
Biotechnology: Bacterial Transformation (Investigation 8): How can we use genetic engineering techniques to manipulate heritable information?

- Explain the use of genetic engineering techniques in analyzing or manipulating DNA.

Biotechnology: Restriction Enzyme Analysis of DNA (Investigation 9): How can we use genetic information to identify and profile individuals?

- Explain the use of genetic engineering techniques in analyzing or manipulating DNA.

Unit 7: Natural Selection

Developing Understanding:
The concepts in Unit 7 build on foundational content from previous units as students discover natural selection, a mechanism of evolution—the theory that populations that are better adapted to their environment will survive and reproduce. Thus, the evolution of a species involves a change in its genetic makeup over time. In this unit, students study the evidence for and mechanisms of evolutionary change. Students also learn what happens when a species does not adapt to a changing or volatile environment and about the Hardy-Weinberg equilibrium as a model for describing and predicting allele frequencies in non evolving populations. Students will learn to calculate and draw conclusions about the evolution, or lack thereof, of a population from data related to allele frequencies. Biological principles studied here and in previous units will culminate in Unit 8, which covers ecology.

Writing Assignments:
Error Analysis Activity- Have students use one of the Rock Pocket Mouse activities available online to learn the principles of the Hardy-Weinberg theorem, to calculate allele frequencies in a population, and to draw conclusions.

Formal Lab Report for Artificial Selection Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Assessment: AP Classroom Unit 7 Progress Check

Labs:
Artificial Selection (Investigation 1): Can extreme selection change expression of a quantitative trait in a population in one generation?
- To investigate natural selection as a major mechanism of evolution
- To convert a data set from a table of numbers that reflects a change in the genetic makeup of a population over time and to apply mathematical methods and conceptual understandings to investigate the cause(s) and effect(s) of this change
- To apply mathematical methods to data from a real population to predict what will happen to the population in the future
- To investigate how natural selection acts on phenotypic variations in populations
- To evaluate data-based evidence that describes evolutionary changes in the genetic makeup of a population over time due to changes in the environment
- To design an investigation based on your observations and questions related to the importance of a single trait in the life history of a plant

Mathematical Modeling: Hardy-Weingberg (Investigation 2): How can mathematical models be used to investigate the relationship between allele frequencies in populations of organisms and evolutionary change?

- Describe the conditions under which allele and genotype frequencies will change in populations.
- Explain the impacts on the population if any of the conditions of HardyWeinberg are not met

Comparing DNA Sequences to Understand Evolutionary Relationships with BLAST (Investigation 3): How can bioinformatics be used as a tool to determine evolutionary relationships and to better understand genetic diseases?

- Explain the connection between variation in the number and types of molecules within cells to the ability of the organism to survive and/or reproduce in different environments.
- Describe the types of evidence that can be used to infer an evolutionary relationship.
- Explain how a phylogenetic tree and/or cladogram can be used to infer evolutionary relatedness.

Unit 8: Ecology

Developing Understanding:

As a culmination of this course, Unit 8 brings together all other units to show how a system's interactions are directly related to the system's available energy and its ability to evolve and respond to changes in its environment. When highly complex living systems interact, communities and ecosystems will change based on those interactions. The more biodiversity present in a system, the more likely that system is to maintain its health and success in the face of disruption. Energy flows through systems; the rate of flow determines the success of the species within the systems. By this point in the curriculum, a student should be able to accurately determine what happens within biological systems when disruptions occur.

Writing Assignments:

Isle Royale Activity- Students can read about the moose and wolves of Isle Royale to obtain background information on the two organisms. They can download a data spreadsheet and graph data about the two populations from the Internet. They can use their graph to make and justify predictions about how the two populations can change relative to each other.

Formal Lab Report for Pill Bugs Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Assessment: AP Classroom Unit 8 Progress Check

Lab:

Energy Dynamics (Investigation 8): What factors govern energy capture, allocation, storage, and transfer between producers and consumers in a terrestrial ecosystem?

- Describe the strategies organisms use to acquire and use energy.
- Explain how changes in energy availability affect populations and ecosystems.
- Explain how the activities of autotrophs and heterotrophs enable the flow of energy within an ecosystem.
- Explain the connection between variation in the number and types of molecules within cells to the ability of the organism to survive and/or reproduce in different environments.

Fruit Fly Behavior (Investigation 12): What environmental factors trigger a fruit fly response?

- Explain how the behavioral and/or physiological response of an organism is related to changes in internal or external environment.
- Explain how the behavioral responses of organisms affect their overall fitness and may contribute to the success of the population.
- Explain how the density of a population affects and is determined by resource availability in the environment.

OR **Pill Bugs Lab**

- Students can perform an animal behavior lab using pill bugs. They can use choice chambers to study the responses of pill bugs to environmental stimuli. Create different environments on either side of the choice chamber. Place the same number of pill bugs on both sides of the choice chamber. Count the number of pill bugs on both sides of the choice chamber at regular intervals for a defined period of time. Chi-square can be used to analyze the null hypothesis.

Writing Assignments (REQUIRED):
Give examples of the writing assignments and the use of critical analysis within the writing assignments.

Unit 1: Chemistry of Life
Surface Tension Activity- Students determine how many drops of water can fit onto a penny. Various substances (e.g., salt, sugar, vinegar) can be added to the water to determine how the surface tension of the water is affected. Students then graph their data, calculate descriptive statistics and draw conclusions.

Formal Lab Report for Transpiration Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Unit 2: Cell Structure and Function
Osmosis Case Study- Before teaching the topic, have students read a case study about osmosis and answer questions (either those given with the case study or those you create) about the scenario. Ask students to draw what they think is occurring on the cellular level. Then, teach the topic in the way that best fits your classroom. Once students have demonstrated an understanding of the topic, have them revisit their answers to the questions in the case study as well as their drawings.

Formal Lab Report for Diffusion and Osmosis Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Unit 3: Cellular Energetics
Toothpickase Activity- Perform the "toothpickase" activity, in which students use their fingers to break as many as 100 toothpicks in 10-second intervals (without looking) onto a paper towel. All broken toothpicks must remain mixed with the unbroken. Broken toothpicks should not be removed from the pile, and each toothpick can only be broken once. Continue breaking toothpicks for these total time intervals (60, 120, and

180 seconds). Students then graph the number of toothpicks broken versus time (10, 20, 30, 60, 120, and 180 seconds). Students will draw conclusions about their findings.

Formal Lab Report for Photosynthesis Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Unit 4: Cell Communication and Cell Cycle

Cell Communication Essay- Have students do research online (provide reputable websites for them to use) to learn about diseases that result from a breakdown in cell communication. Assign students a one-minute essay with a prompt that allows the formative assessment of their understanding, such as, "Describe an example of communication between two cells."

Formal Lab Report for Cell Cycle Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Unit 5: Heredity

Chi-square Test Argument- Students can use genetic corn to apply the chi-square test to a dihybrid cross. First, students calculate the expected genotypic and phenotypic ratios using a Punnett square. They then formulate null hypotheses for the cross and perform a chi-square test. They conclude by stating whether they should reject or fail to reject the null hypothesis and justify their reasoning.

Evolution of Skin Color Case Study- Students can read a case study about the genetics and evolution of skin color, then answer any questions that may accompany the case study.

Unit 6: Gene Expression and Regulation

Transcription Modeling Activity- Students build a model of transcription using pool noodles that can be purchased at a dollar store. Using everyday materials, such as tape, colored paper, yarn (or string), and markers, they identify the promoter region, TATA box, transcription start site, and terminal sequence. Afterwards, they provide a written description of the process of transcription from the initial binding of the transcription factors to the production of the transcript.

Formal Lab Report for Bacterial Transformation Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Unit 7: Natural Selection

Error Analysis Activity- Have students use one of the Rock Pocket Mouse activities available online to learn the principles of the Hardy-Weinberg theorem, to calculate allele frequencies in a population, and to draw conclusions.

Formal Lab Report for Artificial Selection Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

Unit 8: Ecology

Isle Royale Activity- Students can read about the moose and wolves of Isle Royale to obtain background information on the two organisms. They can download a data spreadsheet and graph data about the two populations from the Internet. They can use their graph to make and justify predictions about how the two populations can change relative to each other.

Formal Lab Report for Pill Bugs Lab that includes the following components: Title, guiding question for the investigation, abstract, introduction (background information and purpose), hypothesis, experimental design, materials, safety precautions, procedures, results (data, graphs, calculations, drawings, observations), conclusions, and references.

INSTRUCTIONAL MATERIALS (REQUIRED)	
Textbook #1	
Title: Biology for the AP® Course	Edition: 1st
Author: Morris; Castignetti; Lepri; Relyea	ISBN: ISBN:9781319113315
Publisher: Bedford, Freeman, and Worth	Publication Date: 2022
Usage: ☐ Primary Text ☑ Read in entirety or near	
Textbook #2	
Title: Campbell Biology in Focus	Edition: 4th
Author: Urry, Minorsky, Hull	ISBN: 9780138272579
Publisher: Pearson	Publication Date: 2024
Usage: ☐ Primary Text ☑ Read in entirety or near	
Supplemental Instructional Materials *Please include online, and open source resources if any.*	

Estimated costs for classroom materials and supplies (REQUIRED). *Please describe in detail.* If more space is needed than what is provided, please attach a backup as applicable.	
Cost for a class set of textbooks: $	Description of Additional Costs:
Additional costs:$	
Total cost per class set of instructional materials:	$

Key Assignments (REQUIRED):
Please provide a detailed description of the Key Assignments including tests, and quizzes, which should incorporate not only short answers but essay questions also. How do assignments incorporate topics? Include all major assessments that students will be required to complete

Unit 1: Chemistry of Life
Use AP Classroom to assign the Personal Progress Check for Unit 1.

Lab- Transpiration (Investigation 11): What factors, including environmental variables, affect the rate of transpiration in plants?

- Explain how the behavioral responses of organisms affect their overall fitness and may contribute to the success of the population.
- Explain how the behavioral and/or physiological response of an organism is related to changes in internal or external environment.
- Explain how the density of a population affects and is determined by resource availability in the environment.

Unit 2: Cell Structure and Function
Use AP Classroom to assign the Personal Progress Check for Unit 2.

Lab- Diffusion and Osmosis (Investigation 4): What causes my plants to wilt if I forget to water them?

- Explain the effect of surface area-to-volume ratios on the exchange of materials between cells or organisms and the environment.
- Explain how specialized structures and strategies are used for the efficient exchange of molecules to the environment.
- Explain how concentration gradients affect the movement of molecules across membranes

Unit 3: Cellular Energetics
Use AP Classroom to assign the Personal Progress Check for Unit 3.

Lab- Fermentation

- Have students perform a yeast fermentation lab using the sucrose solutions from the Diffusion and Osmosis Lab your students may have performed in Unit 2. Students can measure the amount of carbon dioxide produced as the dependent variable. At the conclusion of the lab, collect class data. Have students graph the class data, including error bars on their graphs. To enhance this activity,

have students test different kinds of fresh and processed fruit juices and then compare the rates of fermentation among the different solutions

Unit 4: Cell Communication and Cell Cycle
Use AP Classroom to assign the Personal Progress Check for Unit 4.

Lab- Cell Division: Mitosis and Meiosis (Investigation 7): How do eukaryotic cells divide to produce genetically identical cells or to produce gametes with half the normal DNA?

- Describe the events that occur in the cell cycle.
- Explain how mitosis results in the transmission of chromosomes from one generation to the next.
- Explain how meiosis results in the transmission of chromosomes from one generation to the next.
- Describe similarities and/or differences between the phases and outcomes of mitosis and meiosis

Unit 5: Heredity
Use AP Classroom to assign the Personal Progress Check for Unit 5.

Lab- Wisconsin Fast Plants 72-Hour Dihybrid Genetics Kit:
How do parents and offspring express the same or different traits and how do siblings express the same or different traits?

- Observe the inheritance of a phenotypic trait in three generations of seedlings to obtain evidence of how variation can occur between parents and offspring
- Analyze and interpret observational data that is evidence of variation in inherited traits
- Develop a claim that includes the idea that inheritable genetic variation may result from new genetic combinations through meiosis
- Compare predicted results with results from experimental data to construct explanations of the variations of traits observed
- Engage in argument in evidence to support or refute explanation given for the variation of traits that occurs between parental and offspring populations

Unit 6: Gene Expression and Regulation
Use AP Classroom to assign the Personal Progress Check for Unit 6.

Lab- Biotechnology: Bacterial Transformation (Investigation 8): How can we use genetic engineering techniques to manipulate heritable information?

- Explain the use of genetic engineering techniques in analyzing or manipulating DNA.

Unit 7: Natural Selection
Assessment - AP Classroom Unit 7 Personal Progress Check

Lab - Artificial Selection (Investigation 1)

- To investigate natural selection as a major mechanism of evolution
- To convert a data set from a table of numbers that reflects a change in the genetic makeup of a population over time and to apply mathematical methods and conceptual understandings to investigate the cause(s) and effect(s) of this change

- To apply mathematical methods to data from a real population to predict what will happen to the population in the future
- To investigate how natural selection acts on phenotypic variations in populations
- To evaluate data-based evidence that describes evolutionary changes in the genetic makeup of a population over time due to changes in the environment
- To design an investigation based on your observations and questions related to the importance of a single trait in the life history of a plant

Unit 8: Ecology
Use AP Classroom to assign the Personal Progress Check for Unit 8.

Lab- Pill Bugs
- Students can perform an animal behavior lab using pill bugs. They can use choice chambers to study the responses of pill bugs to environmental stimuli. Create different environments on either side of the choice chamber. Place the same number of pill bugs on both sides of the choice chamber. Count the number of pill bugs on both sides of the choice chamber at regular intervals for a defined period of time. Chi-square can be used to analyze the null hypothesis.

Instructional Methods and/or Strategies (REQUIRED):

Please list specific instructional methods that will be used.

- Oral In-Class Participation/Classwork/Homework
- Focus Activities
- Homework/Classwork
- Student Presentations
- Quizzes and Tests
- Writing Assessments
- Projects (including Artifact, Written and Oral Assessment)

Assessment Methods and/or Tools (REQUIRED):

Please list different methods of assessments that will be used.

Assessment: AP Classroom Unit 1 Progress Check
Assessment: AP Classroom Unit 2 Progress Check
Assessment: AP Classroom Unit 3 Progress Check
Assessment: AP Classroom Unit 4 Progress Check
Assessment: AP Classroom Unit 5 Progress Check
Assessment: AP Classroom Unit 6 Progress Check
Assessment: AP Classroom Unit 7 Progress Check
Assessment: AP Classroom Unit 8 Progress Check