Perris Union High School District
Course of Study

A. COURSE INFORMATION

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

Biology

- ☐ New
- ☑ Revised

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

Transcript Course Code/Number:

104131, 104132

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

CREDIT TYPE EARNED: CALPADS CODE:

Science	9324

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;
Specific Supplementary Auth: Biological Science
Specific Subject Matter Auth: Biological Science

Signature — Date: 3/15/2024

Submitted by: Matthew Thomas
Site: Student Services Center
Date: 3/11/24
Email: matthew.thomas@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		03/21/24
Asst. Superintendent of Educational Services	Kindy Lee Machamer	3/21/24
Governing Board		

Prerequisite(s) (REQUIRED):
None
Corequisite(s) (REQUIRED):
None
Brief Course Description (REQUIRED):
This year-long high school course engages students in the study of life and living organisms, and examines biology and biochemistry in the real world. The course encompasses traditional concepts in biology and encourages exploration of new discoveries in the field. The components include biochemistry, cell biology, cell processes, heredity and reproduction, the evolution of life, taxonomy, human body systems, and ecology. This course will introduce biological science as a process of examining organisms and life processes, the chemistry of life, cells and their functions in organisms, DNA and genetics, evolution of life on Earth and ecology. This course is aligned with the Next Generation Science Standards, which were developed by states to improve science education for all students. The goals of these standards are to develop a thorough understanding of content as well as improve key skills like communication, collaboration, inquiry, problem solving, and creative thinking. Completion of this course with C or better satisfies one (1) the "D" (science) requirements for admissions to California State Universities and Colleges.

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.*
The course is designed to build critical thinking and engineering skills using performance assessments rather than traditional multiple-choice tests. The goal of the course is to build important skills including designing experiments, asking questions, building models, developing arguments with evidence, and reading and producing graphical information. We believe that these skills translate beyond science and into any career or professional setting.
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 0: The Study of Life
During this unit, students will be learning about science standards, the scientific process, how to collect, graph, and analyze data. They will continue by learning how to maintain a safe working environment (ie. Science Safety Agreement), and other standard processes. Students will get an introduction to CER and phenomena templates, and incorporate a Cornell style interactive student notebook (ISN).

Module:
- Lesson 1: The Science of Life

Writing Assignments:
- McGraw Smartbook 2.0 Interactive Formative Assessment

Labs/ Projects:
- **Microscopy intro lab:** During this lab students will learn how to operate a microscope and make observations.
- **Biotic vs Abiotic Lab:** Characteristics of life, stations, tangible materials. Students rotate between stations with different items/specimens and write down which characteristics of life they observe in the station and then decide if it is alive, deceased, or abiotic.
- **Crime Scene Investigation:** Scientific method lab based around crime science and forensics phenomena (modified but based on the PLTW Biomedical Unit).
- **Measurement Lab:** Students will learn how to take measurements of many varieties at stations.

Unit 1: Ecology
During this unit, students will explore the mathematical interconnection between birth rates, death rates, and resource consumption for populations as well as their effects on social interactions and group behavior. Students will develop models for the movement of energy and matter throughout ecosystems, populations, and natural cycles.

M2: Principles of Ecology.
- Lesson 1: Organisms and Their Relationships
- Lesson 2: Flow of Energy in an Ecosystem
- Lesson 3: Cycling of Matter

M3: Communities, Biomes, and Ecosystems
- Lesson 1: Community Ecology
- Lesson 2: Terrestrial Biomes
    - Cover climate basics p.54-56, overview specific biomes (terrestrial & aquatic)

M4: Population Ecology
- Lesson 1: Population Dynamics

M5: Biodiversity and Conservation
- Lesson 1: Biodiversity
- Lesson 2: Threats to Biodiversity
- Lesson 3: Conserving Biodiversity
    - Consolidate lessons 1-3 and finish research project
    - Highlight Climate Change (esp. Human impacts and future impacts)

Writing Assignments:

- Food Web Activity: You will pick one animal below that MUST go into your food web. Your task is to research the predators and prey of this animal to create the beginning of a food web. Once you have researched the predators and prey for your animal, research the predators and prey for the other animals that are now included in your food web. Continue this process until you have at least 10 organisms in your food web. You must include producers, primary consumers, secondary consumers, and tertiary consumers. You will create your completed food web on a 8.5 by 11 paper. Once you complete your food web you will write an analysis discussing the number of links between trophic levels that can contribute to the overall stability of the community.
- McGraw Smartbook 2.0 Interactive Formative Assessment

Labs/ Projects:

- **Symbiotic relationships stations lab:** Stations lab where students describe the ecological relationship between two organisms exhibited at each station.
- **Food Web Lab:** Read an excerpt describing the ecosystem of the coastal California ocean biome. Identify each organism as a producer or consumer, their trophic level, and their possible predators/prey. Diagram a Food Web that accurately illustrates these relationships. Answer analysis questions based on this Food Web.
- **Sunflower sampling/population density/dispersion:** students use random sampling to determine the dispersion pattern and population density of a population of sunflowers.
- **Biodiversity TikTok PSA Project:** Decide on an audience to address who can help to improve the situation—your classmates; parents; younger (or older) students; administrators; teachers;city, community, or government officials—and compose an argument both describing a particular endangered or invasive species and proposing changes that may improve biodiversity in the ecosystem. Like scientists, you may need to research the organism's ecosystem, to learn about the endemic species, natural predators, competitors, and prey of the organism you are examining.

Unit 2: Cells

Students will accurately demonstrate the stages of the cell cycle and the movement of specific organelles within that cycle. Students will describe the individual structures within the cell and their function in relation to the homeostasis of tissues and body systems.

M6: Chemistry in Biology

- Lesson 4: The Building Blocks of Life
    - Consolidate background info of lessons 1-3 (matter, bonds, enzymes, water)

M7: Cellular Structure and Function

- Lesson 1: Cell Discovery and Theory
- Lesson 2: The Plasma Membrane
- Lesson 3: Cellular Transport
- Lesson 4: Structures and Organelles
    - Consolidate lessons 2-4 w/ focus on basic structure, function, key vocab, homeostasis

M8: Cellular Energy

- Lesson 1: How Organisms Obtain Energy (ATP)

- Lesson 2: Photosynthesis
- Lesson 3: Cellular Respiration
    - Simplify cycles to input/ output

M9: Cellular Reproduction and Sexual Reproduction

- Lesson 1: Cellular Reproduction
- Lesson 2: Meiosis and Sexual Reproduction

Writing Assignments:

- **Cells Project:** Your goal is to create a project that accurately and creatively depicts organelles in either an animal or plant cell. This is an open concept project, meaning you can decide what you want to create, as long as it meets the requirements listed in the rubric. Examples of projects include, but are not limited to: a 3D model (including a key with pictures), organelle baseball cards, an organelle family photo album, a catalog selling organelles, a travel guide for a eukaryotic cell, FBI's most wanted organelles, etc. Once you have decided on your project, have it approved by the teacher. In addition to your creation, you will provide a written explanation of differences and similarities between animal and plant cells.
- McGraw Smartbook 2.0 Interactive Formative Assessment

Labs/ Projects:

- **Microscopy**: Virtual exploration of how to use a microscope and make observations
- **Barf Bag Lab (fermentation):** Yeast are tiny, unicellular fungi that often use alcoholic fermentation. Baking bread is one of the ways humans use the anaerobic processes of yeast. Although the yeast in the bread dough has some access to oxygen, it quickly converts to alcoholic fermentation when the oxygen is depleted. Alcoholic fermentation breaks down glucose to produce carbon dioxide and ethyl alcohol. You don't generally taste the alcohol in bread because the heat of your oven causes it to evaporate, but alcoholic fermentation can also be used to produce beer, wine, and other alcoholic beverages.
- **Photosynthesis Model Video:** Using your Leaf Model, please include the following in your video:
    - Identify the components of the model and describe each section of the leaf
    - Move through each step in Photosynthesis: Light-Dependent Reactions --> Light Independent Reactions
    - Explain what is used and produced during each step
    - Conclude with describing the overall reaction (What are the reactants? Products?) and the importance of Photosynthesis
- **Modeling Mitosis:** For this assignment, you will be working in groups of 4. Each group member will be assigned a specific phase in Mitosis that they will need to make a model using modeling clay to show what the cell looks like during that specific phase. After each group member has created their model, students will call the teacher over and explain how Mitosis works using all of the groups models, with each member explaining their specific step of Mitosis.
- **Cancer Research Brochure:** In this assignment, you will be creating a brochure that discusses a specific type of cancer. In your brochure, you must include the following sections:
    - The type of the cancer you decided to research
    - General information about this type of cancer (location in body, survival rate, symptoms)

- Known carcinogens or risk factors that can lead to the development of this type of cancer
- Ways to prevent the development of this type of cancer
- Types of Treatment available for this type of cancer
- Contact information and website for more information on the disease (Include your name on the back)

- **Photosynthesis Skittles Lab (biomolecules/conservation of matter):** Students use skittles to model the atoms of the biomolecules in photosynthesis and cellular respiration to demonstrate the conservation of matter
- **Meiosis digital lab:** Students explore the digital "game" simulation to review the process of meiosis and its ultimate results.
- **Diffusion Demo:** Skittles rainbow on a plate. Plase skittles around the edge of a plate and fill the center with water. Observe the color diffusing into the center to create a rainbow.

Unit 3: Genetics
Students will apply their understanding of the chemical structure of genetic material like DNA and RNA to the rate of mutation as seen in relation to Mendelian Genetics and relate the rate of mutations in populations to the prevalence of genetic diseases and the process of natural selection.

M11: Molecular Genetics
- Lesson 1: DNA: The Genetic Material
  - Focus on structure, orientation, nucleotides
  - Lesson 2: Replication of DNA
  - Lesson 3: DNA, RNA, and Protein
  - Lesson 4: Gene Regulation and Mutation
  - Focus on mutations

M10: Introduction to Genetics and Patterns of Inheritance
- Lesson 1: Mendelian Genetics (dihybrid=extension)
- Lesson 4: Basic Patterns of Human Inheritance
- Lesson 5: Complex Patterns of Inheritance
  - Focus on main non-Mendelian examples

M12: Biotechnology (HHMI resources instead)
- Using resources like HHMI Biointeractive case study (Central Dogma and Genetic Medicine,Inheritance and Mutations in a Single Gene Disorder)

Writing Assignments:
- **Meiosis Modeling Activity:** To model meiosis in Drosophila, a fruit fly with 4 chromosomes (2n = 4). The directions will guide you through interphase, but from prophase to cytokinesis it is up to you and your partner(s) to decide how to best model each stage of meiosis I and II using the materials provided for you. Once you are done modeling each stage of mitosis on your desk, draw what you have modeled in the cells provided. Make sure to use colored pencils that are the same color as your chromosome pipe cleaners. Then provide an analysis of how meiosis is different from mitosis.
- McGraw Smartbook 2.0 Interactive Formative Assessment

Labs/ Projects:

- **Karyotype Activity:** In this activity, students use a computer model to look at chromosomes and prepare a karyotype. They diagnose patients for abnormalities and learn the correct notation for characterizing karyotypes.
- **Mystery Pedigrees and Genetic Disease:** For this assignment, you will be working in 2 separate groups. In your first group, you will be analyzing a pedigree and determining the type of genetic disease pattern it shows. Once you have determined this, you will research a disease that follows this pattern. After you have gathered this information, you will report back to your seats and share your information with your second group.
- **Dragon Genetics:** Partners will work together to produce a dragon offspring. Students will simulate meiosis and fertilization. Students will be evaluating Mendelian genetic and Non- Mendelian genetic modes of inheritance. **Monster Mates Activity:** Students, their knowledge of genetics and heredity to create a monster. Then, they will cross their monster with another monster to create a baby monster.
- **Build a DNA Model:** In this activity you will begin to investigate the structural composition of DNA by building a three-dimensional model of the molecule.
- **DNA Class build:** (DNA structure) Student color, cut and paste the molecules together into nucleotides, pair bases together and add to the overall class DNA model.
- **DNA extraction lab: banana or strawberries** (DNA structure and function). Students extract DNA from bananas or strawberries to see it in person as a review of DNA structure and function.
- **Protein Synthesis Monster Lab:** Students transcribe and translate to determine the traits of a mystery organism/monster.
- **Protein Synthesis Scavenger Hunt Lab:** Students decode DNA to amino acid letters to figure out where the next clue is. So on and so forth until they reach the end.
- **Punnett Square Penguin Lab:** Students flip a count to determine the alleles for each genotype for each parent. Then, they cross the parent genotypes and determine the most likely phenotype for each trait. They then draw/color a penguin to match those traits.

Unit 4: Evolution and Diversity of Life
Students will explore the evidence associated with common ancestry and develop detailed connections between change in life recorded in the fossil record and the age of the planet and bridge that evidence with the theory of evolution.

M13: The History of Life
- Lesson 1: Fossil Evidence of Change
    - Focus on fossils

M14: Evolution
- Lesson 1: Darwin's Theory of Evolution by Natural Selection
- Lesson 2: Evidence of Evolution
- Lesson 3: Shaping Evolutionary Theory

M16: Organizing Life's Diversity

- Lesson 1: The History of Classification
    - Focus on taxonomy & binomial nomenclature
- Lesson 2: Modern Classification
    - Focus on phylogenetic trees
- Lesson 3: Domains and Kingdoms

Writing Assignments:

- **Natural Selection in Action:** To research one example that supports the theory of natural selection and provide an analysis of how it is related to natural selection.
- McGraw Smartbook 2.0 Interactive Formative Assessment

Labs/ Projects:

- **MMM March Mammal Madness:** Students discover many different organisms (not just mammals) and determine who they believe will make it through each battle to be the ultimate champion. Explores the diversity of life and how each organisms is specialized to fit their environment (great as we work through evolution)
- **Bird Beak Activity:** Students use different tools to mimic different bird beaks to pick up various items in a certain period of time.
- **Evidence of Evolution Rotations Lab:** Evolution is an important aspect of biology, and it is important to understand how and why this theory developed. In this activity students will visit 5 stations that provide evidence for the evolutionary theory, and discover how these evidences can be related to humans, health, and even how they may contribute to medical research. The stations include activities that cover 5 major evidences of evolution: The fossil record, DNA sequence comparison, anatomical homologies, amino acid sequence comparison, and embryology.
- **Cladogram Lab Activity:** Construct a cladogram based on comparative features presented in a chart. Afterwards have students compare cladograms and discuss how multiple cladograms can be constructed from the same data. Have students debate which cladogram is most likely correct.
- **Embryology quick lab**: Students hypothesize which embryo they believe matches with the 6 organisms. They analyze how each has changed over time and what the embryos have in common across the board. All to assess home embryology can be used as a line of evidence for evolution.

Unit 5: Diversity of Life

This unit is intended to be added on to the end of unit 4. Consolidate selected Unit 5 lessons + Unit 4 into larger Evolution and Diversity Unit. Teachers can cover M17 (Bacteria & Viruses) & M18 (Protists and Fungi).

M19: Introduction to Plants

- Lesson 1: Plant Evolution and Diversity ++
- Lesson 2: Plant Structure and Function
- Lesson 3: Plant Reproduction

M20: Introduction to Animals - -

- Lesson 1: Animal Characteristics

M21: Animal Diversity and Behavior - -

- Lesson 1: Invertebrates

- Lesson 2: Vertebrates
- Lesson 3: Animal Behavior

M15: Primate Evolution

- Lesson 1: Primates
- Lesson 2: Hominoids to Hominins
- Lesson 3: Human Ancestry
    - Consolidate Lessons 1-3
    - Move to create transition from Evolution/ Diversity of Life into Human Body Systems

Writing Assignments:

- **Hominoid Research Paper:** (Follow-up to Hominid Skulls Lab Activity) Students will read and analyze currently accepted and competing theories of human evolution either from their textbooks or from articles. They will defend one of the theories based on what has been read and also on the observations made in the laboratory activity.
- McGraw Smartbook 2.0 Interactive Formative Assessment

Labs/ Projects:

- **Hominoid Skulls Lab Activity:** This lab will allow students to investigate and evaluate evolutionary relationships by examining skulls of living and extinct human relatives. It is a direct, hands-on way of studying human evolution. Working and presenting interpretations in groups will simulate the process of paleo-archeology study that characterizes this scientific field and will tie into a discussion of the various competing theories of human evolution that are currently debated. Students will collect data by measuring and observing primate skulls. Then they will use the data gathered to analyze various phylogenetic trees showing evolutionary relationships between fossil and living specimens of hominoids.

Unit 6: The Human Body

Students will develop an interconnected understanding of the multiple systems of the human body responsible for growth, function, and homeostasis with focus on body systems, immune response, and reproduction.

- **M22: Integumentary, Muscular, and Skeletal Systems**
    - Lesson 1: The Integumentary System
    - Lesson 2: The Skeletal System
    - Lesson 3: The Muscular System
- **M23: Nervous System**
    - Lesson 1: Structure of the Nervous System
    - Lesson 2: Organization of the Nervous
    - Lesson 3: The Senses
    - Lesson 4: Effects of Drugs
- **M24:Circulatory, Respiratory, and Excretory Systems**
    - Lesson 1: Circulatory System
    - Lesson 2: Respiratory System
    - Lesson 3: The The Excretory System

- **M25: Digestive and Endocrine Systems**
  - Lesson 1: The Digestive System
  - Lesson 2: Nutrition
  - Lesson 3: The Endocrine System
- **M26: Human Reproduction and Development**
  - Lesson 1: Reproductive Systems
  - Lesson 2: Human Development before Birth
  - Lesson 3: Birth, Growth, and Aging
- **M27: The Immune System**
  - Lesson 1: Infectious Diseases
  - Lesson 2: The Immune System
  - Lesson 3: Noninfectious Disorders

Writing Assignments:

- **Human Body Systems Interactions:** Select at least two organ systems that would certainly be working together and then explain how they interact with one another and provide detailed specific examples.
- McGraw Smartbook 2.0 Interactive Formative Assessment

Labs/ Projects:

- **Frog Dissection Lab Form:** Students will review body systems as a whole as compared to human bodies.
- **Human Body systems choice board:** Human Body Systems Choice Board: students explore different activities for a few different body systems.
- **Fetal Pig Dissection:** In this exercise students examine the organization of the many body systems studied during this unit in the context of a single specimen, the fetal pig. They identify the structures and functions of major organs as they explore each system.

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

Unit 1: Ecology

Food Web Activity: You will pick one animal below that MUST go into your food web. Your task is to research the predators and prey of this animal to create the beginning of a food web. Once you have researched the predators and prey for your animal, research the predators and prey for the other animals that are now included in your food web. Continue this process until you have at least 10 organisms in your food web. You must include producers, primary consumers, secondary consumers, and tertiary consumers. You will create your completed food web on a 8.5 by 11 paper. Once you complete your food web you will write an analysis discussing the number of links between trophic levels that can contribute to the overall stability of the community.

Unit 2: Cells

Cells Project: Your goal is to create a project that accurately and creatively depicts organelles in either an animal or plant cell. This is an open concept project, meaning you can decide what you want to create, as long as it meets the requirements listed in the rubric. Examples of projects include, but are not limited to: a 3D model (including a key with pictures), organelle baseball cards,

an organelle family photo album, a catalog selling organelles, a travel guide for a eukaryotic cell, FBI's most wanted organelles, etc. Once you have decided on your project, have it approved by the teacher. In addition to your creation, you will provide a written explanation of differences and similarities between animal and plant cells.

Unit 3: Genetics

Meiosis Modeling Activity: To model meiosis in Drosophila, a fruit fly with 4 chromosomes (2n = 4). The directions will guide you through interphase, but from prophase to cytokinesis it is up to you and your partner(s) to decide how to best model each stage of meiosis I and II using the materials provided for you. *Once you are done modeling each stage of mitosis on your desk, draw what you have modeled in the cells provided. Make sure to use colored pencils that are the same color as your chromosome pipe cleaners. Then provide an analysis of how meiosis is different from mitosis.*

Unit 4: Evolution and Diversity of Life

Natural Selection in Action: To research one example that supports the theory of natural selection and provide an analysis of how it is related to natural selection.

Unit 5: Diversity of Life

Hominoid Research Paper (Follow-up to Hominid Skulls Lab Activity): Students will read and analyze currently accepted and competing theories of human evolution either from their textbooks or from articles. They will defend one of the theories based on what has been read and also on the observations made in the laboratory activity.

Unit 6: The Human Body

Human Body Systems Interactions: Select at least two organ systems that would certainly be working together and then explain how they interact with one another and provide detailed specific examples.

INSTRUCTIONAL MATERIALS (REQUIRED)	
Textbook #1	
Title: Inspire Science: Biology	Edition: 1st
Author: McGraw Hill	ISBN: 978-0021452620
Publisher: McGraw Hill	Publication Date: August 1, 2018
Usage: ☑ Primary Text ☐ Read in entirety or near	
Textbook #2	
Title:	Edition:
Author:	ISBN:
Publisher:	Publication Date:
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
Students are provided with multiple exams and quizzes throughout the course. Many exams and quizzes contain multiple types of questions including multiple choice, short response, essay questions, and application of scientific skills. Laboratory activities may also serve as key assignments and/or Assessments due to the ability of students to demonstrate their working scientific knowledge.
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.
• Writing Assessments • Labs experiments and write-ups • Lesson Assessments

- Unit/Chapter Assessments
- Individual Presentations
- Group Presentations
- Cumulative Semester Final
- Quick writes
- Exit tickets