High School Course Description for **Introduction to Zoology: Invertebrate**

Course Title: Introduction to Zoology: Invertebrate

Course Number: SCI301

Grade Level: 10-12

Meets a UC a-g Requirement: To be submitted for "D" laboratory science requirement

Meets High School Graduation Requirement for: Elective Credit

Curricular Area: Life Science

Length: One Semester

Prerequisites: Biology and Algebra I

Meets NCAA Requirement: To be submitted as lab science

Course Description

Zoology, the scientific study of animal life, builds on centuries of human inquiry into the animal world. This class is devoted to studying the Invertebrates (animal without a backbone). Students will participate in dissection labs and other scientific discovery-based laboratory exercises for 20% of their instructional time. This course is well suited for individuals interested in health or animal science careers.

Alignment

This course is aligned to the 1998 California Content Standards for Biology/Life Science and Laboratory Investigation and Experimentation (9-12).

Instructional Materials

Required Textbook(s)

1. *Integrated Principles of Zoology* 14th edition by Hickman, P.C. Jr, Roberts, S.L., Larson, A., I'Anson, H., Mc Graw Hill, 2004

Supplemental Materials

1. *Integrated principles of Zoology Laboratory Manual* 14th edition by Hickman, P.C. Jr, Roberts, S.L., Larson, A., I'Anson, H., Mc Graw Hill, 2004

2. *Zoology Coloring Book* Elson, L.M.,

Software

3. *.Digital Zoology 2.0* with Workbook, Houseman, J.,

Exit Criteria

Activities	Percentage
Laboratory/ Presentations	30%
Tests	30%
Quizzes/ Classwork	30%
Final Examination	10%
Multiple Choice – 4%	
Lab w/ Write up- 4%	
Oral Presentation – 2%	
Total:	100%

Development Team :

This Course of Study was updated in 2009 by Armando Ponce-CHS and Julia Nichols, Educational Services (9-12).

Pacing Guide for **Introduction to Zoology: Invertebrate**

Quarter 1

Weeks: 1-2 UNIT ONE: BIOLOGICAL PRINCIPLES OF ZOOLOGY AND THE ORIGIN OF CHEMICAL LIFE

California Content Standards- Biology

Cell Biology

1. The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells. As a basis for understanding this concept:
    a. Students know cells are enclosed within semi permeable membranes that regulate their interaction with their surroundings.
    b. Students know enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions, and the pH of the surroundings.
    c. Students know how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.
    d. Students know the central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm.
    e. Students know the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins.
    f. Students know usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.
    g. Students know the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.
    h. Students know most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors.

Unit/Lesson/Sections/Chapters: Chapter: 1, 2, and 3. This unit is a general introduction to the subject of zoology and reviews such basic principles as basic molecules, origins, the scientific method, elements and atoms, chemical bonds, acids, bases and salts and organic molecules. It is a review chapter of things already learned in other classes.

CLASS OBJECTIVES

1. To review basic principles of zoology, which will be used during the semester.
2. To help orientate the student to the purpose of their being in zoology.
3. To help students re-identify what they learned about the cells in biology.

LABS USED

1. Cell Identification lab from microscope slides

AUDIO/VISUAL MATERIALS:

None required

Weeks: 3-4: UNIT TWO: TAXONOMY/PHYLOGENY OF ANIMALS

California Content Standards: Biology
Evolution

7. The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept:
    a. Students know why natural selection acts on the phenotype rather than the genotype of an organism.
    b. Students know why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.
    c. Students know new mutations are constantly being generated in a gene pool.
    d. Students know variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.

Unit/Lesson/Sections/Chapters: Chapter 10 is a basic review chapter of the principles of taxonomy. Even though the student should have already been introduced to this subject, the chapter goes into considerable more detail than they have previously learned.

CLASS OBJECTIVES
1. The student will learn the purpose of animal classification.
2. The student will review the different animal kingdoms and criteria for placing animals in each.
3. Students will learn to appreciate the different animal body plans.

LABS USED:
1. Lab #4 – Classification of beans

AUDIO/VISUAL MATERIALS:
1. DVD – Classification

Weeks: 5–6: UNIT THREE: UNICELLULAR ORGANANISMS: PROTOZOANS

California Content Standards- Biology
Physiology

9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. As a basis for understanding this concept:
    a. Students know how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.
    b. Students know how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.
    c. Students know how feedback loops in the nervous and endocrine systems regulate conditions in the body.
    d. Students know the functions of the nervous system and the role of neurons in transmitting electrochemical impulses.
    e. Students know the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.

Weeks: 5–6: UNIT THREE: UNICELLULAR ORGANANISMS: PROTOZOANS (Continued)

Unit/Lesson/Sections/Chapters: Chapter 11 is a unit that deals with the world of the microscopic. The classification of the phylum or kingdom of the protozoans is discussed. The 4 general phyla are also discussed individually.

CLASS OBJECTIVES:
1. The student will learn the taxonomy of the protozoa phylum
2. The student will learn the general features of a typical protozoan.

LABS USED:
1. Lab #18 - Microscopic Life
2. Lab - Constructing A Model Of A Protozoan (clay models)$$
3. Lab - Monocystis

AUDIO/VISUAL MATERIALS:
1. VT - Protists: Form, Function, Ecology
2. VT - Freshwater Pond
3. VT - Conquest of the Parasites (only section on protozoa)
4. Protozoa Computer Program

Week 7: UNIT FOUR: PHYLUM PORIFORA:SPONGES/PLACOZOANS

California Content Standards: Biology
Evolution
7. The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept:
    a. Students know why natural selection acts on the phenotype rather than the genotype of an organism.
    b. Students know why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.
    c. Students know new mutations are constantly being generated in a gene pool.
    d. Students know variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.

Unit/Lesson/Sections/Chapters: Chapters: 12.This chapter discusses the PORIFERA PHYLA and its role in the ecology of the environment. The general features of the sponges are discussed together with their phylogeny. These organisms are sessile and their bodies bear myriads of tiny pores and canals that comprise a filter-feeding system.

CLASS OBJECTIVES:
1. The students shall know the taxonomy of the Phyla Porifera .
2. The student will learn the importance of sponges to the community of animals.

Week 7: UNIT FOUR: PHYLUM PORIFORA:SPONGES/PLACOZOANS (Continued)

LABS USED:
1. Investigating the Biophysics of Sponges
2. Sponge Lab - Using Leucosolenia and other sponge slides.
3. Computer Lab - Porifera CD
4. Computer Lab - Porifera Internet Search

AUDIO/VISUAL MATERIALS:
1. DVD - Porifera from The Shape of Life series
2. vt - Sponges

Weeks: 8 – 9: UNIT FIVE: PSEUDOCOELOMATE ANIMALS

California Content Standards: Biology
Evolution

8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:
    c. Students know the effects of genetic drift on the diversity of organisms in a population.
    d. Students know reproductive or geographic isolation affects speciation.
    e. Students know how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction.

Unit/Lesson/Sections/Chapters: This unit discusses the ecological importance of the pseudocoelomate animals, including members of the following phyla of animals: Phylum Rotifera, Phylum Gastrotricha, Phylum Kinorhyncha, Phylum Lorcifera, Phylum Nematoda, Phylum Nematomorpha, Phylum Acanthocephala, and Phylum Entoprocta.

CLASS OBJECTIVES:
1. The students will be able to differentiate between these different phyla of animals.
2. The student will demonstrate general knowledge of those organisms.
3. The taxonomy of the phyla will be learned by each of the students.

LABS USED:
1. Dissection of Ascaris

AUDIO/VISUAL MATERIALS:
1. vt - Conquest of the Parasites
2. DVD - Worms from 'Animals without Backbone'
3. vt - Nematodes

Weeks: 10-11: UNIT SIX*:* RADIATE ANIMALS PHYLUM CNIDARIA, CTENOPHORA

California Content Standards: Biology
Evolution

7. The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept:

    a. Students know why natural selection acts on the phenotype rather than the genotype of an organism.

    c. Students kno*w* new mutations are constantly being generated in a gene pool.

    d. Students know variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.

8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:

    c. Students know the effects of genetic drift on the diversity of organisms in a population.

    d. Students know reproductive or geographic isolation affects speciation.

    e. Students know how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction.

Unit/Lesson/Sections/Chapters: Chapter 13.This chapter covers two important phyllum of animals, the Cnidarians and the Ctenophores. Both of these groups are radiate animals which means that they exhibit radial symmetry.

CLASS OBJECTIVES:
1. The student will learn about the ecology and the life-style of the Phylum Cnidaria.
2. The student will learn about the ecology and the life-style of the Phylum Ctenophora.
3. The taxonomy of these two phyla will be learned by each student.

LABS USED:
1. Cnidarians Internet Lab
2. Coelenterate Microscope slide Lab

AUDIO/VISUAL MATERIALS:
1. DVD - The Coral Reef
2. vt - Great Barrier Reef
3. vt- Coelenterata

Quarter 2

Weeks:12–13 UNIT SEVEN: ACOELOMATE ANIMALS:FLATWORMS, RIBBON WORMS, JAW WORMS

California Content Standards: Biology

Physiology

9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. As a basis for understanding this concept:
    a. Students know how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.
    b. Students know how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.
    d. Students know the functions of the nervous system and the role of neurons in transmitting electrochemical impulses.
    e. Students know the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.

Unit/Lesson/Sections/Chapters: Chapter14. This chapter deals with three phyla of animals, all bearing the same characteristic of being a flatworm. The three phyla being Platyhelminthes, Nematoda, and Gnathostomulida. Their ecology and importance to the human family are discussed.

CLASS OBJECTIVES:

1. The student will learn about the three phyla of flatworms.
2. The student will be able to distinguish between the three phyla.
3. The taxonomy of the three phyla will be learned by each student.
4. The importance of the three phyla to the human family will also be learned by the students.

LABS USED:

1. Liver Fluke Microscope Lab
2. Platyhelminthes/Planaria Lab

AUDIO/VISUAL MATERIALS:

1. Vt - Three Valleys of St. Lucia
2. DVD - Flatworms from Shape of Life series
3. VT - Flatworms

Weeks: 14-15: UNIT EIGHT: MOLLUSKS AND ANNELIDS

California Content Standards: Biology

Physiology

10. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. As a basis for understanding this concept:
    a. Students know how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.
    b. Students know how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.
    f. Students know the functions of the nervous system and the role of neurons in transmitting electrochemical impulses.
    g. Students know the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.

Unit/Lesson/Sections/Chapters: Chapters 16, 17. The phylum Molluska is discussed in this chapter together with their form and function. The 7 different classes of mollusks are discussed along with their phylogeny and adaptive radiation.

CLASS OBJECTIVES:

1. The student will demonstrate knowledge of the form and function of the phylum Molluska.
2. The student will learn the difference between the following classes of Mollusks: Class Caudofoveata, Class Monoplacophora, Class Polyplacophora, Class Scaphopoda, Class Gastropoda, Class Bivalvia, and Class Cephalopoda.

LABS USED:

1. Clam Dissection Lab

AUDIO/VISUAL MATERIALS:

1. DVD - Mollusks from Shape of the Earth series
2. Computer Dissection of Clam
3. VT - Octopus
4. Cephalopod Internet Lab
5. Computer CD Assignment on Mollusks
6. vt - Incredible Succors

Weeks: 16 – 17: UNIT NINE: ARTHROPODS, TRILOBITES, HEXAPODS

California Content Standards: Biology

Ecology

6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:
    a. Students know bio diversity is the sum total of different kinds of organisms and is affected by alterations of habitats.
    b. Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.
    c. Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.

Physiology

9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. As a basis for understanding this concept:
    a. Students know how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.
    b. Students know how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.
    e. Students know the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.

Unit/Lesson/Sections/Chapters: Chapters: 19 and 21**.**The Phylum Arthropoda embraces the largest assemblage of living animals on earth. It includes the spiders, scorpions,ticks, mites, crustaceans, millipedes, centipedes, insects, and a few other small groups. There are approximately 1,000,000 different species with about twice that many not yet classified. They compete with humans for food and spread serious disease and also serve as food sources and yield drugs, dyes and create such products as silk, honey, and beeswax.

CLASS OBJECTIVES:

1. The student will gain appreciation of this phylum of organisms and their effect upon the human race.
2. The student will demonstrate knowledge of the phylum and be able to distinguish the classes of it.
3. The student will learn the internal and external body parts of a member of the class insecta.
4. The student will learn the internal and external body parts of a member of the class crustacea.
5. The student will learn the ecological importance that these critters have upon the world environment.

LABS UTILIZED:

1. Grasshopper dissection lab
2. Insect parts lab
3. Crayfish dissection lab
4. Computer CD Lab - Arthropods

AUDIO/VISUAL MATERIALS:

1. DVD - Arthropods from Shape of Earth series
2. VT - Life on Earth series - "Insects"
3. VT - Insects: The Ruling Class
4. VT - Horseshoe Crab
5. DVD - Bite of the Black Widow

Weeks: 18: UNIT TEN: ECHINODERMS, LESSER DEUTERSOMES

California Content Standards: Biology

Genetics

4. Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism. As a basis for understanding this concept:
    c. Students know how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.
    d. Students know specialization of cells in multi cellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.
    e. Students know proteins can differ from one another in the number and sequence of amino acids.

Evolution

8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:
    a. Students know how natural selection determines the differential survival of groups of organisms.
    b. Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment.
    c. Students know the effects of genetic drift on the diversity of organisms in a population.
    d. Students know reproductive or geographic isolation affects speciation.
    e. Students know how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction.

Unit/Lesson/Sections/Chapters: Chapter 22; The echinoderms, along with the chordates belong to the Deuterostomia branch of the animal kingdom and are all coelomates. They include the marine forms such as sea stars, brittle stars, sea urchins, sea cucumbers, and sea lilies. They have unique characteristics that are found in no other phylum.

CLASS OBJECTIVES:

1. The student will learn the five classes of echinoderms and know the difference between the five.
2. The student will recognize the common characteristics of a member of the phylum by dissecting the starfish.
3. The student will be able to list the common characteristics of members of this phylum.
4. The student will learn the importance of members of this phylum to the rest of the environment.

LABS UTILIZED:

1. Dissection of the starfish
2. Examining role of starfish in environment

AUDIO/VISUAL MATERIALS:

1. VT - Echinoderms
2. DVD - Echinoderms from Shape of Earth series
3. Computer dissection program on starfish

Week 19: Review for FINAL

ALL UNITS:

Support for English Language Learners:
SDAIE strategies will be utilized: including vocabulary development, use of realia, and multiple visual representations during instruction.

Support for Special Education Students:
Modified assignments and assessment per student's Individualized Educational Plan will be utilized. In addition, students will be assisted with vocabulary development exercise, a variety of instructional groupings, and collaboration with the Resource Specialist and instructional assistant (if applicable).

Stretching the Lesson for GATE Students:
Differentiated tasks for advanced students will accommodate extended learning needs. Instructional groupings and a variety of presentation styles to meet multiple intelligence needs will be utilized