

## High School Course Description for **Introduction to Zoology: Vertebrate**

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**Course Title:** Introduction to Zoology: Vertebrate**Curricular Area:** Life Science**Course Number:** SCI302**Length:** One Semester**Grade Level:** 10-12**Prerequisites:** Biology and Algebra I**Meets a UC a-g Requirement:** To be submitted for "D" laboratory science requirement**Meets NCAA Requirement:** To be submitted as lab science**Meets High School Graduation Requirement for:**  
Elective Credit**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 Vertebrates (animal with 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* 14<sup>th</sup> edition by Hickman, P.C. Jr, Roberts, S.L., Larson, A., P Anson, H., Mc Graw Hill, 2004

Supplemental Materials

1. *Integrated principles of Zoology Laboratory Manual* 14<sup>th</sup> edition by Hickman, P.C. Jr, Roberts, S.L., Larson, A., P 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**

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

**Development Team :**

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

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### Quarter 1

#### Weeks 1–2: UNIT ONE: HISTORY OF LIFE ON EARTH/ORGANIC EVOLUTION

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:
  - e. Students know proteins can differ from one another in the number and sequence of amino acids.
5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:
  - a. Students know the general structures and functions of DNA, RNA, and protein.
  - b. Students know how to apply base-pairing rules to explain precise copying of DNA during semi conservative replication and transcription of information from DNA into mRNA.
  - c. Students know how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.

#### *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: Chapters: Chapters 6,. The beginning of life is a mysterious process. The students will investigate and learn about the Primordial soup model, Lerman's bubble model as well as the first types of life forms on this planet.

#### CLASS OBJECTIVES:

1. The students will learn about the primordial soup model and the Lerman bubble model.
2. The students will study the Earth's changes which would have allowed for life on this planet.
3. The students will be able to differentiate between Creationism and Darwinism through the analysis of published works that can be found through the internet.
4. The students will be able to identify how RNA and DNA may have developed.

#### LABS:

1. Microspheres Lab
2. Radiometric Dating Lab with popcorn kernels
3. Natural Selection Lab

#### AUDIO/VISUAL MATERIALS:

Secondary Curriculum Council Approved: December 8, 2009

Board approved: February 4, 2010

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1. Origins video.

### **Weeks 3–4: UNIT TWO: VERTEBRATE BEGINNINGS AND THE PHYLOGENY OF 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:
  - 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.

#### ***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.

Unit/Lesson/Sections/Chapters: Chapter 9 & 23. What does it mean to be a chordate as well as what does it mean to be an Animal. The students will take a depth look at how the spinal chord develops as well as how limbs and other neurological aspects develop in all groups of vertebrates. The students will learn about the general characteristics, protochordates, and the origin of the early vertebrates.

#### **CLASS OBJECTIVES:**

1. The students will learn about what is a chordate.
2. The students will look at the major animal phyla
3. The students will be able to differentiate between vertebrate and invertebrate animals.
4. The students will be able to identify how the brain and limbs develop.
5. The student will learn about the origin of early vertebrates.

#### **LABS:**

1. Cell tissues Identification slide lab

#### **AUDIO/VISUAL MATERIALS:**

None

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### Weeks 5-6: UNIT THREE: THE RISE OF FISHES

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.
  - d. Students know how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.
  - e. Students know a vital part of an ecosystem is the stability of its producers and decomposers.
  - f. Students know at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.

#### **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.

Unit/Lesson/Sections/Chapters: Chapter 24;The students will be taken on an evolutionary journey of the first vertebrates to live on Earth. Students will learn about the evolution of the class *Agnatha*, class *Chondrichthyes*, and the class *Osteichthyes*.

#### CLASS OBJECTIVES:

1. How did the several classes of fishes evolve.
2. What were the driving forces that forced these animals to evolve.
3. Investigate the evolutionary perspectives and advances that enabled the fishes to be successful.

#### LABS:

1. Dissection of a perch fish, analysis and drawings.

#### AUDIO/VISUAL MATERIALS:

1. The Biology of Chorodates Video

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### **Weeks 7-9: UNIT FOUR: TETRAPODS, AMPHIBIANS AND REPTILES EVOLVE**

California Content Standards: Biology

#### ***Genetics***

2. Mutation and sexual reproduction lead to genetic variation in a population. As a basis for understanding this concept:
  - a. Students know meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.
  - e. Students know why approximately half of an individual's DNA sequence comes from each parent.

#### ***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 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 25 & 26; The Fishes were the first group of chordates to have evolved first in the ocean. The fishes then moved onto the land. This section will investigate the origination and transformation of fishes to amphibians then amphibians into the terrestrial kings, the class *reptilia*.

#### **CLASS OBJECTIVES:**

1. Evolutionary advances and perspectives of the class amphibia.
2. Evolutionary advances and perspectives of the class *reptilia*.
3. *The students* will learn about dichotomis keys and how they are applied to reptiles.
4. The students will learn about the amphibians and reptiles of southern California.

#### **LABS:**

1. Dissection of bullfrog
2. Picture analysis and drawings of snake and frog bone structure.

#### **AUDIO/VISUAL MATERIALS:**

NONE

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### **Week 10: UNIT FIVE: EVOLUTION OF BIRDS**

California Content Standards: Biology

#### ***Genetics***

2. Mutation and sexual reproduction lead to genetic variation in a population. As a basis for understanding this concept:
  - a. Students know meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.
  - e. Students know why approximately half of an individual's DNA sequence comes from each parent

#### ***Evolution***

8. 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 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 27; The class *aves*' evolutionary path is a very unique and intriguing aspect. The development of birds and transition from reptile to birds is extraordinary and are to be considered the kings of the sky.

#### CLASS OBJECTIVES:

1. The students will investigate the evolutionary perspective and advances in birds.
2. The students will learn about the development of chick and the amniotic egg.
3. The students will learn about embryology study and migration of birds.

#### LABS:

1. Embryology lab and analysis of figures and drawings.

#### AUDIO/VISUAL MATERIALS:

NONE

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### Quarter 2

### Weeks 11-13: **UNIT SIX: THE RISE OF MAMMALS AND HOMINID EVOLUTION**

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:
  - a. Students know the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA.
  - b. Students know how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA.
  - 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.

#### ***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.
  - c. Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.
  - e. Students know a vital part of an ecosystem is the stability of its producers and decomposers.
  - f. Students know at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.

#### ***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.

#### ***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.

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### **Weeks 11-13: UNIT SIX: THE RISE OF MAMMALS AND HOMINID EVOLUTION (CONTINUED)**

Unit/Lesson/Sections/Chapters: Chapter 28. An introduction to the largest group of the kingdom animalia. Also the largest in being warm blooded, milk producers, bearing to live young, upright stance, fur and having a placenta. This unit is also designed to investigate the descent of man.

#### CLASS OBJECTIVES:

1. The student will learn about the evolutionary perspective and advances that the class mammalia made from the class reptilia.
2. The students will learn the mammal characteristics to all the orders of mammals.
3. The students will learn the difference between placental vs non-placental mammals.
4. The students will also learn about Homonid evolution.

#### LABS:

1. Phylogentic relationships of the mammals.
2. The tree of mammals
3. The tress of Homonids

#### AUDIO/VISUAL MATERIALS:

NONE

### **Weeks 14–15: UNIT SEVEN: SUPPORT, PROTECTION, AND MOVEMENT OF ANIMALS**

California Content Standards: Biology

#### ***Physiology***

10. Organisms have a variety of mechanisms to combat disease. As a basis for under-standing the human immune response:
  - a. Students know the role of the skin in providing nonspecific defenses against infection.
  - b. Students know the role of antibodies in the body's response to infection.
  - c. Students know how vaccination protects an individual from infectious diseases.
  - d. Students know there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.

Unit/Lesson/Sections/Chapters: Chapter29. The way that the animals are constructed is very unique. This unit will investigate the how the various groups of animals support, protect and move. The bone structure of fishes, amphibians, reptiles, birds, and humans will be compared. Similarities and differences will be clarified.



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### **Weeks 14–15: UNIT SEVEN: SUPPORT, PROTECTION, AND MOVEMENT OF ANIMALS** (CONTINUED)

#### CLASS OBJECTIVES:

1. The student will learn about the evolutionary perspective and advances that the animal kingdom has undergone in the way protection is dealt with.
2. The students will learn the mammal characteristics to all the orders of mammals.
3. The students will learn the difference between placental vs. non-placental mammals.
4. The students will also learn about Hominid evolution.

#### LABS:

1. Phylogentic relationships of the mammals.
2. The tree of mammals
1. The tress of Homonids

#### AUDIO/VISUAL MATERIALS:

1. none

### **Weeks 16 – 17: UNIT EIGHT: ANIMAL BEHAVIOR AND ECOLOGY**

California Content Standards: Biology

#### Genetics

2. Mutation and sexual reproduction lead to genetic variation in a population. As a basis for understanding this concept:
  - a. Students know meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.
  - b. Students know only certain cells in a multi cellular organism undergo meiosis.
  - c. Students know how random chromosome segregation explains the probability that a particular allele will be in a gamete.
  - d. Students know new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).
  - e. Students know why approximately half of an individual's DNA sequence comes from each parent.

#### *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.

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### **Weeks 16 – 17: UNIT EIGHT: ANIMAL BEHAVIOR AND ECOLOGY (CONTINUED)**

Unit/Lesson/Sections/Chapters: Chapter 29. The investigation of why animals act the way they do. Animal coloration is a unique process in the animal kingdom.

#### CLASS OBJECTIVES

1. The students will learn about body line and eyespot coloration in all organisms.
2. The students will learn about natural selection and the relationship it has on animal behavior.
3. The students will learn about the various mimicry in the animal's kingdom.

#### LABS:

NONE

#### AUDIO/VISUAL MATERIALS:

NONE

### **Week 18 UNIT NINE: DIGESTION, NUTRITION, IMMUNITY OF ANIMALS**

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:
  - b. Students know how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.
10. Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:
  - b. Students know the role of antibodies in the body's response to infection.
  - c. Students know how vaccination protects an individual from infectious diseases.
  - e. Students know why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.

Unit/Lesson/Sections/Chapters: Chapter 32 & 35. Potential food is everywhere and little remains exploited. Animals bite, chew, nibble, crush, graze, browse, shred, rasp, and engulf food in a variety of ways. This unit is about investigating why animals eat what they eat and how it affects the place and how they live.

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### **Week 18 UNIT NINE: DIGESTION, NUTRITION, IMMUNITY OF ANIMALS (CONTINUED)**

#### CLASS OBJECTIVES

1. The students will learn about feeding mechanisms.
2. The students will learn about animal digestion.
3. The students will learn about alimentary canals
4. The students will learn about susceptibility and defense of the body.
5. The students will learn about acquired immune response.

#### LABS:

NONE

#### AUDIO/VISUAL MATERIALS:

NONE

#### 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