

# SANTA BARBARA COUNTY ROP / PIONEER VALLEY HIGH SCHOOL SPORTS MEDICINE KINESIOLOGY COURSE OUTLINE

## A. Introduction

1. History of kinesiology including all disciplines involved with sports medicine.
2. Methods of Biological Investigations
  - a. Safety
  - b. Scientific Method
    - i. Testable hypothesis
    - ii. Experimental design
    - iii. Independent/dependent variable
3. Review of Cell Structure, Chemistry of cells

## B. Anatomy and Physiology

### 1. Language of Anatomy

- a. Anatomical Position
- b. Body Orientation and Directional terms
- c. Body Landmarks
- d. Planes and Sections
- e. Body Cavities

#### **Objectives: Objectives: Students will be able to**

1. Explain how anatomy and physiology are related
2. Describe the anatomical position verbally or by demonstrating it.
3. Demonstrate proficiency in using terms describing body landmarks, directions, planes, and surfaces.
4. Be able identify organ systems

#### **Labs: Orientation Terms**

#### **Organ Systems Overview**

### 2. Homeostasis for proper body function

- a. Body temperature regulation
- b. Heart Rate
- c. Blood pressure

#### **Lab: Compare and contrast the blood pressure and heart rate.**

- d. Nutrition
- e. Nutritional Supplements
- f. Response to lack of homeostasis

1. Identify various signs of trauma

#### **Objectives: Students will be able to:**

1. Define Homeostasis and explain its importance.
2. Define negative feedback and describe its role in maintaining homeostasis and normal body function.

### 3. Tissue

#### a. The structure and function of normal tissue

##### 1. Epithelial

**Lab: Measure the sensation of various pressure points using a variety of items for comparison of response on the epithelial tissue**

##### 2. Connective

##### 3. Muscle

##### 4. Nervous

**Lab: Histology – Classification of Tissues**

#### b. Tissue

##### 1. Healing times for various types of tissue

#### c. Tissue response to physical injury

#### d. Physiology of the inflammatory response

##### 1. Pain-spasm-pain cycle

##### 2. Pharmacology

**Objectives: Students will be able to:**

1. Name the four tissue types and their chief subcategories.

2. Explain how the four major tissue types differ structurally and functionally.

3. Give the chief location of the various tissue types in the body.

4. Describe the process of tissue repair.

#### 4. The Circulatory System

- a. Medical terminology pertaining to the cardiovascular system
- b. Anatomy of the heart and circulatory system
  - 1. Major vessels and chambers
  - 2. Blood's path through the heart

##### **Lab: Comparing Arteries and Veins**

##### **Lab: Dissection of Sheep Heart**

- c. Functions of the heart and circulatory system
  - 1. Blood pressure
    - i. Factors effecting blood pressure
    - ii. Heart sounds
  - 2. Heart rate

##### **Lab: Analyze heart rates and blood pressure**

##### **Lab: Analysis of CPR functions to create an understanding of how the blood maintains life.**

- d. Disorders and Diseases of the Heart
- e. Human blood components
  - 1. Red blood cells/hemoglobin
  - 2. Oxygen/carbon dioxide transport
  - 3. White blood cells and defense
  - 4. Blood clotting
  - 5. Blood typing: ABO groups

##### **Lab: Simulated Blood Typing**

##### **Objectives: Students will be able to:**

- 1. Describe the location of the heart in the body and identify its major anatomical areas on an appropriate model or diagram.
- 2. Trace the pathway of blood through the heart.
- 3. Compare the pulmonary and systemic circuits.
- 4. Explain the operation of the heart valves.
- 5. Name the elements of the intrinsic conduction system of the heart and describe the pathway of impulses through this system.
- 6. Define systole, diastole, stroke volume, and cardiac cycle.
- 7. Compare and contrast the structure and function of arteries, veins, and capillaries.
- 8. Define blood pressure and pulse and name several pulse points.
- 9. List factors affecting/or determining blood pressure.
- 10. Define hypertension and atherosclerosis and describe possible health consequences of these conditions.
- 11. Indicate the composition and volume of whole blood.
- 12. Describe the composition of plasma and discuss its importance in the body.
- 13. List the cell types making up the formed elements and describe the major functions of each type.
- 14. Describe the blood-clotting process.

## 5. Respiratory System

### a. Anatomy of the respiratory system

1. Part of the human respiratory system

**Lab: Create their own sponge models of the respiratory system**

### b. Function of the respiratory system

1. Mechanics of breathing
2. Regulation of breathing
3. Air filtration
4. Gas exchange: Diffusion of gases
5. Blood transport of gases
6. Cellular respiration

**Lab: Create a balloon lung**

### c. Discuss affects of exercise on the respiratory system

**Lab: Use spirometers to record and analyze max  $\text{VO}_2$  volumes**

**Objectives: Students will be able to:**

1. Name the organs forming the respiratory passageway and describe the function of each.
2. Describe several protective mechanisms of the respiratory system.
3. Explain how the respiratory muscles cause volume changes that lead to air flow into and out of the lungs (breathing)
4. Define the following respiratory volumes, tidal volume, vital capacity, expiratory reserve volume, inspiratory reserve volume and residual air.
5. Describe the process of gas exchanges in the lungs and tissues.
6. Describe how oxygen and carbon dioxide are transported in the blood.
7. Name several physical factors that influence respiratory rates.
8. Explain the importance of oxygen and carbon dioxide in modifying the rate and depth of breathing.

## 6. Nervous System

- a. Terminology of the Nervous System
- b. Anatomy of the Nervous System
  - 1. Brain
  - 2. Spinal Cord
  - 3. Spinal Nerves
- c. Functions of the nervous system
  - 1. Peripheral nervous system
    - i. Somatic and autonomic systems
    - ii. Sympathetic and parasympathetic systems
    - iii. Reflex

### **Lab. Human Reflex Physiology**

**Lab: Hypothesis how much force it would take to elicit a flex action with the use of a reflex hammer on different joints-**

- d. The nerve cell

### **Lab: Neuron Anatomy and Physiology-**

- e. Neurological diseases and how it affects human function.
- f. Dermatomes and Myotomes

**Lab: Replicate a life size image of the individual dermatomes and myotomes of the upper and lower body**

- g. Types of injuries associated with the CNS and vertebrae

**Lab: Special tests for CNS injury, along with spine board use and practice in emergency situation**

### **Objectives: Students will be able to:**

1. List the functions of the nervous system.
2. Explain the structural and functional classification of the nervous system.
3. Define the central nervous system and peripheral nervous system and list the major parts of each.
4. Describe the structure of a neuron and name its important anatomical regions.
5. Describe the composition of gray matter and white matter.
6. List the two major functional properties of neurons.
7. Define reflex arc and list its elements.
8. Identify and indicate the functions of the major regions of the cerebral hemisphere, diencephalon, brain stem, and cerebellum on a human brain model or diagram.
9. Name the meningeal layers and state their functions.
10. Define EEG and explain how it evaluates functioning.
11. Describe spinal cord structure.
12. Describe the general structure of a nerve.
13. Name the four major nerve plexuses, give the major nerves of each and describe their distribution.
14. Contrast the effect of the parasympathetic and sympathetic divisions on different organs.

## 7. Skeletal System

- a. Medical terminology pertaining to the skeletal system
- b. Functions of the skeletal system
- b. Anatomy of the human skeleton
  - i. Axial and appendicular skeleton
  - ii. Bone types
  - iii. Ligaments and muscle attachment

**Lab: Identify the basic bones of a human skeletal model-**

- c. Growth and formation

**Lab: identify bone structure and formation-**

- d. Joints

1. Types of joints
2. Types of joint movements- Range of Motion
3. Lever arms

**Lab: Analysis of the different functions of level arms using rubber bands and wooden dowels/metal rods**

**Lab: Joints and Body Movements-**

- e. Injures

**Lab: Analyze external and internal forces applied on the skeletal system-**

1. Fracture
  - (a) Types
2. Arthritis
3. Skeletal and joint injures in sport
  - (a) Foot
  - (b) Ankle
  - (c) Knee
  - (d) Hip
  - (e) Hand/wrist
  - (f) Elbow
  - (g) Shoulder
  - (h) Spine

**Lab: Analyze for each body part above the bones and joints stability through a normal range of motion with manual applications**

**Objectives: Students will be able to**

1. Identify the subdivisions of the skeleton.
2. List the functions of the skeletal system
3. Name the four major types of bones.
4. Identify the major anatomical areas of a long bone.
5. Name and describe the types of fractures.
6. Identify and name the bones of the skull.
7. Name the parts of a typical vertebra and explain how the cervical, thoracic and lumbar vertebrae differ from one another.
8. Explain how the abnormal spinal curvatures differ from one another.
9. Identify the bones of the shoulder and pelvic girdles and their attached limbs.
10. Describe the differences between male and female pelvises.
11. Name the three major categories of joints and compare the amount of movement allowed by each.
12. Identify some of the causes of bone and joint problems throughout life.

## 8. Muscular System

### a. Anatomy of the muscular system

1. Types of muscle
2. Skeletal-muscular system
  - i. parts of a muscle
3. Skeletal muscle contraction
4. Muscle strength and exercise
5. Cellular respiration and Muscle Fatigue
6. Identify origin and insertions of skeletal muscles

#### **Lab: Dissection of a Chicken Wing-**

**Lab: Create clay models on small human skeleton model showing muscle from origin to insertion**

**Lab: Create muscles out of ribbon and rubber bands on a small human skeletal model**

### b. Anatomical Planes of Movement

1. Path of movement in each plane

**Lab: Hypothesize what planes the body is going to be stronger in.**

### c. Muscle movement and injury in sport

1. Foot
2. Ankle
3. Knee
4. Hip
5. Hand/wrist
6. Elbow
7. Shoulder
8. Spine

**Lab: Analyze for each body part above the muscles that move the joint.**

#### **Objectives: Students will be able to:**

1. Describe similarities and differences in the structure and function of the three types of muscle and indicate where they are found in the body.
2. Describe the microscopic structure of skeletal muscle and explain the role of actin and myosin-containing myofilaments.
3. Describe how an action potential is initiated in a muscle cell.
4. Describe the events of muscle cell contraction.
5. Define origin, insertion, prime mover, antagonist, synergist, and fixator as they relate to muscles.
6. Demonstrate or identify the different types of body movements.
7. List the criteria used in naming muscles.
8. Name and locate the major muscle of the human body.