COURSE TITLE: Human Anatomy and Physiology

COURSE NUMBERS: (P) 4630 / 4631  (H) 4616 / 4617

DEPARTMENT: Science

PREREQUISITE: Recommend - Biology, Chemistry

LENGTH OF COURSE: One Year

SEMESTER PERIOD OF CREDITS: 5 per semester

GRADE LEVEL(S): 11-12

DATE ADOPTED: 5/18/2012

Meets EUHSD Biological Science Requirement

FULFILLS UC “d” ADMISSION REQUIREMENTS


COURSE DESCRIPTION: This is an intense course for those who are planning on a career in medicine or veterinary medicine for biological research. It provides the study of the structure and function of the human body and the mechanisms for maintaining homeostasis within it. Students will do readings and investigations that will prepare them to operate very effectively in freshman level college courses in this area. Among the laboratory activities is a dissection of a cat.

5/18/2012
COURSE UNITS/TOPICS

AND

ALLOCATED INSTRUCTIONAL TIME

PHYSIOLOGY

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*The honors course includes all Units I - XV; the general course includes Units I-V, Units VII-X and Unit XIV, plus teacher’s choice of two from Units VI, XI, XII, XIII, and XV (indicated by asterisks).*
PHYSIOLOGY

I.  INTRODUCTION TO THE HUMAN BODY

1.0  **Learning Goal:** Understand homeostasis and the organization of the human body

1.1  **Objective:** Students describe the levels of structural organization that make up the human body.
   1.1.1  Students will list the systems of body and general functions.

1.2  **Objective:** Students describe the concept of homeostasis.
   1.2.1  Students will contrast the operation of negative and positive feedback systems.

1.3  **Objective:** Students describe the orientation of the body in the anatomical position.

**Suggested Assessment:**
- Notes/quizzes
- Multiple choice/short answer test

**Key Vocabulary:** Anatomy, physiology, homeostasis, intracellular, extracellular, and interstitial

**Sample Learning Activities:**
- Poster activity
- Directional jeopardy game

**Suggested Resources/Technology Link(s):**

**Biology Standards Addressed:**
9.c  *Students know how feedback loops in the nervous and endocrine systems regulate conditions in the body.*
9.i  *Students know how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.*

II.  CELLULAR LEVEL OF ORGANIZATION

2.0  **Learning Goal:** Understand the fluid-mosaic model and transport across the plasma membranes

2.1  **Objective:** Students describe the structure and functions of the plasma membrane.
2.2 **Objective:** Students describe the processes that transport substances across the plasma membrane.

**Suggested Assessment:**
- Notes/quizzes
- Multiple choice/short answer test

**Key Vocabulary:** Fluid-mosaic model, selectively permeable, and electrochemical gradient

**Sample Learning Activities:** Diffusion/osmosis lab

**Suggested Resources/Technology Link(s):**

**Biology Standards Addressed:**
1.a *Students know cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.*

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**III. TISSUE LEVEL OF ORGANIZATION**

3.0 **Learning Goal:** Understand that the human body is constructed from four types of tissue

3.1 **Objective:** Students identify and discuss the major structural features of epithelial, connective, muscle, and nervous tissue.
   3.1.1 Students will draw examples of the four major types of tissues separately and as they appear in organs.

**Suggested Assessment:**
- Notes/quizzes
- Multiple choice/short answer test
- Honors – Histology lab practical

**Key Vocabulary:** Histology, apical and basal surface, avascular, endocrine, exocrine, matrix, and striation

**Sample Learning Activities:**
- Histology microscope lab; students draw/label the major tissues, Lab Activity #4 (Physiology Lab Manual)

**Honors Extension:** *Focus on Wellness*: Phytochemicals – Protecting Cellular Function. Student groups will discuss the article and perform a web search on one of the discussed phytochemicals.

**Suggested Resources/Technology Link(s):** Student Companion CD-ROM, Principles Of Anatomy & Physiology, Tortora (follow link to “Student Companion Home Page”, “Browse by Resource” and *Focus on Wellness*)
Biology Standards Addressed: N/A

IV. INTEGUMENTARY SYSTEM

4.0 Learning Goal: Understand the main features of the integumentary system

4.1 Objective: Students describe the organization of the skin and how that relates to function.
4.1.1 Students will label a cross section of the skin.

Suggested Assessment:
- Notes/quizzes
- Multiple choice/short answer test

Key Vocabulary: Ectoderm, mesoderm, endoderm, gap junctions, avascular, simple, squamous, stratified, pseudostratified, ciliated, columnar, and cuboidal

Sample Learning Activities:
- Cat Dissection I
- Histology Slide observation
- Observe 3 types of hair
- Accessory Structures of the Skin Lab
- Lab Activity #5 (Physiology Lab Manual)

Honors Extension: Insights and Expolorations: Chapter 5. Students will investigate, through the related links, the use of cultured skin in the treatment of burns.

Suggested Resources/Technology Link(s): Skin Video, Student Companion CD-ROM, Principles Of Anatomy & Physiology, Tortora (follow link to “Student Companion Home Page”, “Browse by Resource” and Insights and Explorations)

Biology Standards Addressed:
9.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.
9.b Students know how the nervous system mediates communication between different parts of the body and the body’s interactions with the environment.
9.c Students know how feedback loops in the nervous and endocrine systems regulate conditions in the body.
10.a Students know the role of the skin in providing nonspecific defenses against infection.

V. SKELETAL SYSTEM

5.0 Learning Goal: Understand the main features of the skeletal system
5.1 **Objective:** Students explain how endochondral ossification occurs.
5.1.1 Students will draw the major features of endochondral ossification.

5.2 **Objective:** Students identify the bones of the human skeleton and the major features of individual bones.
5.2.1 Students will label the bones of the body and label the major condyles, tuberosites, etc.

**Suggested Assessment:**
- Notes/quizzes
- Multiple choice/short answer test
- Honors – Bone lab practical

**Key Vocabulary:** Homeostasis, ossification, hydroxyapatite, interstitial, calcification, hypertrophic, resorbttion, pectoral, humeral, and acromial

**Sample Learning Activities:** Bone Lab (observation, drawings), Bones of the week activity, Lab Activity # 6, 7, and 8 (Physiology Lab Manual)

**Honors Extension:** *Feedback Loop Exercise*: Chapter 6, Homeostasis of Blood Calcium. Students will understand the role of homeostasis and blood calcium levels.

**Suggested Resources/Technology Link(s):** Skeletal Tissue Video, Student Companion CD-ROM, Principles Of Anatomy & Physiology, Tortora (follow link to “Student Companion Home Page”, “Browse by Resource” and *Integrative Feedback Loops Exercises*)

**Biology Standards Addressed:** N/A

VI. JOINTS (Optional chapter)

6.0 **Learning Goal:** Understand the characteristics of joints

6.1 **Objective:** Students describe the different kinds of joints in the human skeleton.
6.1.1 Students will identify drawings of the different kinds of joints found in the skeleton.

**Suggested Assessment:**
- Notes/quizzes
- Multiple choice/short answer test

**Key Vocabulary:** Articulation, distal, proximal, flexion, hyperflexion, extension, hyperextension, abduction, adduction, and circumduction
Sample Learning Activities: Lab Activity #9 (Physiology Lab Manual)

Honors Extension: Focus on Wellness: Joint Care – Prevent Repetitive Motion Injury. Students will answer the “Think It Over” questions.

Suggested Resources/Technology Link(s): Student Companion CD-ROM, Principles Of Anatomy & Physiology, Tortora

Biology Standards Addressed: N/A

VII. MUSCLE TISSUE AND MUSCULAR SYSTEM

7.0 Learning Goal: Understand the structure and function of muscles

7.1 Objective: Students explain how the three types of muscle tissue differ in structure.
   7.1.1 Students will draw the structures involved in striated muscle contraction.

7.2 Objective: Students describe the physiological activities involved in muscle contraction.
   7.2.1 Students will explain how striated and smooth muscle contractions differ.

7.3 Objective: Students identify the major muscles of a mammal.
   7.3.1 Students will do a detailed dissection of a cat.

Suggested Assessment:
• Notes/quizzes
• Multiple choice/short answer test
• Honors – Cat dissection Lab practices

Key Vocabulary: Autorythmicity, neuromuscular, atrophy, hypertrophy, action potential, and flaccid

Sample Learning Activities: Lab Activity #10 (Physiology Lab Manual), Muscle Coloring Activity, Microscope Lab Activity (muscle tissue), Cat Dissection Lab (back and shoulder muscles)

Honors Extension: Insights and Explorations: Chapter 10. Students will investigate, through the related links, muscle atrophy in space.

Suggested Resources/Technology Link(s): Interactive physiology software CD-ROM “Muscles” and Student Companion CD-ROM, Principles Of Anatomy & Physiology, Tortora

Biology Standards Addressed:
9.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.
VIII. NERVOUS SYSTEM

8.0 Learning Goal: Understand the basic organization and functions of the nervous system

8.1 Objective: Students recognize the main subdivisions of the central, peripheral, and autonomic portions of the nervous system.
   8.1.1 Students will label the main parts of the nervous system.

8.2 Objective: Students identify the main types of neurons and neuroglia.
   8.2.1 Students will explain the differences between neurons and neuroglia.

8.3 Objective: Students explain how action potentials are generated and propagated.
   8.3.1 Students will draw the events taking place at a synapse.

8.4 Objective: Students understand the structure and function of the special sense organs (eyes, ears, nose, and tongue).

Suggested Assessment:
- Notes/quizzes
- Multiple choice/short answer test
- Honors – Action potential essay

Key Vocabulary: Cranial, spinal, afferent, efferent, somatic, autonomic, enteric, electrochemical gradient, polarizing, and repolarizing

Sample Learning Activities: Lab Activity #13, 14, 15, 16, 17, and 19B (Physiology Lab Manual), Microscope Lab Drawings (nervous tissue slides) Eye Dissection

Honors Extension: Neurological disorders research presentations (PowerPoint)

Suggested Resources/Technology Link(s): Interactive Physiology CD-ROM “nervous tissue”

Biology Standards Addressed:
9.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.
9.e Students know the functions of the nervous system and the role of neurons in transmitting electrochemical impulses.
9.f Students know the individual functions and sites of secretion of digestive enzymes (amylases, proteases, nucleases, lipases), stomach acid, and bile salts.
9.g Students know the homeostatic role of the kidney in the removal of nitrogenous wastes and the role of the liver in blood detoxification and glucose balance.
9.h Students know the cellular and molecular basis of muscle contraction, including the roles of actin, myosin, Ca^{+2}, and ATP.
IX. ENDOCRINE SYSTEM

9.0  **Learning Goal:** Understand the structure and function of the endocrine system

9.1  **Objective:** Students explain how hormones produce their effects.
   9.1.1 Students will illustrate the method by which lipid and protein hormones produce their effects.

9.2  **Objective:** Students explain how feedback systems regulate endocrine glands.
   9.2.1 Students will draw the feedback system, which controls the human female reproductive cycle.

9.3  **Objective:** Students locate and describe the functions of the hormones secreted by the endocrine glands.
   9.3.1 Students will label a drawing locating the endocrine glands.

**Suggested Assessment:**
- Notes/quizzes
- Multiple choice/short answer test

**Key Vocabulary:** Synergist and antagonist

**Sample Learning Activities:** Lab Activity #20 (Physiology Lab Manual)

**Honors Extension:** *Feedback Loop Exercise*: Chapter 18, Regulation of Glucocorticoid. Students will understand the role of the hormone glucocorticoid in the homeostasis of blood glucose levels.

**Suggested Resources/Technology Link(s):** Interactive Physiology CD-ROM “Endocrine System” and Student Companion CD-ROM, *Principles Of Anatomy & Physiology*, Tortora

**Biology Standards Addressed:**
- 9.c Students know how feedback loops in the nervous and endocrine systems regulate conditions in the body.
- 9.i Students know how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.

X. CARDIOVASCULAR SYSTEM

10.0  **Learning Goal:** Understand the structure and function of the cardiovascular system

10.1  **Objective:** Students identify the components of blood.
   10.1.1 Students will label a drawing of the blood.
10.2 **Objective:** Students explain how blood typing is done and how blood clotting occurs.
10.2.1 Students will label a drawing showing the interaction of antigens and agglutinins.

10.3 **Objective:** Students describe the structure of the cardiovascular system.
10.3.1 Students will label a drawing of the cardiovascular system.

10.4 **Objective:** Students explain the physiology of the cardiovascular system.
10.4.1 Students will describe the feedback mechanisms that control the cardiovascular system.

**Suggested Assessment:**
- Notes/quizzes
- Multiple choice/short answer test

**Key Vocabulary:** Hemopoiesis, cardiopulmonary, autorythmic, depolarization, repolarization, auscultation, and contractility

**Sample Learning Activities:** Heart Dissection, Lab Activity #21(A and B), 22, and 23 (Physiology Lab Manual)

**Honors Extension:** *Focus on Wellness*: Sudden Cardiac Death During Exercise- What’s the Risk? Students will answer the “Think It Over” questions and discuss their responses with their partner. Disorders and Clinical Applications Search and presentation. Student groups will choose a disorder of the cardiovascular system and give an oral presentation on their chosen disorder.

**Suggested Resources/Technology Link(s):** Interactive Physiology CD-ROM “cardiovascular” Student Companion CD-ROM, Principles Of Anatomy & Physiology, Tortora

**Biology Standards Addressed:**

9.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.*

9.c *Students know how feedback loops in the nervous and endocrine systems regulate conditions in the body.*

**XI. LYMPHATIC AND IMMUNE SYSTEM** (Optional chapter)

11.0 **Learning Goal:** Understand the organization and function of the lymphatic and immune system

11.1 **Objective:** Students identify and describe the structures and components of the lymphatic system.

11.2 **Objective:** Students understand the role of the lymphatic system in the immune system.
11.2.1 Students will explain the process of nonspecific and specific resistance.
11.2.2 Students will explain the process of cell-mediated and antibody-mediated immunity.

Suggested Assessment:
- Notes/quizzes
- Multiple choice/short answer test

Key Vocabulary: Metastasis, inflammation, immunogenicity, reactivity, and immunological memory

Sample Learning Activities: Lab Activity #25 (Physiology Lab Manual)

Suggested Resources/Technology Link(s): Biology Standards Addressed:
10.b Students know the role of antibodies in the body’s response to infection.
10.c Students know how vaccination protects an individual from infectious diseases.
10.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.
10.f Students know the rules of phagocytes, B-lymphocytes, and T-lymphocytes in the immune system.

XII. RESPIRATORY SYSTEM (Optional chapter)

12.0 Learning Goal: Understand the organization and function of the respiratory system

12.1 Objective: Students identify and describe the structure and the components of the respiratory system.
12.1.1 Students will label the parts of the respiratory system.

12.2 Objective: Students describe the exchange of oxygen and carbon dioxide in external and internal respiration.
12.2.1 Students will explain how oxygen and carbon dioxide are transported.

Suggested Assessment:
- Notes/quizzes
- Multiple choice/short answer test

Key Vocabulary: Pulmonary, olfactory, pleural, and parietal

Sample Learning Activities: Lab Activity #26 (Physiology Lab Manual), cat dissection/lung pump lab
Suggested Resources/Technology Link(s): Interactive Physiology CD-ROM “respiratory system”

Biology Standards Addressed:
9.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.
9.c Students know how feedback loops in the nervous and endocrine systems regulate conditions in the body.

XIII. DIGESTIVE SYSTEM (Optional chapter)

13.0 Learning Goal: Understand the organization and function of the digestive system

13.1 Objective: Students identify and describe the structure of the components of the digestive system.

13.2 Objective: Students describe the function of the digestive system.

Suggested Assessment:
- Notes/quizzes
- Multiple choice/short answer test

Key Vocabulary: Gastrointestinal, alimentary canal, defecation, salivation, peristalsis, and sphincter

Sample Learning Activities: Lab Activity #27 A and B (Physiology Lab Manual), cat dissection

Suggested Resources/Technology Link(s):

Biology Standards Addressed:
1.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.
9.f Students know the individual functions and sites of secretion of digestive enzymes (amylases, proteases, nucleases, lipases), stomach acid, and bile salts.
9.i Students know how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.

XIV. URINARY SYSTEM

14.0 Learning Goal: Understand the organization and function of the urinary system
14.1 **Objective:** Students identify and describe the structure of the components of the urinary system.
14.1.1 Students will label the parts of the urinary system.

14.2 **Objective:** Students explain the functioning of the nephron.
14.2.1 Students will describe filtration, secretion, and reabsorption.

**Suggested Assessment:**
- Notes/quizzes
- Multiple choice/short answer test

**Key Vocabulary:** Renal, efferent, afferent, proximal, distal, excretion, ascending, descending, hydrostatic, and autoregulation

**Sample Learning Activities:** Lab Activity #28 (Physiology Lab Manual), cat dissection

**Honors Extension:** *Focus on Wellness*: Infection Prevention for Recurrent UTI. Students will answer the “Think It Over” question and discuss their response with their partner.

**Suggested Resources/Technology Link(s):** Interactive Physiology CD-ROM “Urinary system”
Student Companion CD-ROM, Principles Of Anatomy & Physiology, Tortora

**Biology Standards Addressed:**
9.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.*
9.c *Students know how feedback loops in the nervous and endocrine systems regulate conditions in the body.*
9.i *Students know how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.*

**XV. REPRODUCTION SYSTEM** *(Optional chapter)*

15.0 **Learning Goal:** Understand the organization and function of the reproductive system

15.1 **Objective:** Students identify and describe the structure of the components of the male and female reproductive systems.
15.1.1 Students will label the parts of the reproductive system.

15.2 **Objective:** Students explain the functioning of the components of both kinds of reproductive systems.
15.2.1 Students will describe the anatomical and physiological events that lead to fertilization.
15.3  **Objective:** Students describe the various stages of embryonic and fetal development.
15.3.1  Students will label the various stages of embryonic development.

**Suggested Assessment:**
- Notes/quizzes
- Multiple choice/short answer test,

**Key Vocabulary:** Spermatogenesis, oogenesis, follicle, and blastocyst

**Sample Learning Activities:** Lab Activity #29 (Physiology Lab Manual), cat dissection

**Suggested Resources/Technology Link(s):**

**Biology Standards Addressed:**

2.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.

2.c  Students know how random chromosome segregation explains the probability that a particular allele will be in a gamete.

2.d  Students know new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).

2.e  Students know why approximately half of an individual’s DNA sequence comes from each parent.

2.f  Students know the role of chromosomes in determining an individual’s sex.

2.g  Students know how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents.

3.a  Students know how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).

9.i  Students know how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.

**Honors Final Assessment:** First and Second semester finals will be cumulative.