



Western Technical College

## 10806179 Advanced Anatomy & Physiology (A&P)

### Course Outcome Summary

#### Course Information

**Description** Advanced Anatomy and Physiology is the second semester in a two-semester sequence in which normal human anatomy and physiology are studied using a body systems approach with emphasis on the interrelationships between form and function at the gross and microscopic levels of organization. Instructional delivery within a classroom and laboratory setting. Experimentation within a science lab will include analysis of cellular metabolism, the individual components of body systems such as the nervous, neuro-muscular, cardiovascular, and urinary. Continued examination of homeostatic mechanisms and their relationship to fluid, electrolyte, acid-base balance and blood. Integration of genetics to human reproduction and development are also included in this course.

**Instructional Level** Associate Degree Courses

**Total Credits** 4

**Total Hours** 90

#### Pre/Corequisites

Prerequisite 10806177 Gen Anatomy & Physiology

#### Textbooks

Open Educational Resource: *Anatomy and Physiology*. 2nd Edition. Copyright 2022. Publisher: Open Stax. **ISBN-13:** 978-1-951693-42-8. <https://openstax.org/details/books/anatomy-and-physiology-2e> Required.

#### Learner Supplies

Webcam and microphone. **Vendor:** To be discussed in class. Required.

## Success Abilities

1. Cultivate Passion: Expand a Growth-Mindset
2. Refine Professionalism: Act Ethically
3. Refine Professionalism: Improve Critical Thinking
4. Refine Professionalism: Participate Collaboratively
5. Refine Professionalism: Practice Effective Communication

## Course Competencies

### 1. Analyze how the individual components of the nervous system work as an integrated whole.

#### Assessment Strategies

- 1.1. through a written, graphic or oral product or process
- 1.2. in a laboratory or classroom setting

#### Criteria

*You will know you are successful when*

- 1.1. you explain sensory function.
- 1.2. you examine motor and sensory neural pathways.
- 1.3. you describe the role of the autonomic nervous system in maintaining homeostasis.
- 1.4. you describe neuro-physiology including potential generation, impulse conduction, and synaptic transmission.
- 1.5. you evaluate the actions of neurotransmitters.

#### Learning Objectives

- 1.a. Examine sensory function.
- 1.b. Examine motor neural pathways.
- 1.c. Describe the role of the autonomic nervous system.
- 1.d. Describe the generation of neuron action potentials.
- 1.e. Describe neuro-physiology including potentials, impulse conduction, and synaptic transmission.
- 1.f. Identify the role of neurotransmitters.
- 1.g. Correlate cranial nerves to their respective physiological functions.
- 1.h. Relate higher-order brain functions to brain anatomy.
- 1.i. Relate various types of pain to homeostatic mechanism.

### 2. Analyze how the individual components of the endocrine system work as an integrated whole.

#### Assessment Strategies

- 2.1. through a written, graphic or oral product or process
- 2.2. in a laboratory or classroom setting

#### Criteria

*You will know you are successful when*

- 2.1. you relate endocrine function to homeostasis, including hypo- and hyper-secretion.
- 2.2. you identify the advanced mechanisms of hormone actions.
- 2.3. you identify the mechanism of hormone transport.
- 2.4. you correlate the relationship of neural function and hormonal secretion.
- 2.5. you correlate the major hormones to the tissues and organs that secrete them.
- 2.6. you correlate the major hormones to their respective target tissues.
- 2.7. you explain control of hormone secretion.
- 2.8. you describe hormonal response to stress.

### 3. Analyze the processes of cellular metabolism.

#### Assessment Strategies

- 3.1. through a written, graphic or oral product or process
- 3.2. in a laboratory or classroom setting

## Criteria

*You will know you are successful when*

- 3.1. you compare the processes of aerobic and anaerobic respiration.
- 3.2. you distinguish between anabolism and catabolism.
- 3.3. you compare the mechanism of carbohydrate, lipid, and protein metabolism.
- 3.4. you correlate appropriate cellular organelles and transport mechanisms with their roles in cellular metabolism.

## Learning Objectives

- 3.a. Describe the process of protein synthesis.
- 3.b. Compare the processes of aerobic and anaerobic respiration.
- 3.c. Distinguish between anabolism and catabolism.
- 3.d. Compare the mechanism of carbohydrate, lipid and protein metabolism.
- 3.e. Correlate appropriate cellular organelles with their cellular metabolism role.
- 3.f. Diagram includes description of membrane transports and receptor sites.

## 4. Correlate muscle physiology to normal body function.

### Assessment Strategies

- 4.1. through a written, graphic or oral product or process
- 4.2. in a laboratory or classroom setting

## Criteria

*You will know you are successful when*

- 4.1. you identify the microscopic anatomy of the muscle fiber.
- 4.2. you identify the physiology of muscle contraction.
- 4.3. you explain the physiology involved in myoneural junctions.
- 4.4. you explain energy production, storage, and consumption in the muscle cell.

## Learning Objectives

- 4.a. Examine sensory function.
- 4.b. Contrasts neuro-excitatory and -inhibitory neurotransmitters.
- 4.c. Examine sensory function.
- 4.d. Correlate neurotransmitters with receptor sites.
- 4.e. Relate synaptic activity to neural control.
- 4.f. Identify the microscopic anatomy of the muscle fiber.
- 4.g. Identify the physiology of muscle cell contraction.
- 4.h. Explain the physiology involved in myoneural junctions.
- 4.i. Explain energy production, storage, and consumption in the muscle cell.

## 5. Analyze the roles of DNA and RNA in controlling cell function and genetics.

### Assessment Strategies

- 5.1. through a written, graphic or oral product or process
- 5.2. in a laboratory or classroom setting

## Criteria

*You will know you are successful when*

- 5.1. you describe DNA replication.
- 5.2. you demonstrate its relationship to enzyme production.
- 5.3. you describe effect of mutations on cell function.
- 5.4. you describe gene regulation.
- 5.5. you contrast DNA and RNA structures and functions.
- 5.6. you distinguish among the three types of RNA.
- 5.7. you describe the processes involved in protein synthesis.

## Learning Objectives

- 5.a. Describe DNA replication.
- 5.b. Show relationship to enzyme.
- 5.c. Describe effect of mutations on cell function.
- 5.d. Contrast DNA and RNA structures and functions.

5.e. Distinguish among the three types of RNA.

## 6. Evaluate the components of defense and immunity that support homeostasis.

### Assessment Strategies

- 6.1. through a written, graphic or oral product or process
- 6.2. in a laboratory or classroom setting

### Criteria

*You will know you are successful when*

- 6.1. you correlate blood components and composition to homeostasis.
- 6.2. you distinguish among active and passive immunity.
- 6.3. you describe the components of the immune system.
- 6.4. you describe specific and nonspecific immunity.

### Learning Objectives

- 6.a. Distinguish among active and passive immunity.
- 6.b. Describe the components of the immune system.
- 6.c. Describe nonspecific immunity.
- 6.d. Describe specific immunity.
- 6.e. Describe cellular immunity.
- 6.f. Describe humoral immunity
- 6.g. Describe immune disorders.

## 7. Analyze cardiovascular physiology to normal body function.

### Assessment Strategies

- 7.1. through a written, graphic or oral product or process
- 7.2. in a laboratory or classroom setting

### Criteria

*You will know you are successful when*

- 7.1. you examine the conduction system of the heart.
- 7.2. you examine the coronary circulation system.
- 7.3. you examine blood flow dynamics.
- 7.4. you analyze factors affecting blood pressure.
- 7.5. you relate extrinsic and intrinsic factors that influence cardiac function.
- 7.6. you correlate the cardiac cycle with EKG and blood flow dynamics.

### Learning Objectives

- 7.a. Examine the conductive system of the heart.
- 7.b. Examine the coronary circulation system.
- 7.c. Examine blood flow dynamics.
- 7.d. Examine factors affecting blood pressure.
- 7.e. Relate extrinsic and intrinsic factors that influence cardiac function.
- 7.f. Correlate the cardiac cycle with EKG and blood flow dynamics

## 8. Analyze renal physiology.

### Assessment Strategies

- 8.1. through a written, graphic or oral product or process
- 8.2. in a laboratory or classroom setting

### Criteria

*You will know you are successful when*

- 8.1. you correlate nephron structure to filtration, re-absorption, and secretion.
- 8.2. you analyze factors affecting urine formation.
- 8.3. you explain the role of the juxtaglomerular apparatus.
- 8.4. you explain the role of the kidney's vascular system in urine formation.
- 8.5. you explain the normal and abnormal constituents of urine and their significance.

### Learning Objectives

- 8.a. Correlate nephron structure to urine formation.

- 8.b. Describe urine formation.
- 8.c. Examine the role of hormonal control in kidney function.
- 8.d. Explain the role of the juxtaglomerular apparatus.
- 8.e. Explain the role of the kidney's vascular system in urine formation.
- 8.f. Explain the normal and abnormal constituents of urine and their significance.

**9. Evaluate the roles of different organ systems in maintaining adequate tissue perfusion and oxygenation.**

**Assessment Strategies**

- 9.1. through a written, graphic or oral product or process
- 9.2. in a laboratory or classroom setting

**Criteria**

*You will know you are successful when*

- 9.1. you explain the mechanisms that influence hemodynamics.
- 9.2. you describe mechanisms responsible for controlled blood flow through tissues.
- 9.3. you explain compensatory mechanisms.
- 9.4. you explain how alterations in blood, pCO<sub>2</sub>, pH, and pO<sub>2</sub> influence ventilation.
- 9.5. you include the exchange of oxygen and carbon dioxide in the tissues and lungs.
- 9.6. you explain the mechanisms of gas transport.

**Learning Objectives**

- 9.a. Explain the mechanisms that influence hemodynamics.
- 9.b. Examine the mechanisms responsible for controlled blood flow through tissues.
- 9.c. Describe the compensatory mechanisms operative during shock.
- 9.d. Explain how alterations in blood, pCO<sub>2</sub>, pH, and pO<sub>2</sub> influence ventilation.
- 9.e. Explain the exchange of oxygen and carbon dioxide in the tissues and lungs.
- 9.f. Explain the hormonal mechanism influencing hemodynamics.
- 9.g. Recognize the neurological mechanisms influencing hemodynamics.
- 9.h. Explain the mechanisms of gas transport.

**10. Distinguish among the processes of digestion, absorption, and assimilation.**

**Assessment Strategies**

- 10.1. through a written, graphic or oral product or process
- 10.2. in a laboratory or classroom setting

**Criteria**

*You will know you are successful when*

- 10.1. you examine absorption of nutrients.
- 10.2. you examine transport and storage of nutrients.
- 10.3. you examine regulations of digestive processes.
- 10.4. you describe the role of the liver, gall bladder, and pancreas in digestive and related metabolic functions.

**Learning Objectives**

- 10.a. Examine the absorption of nutrients.
- 10.b. Describe the transport of nutrients.
- 10.c. Examine the storage of nutrients.
- 10.d. Relate enzymes to digestion.
- 10.e. Relate hormones to digestion.
- 10.f. Examine the role of the liver, gallbladder, and pancreas in digestive and related metabolic functions.

**11. Correlate fluid, electrolyte, and acid-base balance to the homeostatic mechanisms responsible for their control.**

**Assessment Strategies**

- 11.1. through a written, graphic or oral product or process
- 11.2. in a laboratory or classroom setting

**Criteria**

*You will know you are successful when*

- 11.1. you identify fluid compartments and the water and solute movement between them.
- 11.2. you describe the mechanisms by which the water and electrolyte content of the body fluid is regulated.
- 11.3. you compare the composition of intracellular and extracellular fluids.
- 11.4. you describe mechanisms for regulating pH.
- 11.5. you describe acidosis, alkalosis, and compensatory mechanisms.

#### **Learning Objectives**

- 11.a. Identify fluid compartments and the water and solute movement between them.
- 11.b. Diagram the mechanisms by which the water content of the body fluid is regulated.
- 11.c. Compare the composition of intracellular and extracellular fluids.
- 11.d. Describe mechanisms for regulating pH.
- 11.e. Describe respiratory acidosis, alkalosis, and compensatory mechanisms.

### **12. Integrate genetics, development, and human reproductive physiology.**

#### **Assessment Strategies**

- 12.1. through a written, graphic or oral product or process
- 12.2. in a laboratory or classroom setting

#### **Criteria**

*You will know you are successful when*

- 12.1. you compare mitosis with meiosis.
- 12.2. you distinguish between spermatogenesis and oogenesis.
- 12.3. you describe the events of fertilization/fetal development.
- 12.4. you explain fetal circulation.
- 12.5. you describe the hormonal control of reproductive cycles.
- 12.6. you evaluate the patterns of human inheritance.

#### **Learning Objectives**

- 12.a. Compare mitosis with meiosis.
- 12.b. Distinguish between spermatogenesis and oogenesis.
- 12.c. Identify chromosomal abnormalities.
- 12.d. Describe the events of fertilization/fetal development.
- 12.e. Recognize fetal circulation.
- 12.f. Describe the hormonal changes during and after pregnancy.
- 12.g. Recognize patterns of human inheritance.

### **13. Apply appropriate scientific laboratory methods and safety precautions.**

#### **Assessment Strategies**

- 13.1. in the laboratory

#### **Criteria**

*You will know you are successful when*

- 13.1. you identify hazards and safety equipment in the lab.
- 13.2. you select appropriate personal protective equipment.
- 13.3. you follow all laboratory practice expectations of the college.