

STRANDS AND STANDARDS

HEALTH SCIENCE, ADVANCED: TECHNOLOGY ENHANCED HUMAN ANATOMY & PHYSIOLOGY



Course Description

An Advanced Health Science course that is taught through **Weber State University** as a Concurrent Enrollment class. This course is a college Anatomy & Physiology course that is taught via EdNet and is broadcast into the individual classrooms from Weber State University.

Intended Grade Level	12
Units of Credit	2.0
Core Code	36.01.00.00.001
Concurrent Enrollment Core Code	36.01.00.13.001
Prerequisite	Medical Anatomy & Physiology
Skill Certification Test Number	703
Test Weight	1.0
License Type	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Medical Anatomy & Physiology
Endorsement 2	N/A
Endorsement 3	N/A

STRAND 1

Integumentary System

Standard 1

Identify and describe the tissue type making up the epidermis. Identify and describe layers of the epidermis. Describe renewal of the epidermis.

Standard 2

Explain how each of the layers and their cell types (stem cells, keratinocytes, melanocytes, Langerhans cells, Merkel cells and discs) and substances (keratin, extracellular lipids) contribute to the function of the epidermis.

Standard 3

Identify and describe the dermis and its layers. Know the tissue types that make up each layer.

STRAND 2

Skeletal System

Standard 1

List the cellular components of bone tissue. List the extracellular components of bone tissue.

Standard 2

Explain how hormones are involved in bone growth and maintenance. Explain the roles of calcitonin, parathyroid hormone and calcitriol in bone remodeling and blood calcium regulation.

Standard 3

Identify the bones of the skull on a photograph or diagram.

Standard 4

Identify the bones of the vertebral column on a photograph or diagram. Compare and contrast characteristic features of cervical, thoracic, lumbar, and sacral vertebrae.

Standard 5

Identify the bones of the thorax on a photograph or diagram.

Standard 6

Identify the bones of the pectoral girdle and upper extremity on a photograph or diagram.

Standard 7

Identify the bones of the pelvic girdle and lower extremity on a photograph or diagram.

STRAND 3

Muscular System

Standard 1

Define neuromuscular junction. Be able to properly label the components of the neuromuscular junction on a diagram.

Standard 2

List, in order, the events which occur in a motor neuron and at the neuromuscular junction that result in an action potential in the muscle cell.

Standard 3

Describe the sequence of events that link the muscle cell action potential to the release of calcium from the sarcoplasmic reticulum.

Standard 4

List the sequence of events from an increase in calcium in the muscle cell to contraction of the muscle.

STRAND 4

Nervous System I-Nervous System Overview: Cell Biology of Nervous System

Standard 1

Distinguish between sensory and motor divisions of the nervous system.

Standard 2

Distinguish between somatic (voluntary) and autonomic divisions of the nervous system.

Standard 3

Compare and contrast characteristics of the two cell types of the nervous system: neurons and glial cells.

Standard 4

Compare and contrast concentration and electrical forces. Apply these principles to the movement of ions across the cell membrane.

Standard 5

List and describe the sequence of events in the action potential. Label a diagram of the action potential including: threshold, depolarization, repolarization, hyperpolarization, and absolute refractory period.

Standard 6

List and describe in order the sequence of events at the synapse. Begin with the arrival of the action potential and end with the effect of neurotransmission on the postsynaptic cell (postsynaptic potential and/or biochemical change).

Standard 7

Compare and contrast the action potential with graded potentials (EPSPs and IPSPs).

STRAND 5

Nervous System II-Spinal Cord; Autonomic Nervous System; Brain Anatomy & Function; Cranial Nerves

Standard 1

Describe the gross anatomy of the spinal cord and spinal nerves. Understand the relationship of the spinal cord and spinal nerves to the bony vertebrae surrounding them.

Standard 2

Label on a diagram the structures associated with the spinal cord: dorsal root ganglia, dorsal and ventral roots, and spinal nerves.

Standard 3

Describe the anatomy and physiology of the sympathetic nervous system. In the description of the anatomy, include the location of preganglionic and postganglionic neurons and synapses. In the description of the physiology, include the activity of various organs innervated by the autonomic nervous system.

Standard 4

Describe the anatomy and physiology of the parasympathetic nervous system. In the description of the anatomy, include the location of preganglionic and postganglionic neurons and synapses. In the description of the physiology, include the activity of various organs innervated by the autonomic nervous system.

Standard 5

Identify the effectors of the autonomic nervous system. Identify the effectors of the somatic nervous system. Compare and contrast these.

Standard 6

Identify the three meninges. For each meninx, be able to describe its anatomical relationship to the skull, to the brain, and to the other meninges

Standard 7

Describe cerebrospinal fluid. Identify locations where it is made; where it circulates; and where it is resorbed into the bloodstream.

Standard 8

List the cranial nerves. Be able to correctly associate their names and numbers. State a function for each, and whether it is sensory, motor, or mixed.

STRAND 6

Nervous System III-Motor Systems; Reflexes; Sensory Systems

Standard 1

Define upper motor neuron. Define lower motor neuron. Compare and contrast these.

Standard 2

Identify the general features of a sensory system. Define transduction.

Standard 3

Define each of the following three types of sensory receptor: exteroceptor, interoceptor, proprioceptor.

Standard 4

For each of the six sensory receptor types, list the relevant stimulus and state in which sensory system it might be found: mechanoreceptors, thermoreceptors, nociceptors, photoreceptors, chemoreceptors, and osmoreceptors.

Standard 5

State the concept of dermatomes and their importance to human disease. Be able to identify the skin surface features associated with the C6, T4, T10, and L2-L5 dermatomes.

Standard 6

Label the components of the eye

Standard 7

Explain the location and function of olfactory receptors.

Standard 8

Explain the location and function of gustatory receptors.

Standard 9

Follow the sound conduction pathway from the auricle to the fluids of the inner ear.

Standard 10

Explain the coding of pitch and loudness in the auditory system.

Standard 11

For the vestibular system, define static equilibrium. Define dynamic equilibrium.

STRAND 7

Endocrine System

Standard 1

Describe the anatomical and physiological relationships between the pituitary (which includes the adenohypophysis and the neurohypophysis) and the hypothalamus.

Standard 2

List the seven hormones of the adenohypophysis, their target organs, their principal actions, and the correlating releasing-hormone from the hypothalamus.

Standard 3

Predict the effects and provide examples of hyper- and hyposecretion disorders of human growth hormone (hGH) from the anterior pituitary.

Standard 4

Predict the effects and provide examples of hyper- and hyposecretion of antidiuretic hormone (ADH).

Standard 5

List and describe the actions of T3 and T4.

Standard 6

Describe the role of parathyroid hormone (PTH) in the regulation of calcium (Ca^{2+}), magnesium (Mg^{2+}), phosphate (HPO_4^{2-}), and calcitriol (active form of vitamin D).

Standard 7

Relate the control and effects of the main mineralocorticoid, aldosterone to its role in the renin-angiotensin-aldosterone system (RAAS).

Standard 8

Describe the control and effect of the main glucocorticoid, cortisol.

Standard 9

Relate the secretion of the catecholamines to the symptoms of pheochromocytomas.

Standard 10

Compare the roles of glucagon and insulin in the control of blood glucose levels.

STRAND 8

Cardiovascular System-Blood, Lymphatic System, & Immunity

Standard 1

Identify and describe the components of whole blood.

Standard 2

Describe the structure and function of the red blood cells (RBCs).

Standard 3

Describe the process of erythropoiesis.

Standard 4

Define leukocyte and identify the various types of white blood cells normally present in the blood.

Standard 5

Define hemostasis and describe the three mechanisms that contribute to hemostasis.

Standard 6

Contrast innate and adaptive immunity.

Standard 7

List and describe the local signs of inflammation.

Standard 8

Define the term antigen and relate its characteristics to the adaptive immune system.

Standard 9

List and describe the subtypes of T and B lymphocytes.

Standard 10

Compare cell-mediated and antibody-mediated immunity.

Standard 11

Identify and describe the five classes of antibodies.

Standard 12

Contrast the primary and secondary immune responses.

STRAND 9

Cardiovascular System

Standard 1

List the general functions of each heart chamber and each of the valves of the heart.

Standard 2

Describe the pattern of blood flow in relation to the great vessels, valves, and chambers of the heart. State when each valve is open or closed during blood flow.

Standard 3

Explain autorhythmicity in the heart. Describe the role of the sinoatrial node in the heart's rhythm.

Standard 4

Given a diagram of an electrocardiogram, state the name of each waveform. Explain what is happening at each stage of the electrocardiogram.

Standard 5

Define: heart rate, end-diastolic volume, end-systolic volume, stroke volume output, ejection fraction, and cardiac output. List factors affecting heart rate. List factors affecting stroke volume. Explain how cardiac output is altered by heart rate and stroke volume.

Standard 6

Describe the histology of arteries and veins. Compare and contrast the microscopic structure of arteries and veins.

Standard 7

Explain the process of capillary exchange of nutrients, gases, and wastes. Describe Starling's Law of the Capillary.

Standard 8

Identify the major arteries of the human body. Define: anastomosis.

Standard 9

Identify the major veins of the human body.

Standard 10

Name the parts of the coronary circulation. Be able to label each element on a diagram or photograph of the heart.

STRAND 10

Respiratory System

Standard 1

List each of the structures through which air passes during inspiration.

Standard 2

Define pulmonary ventilation, inspiration, and expiration.

Standard 3

Define: Boyle's Law. Explain the application of Boyle's Law to inspiration and expiration.

Standard 4

State the pressures in the structures of the respiratory system during inspiration and expiration.

Standard 5

State the four respiratory volumes and four respiratory capacities. Identify each of these on a spirogram.

Standard 6

Compare and contrast the processes of external and internal respiration. Compare and contrast the partial pressures of oxygen and carbon dioxide during the process of external and internal respiration.

Standard 7

State the ways carbon dioxide is carried in the blood and rank their relative importance.

Standard 8

State the chemical equation which describes the relationship between carbon dioxide, bicarbonate ion, and carbonic acid in blood. Predict how raising and lowering pH or carbon dioxide concentration will affect this system.

STRAND 11**Digestive System****Standard 1**

Describe and be able to recognize the histology of the alimentary canal (gastrointestinal system). Identify and describe the function of the following layers: mucosa, submucosa, muscularis, serosa.

Standard 2

Explain the function, production, and regulation of hydrochloric acid (HCl) secretion.

Standard 3

Indicate the location of the following regions: duodenum, jejunum, ileum. Describe the histology and function of the unique features of the small intestine: plicae, circularis, villi, microvilli.

Standard 4

Indicate the location of the following regions: cecum, appendix, ascending colon, transverse colon, descending colon, sigmoid colon, rectum, anus. Identify and describe the function of the ileocecal sphincter. Describe the histology and function of the internal and external sphincters of the anus.

Standard 5

Diagram the enterohepatic circulation of bile salts.

Standard 6

Describe or identify on a diagram the structures in a pancreatic acinus. Describe or identify on a diagram the structures in a pancreatic islet. Identify the pancreatic duct and hepatopancreatic sphincter and explain how these structures are involved in digestion.

Standard 7

Define chemical digestion. Identify the role of each of the digestive organs in the process of chemical digestion.

STRAND 12**Urinary System****Standard 1**

Identify the structures that comprise the nephron.

Standard 2

Identify and describe the three regulatory mechanisms to control the glomerular filtration rate (GFR).

Standard 3

Relate renal tubule structure to transport mechanisms and tubular reabsorption routes.

Standard 4

Compare and contrast facultative and obligatory reabsorption of water.

Standard 5

Describe the process of tubular secretion.

Standard 6

Describe the fluid compartments of the body and state the relative volumes for the intra- and extracellular compartments.

Standard 7

Relate changes in intracellular and interstitial osmolarity to water movement.

Standard 8

Characterize the role of buffers, ventilation, and renal function in maintaining acid-base homeostasis.

Standard 9

Distinguish between respiratory and metabolic alkalosis and acidosis.

STRAND 13

Reproductive system

Standard 1

Correlate the events of the ovarian and uterine cycles.

Standard 2

Compare and contrast homologous endocrine events between male spermatogenesis and female oogenesis.

Standard 3

Compare and contrast mitosis and meiosis.

Standard 4

Describe the embryonic events from fertilization to gastrulation.

Skill Certificate Test Points by Strand

Test Name	Test #	Number of Test Points by Standard															Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Advanced HS: Technology Enhanced	703	3	7	4	7	8	11	10	12	10	8	7	9	4			100	100
Anatomy & Physiology																		