# Human Anatomy & Physiology

## Curriculum Map & Pacing Guide

### Unit 1: Levels of Organization

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<th>Textbook Resources:</th>
<th>Month(s):</th>
<th>Time Frame:</th>
<th>Testing:</th>
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<tbody>
<tr>
<td>Chapters 1, 3-4</td>
<td>August-September</td>
<td>19 days</td>
<td>Unit 1 Quizzes&lt;br&gt;Unit 1 Test&lt;br&gt;S1 Final Exam</td>
</tr>
</tbody>
</table>

### By the end of this unit students will be able to:

#### Homeostasis and the Language of Anatomy
- Define anatomy and physiology and explain their relationship
- Describe various levels of structural organization within the human body and explain how they are related
- Define and identify the importance of homeostasis to health and describe an example of a homeostatic mechanism
- Use proper anatomical terminology to describe directional terms, body regions, planes of reference, and body cavities
- Identify correct organ systems for each organ using a human torso model or diagrams
- Identify major body cavities and the organs within

#### Cells
- Describe the structure of the plasma membrane and how structure relates to function
- Identify the major organelles of a cell, their structure, and their function
- Define the types of movement through a membrane
  - Osmosis
  - Active transport
  - Diffusion
  - Facilitated diffusion
  - Endocytosis and exocytosis

#### Tissues & Body Membranes
- Identify the primary tissue types of the body (epithelial, connective, muscular, nervous) and their chief subcategories
- Explain how the major tissue types differ structurally and functionally
- Discuss the process of tissue repair and the inflammatory response
- Demonstrate proper care and use of a microscope by examining prepared slides
- Examine and differentiate between various kinds of tissue using a microscope and prepared slides
  - Epithelial: squamous, stratified, cuboidal, columnar, and transitional
  - Connective: adipose, blood, cartilage, bone, dense, areolar
- Nervous: neuron, neuroglia
  - Muscular: smooth, skeletal, cardiac

- State the location of the tissue types in the body
- List the general functions and location of each membrane type
  - Cutaneous
  - Mucous
  - Serous
  - Synovial

- Compare the structure of the major membrane types
By the end of this unit students will be able to:

**Skeletal System**

- List and explain the function of the skeletal system
- Differentiate between the basic structure of compact and cancellous bone
- Identify microscopic bone structures including
  - Haversian systems
  - Osteocytes
  - Osteoclasts
  - Osteoblasts
  - Bone matrix
  - Periosteum
- Explain the process of bone formation, growth and repair
- Describe some disorders and diseases affecting the skeletal system (may include, but not limited to):
  - Osteomalacia
  - Rickets
  - Osteoarthritis
  - Rheumatoid arthritis
  - Compound/simple fractures
  - Bursitis
  - Osteoporosis
- Distinguish between and identify the bones within the axial skeleton and the appendicular skeleton
- Locate and name the major bones of the human skeleton
- Distinguish by examination the different types of vertebrae
- Identify bones and their major processes from an assembled and disarticulated skeleton

**Joints**
• Describe and locate the different types of joints and compare the amount of movement allowed by each
  o Synovial, fibrous, and cartilaginous
• Distinguish between the following movements
  o Flexion/extension
  o Rotation/circumduction
  o Abduction/adduction
  o Supination/pronation
• Compare major categories of joints as to their structure and mobility
• Demonstrate or identify the various body movements

**Muscular System**

• Describe similarities and differences in the structure and function of the three types of muscle tissue, and indicate where they are found in the body
• Describe the gross and microscopic anatomy of skeletal muscle
• Describe how an action potential is initiated in a muscle cell and the events of muscle cell contraction
• Describe graded response, tetanus, isotonic and isometric contractions, and muscle tone as these terms apply to a skeletal muscle
• Identify some human superficial muscles including their name, origin, insertion, antagonist muscle group, and primary action
• List and describe some problems/diseases of the muscular system (may include, but not limited to):
  o Cerebral palsy
  o Muscular dystrophy
  o Use of anabolic steroids
• Identify and describe each type of muscle tissue microscopically
• Name and locate the major structures of a skeletal muscle fiber
• Distinguish between the origin and insertion of a muscle
• Describe the general actions of prime movers, synergists, and antagonists
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#### Unit 3: Regulation & Integration

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<tr>
<td>Chapters 11-16</td>
<td>October-December</td>
<td>30 days</td>
<td>Unit 3 Quizzes&lt;br&gt;Unit 3 Test&lt;br&gt;S1 Final Exam</td>
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**By the end of this unit students will be able to:**

#### Nervous System

- Name and describe the functions of the two major divisions of the nervous system
- Describe the structure of neurons and the function of their components
- Explain how a nerve impulse is conducted along a neuron as well as from one neuron to another
  - Resting potential
  - Action potential
  - Synaptic transmission
- List the parts of a reflex arc and describe its function
- Identify and describe various chemicals that mimic neurotransmitters (may include, but not limited to):
  - Curare
  - Sarin gas
  - Cocaine
  - Alcohol
  - Barbiturates
- Discuss the meningeal layers of the central nervous system
- Name the major parts of the brain and spinal cord and state the function of each
- Discuss the formation of cerebrospinal fluid and its circulation
- Contrast the structure and function of the autonomic and somatic nervous system
- Distinguish between sympathetic and parasympathetic divisions of the autonomic system
- Identify disorders of the nervous system and their causes (may include, but not limited to):
  - Parkinson’s disease
  - Multiple sclerosis
  - Tetanus
  - Alzheimer’s
  - Strokes
- Poliomyelitis
  - Distinguish between neurons and neuroglial cells on prepared slides
  - Identify the major parts of a neuron on slides or diagrams
  - Demonstrate several reflex actions
  - Identify important anatomical areas on a spinal cord such as nerve plexuses, connective tissue coverings, and white/grey matter

### Somatic and Special Senses

- Distinguish between somatic senses and special senses
- Name the five kinds of receptors and explain their functions
- Explain the relationship between the senses of smell and taste and the mechanism for each
- Name the parts of the ear and the function of each
- Name the parts of the eye and the function of each
- Identify the major ear structures
- Trace the pathway of sound vibrations from the tympanic membrane to the hearing receptors
- Identify the major eye structures on a dissection specimen
- List the structures through which light passes as it travels from the cornea to the retina

### Endocrine System

- Name and locate the major endocrine glands and tissues of the body from a model or diagram
- Differentiate between the effects of steroid and non-steroid hormones on target cells
- List hormones produced by the endocrine glands and the physiological effects of each
- Describe how the hypothalamus regulates hormone secretion from the pituitary gland
- Describe pathological consequences of hypersecretion and hyposecretion of various hormones
- Describe and give an example of a negative feedback mechanism in hormonal production and control
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#### Unit 4: Transport

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<td>Chapters 17-19</td>
<td>January-February</td>
<td>23 days</td>
<td>Unit 4 Quizzes</td>
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By the end of this unit students will be able to:

### Blood
- List the functions of blood
- Describe the structure, function and life cycle of erythrocytes
- Identify the various types of leukocytes and the role each plays in the body
- Describe the components of plasma and give their functions
- Describe the major events of hemostasis
- Explain the basis of ABO and Rh incompatibilities
- Identify various disorders of the blood (may include, but not limited to):
  - Anemia
  - Leukemia
  - Hemophilia
  - Sickle cell anemia
  - Polycythemia
- Examine blood cells, identifying erythrocytes and the five types of leukocytes
- Perform a differential white blood cell count and give examples of disorders that produce abnormal blood test values

### Cardiovascular System
- Describe the structure and function of the heart
- Describe the flow of blood through the heart, naming each chamber, valve, and vessel through which the blood passes
- Explain the structure and function of the conduction system of the heart
- Distinguish between systemic, cardiac, and pulmonary circulation
- Describe the intrinsic and extrinsic regulation of the heart
- Distinguish between an artery, vein, and capillary based on structure, location, and function
- Describe the exchange of material across the capillary membrane
- Explain the mechanisms of return of venous blood to the heart
Describe how blood pressure is created, monitored, and controlled
Identify some major vessels of the body and the areas they service
Identify various disorders (may include, but not limited to):
  - Tachycardia
  - Heart murmurs
  - Pericarditis
  - Coronary heart disease
  - Heart failure
  - Aneurysm
  - Hypertension
  - Arteriosclerosis
Identify major structural features of the heart on a dissection specimen
Examine pulse, determine pulse rates
If possible, use a stethoscope to identify cardiac cycle sounds and a sphygmomanometer to measure blood pressure
Locate major arteries and veins in the pulmonary and systemic circuits using a chart or model
Distinguish between a cross section of an artery and vein microscopically
**Integumentary System**

- Summarize the functions of the skin and explain how these functions are accomplished
- Describe the structure and function of the dermis and epidermal layers
- Name the factors that determine skin color, and describe the function of melanin
- Name the glands of the skin, their function, and describe the secretions they produce  
  - Sebaceous
  - Sweat
  - Apocrine
  - Eccrine
- Describe the accessory organs of the skin and their function  
  - Nails
  - Hair
- Identify some health disorders of the integumentary system and their causes (may include, but not limited to):  
  - Skin cancer
  - Acne
  - Burns
  - Staph scalded skin syndrome
  - Vitiligo
- Distinguish between the epidermis, dermis and subcutaneous layers of the skin using anatomical structures and function
- Explain how new hair, nail, and skin cells are formed and the process of keratinization
- Identify the layers of the skin, hair follicles and glands in a prepared slide and diagram

**Lymphatic System**

- Describe the structure and principal functions of the lymph system
- Describe how lymph is formed and transported
- Name three lymphatic organs and explain the functions of each
- Locate and identify the major lymphatic pathways
- Describe the structure of a lymph node
- Identify the major microscopic structures of a lymph node, thymus, and spleen

<table>
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<tr>
<td>- Distinguish between innate (non-specific) and adaptive (specific) defenses and provide examples of each</td>
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<tr>
<td>- Differentiate between antibody and antigen</td>
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<tr>
<td>- Compare the functions of the B- and T-cell lymphocytes</td>
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<tr>
<td>- Discuss the relationship between the HIV virus and the immune system disease, AIDS</td>
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## Unit 6: Nutrient & Gas Exchange

### Textbook Resources:
- Chapters 22-23

### Month(s):
- March-April

### Time Frame:
- 25 days

### Testing:
- Unit 6 Quizzes
- Unit 6 Test
- S2 Final Exam

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### By the end of this unit students will be able to:

#### Digestive System

- Describe the location and functions of the organs of the alimentary canal
- Explain the difference between mechanical and enzymatic digestion and the organs which perform each
- Describe mastication, deglutition, and peristalsis
- Label the parts of a typical tooth and describe the functions of the different types of teeth
- Explain the role of the accessory organs in the digestive process
  - Salivary glands
  - Pancreas
  - Gall bladder
  - Liver
- Discuss the functions and sources of the major enzymes
  - Amylase
  - Pepsin
  - Lipase
  - Trypsin
  - Proteases
- List the stomach secretions, describe their functions, and explain how each is regulated
- Identify the major components of pancreatic secretion, their functions and how they are regulated
- Describe bile, its source, composition, function and regulation
- List the major functions of the liver
- List the anatomical and histological characteristics of the small intestine that account for its large surface area
- List the anatomical and histological characteristics and functions of the large intestine
- Explain the hepatic portal system and its relation to the digestive system
- Describe the processes of carbohydrate, lipid, and protein digestion, absorption, and metabolism
- Describe the diseases/disorders of the digestive system (may include, but not limited to):
  - Heartburn
  - Gastric/duodenal ulcers
  - Hepatitis
  - Appendicitis
  - Jaundice
  - Cirrhosis
  - Constipation
  - Diarrhea
- Locate and identify digestive and accessory organs with a model
- Describe the histology of the gastrointestinal wall, including the four layers, villi, and microvilli
- Investigate the action of pancreatic enzymes on carbohydrates and/or lipids and the effect of temperature on enzymatic activity

**Respiratory System**

- Name the structures and describe the functions of the upper and lower respiratory tracts
- Identify respiratory air volumes during normal and forceful breathing efforts
- Describe the mechanisms responsible for inspiration and expiration, including pressure changes, muscular contractions, and nervous control
- Explain how alterations in blood carbon dioxide levels, blood pH, and blood oxygen levels effect respiration
- Discuss the role of partial pressure in the exchange of gases in lungs and tissues
- Explain the role of hemoglobin in the transport of gases
- Describe three ways in which carbon dioxide is carried in the blood
- Identify respiratory problems and causes of conditions (may include, but not limited to):
  - Tuberculosis
  - Emphysema
  - Asthma
  - Pneumonia
  - Pleurisy
  - Lung cancer
  - Hyperventilation
  - Cystic fibrosis
- Label the major respiratory system structures on a diagram or model
- Recognize ciliated epithelium and lung tissue on a microscopic slide
- Trace the movement of air through the respiratory tract
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**Unit 7: Waste Removal**

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<td>Chapter 25-26</td>
<td>April</td>
<td>10 days</td>
<td>Unit 7 Quizzes</td>
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<td>Unit 7 Test</td>
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<td>S2 Final Exam</td>
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</table>

By the end of this unit students will be able to:

#### Urinary System

- List the organs of the urinary system and state a function of each
- Describe the structure and location of the nephron within the kidney and explain the functions of its parts
- Trace the path of blood through the renal blood vessels
- Explain the production and composition of glomerular filtrate
- Identify principal factors that influence filtration pressure and explain how they affect the rate of filtration
  - Trace the path of filtrate through a renal tubule
  - Explain tubular reabsorption and secretion and how they affect the composition of urine
  - Explain the regulation of urine concentration and volume dealing with hormonal, neural, and chemical controls
  - Describe the micturition reflex
  - Discuss disorders of the urinary system (may include, but not limited to):
    - Renal failure
    - Dialysis
    - Kidney stones
    - Cystitis
- Describe the location of the kidneys
- Locate and identify the gross anatomical features of a kidney using a model or diagram
- Describe the features of a nephron and locate them in a model
- Conduct urinalysis tests and use them to determine the substances present in a urine specimen
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**Unit 8: Reproduction**

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<th>Testing:</th>
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<td>Chapter 27-28</td>
<td>April-May</td>
<td>10 days</td>
<td>Unit 8 Quizzes, Unit 8 Test, S2 Final Exam</td>
</tr>
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</table>

**By the end of this unit students will be able to:**

**Reproductive System**

- Name the parts of the male and female reproductive system and their functions
- Describe the structure of the testes and ovaries and the formation of gametes
- Describe the route sperm cells follow from the site of their production to outside the body
- Describe the structure of the penis
- Explain the hormonal control of male and female reproduction
- Describe the process of ovulation and fertilization
- Trace the pathway of an egg after ovulation
- List major events of the menstrual cycle
- Discuss disorders of the reproductive system (may include, but not limited to):
  - Breast cancer
  - Pelvic inflammatory disease
  - Infertility
  - Prostate cancer
  - Sexually transmitted diseases
- Examine microscopic structures of mammalian ovary and sperm, relating structure to function
- Locate and name the structures of the male and female reproductive systems using a model or diagram
- Describe the effects of FSH and LH on ovarian and testicular function