

## **ANATOMY AND PHYSIOLOGY**

The National Standard Paramedic Curriculum has identified course work in anatomy and physiology (A&P) as either a pre- or co-requisite. At Weber State, anatomy and physiology is considered a prerequisite. **A mastery of anatomy and physiology is assumed throughout the entire paramedic curriculum.**

A list of objectives has been derived from many of the currently available resources in anatomy and physiology instruction. All of these objectives were consistently found in allied health educational programs or other non-science curricula. Students are expected to bring this prerequisite A&P knowledge to the PAR 2000 course. Although some A&P will be reviewed in PAR 2010-2040, the paramedic student must maintain A&P knowledge throughout the paramedic program.

Students are encouraged to review the objectives below. Should a weak area be identified, any A&P text can be used for review. One text in particular, Brady's Anatomy and Physiology for EMS Providers, is easy to read and very comprehensive. This material will be tested in Exam 2 in PAR 2000.

### OBJECTIVES:

- Define anatomy, physiology, and pathophysiology.
- Name the levels of organization of the body and explain each.
- Name the organ systems of the body.
- Define homeostasis and give an example of a typical homeostatic mechanism.
- Describe the anatomical position.
- Describe the sagittal, midsagittal, transverse and frontal planes.
- Use proper terminology to describe the location of body parts with respect to one another.
- Name the body cavities, their membranes and some organs within each cavity.
- Explain the four quadrants of the abdomen and name the organs in those areas.
- Define matter, element, atom, proton, neutron, and electron.
- Using symbols, name some common elements found in the body.
- Describe the purpose of ionic, covalent and hydrogen bonds in the body.
- Describe what happens in synthesis and decomposition reactions.
- Explain the importance of water to the function of the body.
- Describe where water is found in the body.
- Explain the roles of oxygen and carbon dioxide in cell respiration.
- Explain pH and state normal pH ranges in body fluids.
- Explain how a buffer system resists major pH changes.
- Describe the functions and types of sugars, fats, and proteins.
- Explain how enzymes function as catalysts.
- Describe the function of DNA, RNA and ATP.
- Name the organic molecules that make up the cell membrane and state their functions.
- State the arrangement of the molecules in the cell membrane.
- State the five functions of proteins in the cell membrane.

- Describe the cytoplasm.
- Describe how the cell membrane regulates the composition of the cytoplasm.
- Explain isotonic, hypotonic, and hypertonic solutions and their effects on the cell.
- State the function of the nucleus and chromosomes.
- Describe the function of the cell organelles.
- Define each of these cellular transport mechanisms and give an example of the role of each in the body: diffusion, osmosis, facilitated diffusion, active transport, filtration, phagocytosis and pinocytosis.
- Describe what happens in mitosis and meiosis and describe the importance of each.
- Describe the four major categories of tissues and give general characteristics of each.
- Describe the function of epithelial tissue depending on their location.
- Describe the functions of connective tissue and relate them to the function of the body or an organ system.
- Explain the basic differences between smooth, skeletal and cardiac muscle.
- Describe in brief nervous tissue.
- Name the organs made of nerve tissue.
- Describe the location of pleural membranes, pericardial membranes, and the perineum-mesentery.
- State the location of mucous membranes and state the function of mucus.
- Name some membranes made of connective tissue.
- State the three functions of the integumentary system.
- Name the two layers of skin.
- State the location and function of the stratum corneum and the stratum germinativum.
- Describe the function of melanocytes and melanin.
- Describe the function of hair and nails.
- Describe the functions of the secretions of sebaceous glands, ceruminous glands and eccrine sweat glands.
- Describe how the arterioles in the dermis respond to heat, cold, and stress.
- Name the tissues that make up the subcutaneous tissue and describe their functions.
- Describe the function of the skeleton.
- Explain how bones are classified and give an example of each.
- Describe how the embryonic skeleton is replaced by bone.
- State the nutrients necessary for bone growth.
- Name the hormones involved in bone growth and maintenance.
- Explain what is meant by exercise for bones and explain its importance.
- Identify the two major subdivisions of the skeleton and list the bones in each area.
- Explain how joints are classified; give an example of each and describe the movements possible.
- Describe the parts of a synovial joint and explain their function.
- Describe muscle structure in terms of muscle cells, tendons and bones.
- Describe the difference between antagonistic and synergistic muscles.

- Name the energy sources for muscle contraction and state the simple equation for cell respiration.
- Explain the importance of hemoglobin and myoglobin and oxygen debt and lactic acid.
- Describe the neuromuscular junction and explain the function for each part.
- Describe the structure of a sarcomere.
- Explain polarization, depolarization and repolarization in terms of ions and charges.
- Describe the sliding filament theory of muscle contraction.
- State the major muscles of the body and their functions.
- Name the divisions of the nervous system and state the general functions of each.
- Name the parts of a neuron and the function of each.
- Explain the importance of Schwann cells in the peripheral nervous system and neuroglia in the central nervous system.
- Describe the electrical nerve impulse and impulse transmission at the synapse.
- Describe the types of neurons, nerves and nerve tracts.
- Explain the importance of stretch reflexes and flexor reflexes.
- Describe the reflex arc.
- State the functions of the parts of the brain and locate each part on a diagram.
- Name the meninges and describe their locations.
- State the locations and functions of cerebrospinal fluid.
- Explain the general purpose of sensations.
- Name the parts of the sensory pathway and the general functions of each part.
- Describe the characteristics of sensations.
- Name the cutaneous senses and explain their purpose.
- Explain referred pain and explain its importance.
- Explain the importance of proprioception, or muscle sense.
- Describe the pathways for the senses of smell and taste and explain how these senses are interrelated.
- Name the parts of the eye and explain their function in sight.
- Name the parts of the ear and explain their function in hearing.
- Describe the physiology of equilibrium.
- Distinguish between endocrine and exocrine glands.
- Define hormone and prostaglandin.
- Identify the primary endocrine glands and list the major hormones secreted by each.
- Explain the roles of positive and negative feedback mechanisms in hormone secretions.
- Describe the relationship between parathyroid hormone and calcitonin.
- Describe the relationship between insulin and glucagon.
- Explain what prostaglandins are made of and state some of their functions.
- Explain how protein hormones are believed to exert their effects.
- Explain how steroid hormones are believed to exert their effects.
- Describe the primary functions of blood.
- List the formed elements of blood and state the primary functions of each.
- Name the hemopoietic tissues and the kinds of blood cells each produces.

- Describe what happens to red blood cells at the end of their life span including the fate of hemoglobin.
- Explain the ABO and Rh blood types.
- Name the five kinds of white blood cells and the functions of each.
- State what platelets are and explain how they are involved in hemostasis.
- Describe the three stages of blood clotting.
- Explain how abnormal clotting is prevented in the vascular system.
- Describe the location of the heart in terms of body cavities and relationship to other structures.
- Name the chambers of the heart and the vessels that enter or leave each.
- State the valves of the heart and their function.
- State how heart sounds are created.
- Trace the pathway of a blood cell throughout the body.
- Describe coronary circulation.
- Describe the cardiac conduction pathway and its relationship to a normal electrocardiogram.
- Explain stroke volume, cardiac output and Starling's law of the heart.
- Explain how the nervous system regulates the function of the heart.
- Describe the structure and function of each of the blood vessels: arteries, veins and capillaries.
- Describe the exchange of gases that occur at the capillary level.
- Name the major systemic arteries and the parts of the body they nourish.
- Name the major systemic veins and the parts of the body they drain of blood.
- Define blood pressure and state the normal ranges for the systolic and diastolic indices.
- Describe the functions of the lymphatic system.
- State how lymph is formed.
- Describe the system of lymph vessels and explain how lymph is returned to the blood.
- State the location and function of lymph nodules and nodes.
- State the location and function of the spleen.
- Define immunity.
- Explain the role of the thymus in immunity.
- Explain the differences between humoral immunity and cell mediated immunity.
- Compare and contrast the development and function of B cells and T cells.
- Describe the differences between acquired immunity and genetic immunity.
- Explain how vaccines work.
- State the general function of the respiratory system.
- State the pathway of the respiratory system including nasal cavities, pharynx and larynx.
- State the function of the turbinates in the nasal cavity.
- Describe the structure and function of the larynx and the speaking mechanism.
- State the roles of the visceral and parietal pleura in respiration.
- State the changes in air pressure within the thoracic cavity during respiration.
- Explain the diffusion of gases in external and internal respiration.
- Describe how oxygen and carbon dioxide are transported in the blood.
- Explain the nervous and chemical mechanisms that regulate respiration.

- Explain how respiration affects the pH of certain body fluids.
- Describe the general function of the digestive system and name the major divisions.
- Identify the accessory organs of digestion.
- Explain the difference between mechanical and chemical digestion.
- Describe the structure and function of the teeth and tongue.
- Explain the function of saliva.
- Describe the location and function of the pharynx and esophagus.
- List and describe the four layers of the alimentary canal.
- Describe the difference in absorption between the large and small intestine.
- Describe the function of the normal flora in the colon.
- Define peristalsis.
- Define chyme.
- State the normal range of body temperature.
- Define metabolism, catabolism and anabolism.
- State the different ways heat is generated and lost in the body.
- State why the hypothalamus is the thermostat of the body.
- State what the products of cell respiration are and how the body disposes of them.
- Describe the metabolic roles of fats, glucose and proteins.
- Describe basal metabolic rate and the factors that affect it.
- Define kilocalories.
- Describe the water compartments and the name for the water in each.
- Explain how water moves between the compartments.
- Explain how water is taken in by the body and exits the body.
- Describe the location and general function of each organ in the urinary system.
- Name the parts of a nephron.
- Define glomerular filtration rate.
- Describe how the kidneys function in maintaining normal blood volume and pressure.
- Describe how the kidneys help to maintain normal blood pH and electrolyte balance.
- State the hormones that affect kidney function.
- Explain the interaction between capillary blood pressure and blood proteins.
- Describe the characteristics of normal urine.
- Define diploid and haploid.
- Describe the difference between spermatogenesis and oogenesis.
- Define gametes.
- Name the hormones necessary for the formation of gametes.
- List the essential and accessory organs of the male and female, give the general function of each.
- Identify and describe the structures that constitute external genitals in both sexes.
- Name the parts of a sperm cell.
- Define endometrium.
- Briefly describe the life cycle of an oocyte.
- Describe the menstrual cycle in terms of change in hormone levels and the condition of the endometrium.

- Beginning with fertilization, describe the major developmental changes during gestation.
- Describe the structure and function of the placenta and umbilical cord.
- Describe the difference between fetal circulation/respiration and adult circulation/respiration.
- State the length of an average gestation period.
- Describe the states of labor.
- Describe the major changes that take place in an infant at birth.
- Explain how microorganisms are named and classified.
- Describe the distribution of and the benefits of normal flora.
- Explain what is meant by infectious disease.
- Describe the different methods by which infectious diseases are spread.
- List some important infectious diseases.
- Define genetic disease.
- Explain how genes can cause disease.
- Define homologous chromosomes, autosomes, sex chromosomes and genes.
- Define alleles, genotype, phenotype, homozygous, and heterozygous.
- Discuss the difference between dominant and recessive traits.
- List some important genetic diseases.