Lakewood City Schools Science Course of Study – Eleventh Grade

NAME OF COURSE: ANATOMY & PHYSIOLOGY
UNIT: LEVELS OF ORGANIZATION

Science and Technology Standard (ST)
Scientific Inquiry Standard (SI)
Scientific Ways of Knowing Standard (SW)
Life Sciences Standard (LS)

11-12 Benchmarks	Grade Level Indicators	Instructional Objectives
• Explain how processes at the cellular level affect the functions and characteristics of an organism. (LS-11-A) • Explain how humans are connected to and impact natural systems. (LS-11-B) • Explain the interconnectedness of the components of a natural system. (LS-11-E) • Explain how human choices today will affect the quality and quantity of life on earth. (LS-11-F)	<u>Characteristics and Structure of Life</u> • Describe how the maintenance of a relatively stable internal environment is required for the continuation of life, and explain how stability is challenged by changing physical, chemical and environmental conditions as well as the presence of pathogens. (LS-11-1) • Recognize that chemical bonds of food molecules contain energy. Energy is released when the bonds of food molecules are broken and new compounds with lower energy bonds are formed. Some of this energy is released as thermal energy. (LS-11-2) <u>Diversity and Interdependence of Life</u> • Explain how environmental factors can influence heredity or development of organisms. (LS-11-10) <u>Doing Scientific Inquiry</u> • Formulate testable hypotheses. Develop and explain the appropriate procedures, controls and variables (dependent and independent) in scientific experimentation. (SI-11-1)	<u>Students will be able to:</u> a) define anatomy and physiology, and explain how they are related b) list and describe the major characteristics of life c) list and describe the major requirements of organisms d) define homeostasis and explain its importance to survival e) describe a homeostatic mechanism f) explain what is meant by levels of organization g) describe the locations of major body cavities h) list the organs located in each major body cavity i) name the major organ systems and list the organs associated with each j) describe the general functions of each organ system k) properly use the terms that describe relative positions, body sections, and body regions

• Summarize the historical development of scientific theories and ideas within the study of life sciences. (LS-11-G) • Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data. (SI-11-A) • Explain how scientific evidence is used to develop and revise scientific predictions, ideas or theories. (SW-11-A)	• Evaluate assumptions that have been used in reaching scientific conclusions. (SI-11-2) • Design and carry out scientific inquiry (investigation), communicate and critique results through peer review. (SI-11-3) • Explain why the methods of an investigation are based on the questions being asked. (SI-11-4) • Summarize data and construct a reasonable argument based on those data and other known information. (SI-11-5) <u>Nature of Science</u> • Analyze a set of data to derive a hypothesis and apply that hypothesis to a similar phenomenon (e.g., biome data). (SW-11-1) • Apply scientific inquiry to evaluate results of scientific investigations, observations, theoretical models and the explanations proposed by other scientists. (SW-11-2) • Demonstrate that scientific explanations adhere to established criteria, for example, a proposed explanation must be logically consistent, it must abide by the rules of evidence and it must be open to questions and modifications. (SW-11-3) <u>Ethical Practices</u> • Recognize that bias affects outcomes. People tend to ignore evidence that challenges their beliefs but accept evidence that supports their beliefs. Scientists attempt to avoid bias in their work. (SW-11-5)	l) explain how the study of living material is dependent on the study of chemistry m) describe the relationships between matter, atoms, and molecules n) describe three types of chemical reactions o) discuss the concept of pH p) list the major groups of inorganic substances that are common in cells q) describe the general roles played in cells by various types of organic substances r) explain how the structure of a cell membrane is related to its function s) explain how substances move into and out of cells t) distinguish between anabolic and catabolic metabolism u) explain how enzymes control metabolic processes v) explain how cellular respiration releases chemical energy w) describe the general metabolic pathways of carbohydrates, lipids, and proteins x) explain how metabolic pathways are regulated y) describe the general characteristics and functions of epithelial, connective, muscle and nervous tissue z) list in the correct order and describe all steps of the scientific method aa) use the scientific method to test the validity of a hypothesis concerning the direct, linear relationship between human height and upper limb length bb) clean laboratory surfaces before and after laboratory procedures cc) wear disposable gloves when handling

	Scientific Theories • Explain how theories are judged by how well they fit with other theories, the range of included observations, how well they explain observations and how effective they are in predicting new findings. (SW-11-7) Science and Society • Research the role of science and technology in careers that students plan to pursue. (SW-11-12)	chemicals and animal blood dd) wear safety glasses when using chemicals ee) dispose of laboratory gloves and blood-contaminated items as instructed ff) wash hands before leaving the laboratory gg) research and report on possible careers related to anatomy and physiology, to include but not limited to, health careers, research, zoology, etc. **Teaching Resources:** • **text – *Hole's Human Anatomy & Physiology*** • **study guide – *Student Study Guide for Hole's Human Anatomy & Physiology*** • **transparencies – *Hole's Human anatomy & Physiology Transparencies* binder** • **laboratory exercises -** o **Body Organization and Terminology** o **Care and Use of the Compound Microscope** o **Cellular Structure** o **Movements through Cell Membranes** o **Epithelial Tissues** o **Connective Tissues** o **Muscle and Nervous Tissues**

Lakewood City Schools Science Course of Study – Eleventh Grade

NAME OF COURSE: ANATOMY & PHYSIOLOGY
UNIT: SUPPORT AND MOVEMENT

Science and Technology Standard (ST)
Scientific Inquiry Standard (SI)
Scientific Ways of Knowing Standard (SW)
Life Sciences Standard (LS)

11-12 Benchmarks	Grade Level Indicators	Instructional Objectives
• Explain how processes at the cellular level affect the functions and characteristics of an organism. (LS-11-A) • Explain how humans are connected to and impact natural systems. (LS-11-B) • Explain the interconnectedness of the components of a natural system. (LS-11-E) • Explain how human choices today will affect the quality and quantity of life on earth. (LS-11-F)	Characteristics and Structure of Life • Describe how the maintenance of a relatively stable internal environment is required for the continuation of life, and explain how stability is challenged by changing physical, chemical and environmental conditions as well as the presence of pathogens. (LS-11-1) Diversity and Interdependence of Life • Explain how environmental factors can influence heredity or development of organisms. (LS-11-10) Understanding Technology • Identify that science and technology are essential social enterprises but alone they can only indicate what can happen, not what should happen. Realize the latter involves human decisions about the use of knowledge. (ST-11-1) • Predict how decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment and/or humans. (ST-11-2)	Students will be able to: a) describe the four major types of membranes b) describe the structure of the various layers of the skin c) list the general functions of each layer of the skin d) describe the accessory organs associated with the skin e) explain the functions of each accessory organ f) explain how the skin regulates body temperature g) summarize the factors that determine skin color h) classify bones according to their shapes and name an example from each group i) describe the general structure of a bone and list the functions of its parts j) distinguish between intramembranous and endochondral bones, and explain how such bones grow and develop

• Summarize the historical development of scientific theories and ideas within the study of life sciences. (LS-11-G) • Predict how human choices today will determine the quality and quantity of life on Earth. (ST-11-A) • Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data. (SI-11-A) • Explain how scientific evidence is used to develop and revise scientific predictions, ideas or theories. (SW-11-A) • Explain how ethical considerations shape scientific endeavors. (SW-11-B)	• Explore and explain any given technology that may have a different value for different groups of people and at different points in time (e.g., new varieties of farm plants and animals have been engineered by manipulating their genetic instructions to reproduce new characteristics). (ST-11-3) • Explain why basic concepts and principles of science and technology should be a part of active debate about the economics, policies, politics and ethics of various science-related and technology-related challenges. (ST-11-4) <u>Doing Scientific Inquiry</u> • Formulate testable hypotheses. Develop and explain the appropriate procedures, controls and variables (dependent and independent) in scientific experimentation. (SI-11-1) • Evaluate assumptions that have been used in reaching scientific conclusions. (SI-11-2) • Design and carry out scientific inquiry (investigation), communicate and critique results through peer review. (SI-11-3) • Explain why the methods of an investigation are based on the questions being asked. (SI-11-4) • Summarize data and construct a reasonable argument based on those data and other known information. (SI-11-5) <u>Nature of Science</u> • Analyze a set of data to derive a hypothesis and apply that hypothesis to a similar phenomenon (e.g., biome data). (SW-11-1) • Apply scientific inquiry to evaluate results of scientific investigations, observations, theoretical models and the explanations proposed by other scientists. (SW-11-2)	k) describe the effects of sunlight, nutrition, hormonal secretions, and exercise on bone development l) discuss the major functions of bones m) distinguish between the axial and appendicular skeleton and name the major parts of each n) locate and identify the bones and the major features of the bones that comprise the skull, vertebral column, thoracic cage, pectoral girdle, upper limb, pelvic girdle, and lower limb o) explain how joints can be classified according to the type of tissue that binds the bones together p) describe how bones of fibrous joints are held together q) describe how bones of cartilaginous joints are held together r) describe the general structure of a synovial joint s) list six types of synovial joints and name an example of each type t) explain how skeletal muscles produce movements at joints and identify several types of joint movements u) describe the shoulder joint, elbow joint, hip joint and knee joint; explain how the articulating parts are held together v) describe how connective tissue is included in the structure of a skeletal muscle w) name the major parts of a skeletal muscle fiber and describe the function of each part x) explain how a muscle may become fatigued y) distinguish between fast and slow muscles z) distinguish between a twitch and a sustained contraction

• Explain how societal issues and considerations affect the progress of science and technology. (SW-11-C)	• Demonstrate that scientific explanations adhere to established criteria, for example, a proposed explanation must be logically consistent, it must abide by the rules of evidence and it must be open to questions and modifications. (SW-11-3) <u>Ethical Practices</u> • Recognize that bias affects outcomes. People tend to ignore evidence that challenges their beliefs but accept evidence that supports their beliefs. Scientists attempt to avoid bias in their work. (SW-11-5) • Describe the strongly held traditions of science that serve to keep scientists within the bounds of ethical professional behavior. (SW-11-6) <u>Scientific Theories</u> • Explain how theories are judged by how well they fit with other theories, the range of included observations, how well they explain observations and how effective they are in predicting new findings. (SW-11-7) <u>Science and Society</u> • Explain that the decision to develop a new technology is influenced by societal opinions and demands and by cost benefit considerations. (SW-11-8) • Explain how natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society as well as cause risks. (SW-11-9). • Research the role of science and technology in careers that students plan to pursue. (SW-11-11)	aa) describe how exercise affects skeletal muscles bb) explain how various types of muscular contractions produce body movements and help maintain posture cc) explain how the locations of skeletal muscles are related to the movements they produce and how muscles interact to produce such movements dd) identify and describe the locations of the major skeletal muscles of each body region and describe the action of each muscle ee) research and report on selected diseases/disorders of the integumentary system and relate diagnosis, treatments and cures to the advancement of technology ff) research and report on selected diseases/disorders of the skeletal system and relate diagnosis, treatments and cures to the advancement of technology gg) research and report on selected diseases/disorders of the muscular system and relate diagnosis, treatments and cures to the advancement of technology hh) design and implement investigations on the chemical content of bone ii) collect data and draw conclusions regarding the relationships between features of bone and gender jj) analyze samples of skin, muscle and bone to determine its origin and function kk) analyze the features of the skull and hypothesize the relationship between structure and function

		ll) after examination of adult and fetal skulls, compare and contrast the structure mm) after examination, draw conclusions regarding the benefits of the fetal skull structure nn) after examination, compare and contrast the structure and function of cervical, thoracic and lumbar vertebrae oo) after investigation of the vertebral column, determine the similarities and differences between the vertebrae of the cervical, thoracic and lumbar regions and those of the sacrum and coccyx pp) propose a purpose to the fusion of bones in the sacrum and coccyx qq) after examination, compare and contrast true and false ribs rr) after examination, compare and contrast the pelvic bones of males and females ss) examine examples of different types of joints and investigate possible movements for each tt) examine examples of different types of joints and compare and contrast the features/structures of each uu) determine the relationship between structure and function of a joint vv) identify the type of joint and the bones incorporated in the joint of a radiograph image ww) investigate the association of connective tissue with muscle tissue within a skeletal muscle xx) after examination, determine the origin and insertion of a muscle yy) investigate the general actions of prime movers synergists, and antagonists

		zz) investigate the effect of various electrical stimuli on muscle contraction aaa) determine the intensity of stimulation needed for maximal muscle contraction bbb) determine the frequency of stimulation required for tetanic contraction, treppe and fatigue ccc) examine and investigate the action of various muscles of the head, neck, face, chest, shoulder, and upper and lower limbs ddd) clean laboratory surfaces before and after laboratory procedures eee) wear disposable gloves when handling chemicals and animal blood fff) wear safety glasses when using chemicals ggg) dispose of laboratory gloves and blood-contaminated items as instructed hhh) wash hands before leaving the laboratory iii) research and report on possible careers related to anatomy and physiology, to include but not limited to, health careers, research, zoology, etc. **Teaching Resources:** • **text – *Hole's Human Anatomy & Physiology*** • **study guide – *Student Study Guide for Hole's Human Anatomy & Physiology*** • **transparencies – *Hole's Human anatomy & Physiology Transparencies* binder** • **videotapes –** o **Skin** o **Muscles** o **Bones and Joints** • **laboratory exercises -**

		○ **Integumentary System** ○ **Structure and Classification of Bone** ○ **Organization of the Skeleton** ○ **The Skull** ○ **Vertebral Column and Thoracic Cage** ○ **Pectoral Girdle and Upper Limb** ○ **Pelvic Girdle and Lower Limb** ○ **The Joints** ○ **Skeletal Muscle Structure** ○ **Muscles of the Face, Head, and Neck** ○ **Muscles of the Chest, Shoulder, and Upper Limb** ○ **Muscles of the Hip and Lower Limb** ○ **Cat Dissection: Musculature**

Lakewood City Schools Science Course of Study – Eleventh Grade

NAME OF COURSE: ANATOMY & PHYSIOLOGY
UNIT: INTEGRATION AND COORDINATION

Science and Technology Standard (ST)
Scientific Inquiry Standard (SI)
Scientific Ways of Knowing Standard (SW)
Life Sciences Standard (LS)

11-12 Benchmarks	Grade Level Indicators	Instructional Objectives
• Explain how processes at the cellular level affect the functions and characteristics of an organism. (LS-11-A) • Explain how humans are connected to and impact natural systems. (LS-11-B) • Explain the interconnectedness of the components of a natural system. (LS-11-E) • Explain how human choices today will affect the quality and quantity of life on earth. (LS-11-F)	<u>Characteristics and Structure of Life</u> • Describe how the maintenance of a relatively stable internal environment is required for the continuation of life, and explain how stability is challenged by changing physical, chemical and environmental conditions as well as the presence of pathogens. (LS-11-1) <u>Diversity and Interdependence of Life</u> • Explain how environmental factors can influence heredity or development of organisms. (LS-11-10) <u>Understanding Technology</u> • Identify that science and technology are essential social enterprises but alone they can only indicate what can happen, not what should happen. Realize the latter involves human decisions about the use of knowledge. (ST-11-1) • Predict how decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment and/or humans. (ST-11-2)	<u>Students will be able to:</u> a) explain the general functions of the nervous system b) describe the general structure of a neuron c) name four types of neuroglial cells and describe the functions of each d) explain how an injured nerve fiber may regenerate e) explain how environmental factors can influence the development of the nervous system and its components f) explain how a nerve impulse is transmitted from one neuron to another g) distinguish between excitatory and inhibitory postsynaptic potentials h) compare and contrast convergence and divergence i) explain how neurons are classified j) describe how nerve fibers are classified k) describe a reflex arc l) explain reflex behavior

• Summarize the historical development of scientific theories and ideas within the study of life sciences. (LS-11-G) • Predict how human choices today will determine the quality and quantity of life on Earth. (ST-11-A) • Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data. (SI-11-A) • Explain how scientific evidence is used to develop and revise scientific predictions, ideas or theories. (SW-11-A) • Explain how ethical considerations shape scientific endeavors. (SW-11-B)	• Explore and explain any given technology that may have a different value for different groups of people and at different points in time (e.g., new varieties of farm plants and animals have been engineered by manipulating their genetic instructions to reproduce new characteristics). (ST-11-3) • Explain why basic concepts and principles of science and technology should be a part of active debate about the economics, policies, politics and ethics of various science-related and technology-related challenges. (ST-11-4) <u>Doing Scientific Inquiry</u> • Formulate testable hypotheses. Develop and explain the appropriate procedures, controls and variables (dependent and independent) in scientific experimentation. (SI-11-1) • Evaluate assumptions that have been used in reaching scientific conclusions. (SI-11-2) • Design and carry out scientific inquiry (investigation), communicate and critique results through peer review. (SI-11-3) • Explain why the methods of an investigation are based on the questions being asked. (SI-11-4) • Summarize data and construct a reasonable argument based on those data and other known information. (SI-11-5) <u>Nature of Science</u> • Analyze a set of data to derive a hypothesis and apply that hypothesis to a similar phenomenon (e.g., biome data). (SW-11-1) • Apply scientific inquiry to evaluate results of scientific investigations, observations, theoretical models and the explanations proposed by other scientists. (SW-11-2)	m) describe the coverings of the brain and spinal cord n) describe the structure of the spinal cord and its major functions o) name the major parts of the brain and describe the functions of each p) distinguish among motor, sensory and association areas of the cerebral cortex q) explain what is meant by hemisphere dominance r) explain the stages in memory storage s) list the major parts of the peripheral nervous system t) name the cranial nerves and list their major functions u) explain how spinal nerves are named v) explain the function of a spinal nerve w) describe the general characteristics of the autonomic nervous system x) distinguish between the sympathetic and parasympathetic divisions of the autonomic nervous system y) explain the effect of neurotransmitters on effectors z) name five kinds of receptors and explain the functions of each aa) explain how receptors stimulate sensory impulses bb) explain how a sensation is produced cc) distinguish between somatic and special senses dd) describe the receptors associated with the senses of touch and pressure, temperature, and pain ee) describe the sense of pain is produced ff) explain the importance of stretch receptors in muscles and tendons

• Explain how societal issues and considerations affect the progress of science and technology. (SW-11-C)	• Demonstrate that scientific explanations adhere to established criteria, for example, a proposed explanation must be logically consistent, it must abide by the rules of evidence and it must be open to questions and modifications. (SW-11-3) <u>Ethical Practices</u> • Recognize that bias affects outcomes. People tend to ignore evidence that challenges their beliefs but accept evidence that supports their beliefs. Scientists attempt to avoid bias in their work. (SW-11-5) • Describe the strongly held traditions of science that serve to keep scientists within the bounds of ethical professional behavior. (SW-11-6) <u>Scientific Theories</u> • Explain how theories are judged by how well they fit with other theories, the range of included observations, how well they explain observations and how effective they are in predicting new findings. (SW-11-7) <u>Science and Society</u> • Explain that the decision to develop a new technology is influenced by societal opinions and demands and by cost benefit considerations. (SW-11-8) • Explain how natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society as well as cause risks. (SW-11-9). • Research the role of science and technology in careers that students plan to pursue. (SW-11-12)	gg) explain the relationship between the senses of smell and taste hh) describe the structure and function of the ear ii) distinguish between static and dynamic equilibrium jj) describe the structure and function of the eye kk) list major causes, effects and first aid for common eye injuries ll) describe the visual nerve pathway mm) distinguish between endocrine and exocrine glands nn) describe how hormones can be classified according to their chemical composition oo) explain how steroid and nonsteroid hormones produce effects on target cells pp) discuss how negative feedback mechanisms regulate hormonal secretions qq) explain how the nervous system controls hormonal secretions rr) name and describe the locations of the major endocrine glands of the body and list the hormones they secrete ss) describe the general functions of the hormones secreted by the endocrine glands tt) explain how the secretion of each hormone is regulated uu) describe general stress response vv) research and report on selected diseases/disorders of the nervous system and relate diagnosis, treatments and cures to the advancement of technology

		ww) research and report on selected diseases/disorders of the somatic and special senses and relate diagnosis, treatments and cures to the advancement of technology xx) research and report on selected diseases/disorders of the endocrine system and relate diagnosis, treatments and cures to the advancement of technology yy) after observing prepared slides, distinguish between neurons and neuroglial cells zz) after observing prepared slides, draw conclusions regarding the relationship between structure of function of nervous tissue aaa) after observing prepared slides, draw conclusions regarding the relationship between structure and location of nervous tissue bbb) investigate the location, action and purpose of the knee-jerk, ankle-jerk, biceps-jerk, triceps-jerk and plantar reflexes ccc) investigate the structure of a sheep brain ddd) investigate the relationship between cranial nerve size, structure and location in the sheep versus human brain eee) after investigation, draw conclusions regarding the significance of convolutions and sulci structure and function fff) investigate the distribution of touch receptors in the skin ggg) investigate the relationship between regions of the skin and sensitivity (two-point discrimination) hhh) investigate the distribution of heat receptors in the skin

		iii) investigate the distribution of heat and cold receptors in the palm jjj) investigate the relationship between the sense of smell and taste kkk) investigate the distribution of taste receptors on the surface of the tongue lll) determine the time needed for olfactory sensory adaptation to occur mmm) analyze evidence that may indicate variance in the ability to recognize specific odors nnn) investigate the ability of individuals to taste specific food substances ooo) investigate individuals' auditory acuity and sound localization ppp) assess possible conduction deafness by comparing bone and air conduction qqq) determine possible conduction or sensory deafness rrr) demonstrate the importance of vision in the maintenance of equilibrium sss) evaluate a person's ability to integrate sensory information from proprioceptors and receptors within the organs of equilibrium to relay appropriate motor impulses to postural muscles ttt) investigate the role of semicircular canals in maintaining balance uuu) compare and contrast the structure of a human eye with a cow eye vvv) examine prepared slides of mammalian eye sections and analyze the relationship between structure and function www) investigate individuals' visual acuity, astigmatism, accommodation and color vision

		xxx) analyze data related to gender and color vision
		yyy) investigate the relationship between the structure of the retina and vision (blind-spot demonstration)
		zzz) investigate the photopupillary reflex, accommodation papillary reflex, and convergence reflex
		aaaa) clean laboratory surfaces before and after laboratory procedures
		bbbb) wear disposable gloves when handling chemicals and animal blood
		cccc) wear safety glasses when using chemicals
		dddd) dispose of laboratory gloves and blood-contaminated items as instructed
		eeee) wash hands before leaving the laboratory
		
		ffff) research and report on possible careers related to anatomy and physiology, to include but not limited to, health careers, research, zoology, etc.
		
		Teaching Resources:
		• **text – *Hole's Human Anatomy & Physiology***
		• **study guide – *Student Study Guide for Hole's Human Anatomy & Physiology***
		• **transparencies – *Hole's Human Anatomy & Physiology Transparencies* binder**
		• **videotapes –**
		  o **The Brain**
		  o **The Senses**
		• **laboratory exercises -**
		  o **Nervous Tissue and Nerves**
		  o **The Meninges and Spinal Cord**
		  o **The Reflex Arc and Reflexes**
		  o **The Brain and Cranial Nerves**

		○ **Dissection of the Sheep Brain** ○ **Receptors and Somatic Senses** ○ **Senses of Smell and Taste** ○ **The Ear and Hearing** ○ **Sense of Equilibrium** ○ **The Eye** ○ **Visual Tests and Demonstrations** ○ **Endocrine System**

Lakewood City Schools Science Course of Study – Eleventh Grade

NAME OF COURSE: ANATOMY & PHYSIOLOGY
UNIT: TRANSPORT

Science and Technology Standard (ST)
Scientific Inquiry Standard (SI)
Scientific Ways of Knowing Standard (SW)
Life Sciences Standard (LS)

11-12 Benchmarks	Grade Level Indicators	Instructional Objectives
• Explain how processes at the cellular level affect the functions and characteristics of an organism. (LS-11-A) • Explain how humans are connected to and impact natural systems. (LS-11-B) • Explain the interconnectedness of the components of a natural system. (LS-11-E) • Explain how human choices today will affect the quality and quantity of life on earth. (LS-11-F)	Characteristics and Structure of Life • Describe how the maintenance of a relatively stable internal environment is required for the continuation of life, and explain how stability is challenged by changing physical, chemical and environmental conditions as well as the presence of pathogens. (LS-11-1) Diversity and Interdependence of Life • Explain how environmental factors can influence heredity or development of organisms. (LS-11-10) Understanding Technology • Identify that science and technology are essential social enterprises but alone they can only indicate what can happen, not what should happen. Realize the latter involves human decisions about the use of knowledge. (ST-11-1) • Predict how decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment and/or humans. (ST-11-2)	Students will be able to: a) describe the general characteristics of the blood and discuss its major functions b) distinguish between the various types of blood cells c) explain how blood cell counts are made and how they are used d) discuss the life cycle of a red blood cell e) explain how red blood cell production is controlled f) list the major components of blood plasma and describe the functions of each g) define hemostasis and explain the mechanisms that help to achieve it h) review the major steps in blood coagulation i) explain how coagulation can be prevented j) explain the basis for blood typing k) describe how blood reactions may occur between the fetal and maternal tissues l) explain how environmental factors can influence the development and function of blood

• Summarize the historical development of scientific theories and ideas within the study of life sciences. (LS-11-G) • Predict how human choices today will determine the quality and quantity of life on Earth. (ST-11-A) • Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data. (SI-11-A) • Explain how scientific evidence is used to develop and revise scientific predictions, ideas or theories. (SW-11-A) • Explain how ethical considerations shape scientific endeavors. (SW-11-B)	• Explore and explain any given technology that may have a different value for different groups of people and at different points in time (e.g., new varieties of farm plants and animals have been engineered by manipulating their genetic instructions to reproduce new characteristics). (ST-11-3) • Explain why basic concepts and principles of science and technology should be a part of active debate about the economics, policies, politics and ethics of various science-related and technology-related challenges. (ST-11-4) <u>Doing Scientific Inquiry</u> • Formulate testable hypotheses. Develop and explain the appropriate procedures, controls and variables (dependent and independent) in scientific experimentation. (SI-11-1) • Evaluate assumptions that have been used in reaching scientific conclusions. (SI-11-2) • Design and carry out scientific inquiry (investigation), communicate and critique results through peer review. (SI-11-3) • Explain why the methods of an investigation are based on the questions being asked. (SI-11-4) • Summarize data and construct a reasonable argument based on those data and other known information. (SI-11-5) <u>Nature of Science</u> • Analyze a set of data to derive a hypothesis and apply that hypothesis to a similar phenomenon (e.g., biome data). (SW-11-1) • Apply scientific inquiry to evaluate results of scientific investigations, observations, theoretical models and the explanations proposed by other scientists. (SW-11-2)	m) name the organs of the cardiovascular system and discuss their functions n) name and describe the locations of the major parts of the heart and discuss the function of each part o) trace the pathway of the blood through the heart and the vessels of the coronary circulation p) discuss the cardiac cycle and explain how it is controlled q) compare the structures and functions of the major types of blood vessels r) describe the mechanisms that aid in returning venous blood to the heart s) explain how blood pressure is produced and controlled t) compare pulmonary and systemic circuits of the cardiovascular system u) identify and locate the major arteries and veins of the pulmonary and systemic circuits v) explain how environmental factors can influence the development and function of the cardiovascular system w) describe the general function of the lymphatic system x) describe the location of the major lymphatic pathways y) describe the function of lymph z) explain how lymphatic circulation is maintained and describe the consequence of lymphatic obstruction aa) describe a lymph node and its major functions bb) describe the location of the major chains of lymph nodes

• Explain how societal issues and considerations affect the progress of science and technology. (SW-11-C)	• Demonstrate that scientific explanations adhere to established criteria, for example, a proposed explanation must be logically consistent, it must abide by the rules of evidence and it must be open to questions and modifications. (SW-11-3) <u>Ethical Practices</u> • Recognize that bias affects outcomes. People tend to ignore evidence that challenges their beliefs but accept evidence that supports their beliefs. Scientists attempt to avoid bias in their work. (SW-11-5) • Describe the strongly held traditions of science that serve to keep scientists within the bounds of ethical professional behavior. (SW-11-6) <u>Scientific Theories</u> • Explain how theories are judged by how well they fit with other theories, the range of included observations, how well they explain observations and how effective they are in predicting new findings. (SW-11-7) <u>Science and Society</u> • Explain that the decision to develop a new technology is influenced by societal opinions and demands and by cost benefit considerations. (SW-11-8) • Explain how natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society as well as cause risks. (SW-11-9). • Research the role of science and technology in careers that students plan to pursue. (SW-11-12)	cc) discuss the functions of the thymus and spleen dd) distinguish between active and passive immunity ee) explain how allergic reactions, tissue rejection reactions, and autoimmunity are related to immune mechanisms ff) explain how environmental factors influence the development and function of the lymphatic and immune systems gg) research and report on selected diseases/disorders of the blood and relate diagnosis, treatments and cures to the advancement of technology hh) research and report on selected diseases/disorders of the cardiovascular system and relate diagnosis, treatments and cures to the advancement of technology ii) research and report on selected diseases/disorders of the lymphatic and immune systems and relate diagnosis, treatments and cures to the advancement of technology jj) identify red blood cells, five types of white blood cells and platelets on a stained blood slide kk) perform a differential white blood cell count ll) analyze the results of a differential white blood cell count to determine presence of disease or disorder mm) determine the ABO type of a blood sample nn) determine the Rh type of a blood sample oo) analyze the results of blood type to determine the relative percentage of each blood type in a population

		pp) determine the safety of transfusing one blood type to another qq) compare and contrast the features of the human heart with those of another mammal rr) investigate the structure of the valves of the heart and relate structure to function and location ss) investigate the significance of differences in thickness between the walls of the atria and ventricles tt) investigate the significance of the differences in thicknesses of the walls of arteries and veins uu) trace that pat of blood through the heart vv) investigate the role of heart valves the flow of blood through the heart ww) identify the sounds produced during a cardiac cycle xx) identify the components of a normal ECG pattern yy) describe the phase of a cardiac cycle represented by each part of a normal ECG pattern zz) analyze ECG results to determine diseases or disorders, if any aaa) distinguish cross sections of arteries and veins microscopically bbb) identify pulse points on human ccc) determine pulse rate ddd) investigate the effect of lying down, standing, and exercise on pulse rate eee) relate pulse rate to heart rate fff) measure blood pressure using a sphygmomanometer ggg) investigate the effects of lying down, standing, and exercise on blood pressure

		hhh) locate and identify the major organs of the cardiovascular system of the cat
		iii) identify the corresponding organs in the human torso
		jjj) compare and contrast the features of the cardiovascular system of the cat with those of the human
		kkk) identify the major microscopic structures of lymph node, thymus, and spleen
		lll) examine the collecting ducts in the thorax of the embalmed cat to assess the role of valves in the prevention backflow of lymph
		mmm) clean laboratory surfaces before and after laboratory procedures
		nnn) wear disposable gloves when handling chemicals and animal blood
		ooo) wear safety glasses when using chemicals
		ppp) dispose of laboratory gloves and blood-contaminated items as instructed
		qqq) wash hands before leaving the laboratory
		
		rrr) research and report on possible careers related to anatomy and physiology, to include but not limited to, health careers, research, zoology, etc.
		
		Teaching Resources:
		• **text – *Hole's Human Anatomy & Physiology***
		• **study guide – *Student Study Guide for Hole's Human Anatomy & Physiology***
		• **transparencies – *Hole's Human Anatomy & Physiology Transparencies* binder**
		• **videotapes –**
		  ○ **Blood**
		• **laboratory exercises -**
		  ○ **Blood Cells**

		○ **Blood Testing** ○ **Blood Typing** ○ **Structure of the Heart** ○ **The Cardiac Cycle** ○ **Factors Affecting the Cardiac Cycle** ○ **Blood Vessels** ○ **Pulse Rate and Blood Pressure** ○ **Major Arteries and Veins** ○ **Cat Dissection: Cardiovascular System**

Lakewood City Schools Science Course of Study – Eleventh Grade

NAME OF COURSE: ANATOMY & PHYSIOLOGY
UNIT: ABSORPTION AND EXCRETION

Science and Technology Standard (ST)
Scientific Inquiry Standard (SI)
Scientific Ways of Knowing Standard (SW)
Life Sciences Standard (LS)

11-12 Benchmarks	Grade Level Indicators	Instructional Objectives
• Explain how processes at the cellular level affect the functions and characteristics of an organism. (LS-11-A) • Explain how humans are connected to and impact natural systems. (LS-11-B) • Explain the interconnectedness of the components of a natural system. (LS-11-E) • Explain how human choices today will affect the quality and quantity of life on earth. (LS-11-F)	Characteristics and Structure of Life • Describe how the maintenance of a relatively stable internal environment is required for the continuation of life, and explain how stability is challenged by changing physical, chemical and environmental conditions as well as the presence of pathogens. (LS-11-1) Diversity and Interdependence of Life • Explain how environmental factors can influence heredity or development of organisms. (LS-11-10) Understanding Technology • Identify that science and technology are essential social enterprises but alone they can only indicate what can happen, not what should happen. Realize the latter involves human decisions about the use of knowledge. (ST-11-1) • Predict how decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment and/or humans. (ST-11-2)	Students will be able to: a) name and describe the locations of the organs of the digestive system and their major parts b) describe the general functions of each digestive organ c) describe the structure of the wall of the alimentary canal d) explain how the contents of the alimentary canal are mixed and moved e) describe the mechanisms of swallowing, vomiting, and defecating f) explain how the products of digestion are absorbed g) explain how environmental factors can influence the development and function of the digestive system h) list the general functions of the respiratory system i) name and describe the locations of the organs of the respiratory system

• Summarize the historical development of scientific theories and ideas within the study of life sciences. (LS-11-G) • Predict how human choices today will determine the quality and quantity of life on Earth. (ST-11-A) • Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data. (SI-11-A) • Explain how scientific evidence is used to develop and revise scientific predictions, ideas or theories. (SW-11-A) • Explain how ethical considerations shape scientific endeavors. (SW-11-B)	• Explore and explain any given technology that may have a different value for different groups of people and at different points in time (e.g., new varieties of farm plants and animals have been engineered by manipulating their genetic instructions to reproduce new characteristics). (ST-11-3) • Explain why basic concepts and principles of science and technology should be a part of active debate about the economics, policies, politics and ethics of various science-related and technology-related challenges. (ST-11-4) <u>Doing Scientific Inquiry</u> • Formulate testable hypotheses. Develop and explain the appropriate procedures, controls and variables (dependent and independent) in scientific experimentation. (SI-11-1) • Evaluate assumptions that have been used in reaching scientific conclusions. (SI-11-2) • Design and carry out scientific inquiry (investigation), communicate and critique results through peer review. (SI-11-3) • Explain why the methods of an investigation are based on the questions being asked. (SI-11-4) • Summarize data and construct a reasonable argument based on those data and other known information. (SI-11-5) <u>Nature of Science</u> • Analyze a set of data to derive a hypothesis and apply that hypothesis to a similar phenomenon (e.g., biome data). (SW-11-1) • Apply scientific inquiry to evaluate results of scientific investigations, observations, theoretical models and the explanations proposed by other scientists. (SW-11-2)	j) describe the functions of each organ of the respiratory system k) explain how environmental factors can influence the development and function of the respiratory system l) explain how inspiration and expiration are accomplished m) name and define each of the respiratory air volumes and capacities n) list several nonrespiratory air movements and explain how each occurs o) describe the structure and function of the respiratory membrane p) name the organs of the urinary system and list their general functions q) describe the locations of the kidneys and the structure of a kidney r) list the functions of the kidneys s) trace the pathway of blood through the major vessels within a kidney t) describe a nephron and explain the functions of its major parts u) describe the structure of the ureters, urinary bladder, and urethra v) discuss the process of micturition and explain how it is controlled w) explain how environmental factors can influence the development and function of the urinary system x) research and report on selected diseases/disorders of the digestive system and relate diagnosis, treatments and cures to the advancement of technology

• Explain how societal issues and considerations affect the progress of science and technology. (SW-11-C)	• Demonstrate that scientific explanations adhere to established criteria, for example, a proposed explanation must be logically consistent, it must abide by the rules of evidence and it must be open to questions and modifications. (SW-11-3) <u>Ethical Practices</u> • Recognize that bias affects outcomes. People tend to ignore evidence that challenges their beliefs but accept evidence that supports their beliefs. Scientists attempt to avoid bias in their work. (SW-11-5) • Describe the strongly held traditions of science that serve to keep scientists within the bounds of ethical professional behavior. (SW-11-6) <u>Scientific Theories</u> • Explain how theories are judged by how well they fit with other theories, the range of included observations, how well they explain observations and how effective they are in predicting new findings. (SW-11-7) <u>Science and Society</u> • Explain that the decision to develop a new technology is influenced by societal opinions and demands and by cost benefit considerations. (SW-11-8) • Explain how natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society as well as cause risks. (SW-11-9). • Research the role of science and technology in careers that students plan to pursue. (SW-11-12)	y) research and report on selected diseases/disorders concerning nutrition, metabolism and water balance and relate diagnosis, treatments and cures to the advancement of technology z) research and report on selected diseases/disorders of the respiratory system and relate diagnosis, treatments and cures to the advancement of technology aa) research and report on selected diseases/disorders of the urinary system and relate diagnosis, treatments and cures to the advancement of technology bb) recognize tissue sections of major digestive organs and glands cc) investigate the features of the mouth and relate structure to function dd) investigate the features of a tooth and relate structure to function ee) investigate the features of the alimentary canal and relate structure to function ff) investigate the changes in the wall of the alimentary canal from mouth to anus and relate those changes to the specific functions of each region gg) locate and identify the major digestive organs of the embalmed cat hh) identify the corresponding organs in the human torso ii) compare and contrast the digestive system of the cat with that of the human jj) investigate the relationship between the teeth of the cat and its diet kk) recognize tissue sections of trachea and lung

		ll) investigate prepared slides of normal and disease lungs and analyze the effect of changes in structure to symptoms of disease mm) locate and identify the major respiratory organs of the embalmed cat nn) identify the corresponding organs in the human oo) compare and contrast the respiratory system of the human with that of the cat pp) investigate the relationship between the auditory tubes and the nasopharynx qq) investigate the changes in the walls of the respiratory system from mouth to alveoli and draw conclusions regarding the relationship between structure and function rr) measure or calculate the respiratory air volumes and capacities ss) investigate the effect of hyperventilation, rebreathing air, breath holding and exercise on breathing rate. tt) design an experiment to test the effect of some factor on the length of time a person can hold the breath uu) implement experimental design, gather data and draw conclusions related to proposed problem and hypothesis vv) locate and identify the major structures of a kidney ww) evaluate the color, transparency and specific gravity of a urine sample xx) determine the pH of a urine sample yy) test urine sample for the presence of glucose, protein, ketones, bilirubin, and hemoglobin zz) perform a microscopic study of urine sediment

		aaa) evaluate the results of urine sample investigation and determine disease or disorders, if any
		bbb) locate and identify the urinary organs of the cat
		ccc) identify the corresponding organs in the human
		ddd) compare and contrast the urinary organs of the cat with those of the human
		eee) investigate the wall of the urinary organs and relate structure to function
		fff) clean laboratory surfaces before and after laboratory procedures
		ggg) wear disposable gloves when handling chemicals and animal blood
		hhh) wear safety glasses when using chemicals
		iii) dispose of laboratory gloves and blood-contaminated items as instructed
		jjj) wash hands before leaving the laboratory
		
		kkk) research and report on possible careers related to anatomy and physiology, to include but not limited to, health careers, research, zoology, etc.
		
		Teaching Resources:
		• **text – *Hole's Human Anatomy & Physiology***
		• **study guide – *Student Study Guide for Hole's Human Anatomy & Physiology***
		• **transparencies – *Hole's Human Anatomy & Physiology Transparencies* binder**
		• **videotapes –**
		  o **Breathing**
		  o **Digestion**
		  o **Homeostasis**
		• **laboratory exercises -**

		○ **Organs of the Digestive System** ○ **Cat Dissection: Digestive System** ○ **Action of a Digestive Enzyme** ○ **Organs of the Respiratory System** ○ **Cat Dissection: Respiratory System** ○ **Breathing and Respiratory Volumes and Capacities** ○ **Control of Breathing** ○ **Structure of the Kidney** ○ **Urinalysis** ○ **Cat Dissection: Urinary System**

Lakewood City Schools Science Course of Study – Eleventh Grade

NAME OF COURSE: ANATOMY & PHYSIOLOGY
UNIT: REPRODUCTION

Science and Technology Standard (ST)
Scientific Inquiry Standard (SI)
Scientific Ways of Knowing Standard (SW)
Life Sciences Standard (LS)

11-12 Benchmarks	Grade Level Indicators	Instructional Objectives
• Explain how processes at the cellular level affect the functions and characteristics of an organism. (LS-11-A) • Explain how humans are connected to and impact natural systems. (LS-11-B) • Explain the interconnectedness of the components of a natural system. (LS-11-E) • Explain how human choices today will affect the quality and quantity of life on earth. (LS-11-F)	Characteristics and Structure of Life • Describe how the maintenance of a relatively stable internal environment is required for the continuation of life, and explain how stability is challenged by changing physical, chemical and environmental conditions as well as the presence of pathogens. (LS-11-1) Diversity and Interdependence of Life • Explain how environmental factors can influence heredity or development of organisms. (LS-11-10) Understanding Technology • Identify that science and technology are essential social enterprises but alone they can only indicate what can happen, not what should happen. Realize the latter involves human decisions about the use of knowledge. (ST-11-1) • Predict how decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment and/or humans. (ST-11-2)	Students will be able to: a) state the general functions of the male reproductive system b) name the parts of the male reproductive system and describe the general functions of each part c) outline the process of spermatogenesis d) trace the path followed by sperm cells from their site of formation to the outside e) describe the structure of the penis and explain how its parts function to produce an erection f) explain how hormones control the activities of the male reproductive organs and the development of male secondary sexual characteristics g) explain how environmental factors can influence the development of the reproductive systems h) explain how environmental factors can influence the function of the reproductive systems

• Summarize the historical development of scientific theories and ideas within the study of life sciences. (LS-11-G) • Predict how human choices today will determine the quality and quantity of life on Earth. (ST-11-A) • Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data. (SI-11-A) • Explain how scientific evidence is used to develop and revise scientific predictions, ideas or theories. (SW-11-A) • Explain how ethical considerations shape scientific endeavors. (SW-11-B)	• Explore and explain any given technology that may have a different value for different groups of people and at different points in time (e.g., new varieties of farm plants and animals have been engineered by manipulating their genetic instructions to reproduce new characteristics). (ST-11-3) • Explain why basic concepts and principles of science and technology should be a part of active debate about the economics, policies, politics and ethics of various science-related and technology-related challenges. (ST-11-4) <u>Doing Scientific Inquiry</u> • Formulate testable hypotheses. Develop and explain the appropriate procedures, controls and variables (dependent and independent) in scientific experimentation. (SI-11-1) • Evaluate assumptions that have been used in reaching scientific conclusions. (SI-11-2) • Design and carry out scientific inquiry (investigation), communicate and critique results through peer review. (SI-11-3) • Explain why the methods of an investigation are based on the questions being asked. (SI-11-4) • Summarize data and construct a reasonable argument based on those data and other known information. (SI-11-5) <u>Nature of Science</u> • Analyze a set of data to derive a hypothesis and apply that hypothesis to a similar phenomenon (e.g., biome data). (SW-11-1) • Apply scientific inquiry to evaluate results of scientific investigations, observations, theoretical models and the explanations proposed by other scientists. (SW-11-2)	i) state the general functions of the female reproductive system j) name the parts of the female reproductive system and describe the general functions of each part k) outline the process of oogenesis l) describe how hormones control the activities of the female reproductive system and the development of female secondary sexual characteristics m) describe the major events that occur during menstrual cycle n) research and report on selected diseases/disorders of the reproductive system and relate diagnosis, treatments and cures to the advancement of technology o) recognize sections of the testis, epididymis, and penis microscopically p) identify the major features of these microscopic sections and relate structure to function q) recognize sections of the ovary, uterine tube, and uterus wall microscopically r) identify the major features of these microscopic sections and relate structure to function s) analyze sections of the uterine mucosa taken during different phase of the menstrual cycle t) explain the significance of the changes in the uterine wall during the menstrual cycle u) locate and identify the reproductive organs of a cat v) identify the corresponding organs in models of the human reproductive systems

• Explain how societal issues and considerations affect the progress of science and technology. (SW-11-C)	• Demonstrate that scientific explanations adhere to established criteria, for example, a proposed explanation must be logically consistent, it must abide by the rules of evidence and it must be open to questions and modifications. (SW-11-3)
	
	Ethical Practices
	• Recognize that bias affects outcomes. People tend to ignore evidence that challenges their beliefs but accept evidence that supports their beliefs. Scientists attempt to avoid bias in their work. (SW-11-5)
	
	• Describe the strongly held traditions of science that serve to keep scientists within the bounds of ethical professional behavior. (SW-11-6)
	
	Scientific Theories
	• Explain how theories are judged by how well they fit with other theories, the range of included observations, how well they explain observations and how effective they are in predicting new findings. (SW-11-7)
	
	Science and Society
	• Explain that the decision to develop a new technology is influenced by societal opinions and demands and by cost benefit considerations. (SW-11-8)
	
	• Explain how natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society as well as cause risks. (SW-11-9).
	
	• Research the role of science and technology in careers that students plan to pursue. (SW-11-12)
		w) compare and contrast the reproductive organs of the cat with those of the human
		x) assess the function of the uterine horns of the cat
		
		y) clean laboratory surfaces before and after laboratory procedures
		z) wear disposable gloves when handling chemicals and animal blood
		aa) wear safety glasses when using chemicals
		bb) dispose of laboratory gloves and blood-contaminated items as instructed
		cc) wash hands before leaving the laboratory
		
		dd) research and report on possible careers related to anatomy and physiology, to include but not limited to, health careers, research, zoology, etc.
		
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		• **transparencies – *Hole's Human Anatomy & Physiology Transparencies* binder**
		• **videotape – Reproduction: Designer Babies**
		• **laboratory exercises -**
		  ○ **Male Reproductive System**
		  ○ **Female Reproductive System**
		  ○ **Cat Dissection: Reproductive Systems**