

An Overview of Body Systems

Course

Health Science

Unit IX

Body Systems
Structure and
Function

**Essential
Question**

How is the body
organized for
systematic
study?

TEKS

130.204 (c) 1E,
1F

**Prior Student
Learning**

Basic
understanding of
anatomy and
physiology

Estimated time

3-5 hours

Rationale

It is vital for any healthcare practitioner to be knowledgeable about the human body.

Objectives

Upon completion of this lesson, the student will be able to:

- Recognize normal anatomy and physiology
- Identify abnormal anatomy and physiology

Engage

Remind the students that systems are composed of organs working together to perform a particular function. See if the students are able to brainstorm/remember the eleven systems.

Key Points

I. The Body is composed of 11 systems

A. 11 Body Systems

1. Integumentary.
2. Skeletal.
3. Muscular.
4. Nervous.
5. Endocrine.
6. Cardiovascular.
7. Lymphatic.
8. Respiratory.
9. Digestive
10. Urinary.
11. Reproductive.

B. Major Structures and Functions of the Systems

1. Integumentary System

a. Skin is the major organ:

- 1) The largest organ of the body (approximately 22 square feet and 10-11 pounds in adults)

b. Functions

- 1) A mechanical, chemical, and biological barrier
 - a) Protects the internal environment from invasion
 - b) Protects against fluid and protein loss
- 2) Thermoregulation
 - a) Control of the internal temperature by increasing or decreasing heat loss from the body
- 3) Sensations
 - a) Receptors for touch, temperature, and pain
 - b) Waste elimination

- c) Production of vitamin D
- c. Accessory organs
 - a) Hair
 - b) Nails
 - c) Sweat glands
 - d) Oil glands
- 2. Skeletal System
 - a. Each bone is an organ.
 - 1) Over 200 bones
 - 2) Approximately 22 of the pounds of weight in a 125 pound person
 - b. The joints and cartilage complete the system.
 - c. Functions
 - 1) Supports the body
 - 2) Protects the organs
 - 3) The sites for muscle attachment
 - 4) The levers for movement
 - 5) Blood cell formation
 - 6) Mineral storage
- 3. Muscular System
 - a. Each muscle is an organ.
 - 1) Over 700 muscles
 - 2) Make up 50-63 of the pounds of the weight in a 125-pound adult's weight
 - 3) Attach to bones
 - b. Functions
 - 1) Contract and relax to cause movement by pulling on the bones
 - 2) Stabilize body position
 - 3) Generate heat
- 4. Nervous System
 - a. Composed of the brain, spinal cord, nerves and special sense organs; one of the most complex, yet smallest systems of the body
 - b. Capable of producing electrical messages for communication within the body
 - 1) These messages can be transmitted within milliseconds.
 - c. Functions
 - 1) Monitors internal and external environments with receptors
 - 2) Interprets stimuli
 - 3) Responds to stimuli by sending an electrical message to another nerve, muscle, or gland
 - 4) Thus, regulates bodily activities
 - 5) Special senses are taste, smell, sight, hearing and

equilibrium

5. Endocrine System.

a. Composed of glands that secrete hormones locally, or into the blood supply

1) Examples

- a) Pineal,
 - b) Pituitary,
 - c) Hypothalamus,
 - d) Thyroid,
 - e) Parathyroids,
 - f) Thymus,
 - g) Adrenals,
 - h) Pancreas,
 - i) Testes,
 - j) Ovaries, and
 - k) Hormone-producing tissue found in other organs
- b. Hormones are chemical messengers that are released from glands, and that affect a change in some target organ.

6. Cardiovascular System

a. Composed of:

1) Heart

- a) Pump,
- b) Blood,
- c) Blood vessels:
 - i. Arteries,
 - (a) Flow away from the heart
 - ii. Veins,
 - (a) Flow toward the heart
 - iii. Capillaries.
 - (a) Flow between arteries and veins

2) The heart is a 4-chambered pump.

3) The left side of the heart pumps blood through the arteries to the capillaries.

4) At the capillaries, the blood releases nutrients, oxygen, and other necessary molecules into the body tissues.

5) Also at the capillaries, the blood receives waste products, carbon dioxide, and other cellular products.

6) Deoxygenated blood returns to the heart via the veins.

7) The right side of the heart pumps the blood to the lungs to release carbon dioxide and receive oxygen.

8) In the course of 1 minute, all the blood in the body circulates through the heart.

b. Functions of the cardiovascular system

- 1) Supplies cells with nutrients and oxygen
- 2) Removes waste products from cells and delivers them for removal from the body

- 3) Helps regulate the acid-base balance (pH)
 - 4) Helps regulate water volume
 - 5) Helps regulate temperature
 - 6) Helps defend against disease
 - 7) Mends damaged vessels
7. Lymphatic System
- a. Composed of
 - 1) Spleen,
 - 2) Thymus,
 - 3) Lymph nodes,
 - 4) Tonsils,
 - 5) Lymph,
 - 6) Lymph vessels
 - b. Functions
 - 1) Returns to the blood supply fluid and proteins that have moved out of the blood vessels
 - 2) Transports lipids from the small intestine to the bloodstream
 - 3) Houses lymphocytes that defend the body against invasion by microbes, foreign cells, toxins, and cancer cells
8. Respiratory System
- a. Composed of
 - 1) Nose,
 - 2) Pharynx,
 - 3) Larynx,
 - 4) Trachea,
 - 5) Bronchi,
 - 6) Lungs
 - b. Functions
 - 1) Brings air from the atmosphere into the lungs
 - a) Warms and moistens air in the nasal cavity
 - 2) Transfers oxygen from the inhaled air to the blood, and receives carbon dioxide from the blood to be exhaled
 - 3) Helps regulate the acid-base balance (pH)
 - 4) Air flowing from the lungs through the vocal cords of the larynx produces sound.
 - 5) A healthy adult breathes in and out 12-15 times each minute, exchanging a total of 6 liters of gas per minute.
9. Digestive System
- a. The digestive tract is composed of any structure through which ingested material passes:
 - 1) Mouth,
 - 2) Pharynx,
 - 3) Esophagus,
 - 4) Stomach,

- 5) Small and large intestines,
- 6) Anus
- b. Accessory organs are structures that assist in the digestive processes:
 - 1) Teeth,
 - 2) Tongue,
 - 3) Salivary glands,
 - 4) Gall bladder,
 - 5) Liver,
 - 6) Pancreas
- c. Food that is eaten is not considered “in” the body until it is digested and absorbed by the digestive tract.

10. Urinary System

- a. Composed of
 - 1) 2 kidneys,
 - 2) 2 ureters,
 - 3) 1 bladder,
 - 4) 1 urethra
- b. Functions
 - 1) Filters blood,
 - 2) Eliminates wastes,
 - 3) Regulates fluid and chemical composition of the blood,
 - 4) Helps maintain the acid-base balance,
 - 5) Helps maintain mineral homeostasis,
 - 6) Produces urine.
 - 7) Each day 180 liters of water are removed from the blood and 178-179 liters are returned to the blood, producing 1-2 liters of urine.
 - 8) Helps regulate the production of red blood cells

11. Reproductive Systems

- a. Female
 - 1) Composed of:
 - a) Uterus,
 - b) Fallopian tubes,
 - c) Ovaries,
 - d) Vagina
 - 2) Functions
 - a) Produces gametes (eggs),
 - b) Stores eggs,
 - c) Transports eggs,
 - d) Produces hormones,
 - e) Nourishes and supports a developing embryo and fetus
 - f) Delivers a baby
- b. Male
 - 1) Composed of

- a) Testes,
- b) Epididymis,
- c) Ductus deferens,
- d) Penis
- 2) Functions
 - a) Produces gametes (sperm),
 - b) Stores sperm,
 - c) Transports sperm,
 - d) Delivers sperm,
 - e) Produces hormones
- c. The two systems work together to produce human offspring.

Activity

- I. Complete the System Chart.
- II. Divide the class into twelve groups (doing male and female reproductive as separate systems). Have each group illustrate a system by creating a model or poster of one of the systems. As they are designing their representation of a system, have them consider how their system contributes to the overall homeostasis of the body and determine at least one other system with which theirs must work closely. Have the groups present to the class their models, how the system contributes to homeostasis and the other system with which theirs must work closely. Have the class discuss how the various systems may be interdependent.

Assessment

Overview of Body Systems Test

Materials

Poster and modeling supplies.

Key – System Chart

Key – Overview of Body Systems Test

Accommodations for Learning Differences

For reinforcement, the students will draw and label each system.

For enrichment, the students will research at least one disease of each system.

National and State Education Standards

National Health Science Cluster Standards

HLC01.01 Academic Foundations

Health care workers will know the academic subject matter required (in addition to state high school graduation requirements) for proficiency within their area. They will use this knowledge as needed in their role.

HLC10.01 Technical Skills

Health Care Workers will apply technical skills required for all career specialties. They will demonstrate skills and knowledge as appropriate.

TEKS

130.204 (c)(1)(E) summarize biological and chemical processes that maintain homeostasis; and

130.204 (c)(1)(F) explain the changes in structure and function due to trauma and disease.

Texas College and Career Readiness Standards

English Language Arts

II. B. Understand new vocabulary and concepts and use them accurately in reading writing and speaking.

III. B. Develop effective speaking styles for both group and one on one situations.

IV. A. Apply listening skills as an individual and as a member of a group in a variety of settings.

IV. B. 2. Listen actively and effectively in one-on-one communication situations.

Science

1.E.1. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

1.E.2. Use essential vocabulary of the discipline being studied.

3.A.1. Use correct applications of writing practices in scientific communication.

Overview of Body Systems Test

Name: _____ Date: _____

Match the following:

- ___ 1. Which of the following is true of the integumentary system?
 - A) Provides protection from external stresses; helps regulate body temperature
 - B) Absorbs nutrients and eliminates wastes
 - C) Stores minerals and supports the body
 - D) Creates gametes

- ___ 2. Which of the following is true of the skeletal system?
 - A) Filters blood and produces urine
 - B) Acts as a barrier against external invasion
 - C) Provides support and protection; stores minerals
 - D) Removes fluid and proteins that have left the blood vessels

- ___ 3. Which of the following is true of the muscular system?
 - A) Stores fats and minerals
 - B) Produces movement; generates heat; stabilizes body position
 - C) Digests food and eliminates wastes
 - D) Transports chemical messengers and nutrients to the cells

- ___ 4. Which of the following is true of the nervous system?
 - A) Helps regulate red blood cell production; eliminates wastes
 - B) Creates gametes
 - C) Acts as a barrier against external invasion
 - D) Detects, interprets, and responds to changes in the environment; regulates homeostasis

- ___ 5. Which of the following is true of the cardiovascular system?
- A) Detects, interprets, and responds to changes in the environment
 - B) Exchanges oxygen and carbon dioxide between the body and the atmosphere
 - C) Transports oxygen, carbon dioxide, nutrients, and wastes to and from cells
 - D) Digests food and eliminates wastes
- ___ 6. Which of the following is true of the endocrine system?
- A) Acts as a barrier against external invasion
 - B) Nourishes a developing fetus and embryo
 - C) Helps regulate red blood cell production; eliminates wastes
 - D) Regulates body activities via hormone secretion.
- ___ 7. Which of the following is true of the lymphatic system?
- A) Creates gametes
 - B) Returns proteins and fluids to the blood and transports fats from the gastrointestinal tract to the blood
 - C) Produces movement; generates heat; stabilizes body position
 - D) Detects, interprets, and responds to changes in the environment
- ___ 8. Which of the following is true of the respiratory system?
- A) Regulates volume and chemical composition of blood
 - B) Transfers oxygen and carbon dioxide between air and the blood; helps regulate the acid-base balance
 - C) Produces movement; generates heat
 - D) Digests food and eliminates wastes
- ___ 9. Which of the following is true of the digestive system?
- A) Detects, interprets, and responds to changes in the environment
 - B) Exchanges oxygen and carbon dioxide between the body and the atmosphere
 - C) Helps regulate body temperature
 - D) Breaks down food, absorbs nutrients, and eliminates wastes

- ___ 10. Which of the following is true of the urinary system?
- A) Regulates volume and chemical composition of blood; helps regulate red blood cell production; eliminates wastes
 - B) Stores fats and minerals
 - C) Breaks down food, absorbs nutrients, and eliminates wastes
 - D) Nourishes a developing fetus and embryo
- ___ 11. Which of the following is true of the male reproductive system?
- A) Creates gametes
 - B) Nourishes a developing fetus and embryo
 - C) Helps regulate body temperature
 - D) Helps regulate red blood cell production; eliminates wastes
- ___ 12. Which of the following is true of the female reproductive system?
- A) Helps regulate red blood cell production; eliminates wastes
 - B) Acts as a barrier against external invasion
 - C) Nourishes a developing fetus and embryo
 - D) Stores minerals and supports the body

Match the following organs to the system in which they are located.

- A) Nails, hair and glands
- B) Nose, pharynx, trachea and lungs
- C) Bones, joints and cartilages
- D) Brain, spinal cord, special senses
- E) Heart, blood, and blood vessels

- ___ 13. Integumentary system
- ___ 14. Skeletal system
- ___ 15. Nervous system
- ___ 16. Cardiovascular system
- ___ 17. Respiratory system

Match the following organs to the system in which they are located.

- A) Pituitary, pineal, hypothalamus
- B) Testes, epididymis, ductus deferens
- C) Tonsils, spleen, thymus
- D) Kidneys, ureters, bladder
- E) Ovaries, uterus, fallopian tubes

- ___ 18. Male reproductive system
- ___ 19. Female reproductive system
- ___ 20. Urinary system
- ___ 21. Lymphatic system
- ___ 22. Endocrine system

Answer key

1. A
2. C
3. B
4. D
5. C
6. D
7. B
8. B
9. D
10. A
11. A
12. C
13. A
14. C
15. D
16. E
17. B
18. B
19. E
20. D
21. C
22. A

System Chart

Complete the following chart that describes the body systems:

System	Functions	Organs
Integumentary		
Skeletal		
Digestive		
Cardiovascular		
Urinary		
Endocrine		
Reproductive		
Muscular		
Nervous		
Lymphatic		
Respiratory		

KEY - System Chart

Complete the following chart that describes the body systems:

System	Functions	Organs
Integumentary	Mechanical, chemical and biological barrier - Protects internal environment from invasion - Protects against fluid and protein loss	Skin, sweat and oil glands, nails, and hair
Skeletal	Gives shape to the body, protects delicate parts of the body, muscle attachment, blood formation, stores minerals	Striated/Skeletal, Cardiac and Smooth
Digestive	Physical /chemical breakdown of foodstuffs so they can be absorbed into the bloodstream and used by the cells/tissues, and eliminate non-digestible substances produced during metabolism	Mouth, salivary glands, pharynx, esophagus, stomach, intestine, liver, gallbladder, pancreas
Cardiovascular	Acquires oxygen, rids the body of carbon dioxide	Heart, arteries, veins, capillaries, lymph nodes, lymph vessels, spleen
Urinary	Filters the blood, eliminates wastes, regulates the fluid and chemical composition of the blood, helps maintain the acid-base balance, helps maintain mineral homeostasis, thus producing urine.	Kidneys, ureters, urinary bladder, urethra
Endocrine	Controls and coordinates bodily functions and the special senses	Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal, Gonads
Reproductive	Provides for reproduction	Male: testes, epididymis, vas deferens, ejaculatory duct, seminal vesicles, prostate gland, penis, urethra Female: ovaries, fallopian tubes, uterus, vagina, breasts
Muscular	Contract and relax to cause movement by pulling bones, stabilize body position, and generate heat	Skeletal, smooth and cardiac muscles
Nervous	Monitors internal and external environments with receptors, interprets stimuli, responds to stimuli by sending an electrical message to another nerve, a muscle, or a gland; thus, regulates bodily activities. Special senses are taste, smell, sight, hearing and equilibrium.	Nerves, brain, spinal cord, and special sense organs
Lymphatic	Carries some tissue fluid and wastes to blood, assists with fighting infection.	Lymph nodes, lymph vessels, spleen, tonsils, and thymus gland
Respiratory	Breathes in oxygen and eliminates carbon dioxide.	Nose, pharynx, larynx, trachea, bronchi, lungs