<u>Chapter 1</u> An Introduction to the Human Body



Chapter Overview:

- \rightarrow Overview of Anatomy and Physiology
- \rightarrow Structural Organization of the Human Body
- \rightarrow Functions of Human Life
- \rightarrow Requirements for Human Life
- \rightarrow Homeostasis
- \rightarrow Anatomical Terminology
- \rightarrow Medical Imaging

- 1. How does gross anatomy differ from microscopic anatomy?
- 2. What is the difference between anatomy and physiology?
- 3. What is the smallest independently functioning unit of a living organism?
- 4. List the structural levels of organization of the human body from simplest to most complex.
- 5. Name five organ systems other than the muscular or skeletal system.
- 6. What is the difference between anabolism and catabolism?
- 7. What is metabolism?
- 8. What is the primary energy-carrying molecule in cells?



- 9. What are the six basic functions of human life?
- 10. What is responsiveness?
- 11. Human development includes what two major processes?
- 12. What are the four primary requirements for human life?
- 13. What term refers to the body's ability to maintain a stable internal environment?

14. Feedback control systems help maintain homeostatic set points. What is the difference between a negative feedback loop and a positive feedback loop?

15. Provide two examples of positive and negative feedback loops that occur within the human body.

- 16. Describe the orientation of the human body in anatomical position.
- 17. Describe the difference between prone and supine.
- 18. Explain the meanings of anterior and posterior, and provide an alternative term for each.
- 19. Define superior, inferior, lateral, medial, proximal, distal, superficial, and deep.

20. Describe how the three planes of motion divide the human body, and provide an example of an exercise that predominantly occurs in each plane.

21. What cavities make up the dorsal and ventral body cavities, respectively?

22. The belly button can be found in what abdominal region?

23. Explain the following abbreviations: RUQ, LUQ, RLQ, and LLQ.

24. What are the two general layers of serous membranes, and which organs are associated with each of the three types of serous membranes?

- 25. What type of imaging technique is predominantly used for diagnosing bone fractures?
- 26. What imaging technique is used to detect lung cancer in a patient with a pacemaker?
- 27. What is the least invasive form of medical imaging, and in what scenarios is it best used?

1. How does gross anatomy differ from microscopic anatomy?

Gross (macro) anatomy is the study of large structures visible to the naked eye, while microscopic anatomy focuses on small structures that can only be seen through a microscope. Both may study the same structures but at different scales.

2. What is the difference between anatomy and physiology?

Anatomy is the study of body structures, including regional anatomy (the study of all structures within a specific body region) and systemic anatomy (the study of all structures that make up a discrete body system). Physiology, on the other hand, is the study of body functions, emphasizing the chemistry and physics of the body's structures and centering on the body's tendency toward homeostasis.

3. What is the smallest independently functioning unit of a living organism? **The smallest independently functioning unit of a living organism is the cell.**

4. List the structural levels of organization of the human body from simplest to most complex. The structural levels of organization in the human body, from simplest to most complex, are chemical (subatomic particles, atoms, molecules, macromolecules), cellular (organelles, cells), tissues, organs, organ systems, and the human organism.

5. Name five organ systems other than the muscular or skeletal system.

Additional major organ systems other than the muscular or skeletal system include the integumentary system, nervous system, endocrine system, cardiovascular system, lymphatic system, respiratory system, digestive system, urinary system, or the reproductive system.

6. What is the difference between anabolism and catabolism?

Anabolism involves the combination of smaller, simpler molecules to form more complex substances, requiring energy. In contrast, catabolism involves the breakdown of larger, more complex substances into smaller, simpler molecules, releasing energy.

7. What is metabolism?

Metabolism is the sum of all anabolic and catabolic reactions that take place in the body, encompassing the chemical processes that change food into energy.

8. What is the primary energy-carrying molecule in cells? **The primary energy-carrying molecule in cells is adenosine triphosphate (ATP).**

9. What are the six basic functions of human life?

The six basic functions of human life are organization, metabolism, responsiveness, movement, development, and reproduction.

10. What is responsiveness?

Responsiveness refers to the ability of an organism to adjust to changes in its external and internal environments.

11. Human development includes what two major processes?

Human development includes differentiation, where unspecialized cells become specialized, and growth, which includes hyperplasia (an increase in cell number) and hypertrophy (an increase in cell size).

12. What are the four primary requirements for human life?

The four primary requirements for human life are oxygen (important for reactions that build ATP), nutrients (including water, macronutrients such as proteins, carbohydrates, and fats, and micronutrients such as vitamins and minerals), a narrow temperature range (as extreme heat or cold can denature enzymes, inhibiting metabolism and depleting the body of energy), and a narrow atmospheric pressure range (necessary for proper respiration).

13. What term refers to the body's ability to maintain a stable internal environment? Homeostasis refers to the body's ability to maintain a stable internal environment. It is a dynamic, rather than a static, process.

14. Feedback control systems help maintain homeostatic set points. What is the difference between a negative feedback loop and a positive feedback loop?

A negative feedback loop reverses a deviation from the set point, which is a physiological value around which the normal range fluctuates. In contrast, a positive feedback loop intensifies a deviation from the set point. In a feedback loop, a stimulus triggers a change that can be internal or external. A sensor monitors the physiological value and sends an afferent impulse to the control center, which compares the value to the normal range. The effector then responds to an efferent impulse by causing a change.

15. Provide two examples of positive and negative feedback loops that occur within the human body.

Examples of positive feedback loops include childbirth, blood clotting, the menstrual cycle, lactation, and ovulation. Examples of negative feedback loops include blood glucose regulation, thermoregulation, osmoregulation, blood pressure regulation, metabolism, and erythropoiesis.

16. Describe the orientation of the human body in the anatomical position.

In the anatomical position, the body is standing upright and facing forward, with arms hanging at the sides and palms supinated (facing forward), feet parallel and shoulder-width apart, and toes facing forward. This standardized position allows regional and directional terms to be easily applied to the body.

17. Describe the difference between prone and supine.

Prone refers to lying face-down on the stomach, while supine refers to lying face-up on the back.

18. Explain the meanings of anterior and posterior, and provide an alternative term for each. Anterior refers to being toward the front of the body (ventral), while posterior refers to being toward the body (dorsal).

19. Define superior, inferior, lateral, medial, proximal, distal, superficial, and deep. Superior (cranial) means positioned above (more towards the head), while inferior (caudal) means positioned below (more towards the feet). Lateral means away from the midline, while medial means toward the midline. Proximal means positioned nearer to the trunk, while distal means positioned further from the trunk. Superficial means closer to the body surface, while deep means further from the body surface.

20. Describe how the three planes of motion divide the human body, and provide an example of an exercise that predominantly occurs in each plane.

The frontal (coronal) plane divides the body into front and back; movements in this plane involve abduction and adduction, such as side lunges, lateral shuffles, and dumbbell lateral raises. The transverse (horizontal) plane divides the body into top and bottom; movements in this plane involve rotation, such as Russian twists, rotational medicine ball throws, and Pallof presses. The sagittal (longitudinal) plane divides the body into left and right sides; movements in this plane involve flexion and extension, such as step-ups, deadlifts, and bicep curls. A midsagittal plane is aligned along the exact center of the body, separating it into equal left and right sides. In contrast, a parasagittal plane is aligned off-center, separating the body into unequal left and right sides.

21. What cavities make up the dorsal and ventral body cavities, respectively?

The dorsal (posterior) body cavities include the cranial cavity, which houses the brain, and the vertebral (spinal) cavity, which houses the spinal cord. The ventral (anterior) body cavities include the thoracic cavity, which can be subdivided into the mediastinum - where the inferior middle mediastinum houses the heart within the pericardial cavity - and two pleural cavities, which house the lungs. The ventral body cavities also include the abdominopelvic cavity, which can be subdivided into the abdominal cavity, housing the digestive organs, and the pelvic cavity, housing the reproductive organs.

22. The belly button can be found in what abdominal region?

The belly button is located in the umbilical region. The nine abdominal regions, from most superior to most inferior and from left to right, include the left hypochondriac, epigastric, right hypochondriac, left lumbar, umbilical, right lumbar, left iliac, hypogastric, and right iliac regions.

23. Explain the following abbreviations: RUQ, LUQ, RLQ, and LLQ. The abbreviations RUQ, LUQ, RLQ, and LLQ represent the four abdominal quadrants: right upper quadrant, left upper quadrant, right lower quadrant, and left lower quadrant.

24. What are the two general layers of serous membranes, and which organs are associated with each of the three types of serous membranes?

The two general layers of serous membranes are the parietal layer, which lines the walls of body cavities (outermost layer), and the visceral layer, which covers organs (innermost layer). The pleura lines the thoracic cavity and surrounds the lungs, the pericardium lines the mediastinum and surrounds the heart, and the peritoneum lines the abdominopelvic cavity and surrounds intraperitoneal organs.

25. What type of imaging technique is predominantly used for diagnosing bone fractures? **X-ray imaging is predominantly used for diagnosing bone fractures. It uses high-energy ionizing electromagnetic radiation to visualize hard body surfaces such as bones and teeth, producing a two-dimensional image from a single angle. However, it is capable of damaging cells and initiating changes that can lead to cancer.**

26. What imaging technique is used to detect lung cancer in a patient with a pacemaker? A CT scan (computed tomography) would be used to detect lung cancer in a patient with a pacemaker. It combines several X-ray images to create a highly detailed 2-D view of the scanned area, making it especially useful for soft tissue scanning, such as the brain or internal organs. A CT scan exposes patients to a higher dose of radiation than standard X-rays. MRI (magnetic resonance imaging) would be contraindicated in this scenario because the strong magnetic fields could interfere with the function of the pacemaker. MRI uses magnetic fields and radio waves to examine radio signals emitted from the body. It is especially useful for detecting cancerous tumors and diagnosing problems in joints, soft tissues, ligaments, and tendons. Although MRI is a high-cost procedure, it involves low radiation. However, it can be noisy, lengthy, and uncomfortable for patients.

27. What is the least invasive form of medical imaging, and in what scenarios is it best used? Ultrasonography is the least invasive form of medical imaging and is best used for sensitive situations, such as pregnancy. It involves the transmission of high-frequency sound waves into the body to generate an echo signal, which is converted into a real-time image of anatomy and physiology. However, ultrasonography cannot penetrate bone, and the quality of the images is heavily dependent on the skill of the operator.

An Introduction to the Human Body: True or False Questions

- 1. The study of small body structures is called gross anatomy.
- 2. Systemic anatomy refers to the study of body functions.
- 3. Atoms are the smallest independently functioning unit of a living organism.
- 4. Tissues are more complex than organelles.
- 5. There are only four major organ systems in humans.
- 6. Catabolism requires energy to build complex substances.
- 7. Metabolism refers to the sum of all anabolic and catabolic reactions within the body.
- 8. Adenosine triphosphate is the primary energy-carrying molecule in cells.
- 9. Reproduction is not considered a basic function of human life.
- 10. Responsiveness refers to the ability of an organism to adjust to changes in its internal and external environments.
- 11. An increase in the number of muscle fibers would be considered hypertrophy.
- 12. A narrow atmospheric pressure range is essential for human life.
- 13. Homeostasis refers to the body's ability to maintain a stable internal environment.
- 14. A positive feedback loop reverses a deviation from the set point.
- 15. Thermoregulation is an example of a negative feedback loop.

An Introduction to the Human Body: True or False Questions

- 16. The palms are supinated in the anatomical position.
- 17. If a patient is lying face down, they are said to be in the supine position.
- 18. The vertebral column is ventral to the sternum.
- 19. The ankle is proximal to the knee.
- 20. The frontal plane divides the body into left and right sides.
- 21. The dorsal cavities consist of the cranial cavity and vertebral cavity.
- 22. The epigastric abdominal region is located below the umbilical region.
- 23. The left kidney is found within the LUQ.
- 24. The visceral pleura directly covers the lungs.
- 25. Ultrasonography is predominantly used for diagnosing bone fractures.
- 26. A CT scan is contraindicated in the presence of internal metallic objects.
- 27. MRI is the least invasive form of medical imaging.

An Introduction to the Human Body: True or False Answers

1. False	2. False	3. False	4. True
5. False	6. False	7. True	8. True
9. False	10. True	11. False	12. True
13. True	14. False	15. True	16. True
17. False	18. False	19. False	20. False
21. True	22. False	23. True	24. True
25. False	26. False	27. False	

Each true or false question is based on the corresponding extended response question. For example, if you don't understand why question five is false, simply refer to the fifth extended response question from the previous section to find your explanation.

Compete with these true or false questions on Kahoot.







Label the diagram using the word bank below:

Word Bank			
1. Organelle	2. Macromolecule	3. Organ	
4. Cell	5. Atom	6. Tissue	
7. Molecule	8. Organ System	9. Organism	

Label the diagram using the word bank below:

- 1. Metabolism
- 2. Responsiveness
- 3. Organization
- 4. Reproduction
- 5. Movement
- 6. Development

Basic Functions of Human Life		
	Arrangement of biological structures	
	Sum of all chemical reactions within the body	
	Ability to adapt to changes in the environment	
	Process of changing position	
	Process of differentiation and growth	
	Production of offspring	





Label the diagram using the word bank below:

1. Nervous System 4. Female Reproductive System	2. Urinary System	3. Cardiovascular System
7. Muscular System	8. Endocrine System	9. Male Reproductive System
10. Integumentary System	11. Digestive System	12. Lymphatic System



Label the diagram using the word bank below: Word Bank 1. Effector 2. Positive Feedback 3. Stimulus 4. Negative Feedback Returns the body back to 5. Control the homeostatic set point. 6. Sensor | () () Amplifies the physiological response elicited by the original stimulus.

Label the diagram using the word bank below:

Word Bank

1. Lateral

- 2. Dorsal
- 3. Superior
- 4. Medial
- 5. Posterior
- 6. Right
- 7. Ventral
- 8. Distal (2)
- 9. Inferior
- 10. Cranial
- 11. Left
- 12. Proximal (2)
- 13. Anterior
- 14. Caudal





Label the diagram using the word bank below: Word Bank 1. Brachium 2. Abdomen 3. Femur 4. Mamma 5. Axilla 6. Digits (2) 7. Inguen 8. Auris 9. Umbilicus 10. Palma 11. Hallux 12. Frons 13. Thoreis 14. Crus 15. Mentis 16. Trunk 17. Oculus 18. Carpus 19. Pelvis 20. Oris 21. Cervicis 22. Bucca 23. Cranium 24. Patella 25. Hip 26. Pollex 27. Antecubitis 28. Tarsus 29. Pes 30. Facies 31. Nasus 32. Pubis 33. Antebrachium



Label the diagram using the word bank below:

Word Bank

- 1. Popliteus
- 2. Cervicis
- 3. Manus
- 4. Planta
- 5. Sura
- 6. Antebrachium
- 7. Cephalon
- 8. Sacrum
- 9. Upper Limb
- 10. Olecranon
- 11. Dorsum
- 12. Lower Limb
- 13. Femur
- 14. Shoulder
- 15. Lumbus
- 16. Calcaneus
- 17. Brachium
- 18. Gluteus

Label the diagram using the word bank below:

- 1. Transverse Plane
- 2. Frontal Plane
- 3. Sagittal Plane









Label the diagram using the word bank below:

Word Bank

- 1. Visceral Pleura
- 4. Retroperitoneal Organs (2)
- 7. Parietal Pericardium
- 10. Visceral Peritoneum
- 13. Pericardial Cavity
- 8. Mesentery (2) 11. Visceral Pericardium

2. Parietal Peritoneum

14. Pleural Cavity

5. Lung

- 3. Heart 6. Intraperitoneal Organs 9. Peritoneal Cavity
- 12. Parietal Pleura
- 15. Diaphragm



Label the diagram using the word bank below:

- 1. Epigastric Region 2. Left Lumbar Region 3. Right Upper Quadrant 4. Left Lower Quadrant 5. Right Iliac Region 6. Left Hypochondriac Region 7. Right Lumbar Region 8. Left Upper Quadrant 9. Hypogastric Region 10. Left Iliac Region
- 13. Umbilical Region
- 11. Right Hypochondriac Region
- 12. Right Lower Quadrant



Label the diagram using the word bank below:

Word Bank

- 1. Pelvic Cavity
- 4. Abdominopelvic Cavity
- 7. Inferior Mediastinum
- 10. Pleural Cavity
- 13. Anterior Mediastinum
- 16. Vertebral Cavity
- Cranial Cavity
 Pericardial Cavity
- 8. Middle Mediastinum
- 11. Dorsal Body Cavity
- 14. Thoracic Cavity

- 3. Posterior Mediastinum
- 6. Ventral Body Cavity
- 9. Superior Mediastinum
- 12. Abdominal Cavity
- 15. Peritoneal Cavity

Label the diagram using the word bank below:

- 1. CT Scan
- 2. MRI
- 3. Ultrasound
- 4. X-Ray





Structural Levels of Organization of the Human Body



Functions of Human Life

	Basic Functions of Human Life		
3	Organization	Arrangement of biological structures	
1	Metabolism	Sum of all chemical reactions within the body	
2	Responsiveness	Ability to adapt to changes in the environment	
5	Movement	Process of changing position	
6	Development	Process of differentiation and growth	
4	Reproduction	Production of offspring	





Feedback Loops and Homeostasis



21



Hallux or great toe

11

Anatomical Position and Anterior Regional Terms



Anatomical Position and Posterior Regional Terms



Three Types of Serous Membranes



Abdominal Regions and Quadrants





Medical Imaging Techniques



An Introduction to the Human Body: Practice Test

- 1. The nose is ______ to the chin.
- a. superior
- b. medial
- c. anterior
- d. superficial
- 2. What does the transverse plane divide the body into?
- a. superior and inferior halves
- b. left and right halves
- c. unequal halves
- d. ventral and dorsal halves

3. In which body cavity are the lungs located?

- a. ventral
- b. pleural
- c. thoracic
- d. all of the above
- 4. The liver is ______ to the skin.
- a. lateral
- b. distal
- c. superficial
- d. deep
- 5. Which statement best describes the study of physiology?
- a. the study of the body's small structures
- b. the study of the body's functions
- c. the study of the body's large structures
- d. the study of thoughts and emotions

6. Determine which of the following levels of organization is the most complex.

- a. organs
- b. molecules
- c. organelles
- d. cells

7. What is the formation of larger, complex molecules from smaller ones using energy called?

- a. metabolism
- b. anabolism
- c. cannibalism
- d. catabolism

An Introduction to the Human Body: Practice Test

- 8. A negative feedback loop _____.
- a. promotes childbirth
- b. reverses a deviation from the set point
- c. intensifies a deviation from the set point
- d. disrupts homeostasis
- 9. What plane does a deadlift primarily occur in?
- a. frontal plane
- b. sagittal plane
- c. transverse plane
- d. coronal plane

10. What is the abdominal region located just below the left rib cage called?

- a. left iliac
- b. left lumbar
- c. hypogastric
- d. left hypochondriac

11. Match each term with the description it best matches below:

Toward the midline	1. anterior
Closer to the body surface	2. prone
Toward the front of the body (ventral)	3. inferior
Away from the midline	4. posterior
Positioned above (more towards the head, cranial)	5. distal
Face-down on the stomach	6. supine
Positioned nearer to the trunk	7. superior
Toward the back of the body (dorsal)	8. lateral
Further from the body surface	9. deep
Positioned farther from the trunk	10. medial
Face-up on the back	11. proximal
Positioned below (more towards the feet, caudal)	12. superficial

12. What is the outermost serous layer of the lungs called?

- a. visceral pleura
- b. parietal pericardium

c. parietal pleura

d. visceral peritoneum



An Introduction to the Human Body: Practice Test

13. Which imaging technique is contraindicated for patients with pacemakers?

a. X-ray b. CT scan

c. ultrasonography

d. MRI

14. The ______ is located within the dorsal body cavity.

a. heart

- b. spinal cordc. small intestine
- d. urethra



An Introduction to the Human Body: Practice Test Answers

- 1. The nose is _____ to the chin.
- a. superior (x)
- b. medial
- c. anterior
- d. superficial
- 2. What does the transverse plane divide the body into?

a. superior and inferior halves (x)

- b. left and right halves
- c. unequal halves
- d. ventral and dorsal halves

3. In which body cavity are the lungs located?

- a. ventral
- b. pleural
- c. thoracic

d. all of the above (x)

- 4. The liver is _____ to the skin.
- a. lateral
- b. distal
- c. superficial
- d. deep (x)
- 5. Which statement best describes the study of physiology?
- a. the study of the body's small structures

b. the study of the body's functions (x)

- c. the study of the body's large structures
- d. the study of thoughts and emotions

6. Determine which of the following levels of organization is the most complex.

- a. organs (x)
- b. molecules
- c. organelles
- d. cells

7. What is the formation of larger, complex molecules from smaller ones using energy called?

a. metabolism

b. anabolism (x)

- c. cannibalism
- d. catabolism



An Introduction to the Human Body: Practice Test Answers

- 8. A negative feedback loop _____.
- a. promotes childbirth
- b. reverses a deviation from the set point (x)
- c. intensifies a deviation from the set point
- d. disrupts homeostasis
- 9. What plane does a deadlift primarily occur in?
- a. frontal plane
- **b.** sagittal plane (x)
- c. transverse plane
- d. coronal plane

10. What is the abdominal region located just below the left rib cage called?

- a. left iliac
- b. left lumbar
- c. hypogastric

d. left hypochondriac (x)

11. Match each term with the description it best matches below:

10_	Toward the midline	1. anterior
12_	Closer to the body surface	2. prone
1	Toward the front of the body (ventral)	3. inferior
8	_ Away from the midline	4. posterior
7	Positioned above (more towards the head, cranial)	5. distal
2	Face-down on the stomach	6. supine
11	Positioned nearer to the trunk	7. superior
4	Toward the back of the body (dorsal)	8. lateral
9	Further from the body surface	9. deep
5	Positioned farther from the trunk	10. medial
6	Face-up on the back	11. proximal
_3	Positioned below (more towards the feet, caudal)	12. superficial

- 12. What is the outermost serous layer of the lungs called?
- a. visceral pleura
- b. parietal pericardium
- c. parietal pleura (x)
- d. visceral peritoneum



An Introduction to the Human Body: Practice Test Answers

13. Which imaging technique is contraindicated for patients with pacemakers?

a. X-ray

b. CT scan

c. ultrasonography

d. MRI (x)

14. The ______ is located within the dorsal body cavity.

a. heart

b. spinal cord (x) c. small intestine

d. urethra

Chapter 1 - An Introduction to the Human Body

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