

CHAPTER 1: AN INTRODUCTION TO HUMAN ANATOMY & PHYSIOLOGY

OBJECTIVES

1. Define the terms *anatomy* and *physiology*, and explain their relationship using an example of a human structure with its corresponding function.
2. List, in order from least to most complex, the levels of structural organization, discuss the relationship between the levels, and name an example at each level.
3. List the 11 organ systems of the human organism, name the major organs within each, and give a general function for each system.
4. Name the six life processes that distinguish living from non-living things.
5. Specify the five environmental needs required for life.
6. Define the term *homeostasis*, and explain how a homeostatic mechanism is regulated (i.e. negative feedback) by using an example we discussed in class.
7. Demonstrate what is meant by "anatomical position".
8. Define various directional terms (i.e. superior, inferior, etc.), and compare different body parts using these terms (i.e. the elbow is proximal to the wrist).
9. List both anterior and posterior anatomical landmarks (i.e. orbital, inguinal, etc.).
10. Name the three major body sections (planes, cuts), and describe how each would be accomplished.
11. Designate the five major human body cavities and name the organs within each on a human diagram.

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12. Describe the anatomical importance of the *diaphragm* muscle and make sure you can spell it correctly!!!!
13. Describe the nine regions of the abdominopelvic cavity and the four quadrants of the abdominopelvic cavity and list the major organs found within each.
14. Distinguish between visceral and parietal serous membranes, and differentiate between pericardial, pleural, and peritoneal varieties.
15. Name the function of serous fluid.

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I. INTRODUCTION

A. DEFINITIONS:

1. **ANATOMY** = the study of the **structure** (morphology, form) of body parts.
 - a. histology = the microscopic study of tissues.
 - b. cytology = the microscopic study of cells.
2. **PHYSIOLOGY** = the study of the **function** of body parts.

B. Life Processes distinguish living from non-living things.

1. Six processes: See Table 1.1, page 5.
 - a. **Metabolism = the sum of chemical and physical reactions that occur in the body.**
 - m **Catabolism** = breakdown reactions; i.e. digesting a protein into amino acids.
 - m **Anabolism** = building reactions; taking digested amino acids to build a body protein.
 - b. Responsiveness
 - c. Movement
 - d. Growth
 - e. Differentiation
 - f. Reproduction
2. **Environmental Needs:** See Table 1.2, page 6.
 - a. nutrients for energy
 - b. oxygen for cellular respiration
 - c. water for most metabolic reactions, lubrication, etc.
 - d. heat to maintain 37°C body temp, enzyme action
 - e. pressure for breathing and filtering blood through kidneys.

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I. INTRODUCTION

E. HOMEOSTASIS See Fig 1.4 and Fig 1.5, page 7.

1. Definition = the tendency of an organism to maintain **a stable internal environment**.
2. All life processes and metabolic reactions work to maintain homeostasis.
3. Most homeostatic mechanisms are regulated by **negative feedback** (see example below).
4. Example = maintenance of body temperature at 98.6°F/37°C.

Sweating;
Dilation of superficial blood vessels;
Increase in heart rate;
Increase in breathing rate.

Stress: ↑ body temperature

↓ body temp

Normal body Temperature
37°C

↑ body temperature

Stress: ↓ body temp

Shivering (involuntary contraction of skeletal muscles);
Inactivation of sweat glands;
Constriction of superficial blood vessels.

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II. STRUCTURAL LEVELS OF ORGANIZATION:

See Fig 1.6, page 9 and Table 1.3, page 10.

- A. The **atom** (i.e. C, H, O) is the least complex level; the smallest particle of an element.
Atoms combine with another to form...
- B. **molecules** (i.e. CO₂, H₂O);
Molecules combine with another to form...
- C. **macromolecules** (i.e. carbohydrates, lipids, proteins, nucleic acids);
Macromolecules combine to form...
- D. **organelles** (i.e. cell membrane, nucleus, ribosomes); small organs of a cell each with a particular function;
Organelles collectively compose ...
- E. **cells** (i.e. skin cell, muscle cell, neuron); *The cell is the basic unit of structure and function of living things!*
(See the amoeba a single-celled organism in Fig 1.3, page 6)
Similar cells are arranged into...
- F. **tissues** (i.e. epithelia, connective, muscle, nervous);
Two or more tissues combine to form...
- G. **organs** (i.e. skin, heart, brain);
Two or more organs combine to form...
- H. **organ systems** (i.e. integumentary, cardiovascular);
The eleven organ systems collectively form the...
- I. The **human organism**; the most complex level of organization.

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III. Organization of the Human Body

A. Body Cavities(See Fig 1.7, page 12)

HUMAN BODY

AXIAL PORTION

head
neck
trunk

APPENDICULAR PORTION

arms
legs

MAJOR CAVITIES

DORSAL CAVITY

CRANIAL CAVITY

brain

VERTEBRAL CANAL

spinal cord

VENTRAL CAVITY

THORACIC CAVITY

lungs
mediastinum
heart
esophagus
trachea
thymus

ABDOMINOPELVIC CAVITY

ABDOMINAL CAVITY

stomach
liver
spleen
gallbladder
intestine
kidneys
adrenals
pancreas

PELVIC CAVITY

anus
urinary bladder
internal
reprod.
organs

* Note that the diaphragm muscle separates the thoracic from abdominopelvic cavities.

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III. Organization of the Human Body

B. Serous Membranes of the Ventral Body Cavity

1. **Membrane** = a soft, thin, pliable layer of tissue that either:
 - a. covers a vital (visceral organ) = **VISCERAL MEMBRANE**.
 - b. lines a body cavity = **PARIETAL MEMBRANE**.

2. There is a space between a visceral and parietal membrane into which **SEROUS fluid** is secreted for **lubrication**.

3. There are specific names for the membranes around the heart, lungs, and abdominal organs:

a. Serous Membranes of the **HEART**

m The membrane on the **surface** of the heart is called **visceral pericardium**.

m The membrane that **lines the cavity** in which the heart is located is called **parietal pericardium**.

m The space between these two membranes is called the **pericardial cavity**, and it is filled with **serous fluid**.

b. Serous Membranes of the **LUNGS**

m The membrane on the **surface** of the lung is called **visceral pleura**.

m The membrane that **lines the cavity** in which the lungs are located is called **parietal pleura**.

m The space between these two membranes is called the **pleural cavity**, and it is filled with **serous fluid**.

c. Serous Membranes of the **ABDOMINAL ORGANS**

m The membrane on the **surface** of the liver, stomach, etc. is called **visceral peritoneum**.

m The membrane that **lines the abdominal cavity** is called **parietal peritoneum**.

m The space between these two membranes is called the **peritoneal cavity**, and it is filled with **serous fluid**.

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IV. ANATOMICAL TERMINOLOGY (pages 18-25)

A. Definition = a language used to describe the relative position of body parts; needed for **communication**.

B. **Anatomical Position** = standing erect, face forward, palms forward.

C. **Terms Referring to Direction/Relative Position**

1. Superior = above; Inferior = below;

2. Anterior = front; Posterior = back;

3. Medial = center; Lateral = side;

4. Cephalad = head; Caudal = tail;

5. Ventral = front; Dorsal = back;

6. Proximal = closer to trunk; Distal = farther from trunk;

7. Superficial = surface; Deep = internal.

D. **Terms Referring to Body Sections (cuts, planes)**

See Fig 1.18 and Fig 1.19 on page 21, and Fig 1.20, page 22.

1. **Sagittal cut**: divides the body into right and left portions.

a. midsagittal = equal right and left portions.

2. **Frontal Cut**: divides the body into anterior and posterior portions.

3. **Transverse Cut**: divides the body into superior and inferior portions.

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IV. Anatomical Terminology (Keyed on page 13 of outline)

E. Terms Referring to Abdominopelvic Areas: See Fig 1.21 page 22.

1. Nine regions

2. Four Quadrants: See Fig 1.22, page 22.

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III. Anatomical Terminology

F. Terms Referring to Surface Anatomy (Landmarks):

See Fig 1.23, page 23.

1. Anterior Landmarks:

- | | | | |
|-----|----------------------------|-----|----------------------|
| a. | cranial= skull | b. | facial=face |
| c. | cephalic=head | d. | cervical=neck |
| e. | axillary=armpit | f. | brachial=upper arm |
| g. | antecubital=anterior elbow | h. | antebrachial=forearm |
| I. | carpal=wrist | j. | metacarpal=hand |
| k. | digital=finger | l. | femoral=thigh |
| m. | patellar=knee cap | n. | crural=leg |
| o. | frontal=forehead | p. | orbital=eye |
| q. | otic=ear | r. | buccal=cheek |
| s. | nasal=nose | t. | oral=mouth |
| u. | mental=chin | v. | mammary=breast |
| w. | umbilical=naval | x. | coxal=hip |
| y. | inguinal=groin | aa. | pubic=pelvic |
| bb. | tarsal=ankle | | |

others:

2. Posterior Landmarks

- | | | | |
|----|-------------------|----|------------------------|
| a. | acromial=shoulder | b. | olecranial=elbow |
| c. | gluteal=buttocks | d. | popliteal=back of knee |
| e. | pedal=foot | f. | plantar=sole |
| g. | dorsal=back | h. | lumbar=loin |
| I. | calcaneal=heel | | |

others:

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Organ Systems Overview(outline page 8)

SYSTEM NAME	ORGANS IN SYSTEM	FUNCTION(S)
INTEGUMENTARY	Skin, hair, nails, sweat glands, sebaceous glands	protection, regulation of body temperature, synthesis of Vitamin D, etc.
SKELETAL	Bones, tendons, ligaments, cartilages	support, protection, movement, Ca ⁺⁺ store, hematopoiesis
MUSCULAR	Skeletal Muscles	movement, heat production
NERVOUS	Brain, spinal cord, nerves	coordination of body parts; control
ENDOCRINE	Endocrine Glands that secrete hormones	maintenance of homeostasis
CARDIOVASCULAR	Heart, blood vessels	transport of nutrients, wastes, O ₂ and CO ₂
LYMPHATIC	Lymph nodes, thymus, spleen	to fight infection
RESPIRATORY	oral cavity, nose, nasal cavity, pharynx, larynx, trachea, bronchial tubes within lungs, alveoli	exchange of gases (O ₂ and CO ₂), maintenance of blood pH and electrolytes
URINARY	kidneys, ureters, urinary bladder, urethra	removal of metabolic wastes from blood, maintenance of blood pH and electrolytes
DIGESTIVE	mouth, pharynx, esophagus, stomach, small and large intestine, salivary glands, liver, pancreas, gall bladder	breakdown of food into substances that can be absorbed (for energy)
REPRODUCTIVE	male: testes, epididymis, vas deferens, prostate, seminal vesicle, bulbourethral glands, urethra, penis, scrotum female: ovaries, fallopian tubes, uterus, cervix, vagina, labia, clitoris	production, maintenance and transport of gametes; production of sex hormones

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E. Terms Referring to Abdominopelvic Areas (outline page 10)

1. Nine regions

RIGHT HYPOCHONDRIAC REGION	EPIGASTRIC REGION	LEFT HYPOCHONDRIAC REGION
RIGHT LUMBAR REGION	UMBILICAL REGION	LEFT LUMBAR REGION
RIGHT ILIAC REGION	HYPOGASTRIC REGION	LEFT ILIAC REGION

2. Four Quadrants:

RIGHT UPPER QUADRANT	LEFT UPPER QUADRANT
RIGHT LOWER QUADRANT	LEFT LOWER QUADRANT