

CHAPTER 1: INTRODUCTION TO HUMAN ANATOMY AND PHYSIOLOGY

I. INTRODUCTION

- Study of anatomy and physiology is an ever-developing science.
- Greek and Latin form the basis for the language of anatomy and physiology.

II. DEFINITIONS:

- A. **ANATOMY** = the study of the **structure** (morphology, form) of body parts.
- B. **PHYSIOLOGY** = the study of the **function** of body parts.

III. STRUCTURAL LEVELS OF ORGANIZATION:

- A. The **atom** [i.e. Carbon (C), Hydrogen (H), or Oxygen(O)] is the least complex level. An atom is defined as the smallest particle of an element. Atoms combine with (react with) other atoms to form...
- B. **molecules** [i.e. carbon dioxide (CO₂), water (H₂O)]. A molecule is defined as a particle composed of 2 or more joined atoms. Molecules combine with other molecules to form...
- C. **macromolecules** (i.e. carbohydrates, lipids, proteins, nucleic acids). A macromolecule is defined as a large molecule. Macromolecules combine with other macromolecules to form...
- D. **organelles** (i.e. cell membrane, nucleus, ribosomes). An organelle is defined as a small organ of a cell, which performs a particular function. Organelles collectively compose ...
- E. **cells**. *The cell is defined as the basic unit of structure and function of living organisms!*
Each cell has a set of organelles and performs a particular function (i.e. a red blood cell has a biconcave shape and is a nucleate. This structure increases its surface area, allowing for the transport of more oxygen).
Some cells have all of the machinery that they need to live.
Similar cells are arranged into...
- F. **tissues** (i.e. epithelia, connective, muscle, nervous). A tissue is defined as a group of similar cells that performs a specialized function. Two or more tissues combine to form...
- G. **organs** (i.e. skin, heart, brain). An organ is defined as a structure consisting of a group of tissues that performs a specialized function. Two or more organs combine to form...
- H. **organ systems** (i.e. integumentary, cardiovascular). An organ system is defined as a group of organs that act together to carry on a specialized function. The eleven organ systems collectively form the...
- I. **human organism**. An organism is the most complex level of organization and is defined as an individual living thing.
- J. The levels of hierarchy could be further extended to include; **populations, communities, ecosystems, and the biosphere.**

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IV. CHARACTERISTICS OF LIFE

1. Movement
2. Responsiveness
3. Growth
4. Reproduction
5. Respiration
6. Digestion
7. Absorption
8. Circulation
9. Assimilation
10. Excretion

V. MAINTANENCE OF LIFE

A. Requirements of Organisms

1. nutrients for energy
2. oxygen for cellular respiration
3. water for most metabolic reactions, lubrication, etc.
4. heat to maintain 37°C body temp, enzyme action
5. pressure for breathing and filtering blood through kidneys

B. Homeostasis

1. Definition = the tendency of an organism to maintain a **stable internal environment**.
2. All life processes and metabolic reactions work to maintain homeostasis.
2. Most homeostatic mechanisms are regulated by **negative feedback** (see example below).
3. All homeostatic mechanisms have three components in common.
 - a. Receptor – senses change in environment
 - b. Control Center – Regulates set-point of variables
 - c. Effector – organ that acts in response to changes
5. Example = maintenance of body temperature at 98.6°F/37°C.

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VI. ORGANIZATION OF THE HUMAN BODY

A. Body Cavities

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
thymus
heart
esophagus
trachea

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

ABDOMINOPELVIC CAVITY

ABDOMINAL CAVITY

stomach
liver
spleen
gallbladder
small intestine
large intestine

PELVIC CAVITY

urinary bladder
internal reproductive
organs

* Note that the kidneys, adrenal glands, pancreas, and ureters are behind the abdominopelvic cavity. This is referred to as RETROPERITONEAL.

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VI. ORGANIZATION OF THE HUMAN BODY

B. Thoracic and Abdominopelvic Membranes

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 **LUNGS**:

- The membrane on the **surface** of the lung is called **visceral pleura**.
- The membrane that **lines the cavity** in which the lungs are located is called **parietal pleura**.
- The space between these two membranes is called the **pleural cavity**, and it is filled with **serous fluid**.

b. Serous Membranes of the **HEART**:

- The membrane on the **surface** of the heart is called **visceral pericardium**.
- The membrane that **lines the cavity** in which the heart is located is called **parietal pericardium**.
- The space between these two membranes is called the **pericardial cavity**, and it is filled with **serous fluid**.

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

- The membrane on the **surface** of the liver, stomach, etc. is called **visceral peritoneum**.
- The membrane that **lines the abdominal cavity** is called **parietal peritoneum**.
- The space between these two membranes is called the **peritoneal cavity**, and it is filled with **serous fluid**.

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(Keyed at the end of this outline)

VI. ORGANIZATION OF THE HUMAN BODY

C. Organ Systems:

BASIC CLASSIFICATION	SYSTEM NAME	ORGANS IN SYSTEM	FUNCTION(S)
Body coverings			
Support and Movement			
Integration and Coordination			
Transport			
Absorption and Secretion			
Reproduction			

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VIII. ANATOMICAL TERMINOLOGY

- A. Definition = a language used to describe the relative position of body parts; needed for **communication**.
- B. **Anatomical Position** = standing erect, face forward, upper limbs at sides, palms forward.
- C. **Relative Position**
1. Superior = above; Inferior = below;
 2. Anterior = front; Posterior = back;
 3. Ventral = front; Dorsal = back;
 4. Medial = center; Lateral = side;
 5. Ipsilateral = same side; Contralateral = other side
 6. Proximal = closer to trunk; Distal = farther from trunk;
 7. Superficial = surface; Deep = internal.
- D. **Body Sections (cuts, planes)**
1. **Sagittal cut**: divides the body into right and left portions.
 - a. midsagittal (median) = equal right and left portions.
 2. **Transverse Cut** (or horizontal): divides the body into superior and inferior portions
 3. **Coronal Cut** (or frontal): divides the body into anterior and posterior portions.
 4. Cross-section: cut at 90 degrees to long axis of the object
 5. Oblique section: cut at an angle across an object
 6. Longitudinal section: cut with the long axis of an object

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VIII. ANATOMICAL TERMINOLOGY (Keyed at the end of this outline)

E. Body Regions

1. Abdominal regions

2. Abdominal Quadrants:

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VIII. ANATOMICAL TERMINOLOGY

F. Surface Anatomy (Landmarks):

1. Anterior Landmarks:

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

2. Posterior Landmarks

Above the Waist		Below the Waist	
a.	acromial=shoulder	e.	gluteal=buttocks
b.	cubital=elbow	f.	popliteal=back of knee
c.	lumbar=loin	g.	pedal=foot
d.	dorsal=back	h.	plantar=sole
		i.	calcaneal=heel

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Organ Systems

BASIC CLASSIFICATION	SYSTEM NAME	ORGANS IN SYSTEM	FUNCTION(S)
Body coverings	INTEGUMENTARY	Skin, hair, nails, sweat glands, sebaceous glands	protection, regulation of body temperature, synthesis of Vitamin D, etc.
Support and Movement	SKELETAL	Bones, tendons, ligaments, cartilages	support, protection, movement, Ca ⁺⁺ store, hematopoiesis
	MUSCULAR	Skeletal Muscles	movement, heat production
Integration and Coordination	NERVOUS	Brain, spinal cord, nerves	coordination of body parts; information processing
	ENDOCRINE	Endocrine Glands that secrete hormones	maintenance of homeostasis
Transport	CARDIOVASCULAR	Heart, blood vessels	Electrolyte maintenance, transport of nutrients, wastes, O ₂ and CO ₂
	LYMPHATIC	Bone marrow, lymph nodes, thymus, spleen	to fight infection
Absorption and Secretion	RESPIRATORY	oral cavity, nose, nasal cavity, sinuses, pharynx, larynx, trachea, bronchial tubes within lungs, alveoli	exchange of gases (O ₂ and CO ₂), maintenance of blood pH and electrolytes; voice production
	URINARY	kidneys, ureters, urinary bladder, urethra	removal of metabolic wastes from blood, maintenance of blood (i.e. pH, pressure, etc.), maintenance of electrolytes
	DIGESTIVE	Oral cavity, pharynx, esophagus, stomach, small and large intestine, salivary glands, liver, pancreas, gall bladder	breakdown of food into substances that can be absorbed (for energy)
Reproduction	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 Female: house developing embryo/fetus

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Abdominopelvic Areas

Nine Regions

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

Four Quadrants:

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