

### Human Anatomy & Physiology

- Study of the structure and function of the human body and its parts

### Importance of A & P

- Understand how body responds to a stimulus
- Understand basis of disease
- Essential knowledge for health care workers
- Improve your understanding of treatments, advertisements, and reports as a patient/client/consumer

### Body Organization

Diagram illustrating the levels of biological organization:


- Chemical level:** The study of atoms and molecules.
- Organ level:** The study of organs and their functions.
- Organ system level:** The study of organs that work together closely.
- Organism level:** The study of the whole organism.

### Chemical Level

- Interactions among atoms and their combinations into molecules and compounds
- H, C, N, O = 96% of human body

### Cellular Level


- Basic living units of organisms
- Contain organelles
  - Specific functions



**Smooth muscle cell**  
 Cellular level  
 Cells are made up of molecules.

### Tissue Level

- Group of similar cells and materials surrounding them that act together to perform a common function
- Ex: epithelial, connective, muscle, nervous



**Smooth muscle tissue**  
 Tissue level  
 Tissues consist of similar types of cells.

### Organ Level

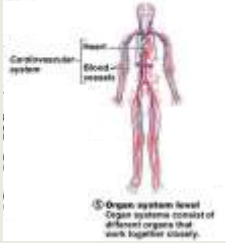
- Group of 2 or more tissue types working together to perform a special function
- Ex: heart, lung, kidney, spleen



**Organ level**  
 Organs are made up of different types of tissues.

### Organ System

- Group of organs classified as a unit because of common function or set of functions



**Organ system level**  
 Organ systems consist of different organs that work together closely.

### Organism

- Any living thing considered as a whole
  - Unicellular or multicellular

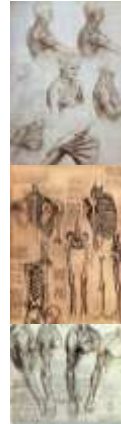
### Organ System Overview



### 1. Integumentary System

- Skin, hair, nails, sweat glands
- Provides protection
- Regulates temperature
- Prevents water loss
- Involved in vitamin D production

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### 2. Skeletal System

- Bones, cartilage, ligaments, joints
- Provides protection and support
- Allows body movement
- Produces blood cells
- Stores minerals and fat

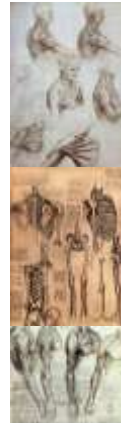
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### 3. Muscular System

- Muscles (attached to skeleton by tendons)
- Produces body movement
- Maintains posture
- Produces body heat

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### 4. Cardiovascular System

- Heart, blood vessels, blood
- Transports nutrients, waste products, gases and hormones
- Plays role in immune response and body temperature regulation

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### 5. Respiratory System

- Lungs, respiratory passages
- Exchange oxygen and carbon dioxide between blood and air
- Regulate blood pH

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### 6. Digestive System

- Mouth, esophagus, stomach, intestines, glands
- Mechanical and chemical processes of digestion, absorption of nutrients, elimination of wastes

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## 7. Urinary System

- Kidneys, urinary bladder, ducts that carry urine
- Removes nitrogen-containing waste products from blood
- Regulates blood pH, ion balance, and water balance

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## 8. Nervous System

- Brain, spinal cord, nerves, sensory receptors
- Major regulatory system that detects sensation
- Controls movements, physiologic processes, and intellectual functions

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## 9. Endocrine System

- Glands that secrete hormones
  - Pituitary, adrenal, thyroid, thymus, ...
- Major regulatory system that influences metabolism, growth, reproduction, etc.

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## 10. Reproductive System (female)

- Ovaries, vagina, uterus, mammary glands, associated structures
- Produces oocytes
- Site of fertilization and fetal development
- Produces hormones that influence sexual function and behaviors

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## 11. Reproductive System (male)

- Testes, accessory structures, ducts, penis
- Produces and transfers sperm cells to female
- Produces hormones that influence sexual function and behaviors


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## 12. Lymphatic/Immune System

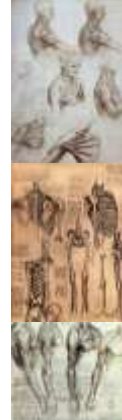
- Lymphatic vessels, lymph nodes, other lymph organs
- Removes foreign substances from blood and lymph
- Combats disease
- Maintains tissue fluid balance
- Absorbs fat from digestive tract

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Maintaining Life


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Life Functions

1. Maintaining Boundaries
  - Keeping “inside” separate from “outside”
2. Movement
  - Change of place or posture
3. Responsiveness
  - Irritability
  - Ability to sense changes to environment and react to them


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Life Functions

4. Digestion
  - Breaking down food into simple molecules that can be absorbed
5. Metabolism
  - Chemical reactions that occur in cells
6. Excretion
  - Removal of wastes

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Life Functions

7. Reproduction
  - Production of offspring
8. Growth
  - Increase in size


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Survival Needs


- Nutrients
- Oxygen
- Water
- Body temperature
- Regulation of pressure

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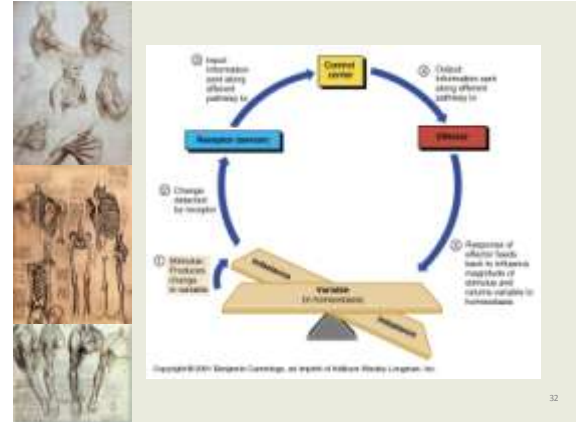

Homeostasis

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- Ability to maintain stable internal conditions in a changing environment
  - Dynamic equilibrium
  - Narrow range (blood pH  $\rightarrow$  7.35 to 7.45)

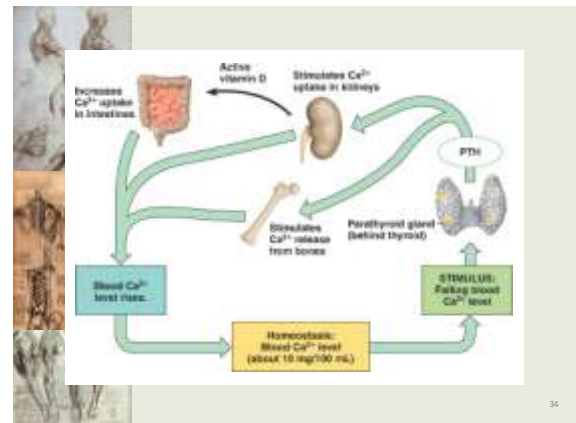

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Feedback Mechanisms

- Negative
  - Net effect of the response to the stimulus is to shut off or reduce the original stimulus.
  - Ex: body temperature, heart rate

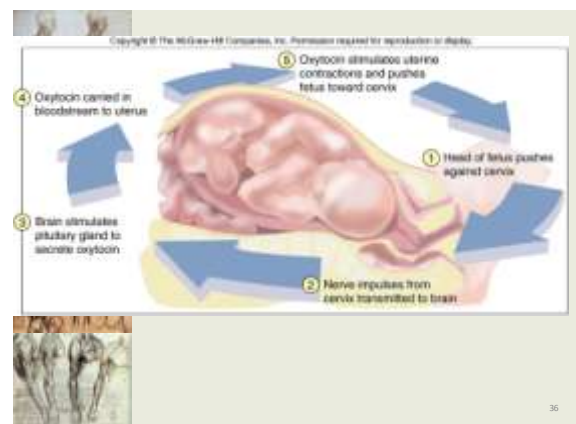
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Feedback Mechanisms

- Positive
  - Net effect of the response to the stimulus is to increase the stimulus and to push variable farther from its original value
  - Ex. blood clotting, labor

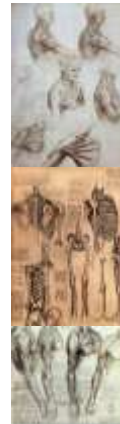
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### Terminology

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### Anatomical Position

- Body erect
- Feet parallel
- Arms hanging at sides
- Palms facing forward
- Thumbs point away from body



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### Orientation and Direction

**Superior (cranial)**      Toward the head end or upper part of a structure or the body; above

**Inferior (caudal)**      Away from the head end or toward the lower part of a structure or the body; below



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### Orientation and Direction

**Anterior (ventral)\***      Toward or at the front of the body; in front of

**Posterior (dorsal)\***      Toward or at the back of the body; behind



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### Orientation and Direction

**Medial**      Toward or at the midline of the body; on the inner side of

**Lateral**      Away from the midline of the body; on the outer side of




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### Orientation and Direction

**Proximal**      Closer to the origin of the body part or the point of attachment of a limb to the body trunk

**Distal**      Farther from the origin of a body part or the point of attachment of a limb to the body trunk



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### Orientation and Direction


Term	Definition
Superficial (external)	Toward or at the body surface
Deep (internal)	Away from the body surface; more internal




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### Anterior Body Landmarks

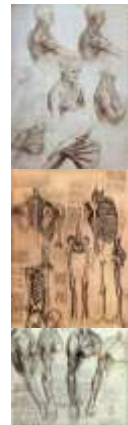

- abdominal
- acromial
- antebrachial
- antecubital
- axillary
- brachial
- buccal
- carpal
- cephalic
- cervical
- coxal
- crural
- digital
- femoral
- fibular
- frontal
- inguinal
- mammary
- mental
- nasal
- oral
- orbital
- palmer
- patellar
- pectoral
- pelvic
- pes
- pubic
- sternal
- tarsal
- thoracic
- umbilical



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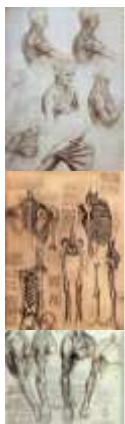

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### Posterior Body Landmarks

- calcaneal
- cranial
- deltoid
- gluteal
- lumbar
- occipital
- olecranal
- otic
- perineal
- popliteal
- sacral
- scapular
- sural
- vertebral



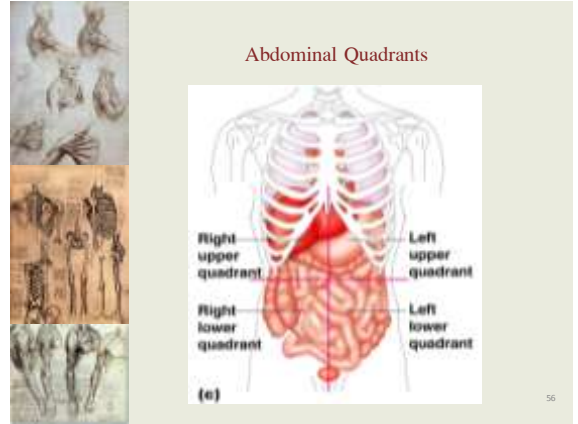
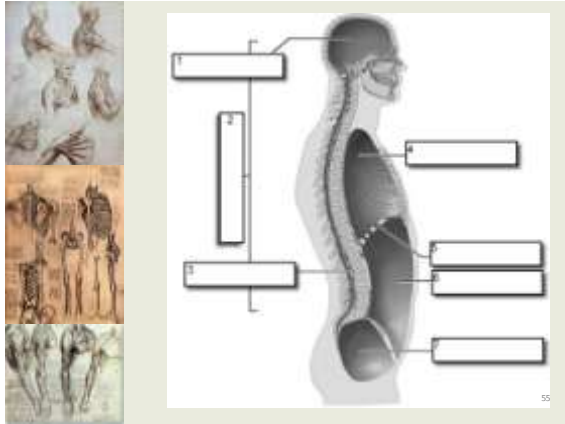
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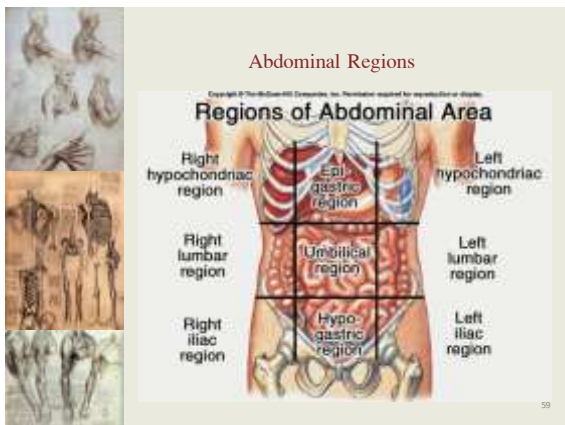


### Organs in Abdominal Quadrants


<ul style="list-style-type: none"> <li>• RUQ                     <ul style="list-style-type: none"> <li>– Liver</li> <li>– Gallbladder</li> <li>– Pancreas</li> <li>– Duodenum (small intestines)</li> <li>– Rt. Adrenal gland</li> <li>– Rt. Kidney</li> <li>– Colon</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• LUQ                     <ul style="list-style-type: none"> <li>– Liver</li> <li>– Stomach</li> <li>– Spleen</li> <li>– Left Kidney</li> <li>– Pancreas</li> <li>– Left Adrenal gland</li> <li>– Colon</li> </ul> </li> </ul>
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### Organs in Abdominal Quadrants

<ul style="list-style-type: none"> <li>• RLQ                     <ul style="list-style-type: none"> <li>– Rt Kidney</li> <li>– Cecum</li> <li>– Appendix</li> <li>– Colon</li> <li>– Rt. Ovary</li> <li>– Rt. Fallopian Tube</li> <li>– Rt. Spermatic cord</li> <li>– Rt. Ureter</li> <li>– Uterus</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• LLQ                     <ul style="list-style-type: none"> <li>– Left Kidney</li> <li>– Colon</li> <li>– Left Ovary</li> <li>– Left Fallopian Tube</li> <li>– Left Ureter</li> <li>– Left Spermatic cord</li> <li>– uterus</li> </ul> </li> </ul>
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Rt. Hypochondriac	Epigastric	Left Hypochondriac
Liver	Esophagus	Stomach
Gall bladder	Stomach	Liver
Small intestine	Liver	Pancreas
Colon	Pancreas	Small intestine
Right Kidney	Adrenal glands	Colon
	Kidneys	Left Kidney
	Ureters	Spleen
	Spleen	
	Small intestine	
	Colon	



Right Lumbar	Umbilical	Left Lumbar
Liver	Stomach	Small intestine
Gall Bladder	Pancreas	Colon
Small intestine	Small intestine	Left Kidney
Colon	Colon	
Right Kidney	Kidneys	
	Ureters	

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Right Iliac	Hypogastric	Left Iliac
Small Intestine	Small intestine	Small intestine
Colon	Colon	Colon
Cecum	Rectum	Left Ovary
Appendix	Ovaries	Left Fallopian Tube
Rt. Ovary	Ureters	
Rt. Fallopian Tube	Bladder	
	Uterus	
	Fallopian Tubes	
	Vas Deferens	
	Seminal vessicle	
	Prostate	

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