

Slide 1

**Anatomy and  
Physiology Review**

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Suzanne Martin  
Maricopa Community Colleges

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Slide 2

**Learning Objectives**

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- List the functional characteristics necessary to maintain life
- Define homeostasis
- Identify the hierarchy of structural organization
- Recognize homeostatic imbalances of the body

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Slide 3

**What is Anatomy and  
Physiology?**

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- Anatomy – The study of structure
  - Macroscopic (Gross)
    - Regional, Systemic
  - Microscopic
    - Cytology (Cells), Histology (Tissues)
  - Developmental
    - Embryology
- Physiology – The study of function

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Slide 4

**Principle of Complementarity**

- Function always reflects structure
- What a structure can do depends on its specific form

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Slide 5

**Language of Anatomy**

- Anatomical Position
- Planes of the Body
- Directional Terms

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Slide 6

**Language of Anatomy**

Anatomical Position



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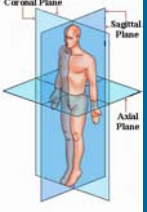
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Slide 7

### Language of Anatomy



**Planes of the Body:**

- Sagittal
- Coronal or Frontal
- Axial or Transverse

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Slide 8

### Language of Anatomy

**Directional Terms**

Directional terms describe the positions of structures relative to other structures or locations in the body.

- **Superior or cranial** toward the head end of the body; upper (example, the hand is part of the superior extremity).
- **Inferior or caudal** away from the head; lower (example, the foot is part of the inferior extremity).

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Slide 9

### Language of Anatomy

**Directional Terms**

Directional terms describe the positions of structures relative to other structures or locations in the body.

- **Anterior or ventral** front (example, the kneecap is located on the anterior side of the leg).
- **Posterior or dorsal** back (example, the shoulder blades are located on the posterior side of the body).

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Slide 10

**Language of Anatomy**

**Directional Terms**

Directional terms describe the positions of structures relative to other structures or locations in the body.

- **Medial**  
toward the midline of the body (example, the middle toe is located at the medial side of the foot).
- **Lateral**  
away from the midline of the body (example, the little toe is located at the lateral side of the foot).

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**Language of Anatomy**

**Directional Terms**

Directional terms describe the positions of structures relative to other structures or locations in the body.

- **Proximal**  
toward or nearest the trunk or the point of origin of a part (example, the proximal end of the femur joins with the pelvic bone).
- **Distal**  
away from or farthest from the trunk or the point or origin of a part (example, the hand is located at the distal end of the forearm).

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**Language of Anatomy**

**Directional Terms**

Directional terms describe the positions of structures relative to other structures or locations in the body.

- **Superficial**  
toward or on the surface of the body (example, the ribs are superficial to the lungs).
- **Deep**  
away from or farthest from the surface of the body (example, the pancreas is deep to the stomach).

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Slide 13

### Levels of Structural Organization

- Cells
- Tissues
- Organs
- Organ Systems
- Organisms



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Slide 14

### Levels of Structural Organization

- Cells
  - The smallest unit of all living things
  - Individual cells vary widely in size and shape, depending on their specific functions within the body

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### Levels of Structural Organization

Tissue: Group of similar cells with a common function

<ul style="list-style-type: none"><li>■ <b>Epithelial</b><ul style="list-style-type: none"><li>■ "Covering"</li><li>■ Lining, Covering, and Glandular Tissue</li><li>■ Protection, Absorption, Filtration, and Secretion</li></ul></li><li>■ <b>Connective</b><ul style="list-style-type: none"><li>■ "Support"</li><li>■ Most abundant and widely distributed</li><li>■ Protecting, Supporting, and Binding Together body tissues</li></ul></li></ul>	<ul style="list-style-type: none"><li>■ <b>Nervous</b><ul style="list-style-type: none"><li>■ "Control"</li><li>■ Receive and conduct electrochemical signals (Irritability and conductivity)</li></ul></li><li>■ <b>Muscle</b><ul style="list-style-type: none"><li>■ "Movement"</li><li>■ Highly specialized cells contract (shorten) to produce movement</li><li>■ Skeletal, Cardiac, and Smooth muscle types</li></ul></li></ul>
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**Levels of Structural Organization**

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Organ: Structure made up of more than one tissue type that performs a specific function in the body

**Examples:**

- Heart
- Skin
- Lungs
- Stomach
- Kidneys

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**Levels of Structural Organization**

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Organ System: A group of organs cooperating to accomplish a common purpose

- There are 11 organ systems in the human body, each with a unique function.

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**Levels of Structural Organization**

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**System Functions:**

1. Integumentary System – protective function, insulates and cushions
2. Skeletal System – body protection and motion
3. Muscular System – contraction, responsible for virtually all body movement
4. Nervous System – control and communication
5. Endocrine System – coordinates and directs cellular activity
6. Cardiovascular System – transportation of oxygen, nutrients, waste, and hormones

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**Levels of Structural Organization**

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**System Functions:**

7. Lymphatic System – fluid transport, body defense, and disease resistance
8. Respiratory System – exchange gases to supply oxygen and remove carbon dioxide
9. Digestive System – converts food into the raw materials that build and fuel the body (ingestion, digestion, absorption, and defecation)
10. Urinary System – filter fluids, excrete wastes
11. Reproductive System – produce offspring

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**Necessary Life Functions**

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- Maintaining Boundaries
- Movement
- Responsiveness
- Digestion
- Metabolism
- Excretion
- Reproduction
- Growth

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**Homeostasis**

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Maintenance of relatively stable internal conditions in a continuously changing environment.

A dynamic state of equilibrium.

Internal conditions vary within a relatively narrow range.

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**Homeostasis**

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The organs and tissues which maintain homeostasis are called control systems.

Some controls that generate a response to change are built into the organ. This type of mechanism is termed intrinsic control.

However, most control systems are initiated by factors external to the organ and are mediated by either the nervous or endocrine systems. This type of control system is termed extrinsic control.

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**Homeostasis**

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- All homeostatic control mechanisms have at least three components:
  - Receptor – Sensor
  - Control Center – Determines Set Point
  - Effector – Output

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**Homeostasis**

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Components of Feedback Mechanisms:

1. Stimulus: The change from ideal or resting conditions.
2. Receptor: The cells or tissue which detects the change due to the stimulus.
3. Relay: The transmission of the message, via nerves or hormones or both, to the effector.
4. Effector: The cells or tissue, usually a gland or muscles, which cause the response to happen.
5. Response: An action, at cell, tissue or whole organism level which would not have occurred in the absence of the stimulus.
6. Feedback: The consequence of the response on the stimulus. May be positive or negative.

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**Homeostasis**

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- **Feedback Mechanisms:**
  - Negative
  - Positive

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**Negative Feedback**

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- **Most common homeostatic feedback mechanism**
- **The response diminishes the original stimulus**

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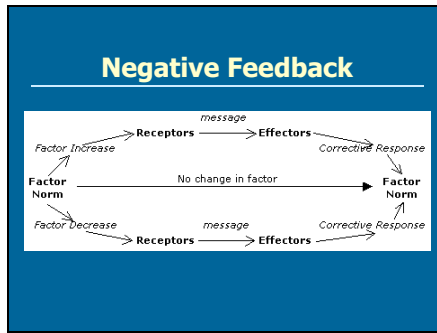
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**Negative Feedback**

Examples:

- Body Temperature – Nervous System
- Blood Calcium Levels – Endocrine System

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**Positive Feedback**

- Rare homeostatic feedback mechanism
- The response enhances the original stimulus

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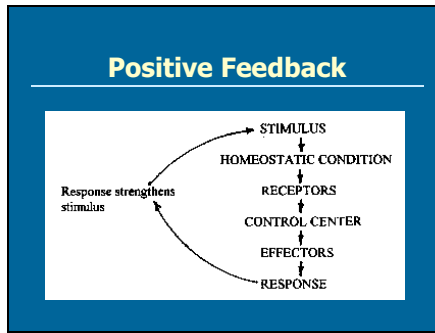
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Slide 31

**Positive Feedback**

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Examples:

- Hemorrhage
- Childbirth
- Lactation

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Slide 32

**Homeostatic Imbalances in the Body**

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1. Integumentary System – Burns, Cutaneous Lesions (Cold Sores, Impetigo, Psoriasis), Skin Cancer
2. Skeletal System – Rickets, Abnormal Spinal Curvatures (Scoliosis, Kyphosis, Lordosis), Osteoporosis

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**Homeostatic Imbalances in the Body**

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3. Muscular System – Muscular Dystrophy, Myasthenia Gravis
4. Nervous System – Multiple Sclerosis, Huntington's Disease, Parkinson's Disease, Alzheimer's Disease

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**Homeostatic Imbalances in the Body**

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5. Endocrine System – Goiter, Graves' Disease, Pituitary Dwarfism, Infertility
6. Cardiovascular System – Pericarditis, Valvular Stenosis, Varicose Veins, Atherosclerosis

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**Homeostatic Imbalances in the Body**

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7. Lymphatic System – Allergies, Immunodeficiencies (SCID, AIDS), Autoimmune Disease (Lupus, Rheumatoid Arthritis, etc)
8. Respiratory System – Sinusitis, Tonsillitis, Pleurisy, Emphysema, Bronchitis, Cystic Fibrosis

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**Homeostatic Imbalances in the Body**

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9. Digestive System – Gallstones, Heartburn, Gastric Ulcers
10. Urinary System – Kidney Stones, Addison's Disease, Polycystic Kidney Disease

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**Homeostatic Imbalances in the Body**

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11. Reproductive System – Pelvic Inflammatory Disease, Cervical Cancer, Testicular Cancer

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**Learning Objectives**

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- List the functional characteristics necessary to maintain life
- Define homeostasis
- Identify the hierarchy of structural organization
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**Learning Objectives**

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1. Which one of the following is NOT a major functional characteristic of all organisms?

- a. Movement
- b. Respond to the environment
- c. Excretion of nutrients
- d. Metabolism
- e. Maintenance of boundaries

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Slide 40

**Learning Objectives**

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2. The tendency of living organisms to maintain constant internal conditions within rather narrow limits is called

- a. Metabolism
- b. Homeostasis
- c. Bioenergetics
- d. Physiology
- e. Allosterism

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**Learning Objectives**

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3. The correct sequence of levels in the structural hierarchy of humans is

- a. organs, organ systems, cells, tissues, organism
- b. cells, tissues, organism, organs, organ systems
- c. organism, organs, organ systems, tissues, cells
- d. cells, tissues, organs, organ systems, organism
- e. cells, organs, tissues, organism, organ systems

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**Learning Objectives**

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4. The most common lethal genetic disease in the US strikes 1 in 2400 births. This genetic disease causes over-secretion of a viscous mucus that clogs respiratory passages, providing a breeding ground for airborne bacteria. This genetic disease is known as

- a. Tuberculosis
- b. Multiple Sclerosis
- c. Asthma
- d. Chronic Obstructive Pulmonary Disease
- e. Cystic Fibrosis

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**Anatomy and  
Physiology Review**

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