Hole’s Human Anatomy and Physiology

Chapter 1
Chapter 1
Introduction to Human Anatomy and Physiology
Levels of Organization

Subatomic Particles – electrons, protons, neutrons
Atom – hydrogen atom, lithium atom
Molecule – water molecule, glucose molecule
Macromolecule – protein molecule, DNA molecule
Organelle – mitochondrion, Golgi apparatus, nucleus
Cell – muscle cell, nerve cell
Tissue – simple squamous epithelium, loose connective tissue
Organ – skin, femur, heart, kidney
Organ System – skeletal system, digestive system
Organism - human
Anatomy and Physiology

**Anatomy** – study of structure  
(Greek – “a cutting up”)

**Physiology** – study of function  
(Greek – “relationship to nature”)

Structure is always related to function
Clinical Application
Medical Imaging

• Noninvasive procedures
• Provide images of soft internal structures

Ultrasonography
• Use of high-frequency sound waves
• Relatively quick and inexpensive

Magnetic Resonance Imaging
• Requires injection of dye
• Produces computerized images from different angles
Characteristics of Life

**Movement** – change in position; motion

**Responsiveness** – reaction to a change

**Growth** – increase in body size; no change in shape

**Reproduction** – production of new organisms and new cells

**Respiration** – obtaining oxygen; removing carbon dioxide; releasing energy from foods
Characteristics of Life

**Digestion** — breakdown of food substances into simpler forms

**Absorption** — passage of substances through membranes and into body fluids

**Circulation** — movement of substances in body fluids

**Assimilation** — changing of absorbed substances into chemically different forms

**Excretion** — removal of wastes produced by metabolic reactions
Requirements of Organisms

Life depends on five environmental factors

- water
- food
- oxygen
- heat
- pressure
Requirements of Organisms

Water
- most abundant substance in body
- required for metabolic processes
- required for transport of substances
- regulates body temperature

Food
- provides necessary nutrients
- supplies energy
- supplies raw materials
Requirements of Organisms

**Oxygen (Gas)**
- one-fifth of air
- used to release energy from nutrients

**Heat**
- form of energy
- partly controls rate of metabolic reactions

**Pressure**
- application of force on an object
- atmospheric pressure – important for breathing
- hydrostatic pressure – keeps blood flowing
Homeostasis

Body’s maintenance of a stable internal environment

**Homeostatic Mechanisms** – monitor aspects of the internal environment and corrects any changes

- **Receptors** - provide information about stimuli

- **Control center** - tells what a particular value should be (includes a set point)

- **Effectors** - elicit responses that change conditions in the internal environment
Homeostatic Mechanisms

- **Control center (set point)**
  - (Change is compared to the set point.)

- **Receptors**
  - **Stimulus**
    - (Change occurs in internal environment.)

- **Effectors (muscles or glands)**
  - **Response**
    - (Change is corrected.)
Homeostatic Mechanisms

Control center
The hypothalamus detects the deviation from the set point and signals effector organs.

Receptors
Thermoreceptors send signals to the control center.

Effectors
Skin blood vessels dilate and sweat glands secrete.

Stimulus
Body temperature rises above normal.

Response
Body heat is lost to surroundings, temperature drops toward normal.

Normal body temperature
37 °C (98.6 °F)

Stimulus
Body temperature drops below normal.

Response
Body heat is conserved, temperature rises toward normal.

Receptors
Thermoreceptors send signals to the control center.

Effectors
Skin blood vessels constrict and sweat glands remain inactive.

Effectors
Muscle activity generates body heat.

If body temperature continues to drop, control center signals muscles to contract involuntarily.
Thoracic & Abdominal Membranes

Visceral layer – covers an organ
Parietal layer – lines a cavity or body wall

Thoracic Membranes
• Visceral pleura
• Parietal pleura
• Visceral pericardium
• Parietal pericardium

Abdominopelvic Membranes
• Parietal peritoneum
• Visceral peritoneum
Serous Membranes
Organ Systems

Integumentary system
Organ Systems

Skeletal system

Muscular system
Organ Systems

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

Nervous system

Endocrine system
Organ Systems

Cardiovascular system

Lymphatic system
Organ Systems

Male reproductive system

Female reproductive system
Anatomical Terminology

Anatomical Position – standing erect, facing forward, upper limbs at the sides, palms facing forward

Terms of Relative Position
- Superior versus Inferior
- Anterior versus Posterior
- Medial versus Lateral
- Ipsilateral versus Contralateral
- Proximal versus Distal
- Superficial versus Peripheral
- Deep
Body Sections

• Sagittal / Midsagittal or Median / Parasagittal
• Transverse or Horizontal
• Coronal or Frontal
• Cross section, Oblique, Longitudinal
Body Sections

A section along the midsagittal plane (median plane)

A section along a transverse plane (horizontal plane)

A section along a coronal plane (frontal plane)
Body Sections
Body Sections
Abdominal Subdivisions