Chapter 1

Body Organization

♦ Definition of Human Sexuality

**human sexuality**
- the behavioral, social, and biological influences that affect the sexual attraction between one human and another

♦ Levels of Body Organization
- In order to study human sexuality, one must understand the levels of body organization (Figure 1.1, Derrickson):

```
+-----------+
| atoms     |
+-----------+
    |    |
    |    |
+-----------+
| molecules |
+-----------+
    |    |
    |    |
+-----------+
| cells     |
+-----------+
    |    |
    |    |
+-----------+
| tissues   |
+-----------+
    |    |
    |    |
+-----------+
| organs    |
+-----------+
    |    |
    |    |
+-----------+
| organ systems |
+-----------+
    |    |
    |    |
+-----------+
| organism  |
```
atom
-the smallest stable unit of matter
-Examples:
  • a carbon (C) atom
  • a hydrogen (H) atom
  • an oxygen (O) atom
  • a nitrogen (N) atom
  • a phosphorus (P) atom

molecule
- a chemical component that consists of two or more atoms that are joined together by covalent bonds (i.e. electron sharing).
-Examples:
  • a molecule of water (H2O)
  • a molecule of ammonia (NH3)
  • a molecule of glucose (C6H12O6)
  • a molecule of protein
  • a molecule of deoxyribonucleic acid (DNA)

cell
-the smallest unit of life
-Examples:
  • a neuron (brain cell)
  • an epithelial cell
  • a muscle cell
  • a red blood cell

-Components of a Cell
-A cell contains the following components (Figure 1.2, Derrickson):
  1. plasma membrane
     -also called the cell membrane
     -regulates the movement of substances into and out of the cell
  2. cytosol
     -the fluid within the cell
     -consists of H2O (the main component) and dissolved substances such as nutrients like glucose
  3. nucleus
     -contains the cell’s DNA, which is organized into chromosomes
     -The chromosomes contain genes, which are sequences of DNA that determine our physical traits.
  4. mitochondrion
     -The mitochondrion (plural is mitochondria) is the “power house” of the cell.
     -synthesizes adenosine triphosphate (ATP), which is used as an energy source
  5. ribosomes
     -the sites where protein synthesis occurs
tissue
-a group of similar cells that perform a common function

-There are 4 major types of tissues: epithelial tissue, connective tissue, muscle tissue, and nervous tissue.

1. epithelial tissue
-tissue that covers the body, lines hollow organs, and forms glands

-Examples of Epithelial Tissue
  ● Epithelial tissue covers the body.
    -The epidermis (outer layer of the skin) is epithelial tissue (Figure 1.3, Derrickson).
  ● Epithelial tissue lines hollow organs.
    -Epithelial tissue lines the lumen (interior space) of hollow organs such as the stomach, intestines, blood vessels, vagina, uterus, and Fallopian (uterine) tubes (Figure 1.4, Derrickson).
  ● Epithelial tissue forms glands.

   gland
   -a cluster of epithelial cells that secrete substances

-There are 2 major types of glands: exocrine glands and endocrine glands (Figure 1.5, Derrickson).

   a. exocrine glands
   -glands that secrete substances into body cavities or onto the body surface through ducts
   -Examples
     1. salivary glands
        -secrete saliva into the mouth (oral cavity) (Figure 1.6, Derrickson)
     2. mammary glands
        -located in the breast (Figure 3.8, Crooks)
        -secrete milk
     3. sweat glands
        -located in the skin
        -secrete sweat onto the skin surface (Figure 1.3, Derrickson)
b. endocrine glands

- ductless glands that secrete hormones into the blood
  - The hormone then travels to its target cell to cause a specific biological response.
- Examples of endocrine glands (Figure 1.7, Derrickson)
  1. pituitary gland
  2. thyroid gland
  3. parathyroid glands
  4. adrenal glands
  5. pancreas
  6. ovaries
  7. testes

2. connective tissue
- tissue that supports, insulates, and protects organs
- Examples
  ● adipose tissue
    - connective tissue that stores triglycerides (fat) (Figure 1.8, Derrickson)
  ● dermis
    - connective tissue that forms the inner layer of the skin (Figure 1.9, Derrickson)
  ● bone tissue
    - hard connective tissue that forms bones (Figure 1.10, Derrickson)
  ● cartilage
    - connective tissue that is resilient (i.e. its shape bounces back after being deformed)
    - located in many places throughout the body: nose, external ear, and larynx (Adam’s apple) (Figure 1.11, Derrickson)
  ● blood
    - fluid connective tissue found in the blood vessels of the body
    - consists of blood cells (such as red blood cells, white blood cells, and platelets) and a fluid called plasma that consists of H₂O, ions, nutrients, gases, wastes, etc. (Figure 1.12, Derrickson).
3. **muscle tissue**
   - also called **muscular tissue**

   - tissue that contracts (shortens) in order to cause movements of different parts of the body

   - 3 types
     a. **skeletal muscle**
       - muscle tissue that attaches to the bones of the body (Figure 1.13, Derrickson)
       - striated (contains alternating light and dark bands)
       - voluntarily controlled

     b. **cardiac muscle**
       - muscle tissue that forms the bulk of the heart wall (Figure 1.14, Derrickson)
       - striated
       - involuntarily controlled

     c. **smooth muscle**
       - muscle tissue that is located within the walls of hollow organs (blood vessels, stomach, intestines, uterus, etc.) (Figure 1.15, Derrickson)
       - looks smooth because it lacks striations
       - involuntarily controlled

4. **nervous tissue**
   - tissue that detects and responds to changes in the environment
   - found in the brain, spinal cord, and nerves of the body
   - consists of cells called **neurons** (Figure 1.16, Derrickson)

**organ**
- a component of the body that consists of two or more different types of tissues that have a common function and typically have a characteristic shape
- Examples:
  - brain
  - kidney
  - heart
  - large intestine
  - lungs
  - liver
organ system
-an interaction of organs that perform a common function
-Examples:
  • digestive system
  • nervous system
  • cardiovascular system
  • respiratory system
  • urinary system
  • reproductive system

organism
-the living individual formed by the interaction of all of the organ systems of the body
Figure 1.1
Levels of Body Organization

**CHEMICAL LEVEL**
Atoms (C, H, O, N, P) → Molecule (DNA)

**CELLULAR LEVEL**
Smooth muscle cell

**TISSUE LEVEL**
Smooth muscle tissue

**SYSTEM LEVEL**
Pharynx
Esophagus
Liver
Stomach
Pancreas
Gallbladder
Small intestine
Large intestine
Digestive system

**ORGAN LEVEL**
Stomach
Epithelial tissue
Smooth muscle tissue layers
Outer layer of epithelial tissue and connective tissue

**ORGANISMAL LEVEL**
Figure 1.2
Parts of a Human Body Cell

- Plasma membrane
- Cytosol
- Ribosome
- Mitochondrion
- Nucleus
Figure 1.3
Example of Epithelial Tissue

- Epidermis (outer layer) of the skin
Figure 1.4
Example of Epithelial Tissue
● Inside layer lining the lumen of a hollow organ
Figure 1.5
Example of Epithelial Tissue
- Glands

General structure of a gland
Figure 1.6
Examples of Exocrine Glands
● Salivary Glands
Figure 1.7
Examples of Endocrine Glands

- Pineal gland
- Hypothalamus
- Pituitary gland
- Parathyroid glands (behind thyroid gland)
- Thyroid gland
- Skin
- Thymus
- Heart
- Liver
- Stomach
- Adrenal Gland
- Kidney
- Pancreas
- Small Intestine
- Ovary (in females)
- Testes
Figure 1.8
Example of Connective Tissue
• Adipose Tissue
Figure 1.9
Example of Connective Tissue
• Dermis (inner layer) of the skin
Figure 1.10
Example of Connective Tissue

- Bone Tissue
Figure 1.11
Example of Connective Tissue
- Cartilage
Figure 1.12
Example of Connective Tissue
● Blood
Figure 1.13
Example of Muscle Tissue
• Skeletal Muscle
Figure 1.14
Example of Muscle Tissue
• Cardiac Muscle
Figure 1.15
Example of Muscle Tissue
• Smooth Muscle
Figure 1.16
Example of Nervous Tissue

Spinal cord

Dendrite
Nucleus of neuroglial cell
Nucleus in cell body
Axon

Neuron of spinal cord