LESSON ASSIGNMENT

LESSON 1

Introduction to Basic Human Anatomy.

TEXT ASSIGNMENT

Paragraphs 1-1 through 1-15.

LESSON OBJECTIVES

After completing this lesson, you should be able to:

1-1. Define anatomy.

1-2. Characterize individuals according to body type and state clinical significance.

1-3. Identify kinds of anatomical studies.

1-4. Trace the organization of the human body into cells, tissues, organs, organ systems, and the total organism.

1-5. List the parts of an upper member and the parts of a lower member.

1-6. Identify a reason for studying terminology.

1-7. Define the anatomical position.

1-8. Given drawings illustrating planes and directions, name the planes and directions.

1-9. Define the cell and match names of major components with drawings representing them.

SUGGESTION

After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.
LESSON 1
INTRODUCTION TO BASIC HUMAN ANATOMY

Section I. GENERAL

1-1. DEFINITIONS

a. Anatomy is the study of the structure of the body. Often, you may be more interested in functions of the body. Functions include digestion, respiration, circulation, and reproduction. Physiology is the study of the functions of the body.

b. The body is a chemical and physical machine. As such, it is subject to certain laws. These are sometimes called natural laws. Each part of the body is engineered to do a particular job. These jobs are functions. For each job or body function, there is a particular structure engineered to do it.

c. In the laboratory, anatomy is studied by dissection (SECT = cut, DIS = apart).

1-2. BODY TYPES

No two human beings are built exactly alike, but we can group individuals into three major categories. These groups represent basic body shapes.

MORPH = body, body form
ECTO = all energy is outgoing
ENDO = all energy is stored inside
MESO = between, in the middle
ECTOMORPH = slim individual
ENDOMORPH = broad individual
MESOMORPH = body type between the two others, "muscular" type

Ectomorphs, slim persons, are more susceptible to lung infections. Endomorphs are more susceptible to heart disease.

1-3. NOTE ON TERMINOLOGY

a. Each profession and each science has its own language. Lawyers have legal terminology. Physicians and other medical professions and occupations have medical
terminology. Accountants have debits, credits, and balance sheets. Physicists have quantums and quarks. Mathematicians have integrals and differentials. Mechanics have carburetors and alternators. Educators have objectives, domains, and curricula.

b. To work in a legal field, you should know the meaning of quid pro quo. To work in a medical field, you should know the meanings of terms such as proximal, distal, sagittal, femur, humerus, thorax, and cerebellum.

1-4. KINDS OF ANATOMICAL STUDIES

a. Microscopic anatomy is the study of structures that cannot be seen with the unaided eye. You need a microscope.

b. Gross anatomy by systems is the study of organ systems, such as the respiratory system or the digestive system.

c. Gross anatomy by regions considers anatomy in terms of regions such as the trunk, upper member, or lower member.

d. Neuroanatomy studies the nervous system.

e. Functional anatomy is the study of relationships between functions and structures.

1-5. ORGANIZATION OF THE HUMAN BODY

The human body is organized into cells, tissues, organs, organ systems, and the total organism.

a. Cells are the smallest living unit of body construction.

b. A tissue is a grouping of like cells working together. Examples are muscle tissue and nervous tissue.

c. An organ is a structure composed of several different tissues performing a particular function. Examples include the lungs and the heart.

d. Organ systems are groups of organs which together perform an overall function. Examples are the respiratory system and the digestive system.

e. The total organism is the individual human being. You are a total organism.
1-6. REGIONS OF THE HUMAN BODY (FIGURE 1-1)

The human body is a single, total composite. Everything works together. Each part acts in association with ALL other parts. Yet, it is also a series of regions. Each region is responsible for certain body activities. These regions are:

a. **Back and Trunk.** The torso includes the back and trunk. The trunk includes the thorax (chest) and abdomen. At the lower end of the trunk is the pelvis. The perineum is the portion of the body forming the floor of the pelvis. The lungs, the heart, and the digestive system are found in the trunk.
b. **Head and Neck.** The brain, eyes, ears, mouth, pharynx, and larynx are found in this region.

c. **Members.**

(1) Each upper member includes a shoulder, arm, forearm, wrist, and hand.

(2) Each lower member includes a hip, thigh, leg, ankle, and foot.

### Section II. ANATOMICAL TERMINOLOGY

#### 1-7. ANATOMICAL TERMINOLOGY

a. As mentioned earlier, you must know the language of a particular field to be successful in it. Each field has specific names for specific structures and functions. Unless you know the names and their meanings, you will have trouble saying what you mean. You will have trouble understanding what others are saying. You will not be able to communicate well.

b. What is a **scientific term**? It is a word that names or gives special information about a structure or process. Some scientific terms have two or three different parts. These parts are known as a **PREFIX**, a **ROOT** (or base), and a **SUFFIX**. An example is the word **subcutaneous**.

    SUB = below prefix

    CUTIS = skin root

    SUBCUTANEOUS = below the skin

A second example is the word **myocardium**.

    MYO = muscle prefix

    CARDIUM = heart root

    MYOCARDIUM = muscular wall of the heart
A third example is the word tonsillitis.

TONSIL = tonsil (a specific organ) root

ITIS = inflammation suffix

TONSILLITIS = an inflammation of the tonsils

1-8. THE ANATOMICAL POSITION

The anatomical position is an artificial posture of the human body (see figure 1-2). This position is used as a standard reference throughout the medical profession. We always speak of the parts of the body as if the body were in the anatomical position. This is true regardless of what position the body is actually in. The anatomical position is described as follows:

a. The body stands erect, with heels together.

b. Upper members are along the sides, with the palms of the hands facing forward.

c. The head faces forward.

1-9. PLANES OF THE BODY

See figures 1-3A through 1-3C for the imaginary planes used to describe the body.

a. Sagittal planes are vertical planes that pass through the body from front to back. The median or midsagittal plane is the vertical plane that divides the body into right and left halves.

b. Horizontal (transverse) planes are parallel to the floor. They are perpendicular to both the sagittal and frontal planes.

c. Frontal (coronal) planes are vertical planes which pass through the body from side to side. They are perpendicular to the sagittal plane.
X is lateral to Y and Z; Y is medial to X and lateral to Z
In the example shown, the body is in the normal anatomical position.

Figure 1-2. Anatomical position and medial-lateral relationships.
Figure 1-3,  A. The sagittal plane.  B. The horizontal plane.  C. The frontal plane.

1-10. DIRECTIONS

a. **Superior, Inferior.** *Superior* means above. *Inferior* means below.

b. **Anterior, Posterior.**

   (1) *Anterior* (or ventral) refers to the front of the body.

   (2) *Posterior* (or dorsal) refers to the back of the body.

c. **Medial, Lateral.** *Medial* means toward or nearer the midline of the body. *Lateral* means away from the midline or toward the side of the body.

d. **Superficial, Deep.** *Superficial* means closer to the surface of the body. *Deep* means toward the center of the body or body part.

e. **Proximal, Distal.** *Proximal* and *distal* are terms applied specifically to the limbs. *Proximal* means nearer to the shoulder joint or the hip joint. *Distal* means further away from the shoulder joint or the hip joint. Sometimes proximal and distal are used to identify the "beginning" and "end" of the gut tract—that portion closer to the stomach being proximal while that further away being distal.
1-11. NAMES

a. Names are chosen to describe the structure or process as much as possible. An international nomenclature was adopted for anatomy in Paris in 1955. It does not use the names of people for structures. (The single exception is the Achilles tendon at the back of the foot and ankle.)

b. Names are chosen to identify structures properly. Names identify structures according to shape, size, color, function, and/or location. Some examples are:

TRAPEZIUS MUSCLE

TRAPEZIUS = trapezoid (shape)

ADDUCTOR MAGNUS MUSCLE

AD = toward

DUCT = to carry (function)

MAGNUS = very large (size)

ERYTHROCYTE

ERYTHRO = red (color)

CYTE = cell

BICEPS BRACHII MUSCLE

BI = two

CEPS = head (shape)

BRACHII = of the arm (location)

Section III. CELLS

1-12. INTRODUCTION

A cell is the microscopic unit of body organization. The "typical animal cell" is illustrated in figure 1-4. A typical animal cell includes a cell membrane, a nucleus, a nuclear membrane, cytoplasm, ribosomes, endoplasmic reticulum, mitochondria, Golgi apparatus, centrioles, and lysosomes.
Figure 1-4. A "typical" animal cell (as seen in an electron microscope).

1-13. MAJOR COMPONENTS OF A "TYPICAL" ANIMAL CELL

a. **Nucleus.** The nucleus plays a central role in the cell. Information is stored in the nucleus and distributed to guide the life processes of the cell. This information is in a chemical form called nucleic acids. Two types of structures found in the nucleus are chromosomes and nucleoli. Chromosomes can be seen clearly only during cell divisions. Chromosomes are composed of both nucleic acid and protein. Chromosomes contain genes. Genes are the basic units of heredity which are passed from parents to their children. Genes guide the activities of each individual cell.

b. **Cell Membrane.** The cell membrane surrounds and separates the cell from its environment. The cell membrane allows certain materials to pass through it as they enter or leave the cell.

c. **Cytoplasm.** The semifluid found inside the cell, but outside the nucleus, is called the cytoplasm.
d. **Mitochondria (Plural).** Mitochondria are the "powerhouses" of the cell. The mitochondria provide the energy wherever it is needed for carrying on the cellular functions.

e. **Endoplasmic Reticulum.** The endoplasmic reticulum is a network of membranes, cavities, and canals. The endoplasmic reticulum helps in the transfer of materials from one part of the cell to the other.

f. **Ribosomes.** Ribosomes are "protein factories" in the cell. They are composed mainly of nucleic acids which help make proteins according to instructions provided by the genes.

g. **Centrioles.** Centrioles help in the process of cell division.

h. **Lysosomes.** Lysosomes are membrane bound spheres which contain enzymes that can digest intracellular structures or bacteria.

1-14. **CELL MULTIPLICATION (MITOSIS)**

Individual cells have fairly specific life spans. Some types of cells have longer life spans than others. During the processes of growth and repair, new cells are being formed. The usual process of cell multiplication is called mitosis. There are two important factors to consider:

a. From one cell, we get two new cells.

b. The genes of the new cells are identical (for all practical purposes) to the genes of the original cell.

1-15. **HYPERTROPHY/HYPERPLASIA**

Hypertrophy and hyperplasia are two ways by which the cell mass of the body increases.

a. With HYPERTROPHY, there is an increase in the **size** of the individual cells. No new cells are formed. An example is the enlargement of muscles due to exercise by the increased diameter of the individual striated muscle fibers.

b. With HYPERPLASIA, there is an increase in the total number of cells. An example of abnormal hyperplasia is cancer.

c. ATROPHY is seen when there is a loss of cellular mass.

*Continue with Exercises*                    *Return to Table of Contents*
EXERCISES, LESSON 1

REQUIREMENT. The following exercises are to be answered by completing the incomplete statement or by writing the answer in the space provided at the end of the question. After you have completed all the exercises, turn to "Solutions to Exercises," at the end of the lesson and check your answers.

1. What is anatomy?

2. What is the body type for each of the following individuals?
   A broad individual: ________________________________.
   A slim individual: ________________________________.
   A person with average build: ________________________.

3. What kind of anatomical study is described by each of the items below?
   Study of structures that cannot be seen with the unaided eye: ________________________________.
   Study of relationships between functions and structures: ________________________________.
   Study of the nervous system: ________________.
   Study of organ systems: ________________.

4. What are the five levels or systems into which the body is organized, in ascending order?
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
5. What is a cell?

6. What is a tissue?

7. What is an organ?

8. What is an organ system?

9. What is the total organism?

10. What are the parts of the upper member? __________, __________, ____________, ____________, ____________, and ____________.

11. What are the parts of the lower member? ____________, ____________, ____________, ____________, ____________, and ____________.

12. What is one reason for studying terminology?

13. Describe the anatomical position.
   a. The body stands _______ with _______ together.
   b. The upper members are along the _______ with palms facing _______.
   c. The head faces _______.
14. Each plane in figure 1-5 is marked by a letter a, b, c, or d. Write the name of each plane in the appropriate space below.

a. _________ plane.

b. _________ plane.

c. _________ plane.

d. _________ plane.

Figure 1-5. Planes of the body (exercise 14).
15. In figure 1-6, three points are labeled a, b, and c, and two borders are labeled d and e. It is correct to say that a is _____ to b and c, b is _____ to a and _____ to c, and c is _____ to a and b. We speak of d as the _____ border. We speak of e as the _____ border.

Figure 1-6. Directions (exercise 15).
16. In figure 1-7, three portions of the arm are marked a, b, and c. The two ends of the arm are marked d and e. The portion marked a is the _____ third. The portion marked c is the _____ third. The end marked d is the _____ end. The end marked e is the _____ end.

Figure 1-7. Directions upon members (exercise 16).

17. A cell is the ______________ unit of body organization.
18. In figure 1-8, parts of a "typical animal cell" are marked with the letters a through g. In the spaces below, provide the name of each structure.

a. 

b. 

c. 

d. 

e. 

f. 

g. 

Figure 1-8. A "typical" animal cell (exercise 18).

*Check Your Answers on Next Page*
SOLUTIONS TO EXERCISES, LESSON 1

1. Anatomy is the study of the structure of the body. (para 1-1a)

2. A broad individual: **endomorph**.
   A slim individual: **ectomorph**.
   A person with average build: **mesomorph**. (para 1-2)

3. Study of structures that cannot be seen with the unaided eye: **microscopic anatomy**.
   Study of relationships between functions and structures: **functional anatomy**.
   Study of the nervous system: **neuroanatomy**.
   Study of organ systems: **gross anatomy by systems**. (para 1-4)

4. The body is organized into **cells**, **tissues**, **organs**, **organ systems**, and the total organism. (para 1-5)

5. A cell is the smallest discrete living unit of the body construction. (para 1-5a)

6. A tissue is a grouping of like cells working together. (para 1-5b)

7. An organ is a structure composed of several different tissues performing a particular function. (para 1-5c)

8. An organ system is a group of organs performing an overall function together. (para 1-5d)

9. The total organism is the individual human being. (para 1-5e)

10. The parts of the upper member are the **shoulder**, **arm**, **forearm**, **wrist**, and **hand**. (para 1-6c(1))

11. The parts of the lower member are the **hip**, **thigh**, **leg**, **ankle**, and **foot**. (para 1-6c(2))

12. One reason for studying terminology is to be successful in a medical field. Another reason is to be able to communicate well. (para 1-7a)

13. The anatomical position is described as follows:
   a. The body stands erect, with **heels** together.
   b. The upper members are along the sides, with palms facing forward.
   c. The head faces **forward**. (para 1-8)
14.  a.  Midsagittal or median plane.
    b.  Sagittal plane.
    c.  Horizontal or transverse plane.
    d.  Frontal or coronal plane.  (para 1-9)

15.  It is correct to say that a is lateral to b and c, b is medial to a and lateral to c, and c is medial to a and b.  We speak of d as the lateral border.  We speak of e as the medial border.  (para 1-10c)

16.  The portion marked a is the distal third.  The portion marked c is the proximal third.  The end marked d is the distal end.  The end marked e is the proximal end.  (para 1-10e)

17.  A cell is the microscopic unit of body organization.  (para 1-12)

18.  a.  Ribosomes.
    b.  Mitochondrion.
    c.  Endoplasmic reticulum.
    d.  Nucleus.
    e.  Centrioles.
    f.  Cytoplasm.
    g.  Cell membrane.  (fig 1-4)