

FOR STUDENT

MANUAL LAB ACTIVITY

Study Skill & Critical Thinking

1st Semester

Academic Year 2019/2020

WEEK 2



Universitas Islam Bandung
Faculty of Medicine
2019

Introduction

Learning Skills and Critical Thinking Block is the first module in undergraduate medical curriculum of the Faculty of Medicine Unisba and last for 3 weeks. This module aims to enable students to understand the principles of learning of medicine and be able to apply these principles well to be a competent doctor in the future.

The learning of this block aims to make students have an understanding of the principles of learning in taking medical education and the principles of scientific methods in gathering information, as well as the skills to use, assess and manage information in a valid and critical manner, the ability to be self-aware, self-development and lifelong learning, as well as the ability to trace and critically examine various scientific information in order to obtain appropriate, trusted and useful learning resources.

The Lab Activity Module of learning skills and critical thinking is applied in the first semester with the number of meetings 3 times in 3 weeks and provides some provisions for students to understand the basic medical terms and basic literatures needed in education in the next semester.

Learning Outcomes:

After completing this lab activity series students can:

1. Know the language structure of medical and health terminology
2. Recognizing basic terms and body of knowledge in medicine and health
3. Knowing the types of literature and their priorities in supporting learning
4. Applying the effective reading method of literature books in medicine
5. Using Mind Mapping in the learning process

Materials

1. Lab Activity Manual
2. LCD Projector
3. Flipchart Paper and Stands
4. Board marker pen (Three Color)
5. E-book (selected chapter)
6. Medical Dictionary (Dorland, etc.)
7. English-English dictionary (recommended as priority) or English-Indonesia Dictionary
8. Laptop for tutor

Methods:

1. Homework assignment
2. Pre-test
3. Discussion
4. Presentation
5. Demonstration
6. Module Practice
7. Feedback
8. Take home self-assignment

References and Further Readings:

1. Gylys, Barbara A. 2009. Medical terminology systems: a body systems approach / 6th ed. Philadelphia. FA. Davis Company
2. Christy Hicks. 2012. Medical Terminology. Clayton State University.
3. Logic. 2016. Medical Terminology Study Guide. Retrieved September 12, 2018. <http://www.dmu.edu/medterms/welcome/>
4. Walker S, Wood M, Nicol J. 2017. Mastering Medical Terminology-2nd edition. Elsevier.
5. Latha Chandran MD, MPH, Study Skills for Medical Students: Part II, Associate Dean, Academic Advising Interim Chair. Dept of Pediatrics
6. Frank, S. (1996). The Everything Study Book. Avon, MA: Adams Media Corporation.
7. Lodish, et al. 2003. Molecular Cell Biology. Garland Science.

WEEK 2

Medical Terminology 2 – Basic Medical Terminology & Body of Knowledge

Activity Outline:

- Summarizing e-book chapter
- Pre-activity discussion (Lesson learned)
- Identifying basic medical terminology in cell biology and Anatomy
- Lab-Activity Task
- Post Test/Home Assignment

Specific Objectives

Upon completion of this activity, you will be able to:

1. Define anatomy and use anatomic reference systems to identify the anatomic position, body planes, directions, and cavities.
2. Recognize, define, spell, and pronounce the terms related to the structure, function of human body.
Identify the body systems in terms of their major structures, functions, and related word parts.
3. Recognize, define, spell, and pronounce the terms related to types of diseases and the body of knowledge/branch and or specialties in medicine

PRE-LAB ACTIVITY HOMEWORK ASSIGNMENT (TUGAS PRA LABORATORIUM DI RUMAH-DIKUMPULKAN SAAT KEGIATAN LAB)!

Read the chapter of Introduction to clinically oriented anatomy from the book “Clinical Oriented Anatomy” Keith L. Moore 6th edition Human and make a summary in a polio paper.

This task must be completed at home and collected to the lecturer before the implementation of the lab activity)

PART ONE - LEVELS OF BODY ORGANIZATION

Levels of Organization

The body is made up of several levels of structure and function. Each of these levels builds on the previous level, and contributes to the structure and function of the entire organism. (See Figure 4–1.)

The levels of organization from least to most complex are:

- cell
- tissue
- organ
- system
- organism.

Cell

The study of the body at the cellular level is called *cytology*. The cell is the structural and functional unit of life. Body cells perform all activities associated with life, including utilizing food, eliminating waste, and reproducing. Cells consist of a cell membrane that encloses cytoplasm and a nucleus.

Cell Membrane and Cytoplasm

The cell membrane acts as a barrier that encloses the entire cell. It controls the transport of many substances to and from the cell. Within the cell membrane is a jellylike matrix of proteins, salts, water, dissolved gases, and nutrients called **cytoplasm**. Inside the cytoplasm are various structures called **organelles** that provide specialized functions for the cell. The largest cell organelle is the nucleus.

Nucleus

The nucleus is responsible for **metabolism**, growth, and reproduction. It also carries the genetic blueprint of the organism. This blueprint is found in a complex molecule called **deoxyribonucleic acid (DNA)** that is organized into threadlike structures called **chromatin**. When the cell is ready to divide, chromatin forms **chromosomes**, which carry thousands of genes that make up our genetic blueprint. In the human, there are about 31,000 genes that determine unique human characteristics. Genes pass biological information from one generation to the next. This biological information includes such traits as hair color, body structure, and metabolic activity. In the human, all cells except sperm cells and egg cells contain 23 pairs, or 46 chromosomes.

Tissue

Groups of cells that perform a specialized activity are called *tissues*. The study of tissues is called *histology*. Between the cells that make up tissues are varying amounts and types of nonliving, intercellular substances that provide pathways for cellular interaction. More than 200 cell types compose four major tissues of the body:

- **Epithelial tissue** covers surfaces of organs, lines cavities and canals, forms tubes and ducts, provides the secreting portions of glands, and makes up the epidermis of the skin. It is composed of cells arranged in a continuous sheet consisting of one or more layers.
- **Connective tissue** supports and connects other tissues and organs. It is made up of diverse cell types, including fibroblasts, fatcells, and blood.
- **Muscle tissue** provides the contractile tissue of the body, which is responsible for movement.
- **Nervous tissue** transmits electrical impulses as it relays information throughout the entire body.

Organ

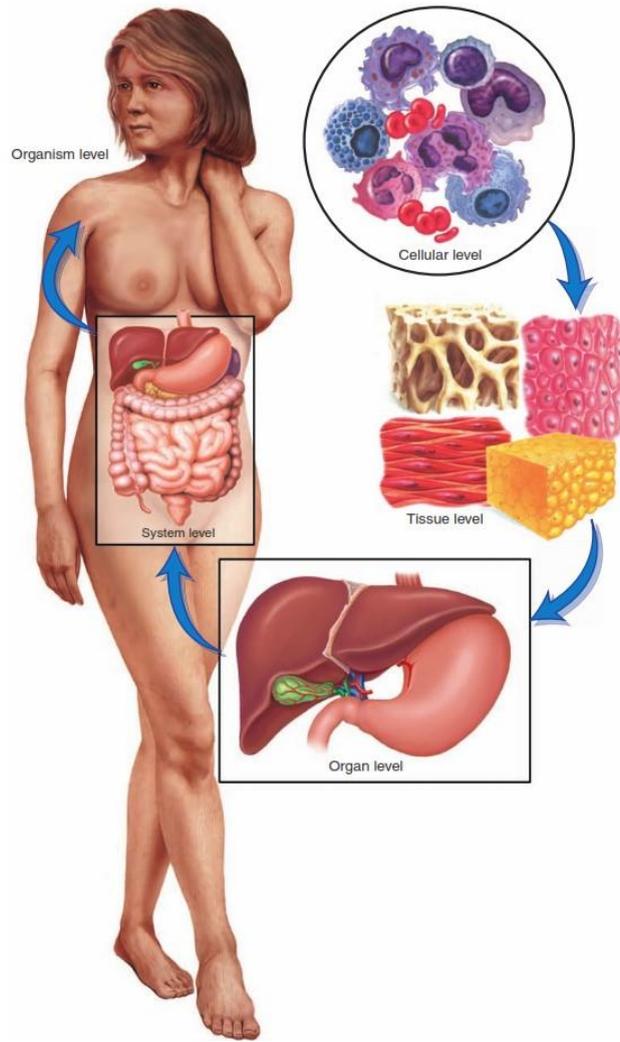
Organs are body structures that perform specialized functions. They are composed of at least two or more tissue types. For example, the stomach is made up of connective tissue, muscle tissue, epithelial tissue, and nervous tissue. Muscle and connective tissue form the wall of the stomach. Epithelial and connective tissue cover the inner and outer surfaces of the stomach. Nervous tissue penetrates the epithelial lining of the stomach and its muscular wall to stimulate the release chemicals for digestion and contraction for **peristalsis**.

System

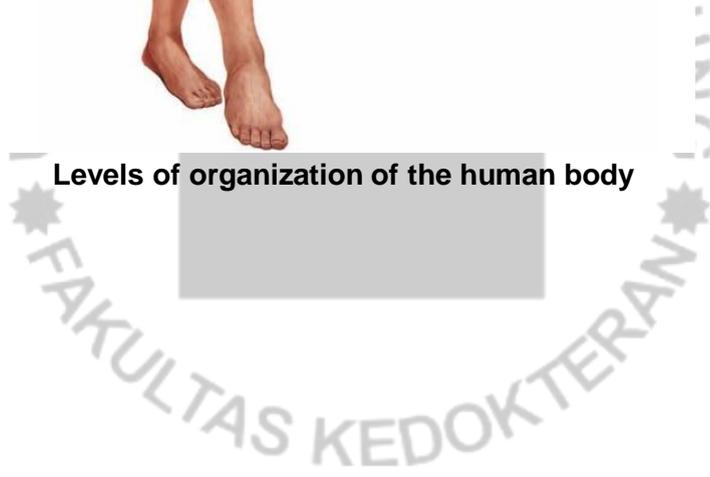
A body system is composed of varying numbers of organs and accessory structures that have similar or related functions. For example, organs of the gastrointestinal system include the esophagus, stomach, small intestine, and bowel. Some of its accessory structures include the liver, gallbladder, and pancreas. The purpose of this system is to digest food, remove and use its nutrients, and expel waste products. Other body systems include the reproductive, respiratory, urinary, and cardiovascular systems.

Organism

The highest level of organization is the organism. An organism is a complete living entity capable of independent existence. All complex organisms, including humans, are made up of several body systems that work together to sustain life.



Levels of organization of the human body



LAB ACTIVITY LEARNING ACTIVITIES I

Learning Activity I-1

Matching Word Elements

Match the blanks with an appropriate meaning!

1.	Chromatin	a. Study of the nature of diseases, their causes, development, and consequences.
2.	chromosome	b. Molecule that holds genetic information capable of replicating and producing an exact copy whenever the cell divides
3.	cytoplasm	c. Cellular structure that provides a specialized function, such as the nucleus (reproduction), ribosomes (protein synthesis), Golgi apparatus (removal of material from the cell), and lysosomes (digestion)
4.	deoxyribonucleic acid (DNA)	d. Structural component of the nucleus composed of nucleic acids and proteins.
5.	metabolism	e. Threadlike structures within the nucleus composed of a deoxyribonucleic acid (DNA) molecule that carries hereditary information encoded in genes
6.	organelle	f. Sum of all physical and chemical changes that take place in a cell or an organism
7.	pathology	g. Jellylike substance found within the cell membrane composed of proteins, salts, water, dissolved gases, and nutrients

<picture of cell>

Learning Activity I-2

Matching Word Elements

Match the following word elements with the definitions in the numbered list.

caud/o
dist/o
dors/o
etilo
hist/o
idilo
jaund/o

kary/o
leuk/o
morph/o
polilo
somat/o
viscer/o

-genesis
-gnosis
-graphy

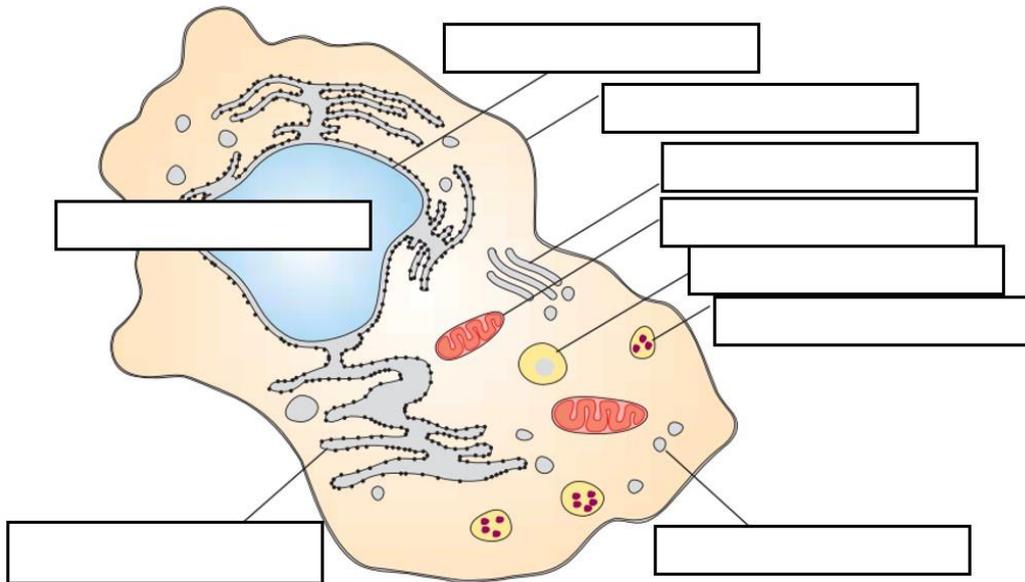
ad
infra
ultra

1. _____ nucleus
2. _____ far, farthest
3. _____ process of recording
4. _____ knowing
5. _____ white
6. _____ internal organs
7. _____ yellow
8. _____ tissue
9. _____ forming, producing, origin
10. _____ below, under
11. _____ excess, beyond
12. _____ tail
13. _____ back (of body)
14. _____ gray
15. _____ cause
16. _____ form, shape, structure
17. _____ dry
18. _____ unknown, peculiar
19. _____ toward
20. _____ body

Learning Activity 1-3

Matching Word Elements

Label the following illustration using the terms below.



Nucleus

Nuclear Membrane

Peroxisome

Mitochondria

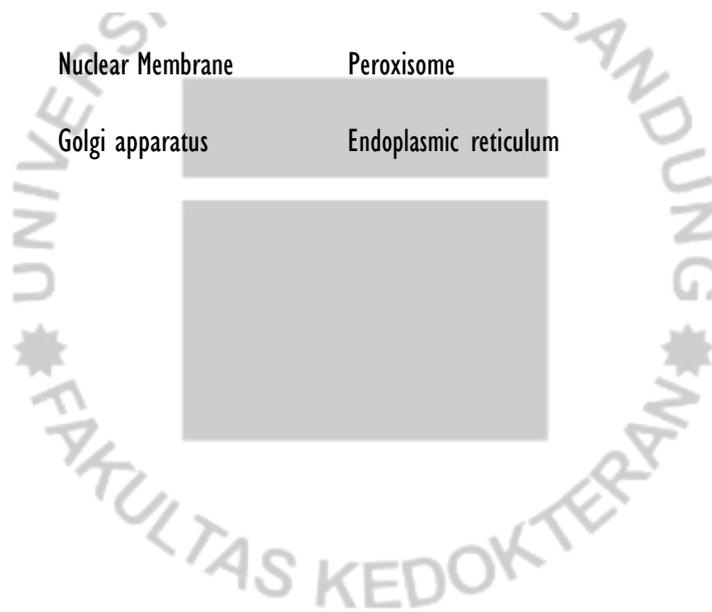
Lysosome

Golgi apparatus

Endoplasmic reticulum

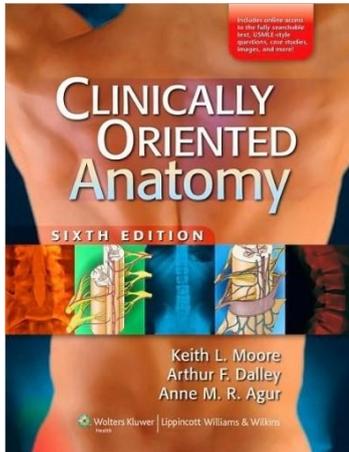
Plasma membrane

Secretory vesicle



PART TWO – ANATOMY

Read the chapter of Introduction to clinically oriented anatomy from the book “Clinical Oriented Anatomy” Keith L. Moore 6th edition.



Introduction to Clinically Oriented Anatomy

APPROACHES TO STUDYING ANATOMY

Anatomy is the setting (structure) in which the events (functions) of life occur. This book deals mainly with functional human gross anatomy—the examination of structures of the human that can be seen without a microscope. The three main approaches to studying anatomy are regional, systemic, and clinical (or applied), reflecting the body's organization and the priorities and purposes for studying it.

Regional Anatomy

Regional anatomy (topographical anatomy) considers the organization of the human body as major parts or segments (Fig. 1.1): a main body, consisting of the head, neck, and trunk (subdivided into thorax, abdomen, back, and pelvis/perineum), and paired upper limbs and lower limbs. All the major parts may be further subdivided into areas and regions. Regional anatomy is the method of studying the body's structure by focusing attention on a specific part (e.g., the head), area (the face), or region (the orbital or eye region); examining the arrangement and relationships of the various systemic structures (muscles, nerves, arteries, etc.) within it; and then usually continuing to study adjacent regions in an ordered sequence. Outside of this Introduction, the regional approach is followed in this book, with each chapter addressing the anatomy of a major part of the body. This is the approach usually followed in anatomy courses that have a laboratory component involving dissection. When studying anatomy by this approach, it is important to routinely put the regional anatomy into the context of that of adjacent regions, parts, and of the body as a whole.

Regional anatomy also recognizes the body's organization by layers: skin, subcutaneous tissue, and deep fascia covering the deeper structures of muscles, skeleton, and cavities, which contain viscera (internal organs). Many of these deeper structures are partially evident beneath the body's outer covering and may be studied and examined in living individuals via surface anatomy.

Surface anatomy is an essential part of the study of regional anatomy. It is specifically addressed in this book in “surface anatomy sections” (orange background) that provide knowledge of what lies under the skin and what structures are perceptible to touch (palpable) in the living body at rest and in action. We can learn much by observing the external form and surface of the body and by observing or feeling the superficial aspects of structures beneath its surface. The aim of this method is to *visualize* (recall distinct mental images of) structures that confer contour to the surface or are palpable beneath it and, in clinical practice, to distinguish any unusual or abnormal findings. In short, surface anatomy requires a thorough understanding of the anatomy of the structures beneath the surface. In people with stab wounds, for example, a physician must be able to visualize the deep structures that may be injured. Knowledge of surface anatomy can also decrease the need to memorize facts because the body is always available to observe and palpate.

Physical examination is the clinical application of surface anatomy. **Palpation** is a clinical technique, used with **observation** and **listening** for examining the body. *Palpation of arterial pulses*, for instance, is part of a physical examination. Students of many of the health sciences will learn to use instruments to facilitate examination of the body (such as an *ophthalmoscope* for observation of features of the eyeballs) and to listen to functioning parts of the body (a *stethoscope* to auscultate the heart and lungs).

Regional study of deep structures and abnormalities in a living person is now also possible by means of radiographic and sectional imaging and endoscopy. *Radiographic and sectional imaging (radiographic anatomy)* provides useful information about normal structures in living individuals, demonstrating the effect of muscle tone, body fluids and pressures, and gravity that cadaveric study does not. *Diagnostic radiology* reveals the effects of trauma, pathology, and aging on normal structures. In this book, most radiographic and many sectional images are integrated into the chapters where appropriate. The medical imaging sections at the end of each chapter provide an introduction to the techniques of radiographic and sectional imaging and include series of sectional images that apply to the chapter. *Endoscopic techniques* (using an insertable flexible fiber optic device to examine internal structures, such as the interior of the stomach) also demonstrate living anatomy. The detailed and thorough learning of the three-dimensional anatomy of deep structures and their relationships is best accomplished initially by dissection. In clinical practice, surface anatomy, radiographic and sectional images, endoscopy, and your experience from studying anatomy will combine to provide you with knowledge of your patient's anatomy.

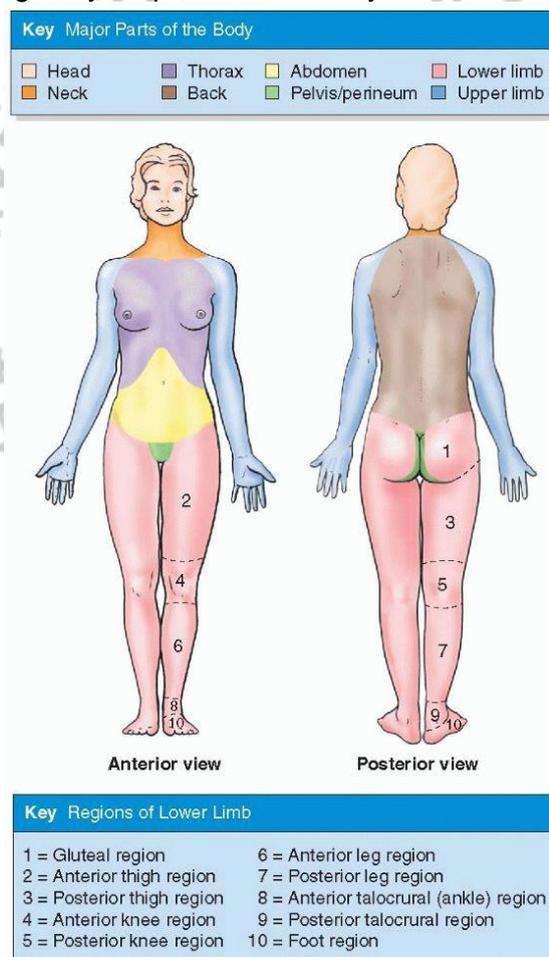


FIGURE I.1. Major parts of the body and regions of the lower limb. Anatomy is described relative to the anatomical position illustrated here.

The computer is a useful adjunct in teaching regional anatomy because it facilitates learning by allowing interactivity and manipulation of two- and three-dimensional graphic models.

Prosections, carefully prepared dissections for the demonstration of anatomical structures, are also useful. However, learning is most efficient and retention is highest when didactic study is combined with the experience of actual dissection—that is, learning by doing. During dissection you observe, palpate, move, and sequentially reveal parts of the body. In 1770, *Dr. William Hunter*, a distinguished Scottish anatomist and obstetrician, stated: “Dissection alone teaches us where we may cut or inspect the living body with freedom and dispatch.”

Systemic Anatomy

Systemic anatomy is the study of the body's organ systems that work together to carry out complex functions. The basic systems and the field of study or treatment of each (in parentheses) are:

- **The integumentary system** (*dermatology*) consists of the skin (L. *integumentum*, a covering) and its appendages—hair, nails, and sweat glands, for example—and the subcutaneous tissue just beneath it. The skin, an extensive sensory organ, forms the body's outer, protective covering and container.
- **The skeletal system** (*osteology*) consists of bones and cartilage; it provides our basic shape and support for the body and is what the muscular system acts on to produce movement. It also protects vital organs such as the heart, lungs, and pelvic organs.
- **The articular system** (*arthrology*) consists of joints and their associated ligaments, connecting the bony parts of the skeletal system and providing the sites at which movements occur.
- **The muscular system** (*myology*) consists of skeletal muscles that act (contract) to move or position parts of the body (e.g., the bones that articulate at joints), or smooth and cardiac muscle that propels, expels, or controls the flow of fluids and contained substance.
- **The nervous system** (*neurology*) consists of the *central nervous system* (brain and spinal cord) and the peripheral nervous system (nerves and ganglia, together with their motor and sensory endings). The nervous system controls and coordinates the functions of the organ systems, enabling the body's responses to and activities within its environment. The sense organs, including the olfactory organ (sense of smell), eye or visual system (ophthalmology), ear (sense of hearing and balance—*otology*), and gustatory organ (sense of taste), are often considered with the nervous system in systemic anatomy.
- **The circulatory system** (*angiology*) consists of the cardiovascular and lymphatic systems, which function in parallel to transport the body's fluids.
 - **The cardiovascular system** (*cardiology*) consists of the heart and blood vessels that propel and conduct blood through the body, delivering oxygen, nutrients, and hormones to cells and removing their waste products.
 - **The lymphatic system** is a network of lymphatic vessels that withdraws excess tissue fluid (lymph) from the body's interstitial (intercellular) fluid compartment, filters it through lymph nodes, and returns it to the bloodstream.
- **The alimentary or digestive system** (*gastroenterology*) consists of the digestive tract from the mouth to the anus, with all its associated organs and glands that function in ingestion, mastication (chewing), deglutition (swallowing), digestion, and absorption of food and the elimination of the solid waste (feces) remaining after the nutrients have been absorbed.
- **The respiratory system** (*pulmonology*) consists of the air passages and lungs that supply oxygen to the blood for cellular respiration and eliminate carbon dioxide from it. The diaphragm and larynx control the flow of air through the system, which may also produce tone in the larynx that is further modified by the tongue, teeth, and lips into speech.
- **The urinary system** (*urology*) consists of the kidneys, ureters, urinary bladder, and urethra, which filter blood and subsequently produce, transport, store, and intermittently excrete urine (liquid waste).

- **The genital (reproductive) system** (*gynecology* for females; *andrology* for males) consists of the gonads (ovaries and testes) that produce oocytes (eggs) and sperms, the ducts that transport them, and the genitalia that enable their union. After conception, the female reproductive tract nourishes and delivers the fetus.
- **The endocrine system** (*endocrinology*) consists of specialized structures that secrete hormones, including discrete ductless endocrine glands (such as the thyroid gland), isolated and clustered cells of the gut and blood vessel walls, and specialized nerve endings. **Hormones** are organic molecules that are carried by the circulatory system to distant effector cells in all parts of the body. The influence of the endocrine system is thus as broadly distributed as that of the nervous system. Hormones influence metabolism and other processes, such as the menstrual cycle, pregnancy, and parturition (giving birth).

None of the systems functions in isolation. The passive skeletal and articular systems and the active muscular system collectively constitute a *supersystem*, the **locomotor system** or **apparatus** (*orthopedics*), because they must work together to produce locomotion of the body. Although the structures directly responsible for locomotion are the muscles, bones, joints, and ligaments of the limbs, other systems are indirectly involved as well. The brain and nerves of the nervous system stimulate them to act; the arteries and veins of the circulatory system supply oxygen and nutrients to and remove waste from these structures; and the sensory organs (especially vision and equilibrium) play important roles in directing their activities in a gravitational environment.

In this Introduction, an overview of several systems significant to all parts and regions of the body will be provided before Chapters 1, 2, 3, 4, 5, 6, 7 and 8 cover regional anatomy in detail. Chapter 9 also presents systemic anatomy in reviewing the cranial nerves.

Clinical Anatomy

Clinical (applied) anatomy emphasizes aspects of bodily structure and function important in the practice of medicine, dentistry, and the allied health sciences. It incorporates the regional and systemic approaches to studying anatomy and stresses clinical application.

Clinical anatomy often involves inverting or reversing the thought process typically followed when studying regional or systemic anatomy. For example, instead of thinking, "The action of this muscle is to ...," clinical anatomy asks, "How would the absence of this muscle's activity be manifest?" Instead of noting, "The ... nerve provides innervation to this area of skin," clinical anatomy asks, "Numbness in this area indicates a lesion of which nerve?"

Clinical anatomy is exciting to learn because of its role in solving clinical problems. The "clinical correlation (blue) boxes" (blue background) throughout this book describe practical applications of anatomy. "Case studies," such as those on the Clinically Oriented Anatomy website (<http://thePoint.lww.com/COA6e>), are integral parts of the clinical approach to studying anatomy.

The Bottom Line STUDYING ANATOMY

Anatomy is the study of the structure of the human body. ♦ Regional anatomy considers the body as organized into segments or parts. ♦ Systemic anatomy sees the body as organized into organ systems. ♦ Surface anatomy provides information about structures that may be observed or palpated beneath the skin. ♦ Radiographic, sectional, and endoscopic anatomy allows appreciation of structures in the living, as they are affected by muscle tone, body fluids

and pressures, and gravity. ♦ Clinical anatomy emphasizes application of anatomical knowledge to the practice of medicine.

ANATOMICOMEDICAL TERMINOLOGY

Anatomical terminology introduces and makes up a large part of medical terminology. To be understood, you must express yourself clearly, using the proper terms in the correct way. Although you are familiar with common, colloquial terms for parts and regions of the body, you must learn the *international anatomical terminology* (e.g., axillary fossa instead of armpit and clavicle instead of collarbone) that enables precise communication among healthcare professionals and scientists worldwide. Health professionals must also know the common and colloquial terms people are likely to use when they describe their complaints. Furthermore, you must be able to use terms people will understand when explaining their medical problems to them.

The terminology in this book conforms to the new *Terminologia Anatomica: International Anatomical Terminology*

(FICAT, 1998). *Terminologia Anatomica* (TA) lists anatomical terms both in Latin and as English equivalents (e.g., the common shoulder muscle is *musculus deltoideus* in Latin and deltoid in English). Most terms in this book are English equivalents. Unfortunately, the terminology commonly used in the clinical arena may differ from the official terminology. Because this discrepancy may be a source of confusion, this text clarifies commonly confused terms by placing the unofficial designations in parentheses when the terms are first used—for example, *pharyngotympanic tube* (auditory tube, eustachian tube) and *internal thoracic artery* (internal mammary artery). *Eponyms*, terms incorporating the names of people, are not used in the new terminology because they give no clue about the type or location of the structures involved. Further, many eponyms are historically inaccurate in terms of identifying the original person to describe a structure or assign its function, and do not conform to an international standard. Notwithstanding, commonly used eponyms appear in parentheses throughout the book when these terms are first used—such as *sternal angle* (angle of Louis)—since you will surely encounter them. Note that eponymous terms do not help to locate the structure in the body. The Clinically Oriented Anatomy website (<http://thePoint.lww.com/COA6e>) provides a list of eponymous terms.

Structure of terms. Anatomy is a descriptive science and requires names for the many structures and processes of the body. Because most terms are derived from Latin and Greek, medical language may seem difficult at first; however, as you learn the origin of terms, the words make sense. For example, the term *gaster* is Latin for stomach or belly. Consequently, the *esophagogastric* junction is the site where the esophagus connects with the stomach, *gastric acid* is the digestive juice secreted by the stomach, and a *diaphragm* is a muscle divided into two bellies.

Many terms provide information about a structure's shape, size, location, or function or about the resemblance of one structure to another. For example, some muscles have descriptive names to indicate their main characteristics. The deltoid muscle, which covers the point of the shoulder, is triangular, like the symbol for delta, the fourth letter of the Greek alphabet. The suffix -oid means “like”; therefore, *deltoid* means like delta. *Biceps* means two-headed and *triceps* means three-headed. Some muscles are named according to their shape—the *piriformis muscle*, for example, is pear shaped (L. *pirum*, pear + L. *forma*, shape or form). Other muscles are named according to their location. The *temporal muscle* is in the temporal region (temple) of the cranium (skull). In some cases, actions are used to describe muscles—for example, the *levator scapulae* elevates the scapula (L. shoulder blade). Anatomical terminology applies logical reasons for the names of muscles and other parts of the body, and

if you learn their meanings and think about them as you read and dissect, it will be easier to remember their names.

Abbreviations. Abbreviations of terms are used for brevity in medical histories and in this and other books, such as in tables of muscles, arteries, and nerves. Clinical abbreviations are used in discussions and descriptions of signs and symptoms. Learning to use these abbreviations also speeds note taking. Common anatomical and clinical abbreviations are provided in this text when the corresponding term is introduced—for example, temporomandibular joint (TMJ). The Clinically Oriented Anatomy website (<http://thePoint.lww.com/COA6e>) provides a list of commonly used anatomical abbreviations. More extensive lists of common medical abbreviations may be found in the appendices of comprehensive medical dictionaries (e.g., Stedman's Medical Dictionary, 28th ed.).

Anatomical Position

All anatomical descriptions are expressed in relation to one consistent position, ensuring that descriptions are not ambiguous (Figs. 1.1 and 1.2). One must visualize this position in the mind when describing patients (or cadavers), whether they are lying on their sides, supine (recumbent, lying on the back, face upward), or prone (lying on the abdomen, face downward).

The anatomical position refers to the body position as if the person were standing upright with the:

- head, gaze (eyes), and toes directed anteriorly (forward),
- arms adjacent to the sides with the palms facing anteriorly, and
- lower limbs close together with the feet parallel.

This position is adopted globally for anatomicomedical descriptions. By using this position and appropriate terminology, you can relate any part of the body precisely to any other part. It should also be kept in mind, however, that gravity causes a downward shift of internal organs (viscera) when the upright position is assumed. Since people are typically examined in the supine position, it is often necessary to describe the position of the affected organs when supine, making specific note of this exception to the anatomical position.

Anatomical Planes

Anatomical descriptions are based on four imaginary planes (median, sagittal, frontal, and transverse) that intersect the body in the anatomical position (Fig. 1.2):

- **The median plane**, the vertical plane passing longitudinally through the body, divides the body into right and left halves. The plane defines the midline of the head, neck, and trunk where it intersects the surface of the body. *Midline* is often erroneously used as a synonym for the median plane.
- **Sagittal planes** are vertical planes passing through the body *parallel to the median plane*. *Parasagittal* is commonly used but is unnecessary because any plane parallel to and on either side of the median plane is sagittal by definition. However, a plane parallel and near to the median plane may be referred to as a *paramedian plane*.
- **Frontal (coronal) planes** are vertical planes passing through the body at right angles to the *median plane*, dividing the body into anterior (front) and posterior (back) parts.
- **Transverse planes** are horizontal planes passing through the body at *right angles to the median and frontal planes*, dividing the body into superior (upper) and inferior (lower) parts. Radiologists refer to transverse planes as transaxial, which is commonly shortened to *axial planes*.

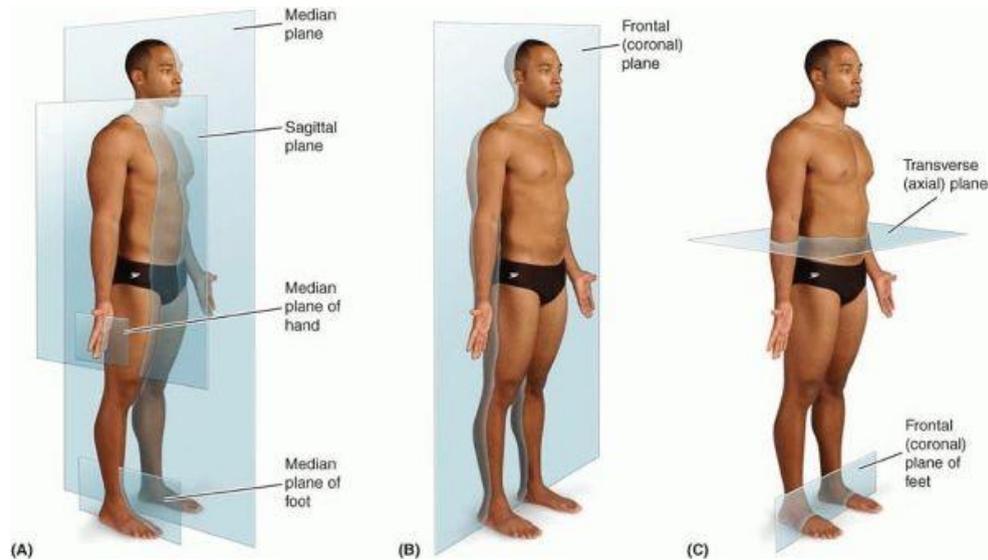


FIGURE 1.2. Anatomical planes. The main planes of the body are illustrated.

Since the number of sagittal, frontal, and transverse planes is unlimited, a reference point (usually a visible or palpable landmark or vertebral level) is necessary to identify the location or level of the plane, such as a “transverse plane through the umbilicus” (Fig. 1.2C). Sections of the head, neck, and trunk in precise frontal and transverse planes are symmetrical, passing through both the right and left members of paired structures, allowing some comparison.

The main use of anatomical planes is to describe sections (Fig. 1.3):

- **Longitudinal sections** run lengthwise or parallel to the long axis of the body or of any of its parts, and the term applies regardless of the position of the body. Although median, sagittal, and frontal planes are the standard (most commonly used) longitudinal sections, there is a 180° range of possible longitudinal sections.
- **Transverse sections**, or cross sections, are slices of the body or its parts that are cut at right angles to the longitudinal axis of the body or of any of its parts. Because the long axis of the foot runs horizontally, a transverse section of the foot lies in the frontal plane (Fig. 1.2C).
- **Oblique sections** are slices of the body or any of its parts that are not cut along the previously listed anatomical planes. In practice, many radiographic images and anatomical sections do not lie precisely in sagittal, frontal, or transverse planes; often they are slightly oblique.

Anatomists create sections of the body and its parts anatomically, and clinicians create them by planar imaging technologies, such as computerized tomography (CT), to describe and display internal structures.

Terms of Relationship and Comparison

Various adjectives, arranged as pairs of opposites, describe the relationship of parts of the body or compare the position of two structures relative to each other (Fig. 1.4). Some of these terms are specific for comparisons made in the anatomical position, or with reference to the anatomical planes:

Superior refers to a structure that is nearer the **vertex**, the topmost point of the cranium (Mediev. L., skull). **Cranial** relates to the cranium and is a useful directional term, meaning toward the head or cranium. **Inferior** refers to a structure that is situated nearer the sole of the foot. **Caudal** (L. *cauda*, tail) is a useful directional term that means toward the feet or tail

region, represented in humans by the coccyx (tail bone), the small bone at the inferior (caudal) end of the vertebral column.

Posterior (dorsal) denotes the back surface of the body or nearer to the back. **Anterior** (ventral) denotes the front surface of the body. **Rostral** is often used instead of anterior P.7

when describing parts of the brain; it means toward the rostrum (L. for beak); however, in humans it denotes nearer the anterior part of the head (e.g., the frontal lobe of the brain is rostral to the cerebellum).

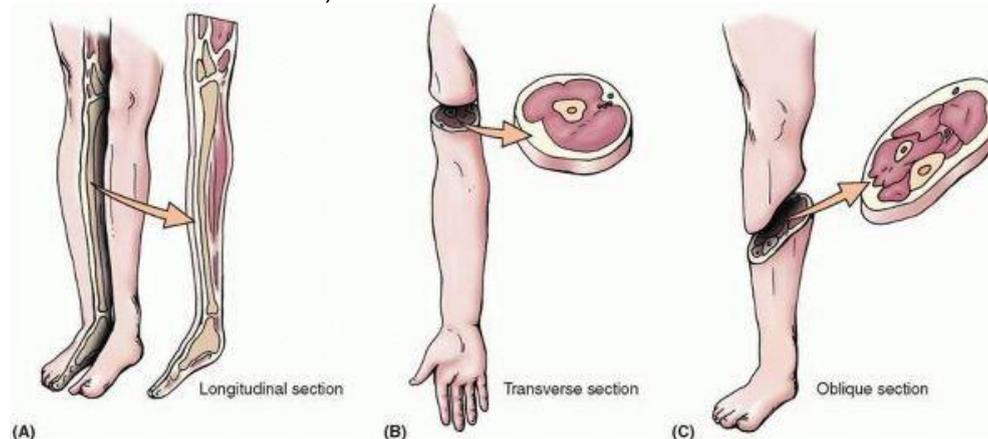


FIGURE 1.3. Sections of the limbs. Sections may be obtained by anatomical sectioning or medical imaging techniques.

Medial is used to indicate that a structure is nearer to the median plane of the body. For example, the 5th digit of the hand (little finger) is medial to the other digits. Conversely, **lateral** stipulates that a structure is farther away from the median plane. The 1st digit of the hand (thumb) is lateral to the other digits.

Dorsum usually refers to the superior aspect of any part that protrudes anteriorly from the body, such as the dorsum of the tongue, nose, penis, or foot. It is also used to describe the posterior surface of the hand, opposite the palm. Because the term dorsum may refer to both superior and posterior surfaces in humans, the term is easier to understand if one thinks of a quadrupedal plantigrade animal that walks on its palms and soles, such as a bear. The sole is the inferior aspect or bottom of the foot, opposite the dorsum, much of which is in contact with the ground when standing barefoot. The surface of the hands, the feet, and the digits of both corresponding to the dorsum is the **dorsal surface**, the surface of the hand and fingers corresponding to the palm is the **palmar surface**, and the surface of the foot and toes corresponding to the sole is the **plantar surface**.

Combined terms describe intermediate positional arrangements: **inferomedial** means nearer to the feet and median plane—for example, the anterior parts of the ribs run inferomedially; **superolateral** means nearer to the head and farther from the median plane.

Other terms of relationship and comparisons are independent of the anatomical position or the anatomical planes, relating primarily to the body's surface or its central core:

Superficial, intermediate, and deep describe the position of structures relative to the surface of the body or the relationship of one structure to another underlying or overlying structure.

External means outside of or farther from the center of an organ or cavity, while internal means inside or closer to the center, independent of direction.

Proximal and **distal** are used when contrasting positions nearer to or farther from the attachment of a limb or the central aspect of a linear structure, respectively.

Terms of Laterality

Paired structures having right and left members (e.g., the kidneys) are **bilateral**, whereas those occurring on one side only (e.g., the spleen) are **unilateral**. Designating whether you are referring specifically to the right or left member of bilateral structures can be critical, and is a good habit to begin at the outset of one's training to become a health professional. Something occurring on the same side of the body as another structure is **ipsilateral**; the right thumb and right great (big) toe are **ipsilateral**, for example. **Contralateral** means occurring on the opposite side of the body relative to another structure; the right hand is contralateral to the left hand.

Terms of Movement

Various terms describe movements of the limbs and other parts of the body (Fig. 1.5). Most movements are defined in relationship to the anatomical position, with movements occurring within, and around axes aligned with, specific anatomical planes. While most movements occur at joints where two or more bones or cartilages articulate with one another, several non-skeletal structures exhibit movement (e.g., tongue, lips, eyelids). Terms of movement may also be considered in pairs of opposing movements:

Flexion and **extension** movements generally occur in sagittal planes around a transverse axis (Fig. 1.5A & B).

Flexion indicates bending or decreasing the angle between the bones or parts of the body. For most joints (e.g., elbow), flexion involves movement in an anterior direction. **Extension** indicates straightening or increasing the angle between the bones or parts of the body. Extension usually occurs in a posterior direction. The knee joint, rotated 180° to other joints, is exceptional in that flexion of the knee involves posterior movement and extension involves anterior movement. **Dorsiflexion** describes flexion at the ankle joint, as occurs when walking uphill or lifting the front of the foot and toes off the ground (Fig. 1.5I). **Plantarflexion** bends the foot and toes toward the ground, as when standing on your toes. Extension of a limb or part beyond the normal limit—**hyperextension** (overextension)—can cause injury, such as “whiplash” (i.e., hyperextension of the neck during a rear-end automobile collision).

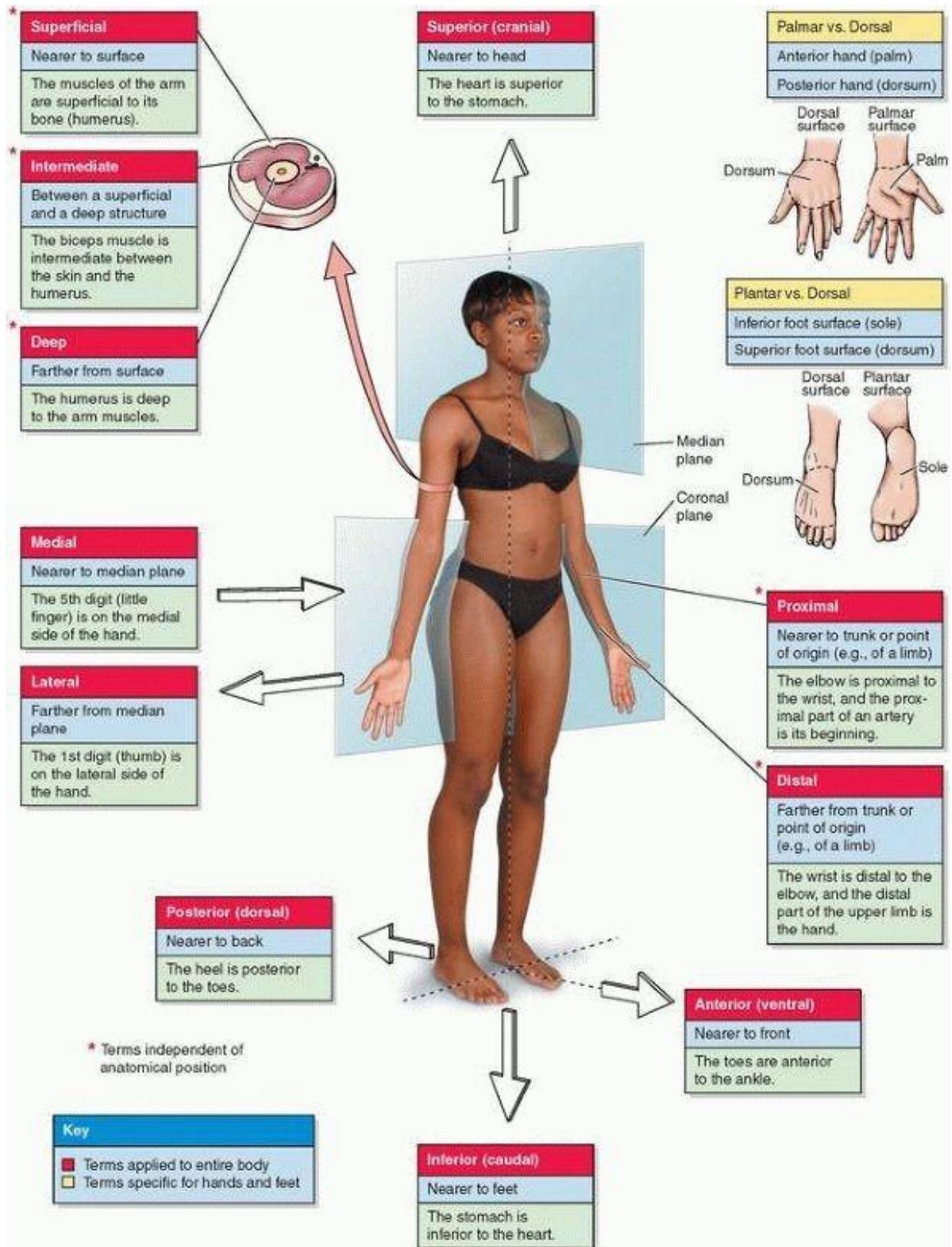
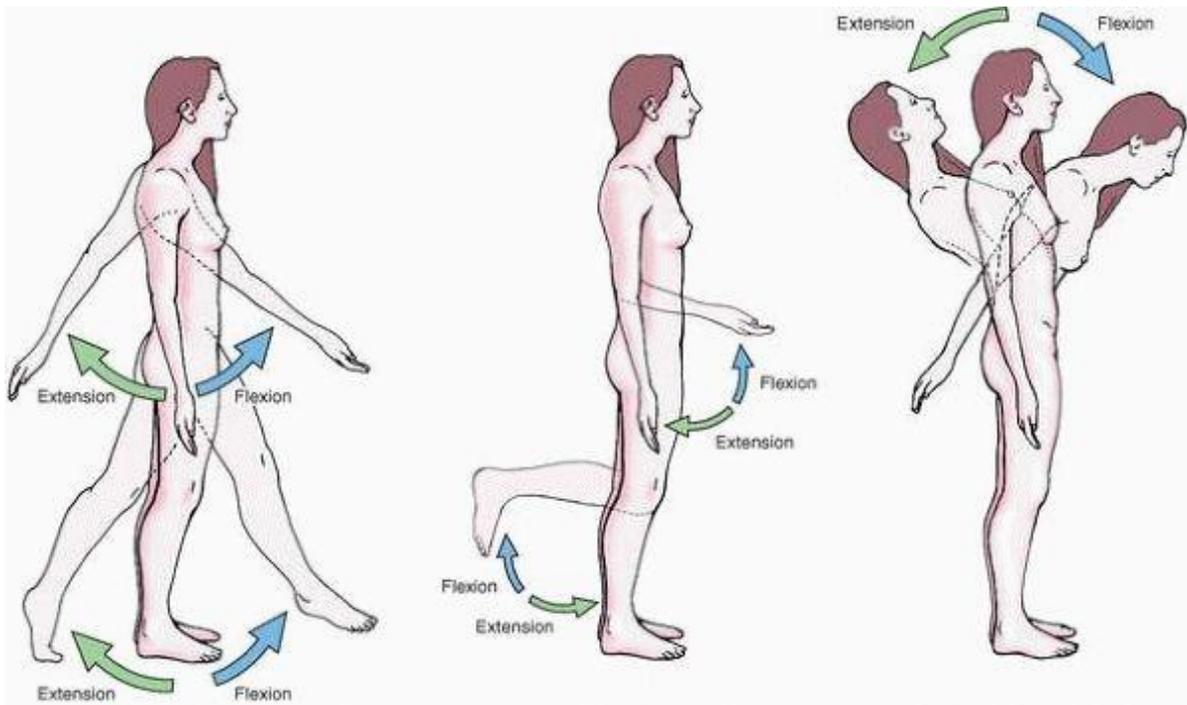


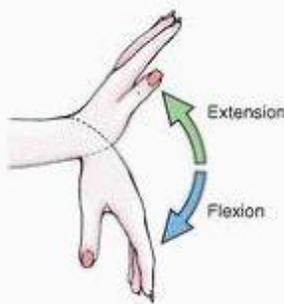
FIGURE I.4. Terms of relationship and comparison. These terms describe the position of one structure relative to another.



(A) Flexion and extension of upper limb at shoulder joint and lower limb at hip joint

Flexion and extension of forearm at elbow joint and of leg at knee joint

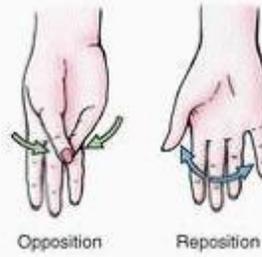
Flexion and extension of vertebral column at intervertebral joints



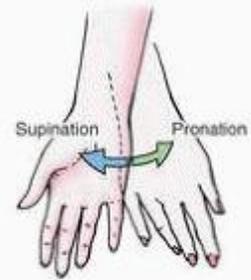
(B) Flexion and extension of hand at wrist joint



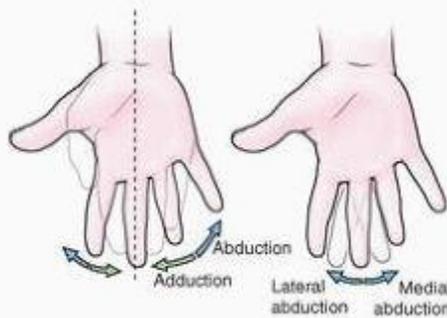
Flexion and extension of digits (fingers) at metacarpophalangeal and interphalangeal joints



(C) Opposition and reposition of the thumb at the carpometacarpal joint and little finger at the metacarpophalangeal joint

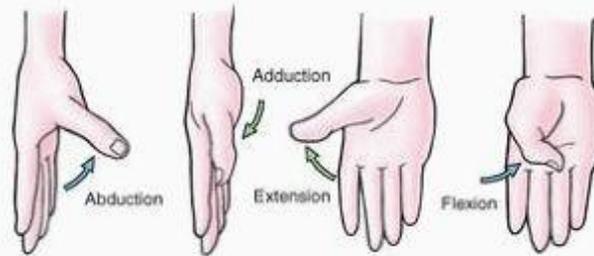


(D) Pronation and supination of forearm at radioulnar joints



(E) Abduction and adduction of 1st, 2nd, 4th, and 5th digits at metacarpophalangeal joints

Abduction of 3rd digit at metacarpophalangeal joint



(F) The thumb is rotated 90° relative to other structures. Abduction and adduction at the metacarpophalangeal joint occurs in a frontal plane; flexion and extension at the metacarpophalangeal and interphalangeal joints occurs in sagittal planes, opposite to these movements at other joints.

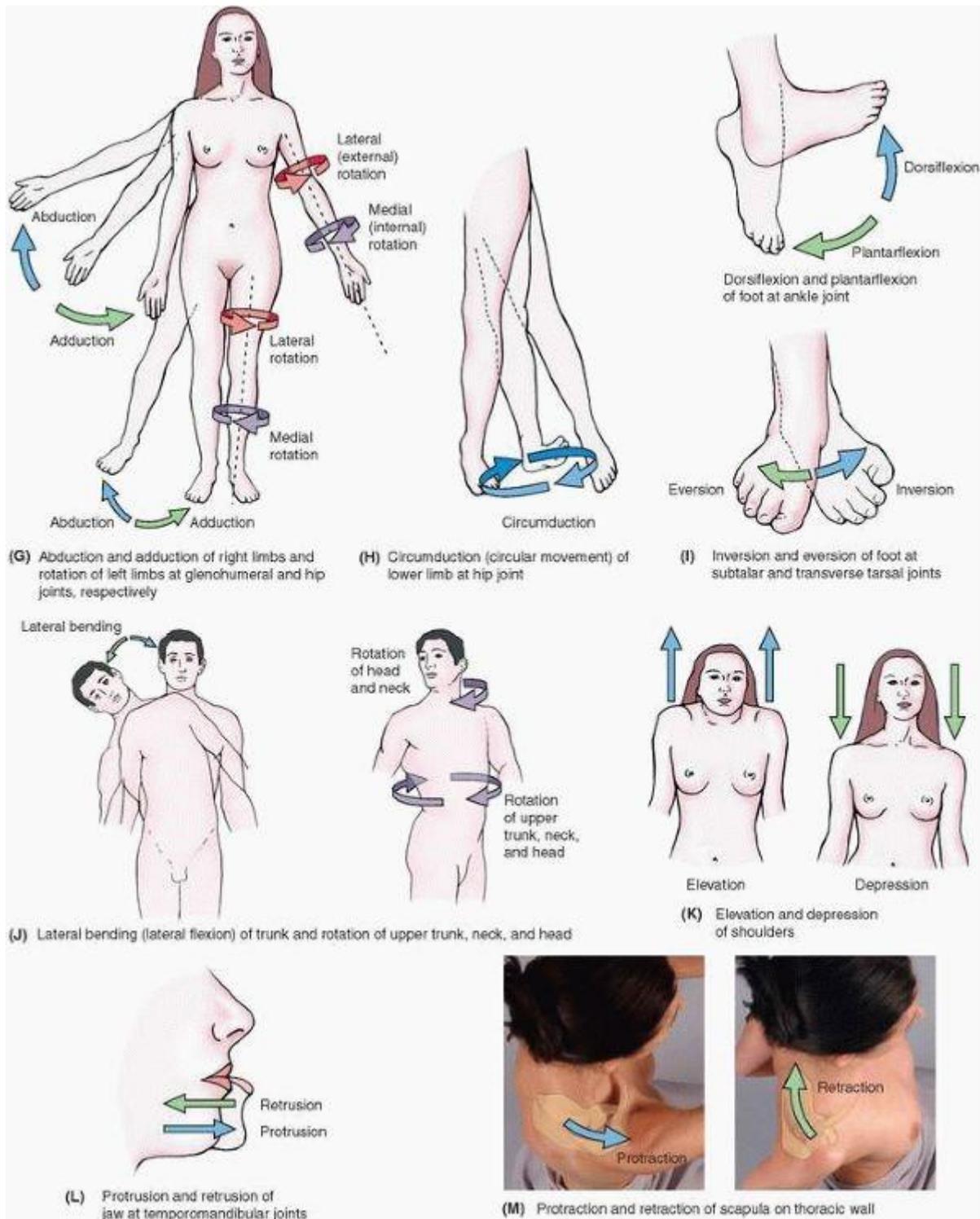


FIGURE 1.5. Terms of movement. These terms describe movements of the limbs and other parts of the body; most movements take place at joints, where two or more bones or cartilages articulate with one another.

Abduction and adduction movements generally occur in a frontal plane around an anteroposterior axis (Fig. 1.5E & G). Except for the digits, **abduction** means moving away from the median plane (e.g., when moving an upper limb laterally away from the side of the body) and **adduction** means moving toward it. In *abduction of the digits* (fingers or toes), the term means spreading them apart—moving the other fingers away from the neutrally positioned 3rd (middle) finger or moving the other toes away from the neutrally positioned 2nd toe. The 3rd finger and 2nd toe medially or laterally abduct away from the neutral position. *Adduction of the*

digits is the opposite—bringing the spread fingers or toes together, toward the neutrally positioned 3rd finger or 2nd toe. Right and left lateral flexion (lateral bending) are special forms of abduction for only the neck and trunk (Fig. 1.5J). The face and upper trunk are directed anteriorly as the head and/or shoulders tilt to the right or left side, causing the midline of the body itself to become bent sideways. This is a compound movement occurring between many adjacent vertebrae.

As you can see by noticing the way the thumbnail faces (laterally instead of posteriorly in the anatomical position), the thumb is rotated 90° relative to the other digits (Fig. 1.5F). Therefore, the thumb flexes and extends in the frontal plane and abducts and adducts in the sagittal plane.

Circumduction is a circular movement that involves sequential flexion, abduction, extension, and adduction (or in the opposite order) in such a way that the distal end of the part moves in a circle (Fig. 1.5H). Circumduction can occur at any joint at which all the above-mentioned movements are possible (e.g., the shoulder and hip joints).

Rotation involves turning or revolving a part of the body around its longitudinal axis, such as turning one's head to face sideways (Fig. 1.5G). *Medial rotation* (internal rotation) brings the anterior surface of a limb closer to the median plane, whereas *lateral rotation* (external rotation) takes the anterior surface away from the median plane.

Pronation and supination are the rotational movements of the forearm and hand that swing the distal end of the radius (the lateral long bone of the forearm) medially and laterally around and across the anterior aspect of the ulna (the other long bone of the forearm) while the proximal end of the radius rotates in place (Fig. 1.5D). **Pronation** rotates the radius medially so that the palm of the hand faces posteriorly and its dorsum faces anteriorly. When the elbow joint is flexed, pronation moves the hand so that the palm faces inferiorly (e.g., placing the palms flat on a table). **Supination** is the opposite rotational movement, rotating the radius laterally and uncrossing it from the ulna, returning the pronated forearm to the anatomical position. When the elbow joint is flexed, supination moves the hand so that the palm faces superiorly. (Memory device: You can hold soup in the palm of your hand when the flexed forearm is supinated but are prone [likely] to spill it if the forearm is then pronated!)

Eversion moves the sole of the foot away from the median plane, turning the sole laterally (Fig. 1.5I). When the foot is fully everted it is also dorsiflexed. **Inversion** moves the sole of the foot toward the median plane (facing the sole medially). When the foot is fully inverted it is also plantarflexed. Pronation of the foot actually refers to a combination of eversion and abduction that results in lowering of the medial margin of the foot (the feet of an individual with flat feet are pronated), and supination of the foot generally implies movements resulting in raising the medial margin of the foot, a combination of inversion and adduction.

Opposition is the movement by which the pad of the 1st digit (thumb) is brought to another digit pad (Fig. 1.5C). This movement is used to pinch, button a shirt, and lift a teacup by the handle. Reposition describes the movement of the 1st digit from the position of opposition back to its anatomical position.

Protrusion is a movement anteriorly (forward) as in protruding the mandible (chin), lips, or tongue (Fig. 1.5L). **Retrusion** is a movement posteriorly (backward), as in retruding the mandible, lips, or tongue. The similar terms **protraction** and **retraction** are used most commonly for anterolateral and posteromedial movements of the scapula on the thoracic wall, causing the shoulder region to move anteriorly and posteriorly (Fig. 1.5M).

Elevation raises or moves a part superiorly, as in elevating the shoulders when shrugging, the upper eyelid when opening the eye, or the tongue when pushing it up against the palate (roof of mouth) (Fig. 1.5K). **Depression** lowers or moves a part inferiorly, as in depressing the

shoulders when standing at ease, the upper eyelid when closing the eye, or pulling the tongue away from the palate.

The Bottom Line

ANATOMICOMEDICAL TERMINOLOGY

Anatomical terms are descriptive terms standardized in an international reference guide, Terminologia Anatomica (TA). These terms, in English or Latin, are used worldwide. ♦ Colloquial terminology is used by—and to communicate with—lay people. ♦ Eponyms are often used in clinical settings but are not recommended because they do not provide anatomical context and are not standardized. ♦ Anatomical directional terms are based on the body in the anatomical position. ♦ Four anatomical planes divide the body, and sections divide the planes into visually useful and descriptive parts. ♦ Other anatomical terms describe relationships of parts of the body, compare the positions of structures, and describe laterality and movement.



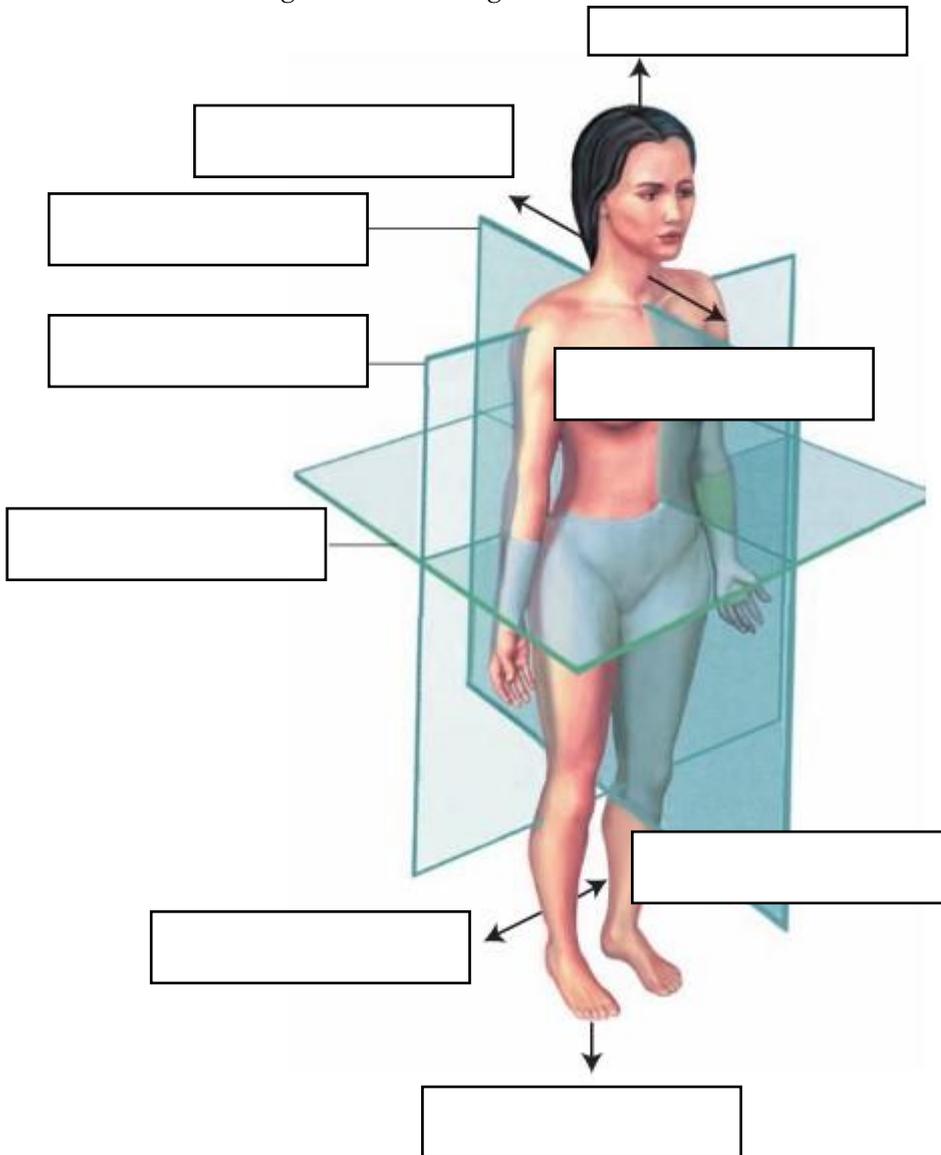
LAB ACTIVITY LEARNING ACTIVITIES II

The following activities provide a review of the body structure terms introduced in this chapter. Complete each activity and review your answers to evaluate your understanding of the chapter.

Laboratory Task 2-1

Identifying Body Planes

Label the following illustration using the terms below.

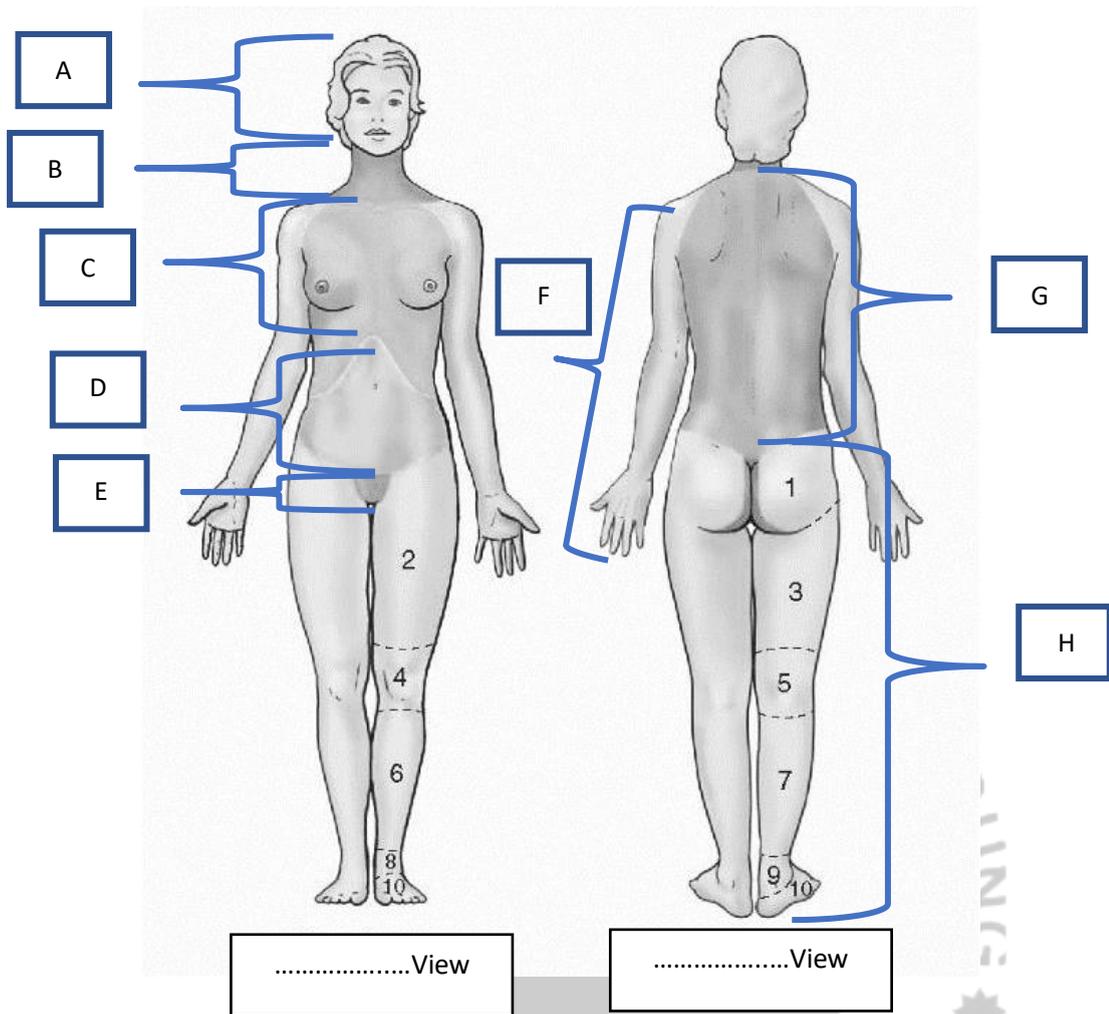


- Anterior* *lateral* *posterior* *coronal (frontal) plane* *medial* *superior*
- Inferior* *midsagittal (median) plane* *transverse (horizontal) plane*

Laboratory Task 2-2

Identifying Body Regions

Match the label of the following illustration using the terms below.



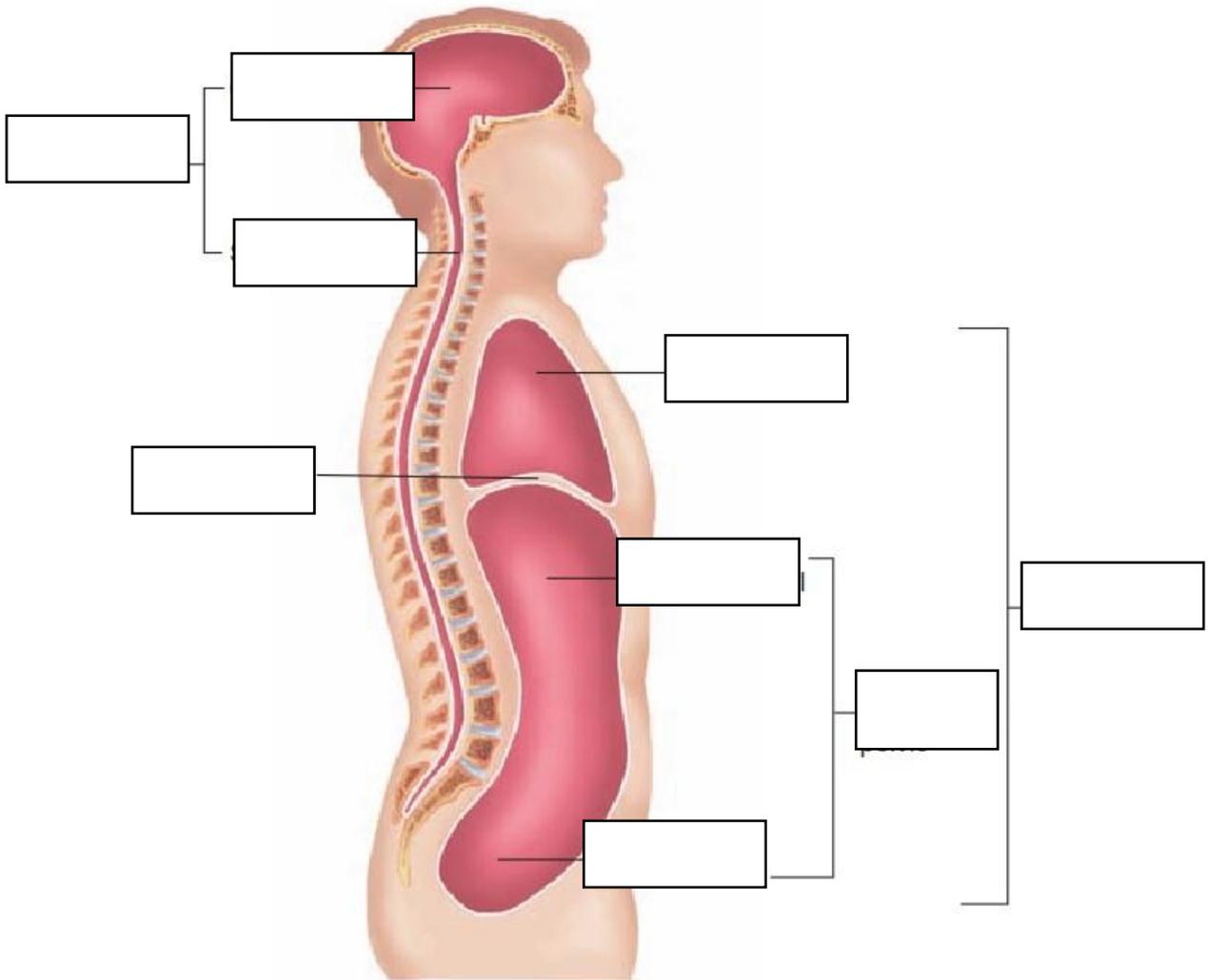
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-	Head/Cephalic	-	Posterior Knee Region
-	Thorax	-	Posterior Thigh Region
-	Pelvis/Perineum	-	Anterior Leg Region
-	Abdomen	-	Foot region
-	Lower Limb	-	Posterior Talocrural Region
-	Upper Limb	-	Anterior view
-	Neck/Cervical	-	Posterior View
-	Anterior Thigh Region	-	Back
-	Posterior Leg Region		
-	Anterior Talocrural (ankle) region		
-	Gluteal region		
-	Anterior Knee region		

Laboratory Task 2-3

Identifying Body Cavities

Label the quadrants on Figure A and regions on Figure B using the terms below.



Ventral

Abdominopelvic

Abdominal

Pelvic

Thoracic

Diaphragm

Spinal

Dorsal

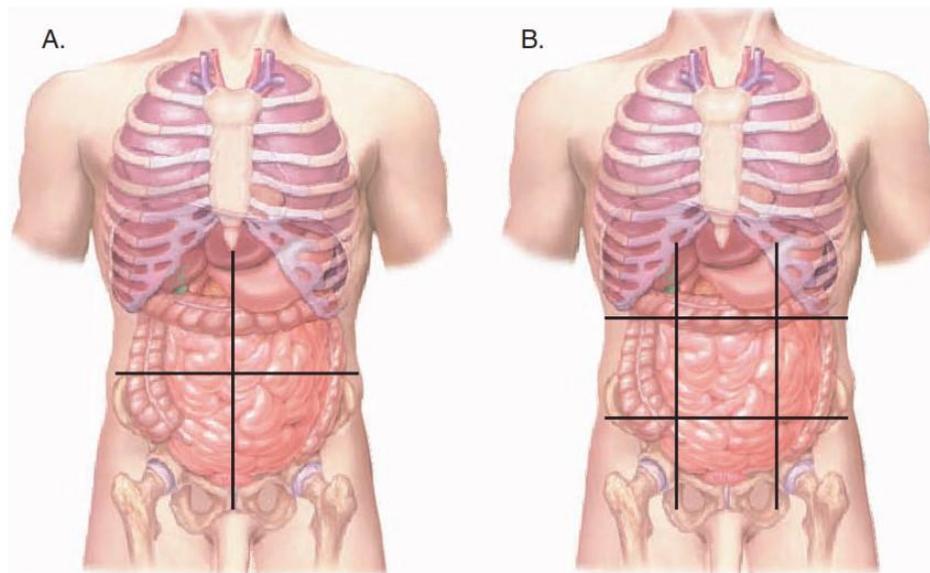
Cranial

KULTAS KEDOKTER

Laboratory Task 2-4

Identifying Abdominopelvic Divisions

Label the quadrants on Figure A and regions on Figure B using the terms below.



epigastric region

left lumbar region

right lower quadrant

hypogastric region

left upper quadrant

right lumbar region

left hypochondriac region

right hypochondriac region

right upper quadrant

left iliac region

right iliac region

umbilical region

left lower quadrant

Laboratory Task 2-5

Matching Body Cavity, Spine, and Directional Terms

Match each term on the left with its meaning on the right.

1.	Abdominopelvic	a.	pertaining to the sole of the foot
2.	Adduction	b.	tail bone
3.	Cervical	c.	ventral cavity that contains heart, lungs, and associated structures
4.	Coccyx	d.	toward the surface of the body (external)
5.	Deep	e.	lying horizontal with face downward
6.	Eversion	f.	turning outward
7.	inferior (caudal)	g.	nearer to the center (trunk of the body)
8.	Inversion	h.	ventral cavity that contains digestive, reproductive, and excretory structures
9.	lumbar	i.	turning inward or inside out
10.	plantar	j.	part of the spine known as the neck
11.	posterior (dorsal)	k.	movement toward the median plane
12.	prone	l.	away from the head; toward the tail or lower part of a structure
13.	proximal	m.	away from the surface of the body (internal)
14.	superficial	n.	part of the spine known as the <i>loin</i>
15.	thoracic	o.	near the back of the body

Laboratory Task 2-6**Matching Anatomical Basic Systems**

Match each term on the left with its meaning on the right.

1.	The integumentary system (dermatology)	a.	consists of skeletal muscles that act (contract) to move or position parts of the body
2.	The skeletal system (osteology)	b.	consists of specialized structures that secrete hormone
3.	The articular system (arthrology)	c.	consists of bones and cartilage
4.	The muscular system (myology)	d.	eye or visual system
5.	The nervous system (neurology)	e.	sense of smell
6.	otology	f.	consists of the skin and its appendages—hair, nails, and sweat glands
7.	ophthalmology	g.	consists of the central nervous system (brain and spinal cord) and the peripheral nervous system (nerves and ganglia, together with their motor and sensory endings).
8.	the olfactory organ	h.	consists of joints and their associated ligaments, connecting the bony parts of the skeletal system and providing the sites at which movements occur.
9.	The circulatory system angiology	i.	sense of taste
10.	gustatory organ (gynecology for females; andrology for males)	j.	consists of the kidneys, ureters, urinary bladder, and urethra, which filter blood and subsequently produce, transport, store, and intermittently excrete urine (liquid waste).
11.	The cardiovascular system (cardiology)	k.	consists of the gonads (ovaries and testes) that produce oocytes (eggs) and sperms, the ducts that transport them, and the genitalia that enable their union
12.	The alimentary or digestive system (gastroenterology)	l.	is a network of lymphatic vessels that withdraws excess tissue fluid (lymph) from the body's interstitial (intercellular) fluid compartment, filters it through lymph nodes, and returns it to the bloodstream
13.	The lymphatic system	m.	consists of the heart and blood vessels that propel and conduct blood through the body, delivering oxygen, nutrients, and hormones to cells and removing their waste products.
14.	The genital (reproductive) system	n.	consists of the air passages and lungs that supply oxygen to the blood
15.	The respiratory system (pulmonology)	o.	consists of the cardiovascular and lymphatic systems, which function in parallel to transport the body's fluids
16.	The urinary system (urology)	p.	consists of the digestive tract from the mouth to the anus, with all its associated organs and glands that function in ingestion, mastication (chewing), deglutition (swallowing), digestion, and absorption of food and the elimination of the solid waste (feces) remaining after the nutrients have been absorbed.
17.	The endocrine system (endocrinology)	q.	sense of hearing and balance

Laboratory Task 2-7 (Take-Home Assignment)

Make a glossary of at least 30 new medical terminology in Levels of Body Organization and Anatomy. Use polio paper and hand writing to perform this post lab activity task!

Name:..... Student's Number:..... Group:.....

New Medical terms	Means of the terms

“Sesungguhnya Kami menciptakan segala sesuatu menurut ukuran” (Q.S Al Qamar Ayat 49)

*“Katakanlah: Siapakah yang memberi rezeki kepadamu dari langit dan bumi, atau siapakah yang kuasa (menciptakan) **pendengaran** dan **penglihatan**”, (Q.S. Yunus: 31)*

