MEDICAL TERMINOLOGY

Faculty of Pharmacy
Menofia University
First year students Second semester
By Stuff Members of Biochemistry Department

رؤية كلية الصيدلة جامعة المنوفية

أن تكون كلية الصيدلة-جامعة المنوفية رائدة على المستوى المحلي و الإقليمي في جودة التعليم الصيدلي و البحث العلمي و خدمة المجتمع.

رسالة كلية الصيدلة جامعة المنوفية

تقديم برامج دراسية متطورة تضمن تخريج صيادلة متميزين مهنياً و خلقيا قادرين على المنافسة في الداخل و الخارج مع الإرتقاء بالبحث العلمي و تطوير صناعة الدواء بما يؤدي إلى تحسين مستوى الخدمات الصحية.

الأهداف الإستراتيجية لصيدلة المنوفية

أ. رفع كفاءة العملية التعليمية مع التحديث المستمر للمناهج الدراسية بما يتوافق مع سوق العمل.
ب. توجيه البحث العلمي لخدمة المجتمع المحلي و الإقليمي.
ت. توثيق التعاون مع المجتمع و زيادة الوعي بالمشاركة المجتمعية.
ث. رفع كفاءة العاملين بالكلية من أعضاء هيئة التدريس و معاونيهم و الجهاز الإداري و الفني.
ج. تنمية الموارد الذاتية من الوحدات الخاصة و البرامج التعليمية.
ح. تحقيق معايير ضمان جودة التعليم بكلية الصيدلة جامعة المنوفية.
خ. التوسع في الأنشطة و الخدمات الطلابية لبناء شخصية متميزة.

Course Specifications

A-Basic Information	
Course name:	Medical terminology
Programme on which the course is given	Bachelor of Pharmacy
Credit hours of the course:	Lecture: 1
Department supervising the course:	Biochemistry Department

B-Professional Information

1-Overall aims of the course:

- To enable the student to understand and use different medical terms.
- To be able to communicate effectively with other medical professionals.

2-Intended learning outcomes (ILO's):

a-Knowledge and Understanding:

By the end of this course, the student should be able to:

a1- Pronounce, spell, and define common prefixes, roots and suffixes of medical terms in order to utilize them in word definition.

a2-recognize anatomic positions and identify body directions.

a3- define words related to different body systems.

a4- define and use common medical abbreviations and symbols.

a5-define common pathological conditions of different body systems.

b-Intellectual Skills:

By the end of this course, the student should be able to:
b1- analyze medical words structurally.
b2-.correlate an understanding of words elements with the basic anatomy, physiology, and disease processes of the human body.
b3-to be aware of spelling and pronunciation problems.

b4- discriminate different pathological conditions of each body system.

c-Professional and Practical Skills:

By the end of this course, the student should be able to:
c1- use a general protocol in splitting the word and predict its meaning.
c2- apply spelling and pronunciation skills.
c3- communicate effectively with other medical professionals.

d-General Skills:

By the end of this course, the student should be able to:

d1-Communicate effectively with his teacher and colleagues.

d2-Cooperate in a team, and independently on solving problems.

d3- Using internet.

d4-Exchange ideas, principles and information by oral, written and visual means

3-Course contents:

week	Topic	No. of hours		
		Lecture	Practical	Total
1.	Introduction to medical terminology	1	-------	1
2.	Common suffix	1	-------	1
3.	Common prefix	1	-------	1
4.	Some common medical terms and Latin abbreviations	1	-------	1
5.	Drug names, Body structure	1	-------	1
6.	The cardiovascular and lymphatic systems	1	-------	1
7.	Central nervous system	1	-------	1
8.	The digestive system	1	-------	1
9.	Mid-term exam	-------	-------	-------
10.	Urinary system, Respiratory system	1	-------	1
11.	Endocrine system organs	1	-------	1
12.	Reproductive system	1	-------	1
13.	The skeleton The muscular system	1	-------	1
14.	Skin	1	-------	1
	Total	13	-------	13

4-Teaching and Learning Methods (lectures, open discussion, role plays, ..etc.):
- Lectures using data show - Open discussion - Diagrams - videos

5- Student Assessment:
a-Assessment Methods and Weighing:
- Assignment: 5% - Mid-term: 15% - Oral exam: 20% - Final exam: 60%
b-Assessment Schedule:
- Assignment : Week 4 - Mid-term exam: week 8 - Oral exam: According to semester timetable - Final exam: According to semester timetable

6-List of References:	
Course Notes	Hands out written by the instructor
Required Books	----------
Recommended Books	Medical terminology, an illustrated guide/ Barbara Jahnson Cohen, Lippincott Williams & Wilkins, 2013.

List of contents

I. Introduction

Medical terminology is a special vocabulary used by health care professionals for effective and accurate communication. Although medical terms have been drawn from many languages, a large majority are from Greek and Latin. Because it is based mainly on Greek and Latin words, medical terminology is consistent and uniform throughout the world. Word formation and specifically medical terminology is of the crucial importance for medical students. When you work in health care, it is important to know the language of medicine. Doing so is vital to become an integral part of the team and is necessary to follow through on your job responsibility. Being able to speak and understand this language enables you to do your job quickly and efficiently.

I. Analysing medical terms

Many of the words used in medicine are made up of parts which are also used in other words. Once you know the meanings of the basic parts of the words, you can put them together to understand the meanings of many medical terms. These basic parts of medical terms are called **roots, prefixes,** and **suffixes**. During this course, you will learn to identify and define a root, a prefix, and a suffix. You will also learn how they are used in combination to describe a medical term and to know some of the most common essential terms and abbreviations used in the medical profession, specifically for pharmacists.

Word Parts

1. A word **root** provides the basic meaning of the term.

Example: hepat means liver in the term hepatitis (inflammation of the liver)

Not all roots are complete words. In fact, most medical roots are derived from other languages and are meant to be used in combinations. The Greek word *kardia*, for example, meaning "heart," gives us the root *cardi*. The Latin word *pulmo*, meaning "lung," gives us the root *pulm*. In a few instances, both the Greek and Latin roots are used. We find both the Greek root *nephr* and the Latin root *ren* used in words referring to the kidney.

Note that the same root may have different meanings in different fields of study. The root *scler* means "hard" but may also apply to the white of the eye. *Cyst* means "a filled sac or pouch" but also refers specifically to the urinary bladder. You will sometimes have to consider the context of a word before assigning its meaning.

Compound words contain more than one root. Some compound medical words are *cardiovascular* (referring to the heart and blood vessels), *urogenital* (referring to the urinary and reproductive systems), and *lymphocyte* (a white blood cell found in the lymphatic system).

2. A **prefix** appears before the word root to change the meaning.

Example: adding of prefix hypo to the term dermic changes the meaning from referring to the skin to referring to below the skin

3. A **suffix** appears at the end of the word.

Example: in the term hepatitis suffix itis which means inflammation is added to the root hepat.

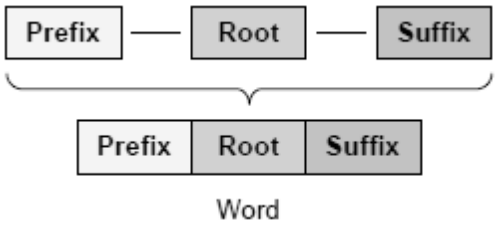


Figure (1): Words are formed from roots, prefixes, and suffixes

4. A combining vowel connects roots to suffixes or roots to other roots.

When a suffix beginning with a consonant is added to a root, a vowel (usually an o) is inserted between the root and the suffix to aid in pronunciation.

Example: laryngoscope – o connects two roots: laryng and scope in the word meaning instrument for visual examination of the larynx (voice box).

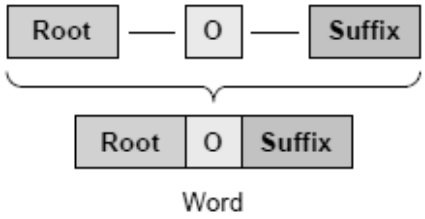


Figure (2): A combining vowel may be added between a root and a suffix.

Thus, when the suffix -logy, meaning "study of," is added to the root neur, meaning "nerve or nervous system," a combining vowel is added:

neur + o + logy = neurology (study of the nervous system)

Roots shown with a combining vowel are called combining forms.

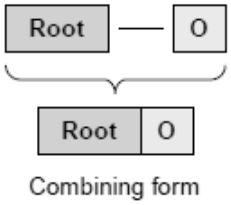


Figure (3): A root with a combining vowel is often called a combining form.

Example: hepat + o = hepato (a combining form meaning liver)

A combining vowel usually is not used if the ending begins with a vowel.

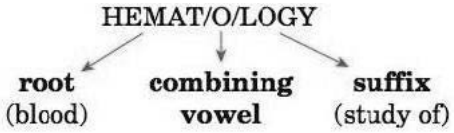
The root *neur* is combined with the suffix *-itis*, meaning "inflammation of," in this way:

neur + itis = neuritis (inflammation of a nerve)

There are some exceptions to this rule, particularly when pronunciation or meaning is affected, but you will observe these as you work.

5. The meaning of a medical term can be determined by starting with the suffix and moving back to the beginning of the word;

Example: the term Hematology. When you analyze a medical term, begin with the end of the word (the suffix). The suffix in Hematology is logy which means study of. Next, look at the beginning of the word. Hemat is the word root. The root gives the essential meaning of the term. The root Hemat means blood. The third part of this term, which is the letter o, is a combining vowel. Now put the meaning of the suffix and the root, Hematology means study of blood.



Some important rules to remember are:

1. Read the meaning of medical words from the suffix to the beginning of the word and then across.
2. Drop the combining vowel before a suffix that starts with a vowel.
3. Keep the combining vowel between word roots, even if the second root begins with a vowel.

Words ending in *x*

When a word ending in *x* has a suffix added, the *x* is changed to a *g* or a *c*. For example, *pharynx* (throat) becomes *pharyngeal,* to mean "referring to the throat"; *thorax* (chest) becomes *thoracotomy* to mean "an incision into the chest."

Suffixes beginning with *rh*

When a suffix beginning with *rh* is added to a root, the *r* is doubled:

hem/o (blood) + -rhage (bursting forth) = hemorrhage (a bursting forth of blood).

men/o (menses) + -rhea (flow, discharge) = menorrhea (menstrual flow).

Exercise

Fill in the blanks:

1. A root with a vowel added to aid in pronunciation is called a (n)……...
2. Combine the word parts *dia-*, meaning “through,” and *-rhea*, meaning “flow,” to form a word meaning “passage of fluid stool”……
3. Combine the root *psych*, meaning “mind,” with the suffix *-logy*, meaning “study of,” to form a word meaning “study of the mind.”……
4. The part of the word which gives the basic meaning to the word is called the……
5. The prefix is the part of the word which comes ……..the root.
6. The part of the word which comes after the root and modifies or augments the meaning of the root is called the……
7. Certain combinations of stems or root words are difficult to pronounce, making it necessary to insert a vowel called a (n)……
8. The combining vowel is usually a (n)……
9. In the word thermometer, "therm" is the root and "therm - o" is the……
10. In the term "specialist," "special” is the root and "ist" is the……
11. In the word "basketball," "ball" is the root and "basket" is the……
12. The word parts of a medical term may include the……., the root, and the suffix.

II. Common suffixes and prefixes

- **Suffixes**

A suffix is a word ending that modifies a root. A suffix may indicate that the word is a noun or an adjective and often determines how the definition of the word will begin. For example, using the root myel/o, meaning "bone marrow," the adjective ending -oid forms the word myeloid, which means "like or referring to bone marrow." The ending -oma produces myeloma, which is a tumor of the bone marrow.

a. Noun suffixes

Table (1): Suffixes that mean "condition of"

Suffix	Example	Definition of example
-ia	phobia	persistent and exaggerated fear
-ism	alcoholism	impaired control of alcohol use
-sis	acidosis	acid condition of body fluids
-y	tetany	sustained muscle contraction

Table (2): Suffixes for medical specialties

Suffix	Meaning	Example	Definition of example
-ian	specialist in a field of study	physician	practitioner of medicine (from root *physi/o,* meaning "nature")
-iatrics	medical specialty	geriatrics	study and treatment of the aged (from root *ger/i,* meaning "old age")
-iatry	medical specialty	podiatry	study and treatment of the foot (from root *pod/o,* meaning "foot")
-ics	medical specialty	orthopedics	study and treatment of the skeleton and joints (from root *ped/o*, meaning "foot" and prefix *ortho,* meaning "straight")
-ist	specialist in a field of study	cardiologist	specialist in the study and treatment of the heart (from root *cardi/o,* meaning "heart")
-logy	study of	physiology	Study of function in a living organism (from root physi/o, meaning "nature")

Table (3): Suffixes for diseases

Suffix	Meaning	Example	Definition of example
-algia, -algesia	pain	myalgia	pain in a muscle (my/o)
-itis	inflammation	meningitis	inflammation of the membranes around the brain (meninges)
-megaly	enlargement	hepatomegaly	enlargement of the liver
-oma	tumor	blastoma	tumor of immature cells
-pathy	any disease of	cardiopathy	any disease of the heart
-rhage, -rhagia	bursting forth, profuse flow, hemorrhage	hemorrhage	profuse flow of blood
-rhea	flow, discharge	mucorrhea	discharge of mucus
edema	accumulation of fluid, swelling	lymphedema	swelling of tissues as a result of lymphatic blockage
lysis	separation, loosening, dissolving, destruction	dialysis	separation of substances by passage through a membrane
malacia	softening	splenomalacia	softening of the spleen (splen/o)

b. <u>Adjective Suffixes</u>

Table (4): Suffixes that mean "referring to" or "resembling.

Suffix	Example	Definition of example
-ac	cardiac	referring to the heart
-al	skeletal	referring to the skeleton
-ar	muscular	referring to muscles
-ary	dietary	referring to the diet
-form	muciform	like or resembling mucus
-ic*	metric	referring to a meter
-ile	febrile	referring to fever
-ical	anatomical	referring to anatomy
-oid	toxoid	resembling toxin (poison)
-ory	respiratory	referring to respiration
-ous	venous	referring to a vein

*For words ending with the suffix *-sis*, the first *s* in the ending is changed to *t* before adding *-ic* to form the adjective, as in psychotic, referring to psychosis (a mental disorder), or diuretic, referring to diuresis (increased urination).

- **Forming plurals**

Many medical words have special plural forms based on the ending of the word.

Table (5): Plural forms of medical words

Singular ending	Plural ending	Example
a	ae	Vertebra-vertebrae
ax	aces	Thorax-thoraces
us	i	Fungus-fungi
um	a	Bacterium-bacteria
is	es	Diagnosis-diagnoses
ma	mata	Carcinoma-carcinomata
on	a	Protozoon-protozoa
nx	nges	Phalanx-phalanges
ex	ices	Apex-apices
ix	ices	Appendix-appendices
en	ina	Lumen-lumina
ies	ietes	Paries-parietes

Some exceptions to the rules

There are exceptions to the rules above for forming plural. For example, the plural of *virus* is *viruses,* and *serums* is sometimes used instead of *sera.* An *-es* ending may be added to words ending in *-ex* or *-ix* to form a plural, as in *appendixes*, *apexes*, and *indexes*. Some people, in error, use *phalange* as the singular of *phalanges.* Words ending in *-oma,* meaning "tumor," should be changed to *-omata,* but most people just add an *s* to form the plural. For example, the plural of *carcinoma* (a type of cancer) should be *carcinomata,* but *carcinomas* is commonly used.

- **Prefixes**

A prefix is a short word part added before a word or word root to modify its meaning. For example, the word lateral means "side." Adding the prefix uni-, meaning "one," forms unilateral, which means "affecting or involving one side". Adding the prefix contra-, meaning "against or opposite," forms contralateral, which refers to an opposite side. The term equilateral means "having equal sides."

Table (6): Prefixes for numbers

Prefix	Meaning	Example	Definition of example
prim/i-	first	primitive	occurring first in time
mon/o-	one	monocular	referring to one eye
uni-	one	unicellular	composed of one cell
hemi-	half; one side	hemisphere	one half of a rounded structure
semi-	half; partial	semisolid	partially solid
bi-	two, twice	bicuspid	a tooth with two points (cusps)
di-	two, twice	dimorphous	having two forms (morph/o)
dipl/o	double	diploid	having two sets of chromosomes
tri-	three	triplet	one of three offspring produced in a single birth
quadr/i-	four	quadrant	one-fourth of an area
tetra-	four	tetrahedron	a figure with four surfaces
multi-	many	multiple	consisting of many parts
poly-	many, much	polysaccharides	substance composed of many sugars

Table (7): Prefixes for colors

Prefix	Meaning	Example	Definition of example
cyan/o	blue	cyanosis	bluish discoloration of the skin due to lack of oxygen
erythr/o	red	erythrocyte	a red blood cell
leuk/o	white, colorless	leukoplakia	white patches in the mouth
melan/o	Black, dark	melanin	the dark pigment that colors the hair and skin
xanth /o	yellow	xanthoderma	yellow coloration of the skin

Table (8): Negative prefixes

Prefix	Meaning	Example	Definition of example
a-, an-	not; without	aseptic	free of infectious organisms
in-, im-	not	insignificant	not important
contra-	against, opposite	contraception	prevention of conception
de-	down, without	depilatory	agent used to remove hair (pil/o)
dis-	absence, removal, separation	dissect	to separate tissues for anatomical study
anti-	against	antidote	means for counteracting a poison
non-	not	noninfectious	not able to spread disease
un-	not	unconscious	not responsive

Table (9): Prefixes for degree

Prefix	Meaning	Example	Definition of example
hyper-	over, excess, abnormally high, increased	hyperventilation	excess breathing
hypo*	under; below	hypoxia	decreased oxygen in the tissues
olig/o	few, scanty	oligomenorrhea	a scanty menstrual flow (men/o)
pan	all	panacea	remedy that cures all ills; a cure-all
super*	above, excess	supernumerary	in excess number

*May also show position, as in hypodermic, superficial.

Table (10): Prefixes for time and/or position

Prefix	Meaning	Example	Definition of example
ante-	before	antenatal	before birth
pre-	before, in front of	predisposing	leading toward a condition, such as disease
pro-	before, in front of	prodrome	symptom that precedes a disease
post-	after, behind	postmenopausal	after menopause
dextr/o-	right	dextrorotatory	rotating the plane of a polarized light ray to the right
end/o	In, within	endoscope	device for viewing the inside of a cavity or organ

Table (11): Prefixes for size and comparison

Prefix	Meaning	Example	Definition of example
equi-	equal, same	equilateral	having equal sides
eu-	true, good, easy, normal	euthyroid	having a normally functioning thyroid gland
hetero-	other, different, unequal	heterosexual	referring to the opposite sex
homo-,homeo	same, unchanging	homothermic	maintaining a constant body temperature (root therm/o); warm blooded
iso-	equal, same	isograft	graft between two genetically identical individuals

Prefix	Meaning	Example	Definition of example
macro-	large, abnormally large	macrocyte	extremely large red blood cell
mega-, megalo-	large; abnormally large	megabladder	enlargement of the bladder
micro-	small	microscopic	extremely small; visible only through a microscope
neo-	new	neonate	a newborn infant
normo-	normal	normovolemia	normal blood volume
ortho-	straight, correct, upright	orthotic	correcting or preventing deformities
pseudo-	false	pseudoplegia	false paralysis (suffix -plegia)
re-	again; back	regurgitation	backward or return flow, as of blood or food

Table (12): Prefixes for disease

Prefix	Meaning	Example	Definition of example
brady-	slow	bradypnea	slow breathing (-pnea)
dys-	abnormal, painful, difficult	dysplasia	abnormal development of tissue
mal-	bad, poor	malabsorption	A disease where the small intestine can't absorb enough of certain nutrients and fluids
tachy-	rapid	tachycardia	rapid heart (cardi) rate
xero-	dry	xerosis	dryness of the skin or membranes

Exercise

1) Write the plural form of each of the following words. The word ending is underlined in each:

1. Vertebra (bone of the spine)
2. Ganglion (mass of nerve tissue)
3. Omentum (abdominal membrane)
4. Testis (male gonad)
5. Lumen (central opening)
6. Matrix (background substance; mold)
7. Serum (liquid)
8. Meninx *(membrane around the brain and spinal cord)*
9. Focus (center)
10. Pelvis (bony hip girdle)
11. Adenoma (tumor of a gland)

2) Write the singular form for each of the following words. The word ending is underlined:

1. Foramina (openings)
2. Ganglia (small masses of nerve tissue)
3. Vertebrae (spinal bones)
4. Indices (directories; lists)
5. Carcinomata (cancers)

3) Give the suffix in the following words that means "specialty" or "specialist":

1. Psychiatry
2. Orthopedist
3. Urology

4) Give the name of the specialist in each of the following fields:

1. Pediatrics
2. Dermatology
3. Pharmacy
4. Gynecology

5) Identify and define the prefix in each of the following words:

1. Amorphous
2. Antibody
3. Megacolon
4. Isometric
5. Premenstrual
6. Post-traumatic
7. Antedate

6) Match the following terms

Column A	Column B
Pandemic	a. located at the surface (above other structures)
Hyposecretion	b. less than the normal number of teeth
Hypertension	c. underproduction of a substance
Oligodontia	d. disease affecting an entire population
Superficial	e. high blood pressure

7) Write the opposite of each of the following words:

1. Heterogeneous (composed of different materials)
2. Macroscopic (visible with the naked eye)

8) Fill in the blanks:

1. A monocular microscope has…….eyepiece(s).
2. To bisect is to cut into …….. parts.
3. A quadruped animal has ……..feet.
4. A triad has ……..part(s).
5. A unicellular organism is composed of …….. cell(s).
6. A diatomic molecule has …….. atom(s)

Case Study

Multiple health problems secondary to injury

D.S., a 28-year-old woman, was treated for injuries sustained in a train accident. During the course of her treatment, she was seen by several specialists. For pain in her knee and hip joints, she was referred to an orthopedist. For migraine headaches and blurry vision, she consulted a neurologist. For pain on urination and occasional bloody urine, she saw an urologist. Later, for a persistent dry cough and problems resulting from a fractured nose, she was referred to an otorhinolaryngologist. During her initial course of treatment, she had a CT scan of her abdomen and brain and an MRI of her hip and knee. Both imaging studies required her to lie motionless on her back for 45 minutes. Several months after the accident, D.S. was still experiencing some discomfort, and she decided to investigate alternative therapies. She made an appointment with a specialist in homeopathy and herbal medicine. Before her appointment, she browsed in the Nutra-Medica Shop, which carried nutritional supplements, vitamin and mineral products, homeopathic remedies, and herbal formulas. She planned to ask the therapist about some of the products that she saw there, which included remedies with the trade names Pneumogen, Arthogesia-Plus, Renovite, Nephrostat, and Hematone.

Case study questions

I. Select the best answer

1. The *-ist* in the word neurologist is a:

a. prefix

b. root

c. suffix

d. combining form

e. conjunction

2. *Endo-* in endoscopic is a:

a. root

b. suffix

c. combining form

d. prefix

e. derivation

3. MRI stands for magnetic resonance imaging. This term represents a (n):

a. combining form

b. acronym

c. prefix

d. suffix

e. abbreviation

4. D.S. needed plastic surgery on her nose to repair the post fracture deformity. This procedure is called a:

a. septoscope

b. rhinoplasty

c. neurectomy

d. cardioplasty

e. rhinitis

5. The products Renovite and Nephrostat are named for their action on the:

a. lung

b. nerves

c. liver

d. heart

e. kidney

II. Write a word from the case study that means each of the following:

1) Expert in the field of urology.

2) The noun *nutrition* used as an adjective

III. Some common medical terms:

Active ingredient: the ingredient in the medicine that works with your body to bring relief to the symptoms.

Side effect: is an effect, whether therapeutic or adverse, that is secondary to the one intended; although the term is predominantly employed to describe adverse effects, it can also apply to beneficial, but unintended, consequences of the use of a drug.

An **adverse drug reaction** (**ADR):** is an injury caused by taking a medication. ADRs may occur following a single dose or prolonged administration of a drug or result from the combination of two or more drugs. The meaning of this expression differs from the meaning of "side effect", as this last expression might also imply that the effects can be beneficial.

Contraindication: a factor that makes the use of a drug undesirable or dangerous.

Over-the-counter drugs (OTCs): medications that may be sold without a prescription or a visit to a medical professional. Note that there can still be interactions and risks associated with OTC drugs. Pharmacist can advise the patient on how to use OTCs safely.

Medical diagnosis: the determination of the nature and cause of an illness, begins with a patient history. This includes a history of the present illness with a description of symptoms, a past medical history, and a family and a social history.

A physical examination, which includes a review of all systems and observation of any signs of illness, follows the history taking. Practitioners use the following techniques in performing physicals:

• **Inspection:** visual examination.

• **Palpation:** touching the surface of the body with the hands or fingers.

• **Percussion:** tapping the body and listening to the sounds produced.

• **Auscultation:** listening to body sounds with a stethoscope.

Vital signs (VS) are also recorded for comparison with normal ranges. Vital signs are measurements that reflect basic functions necessary to maintain life and include:

• **Temperature (T).**

• **Pulse rate,** measured in beats per minute (bpm).

• **Respiration rate (R),** measured in breaths per minute.

Disease: any particular destructive physical process in an organ or organism with a specific cause, or causes, and characteristic symptoms.

Acute: refers to a disease, having a sudden onset and a short duration.

Chronic: refers to a disease of long duration; progressing slowly.

Nosocomial: describing an infection acquired in a hospital (root *nos/o* means "disease," and *comial* refers to a hospital). Such infections can be a serious problem, especially if they are resistant to antibiotics; for example, there are now strains of methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *S. aureus* (VRSA), which cause troublesome infections in hospital settings.

Symptoms: any evidence of disease; sometimes limited to subjective evidence of disease, as experienced by the individual, such as pain, dizziness, weakness.

Etiology: the cause of a disease.

Therapy: Treatment; intervention.

Cure: the effective elimination of a disease or disordered condition.

Idiopathic: having no known cause.

Prevention: taking steps before a disease or other abnormality occurs to ensure that it doesn't occur.

Prognosis: is a prediction of the outcome of the disease.

Exacerbation: worsening of disease; increase in severity of a disease or its symptoms.

Remission: a lessening of disease symptoms; the period during which such lessening occurs.

Prescription: a direction for the preparation and use of a medication for a particular patient to be dispensed by a pharmacist.

Medication order: in a hospital or other institutional setting, an order for the administration of one or more medications to a patient.

Placebo: a preparation containing no therapeutic active ingredient and is given for its psychological effect.

Biopsy: is the removal of tissue for microscopic examination.

Computed tomography (CT scan): use of a computer to generate an image from a large number of x-rays passed at different angles through the body; a three-dimensional picture of a

cross-section of the body is obtained; reveals more about soft tissues than does simple radiography.

Magnetic resonance imaging (MRI): production of images through the use of a magnetic field and radio waves; the characteristics of soft tissue are revealed by differences in molecular properties; eliminates the need for x-rays and contrast media.

Surgery: is a method for treating disease or injury by manual operations. Surgery may be done through an existing body opening, but usually it involves cutting or puncturing tissue with a sharp instrument in the process of **incision.**

Suture: to unite parts by stitching them together; also the thread or other material used in that process or the closure formed by surgical stitch.

Hernia: protrusion of an organ through an abnormal opening; a rupture.

Inflammation: a localized response to tissue injury characterized by heat, pain, redness, and swelling. The suffix *-itis* indicates inflammation, as in appendicitis (inflammation of the appendix) and tonsillitis (inflammation of the tonsils).

Neoplasm: an abnormal and uncontrolled growth of tissue, namely, a tumor; may be benign or malignant.

Benign: not recurrent or malignant; favourable for recovery; describing tumors that do not spread.

Malignant: growing worse; harmful; tending to cause death; describing tumors that spread (metastasize).

Metastasize: to spread from one part of the body to another; characteristic of cancer. The noun is metastasis.

Necrosis: death of tissue.

Alternative and complementary medicine: many people have begun to consider healing practices from other philosophies and cultures as alternatives and complements to conventional medicine. Some of these philosophies include **homeopathy,** techniques of **acupuncture,** massage, and meditation may also be used, as well as herbal remedies and nutritional counselling on diet, vitamins, and minerals.

Acupuncture: an ancient Chinese method of inserting thin needles into the body at specific points to relieve pain, induce anesthesia, or promote healing; similar effects can be obtained by using firm finger pressure at the surface of the body in the technique of *acupressure.*

Homeopathy: a philosophy of treating disease by administering drugs in highly diluted form along with promoting healthy life habits and a healthy environment (from home/o, meaning "same," and path, meaning "disease").

Routes of drug administration

Absorption: drug taken into the circulation through the digestive tract or by transfer across another membrane.

Inhalation: administration though the respiratory system, as by breathing in an aerosol or nebulizer spray.

Instillation: liquid is dropped or poured slowly into a body cavity or on the surface of the body, such as into the ear or onto the conjunctiva of the eye.

Oral: given by mouth; per os (po).

Rectal: administered by rectal suppository or enema.

Sublingual: administered under the tongue.

Topical: applied to the surface of the skin.

Transdermal: absorbed through the skin, as from a patch placed on the surface of the skin.

Injection: administered by a needle and syringe; described as parenteral.

Epidural: injected into the space between the meninges (membranes around the spinal cord) and the spine.

Intradermal (ID): injected into the skin.

Intramuscular (IM): injected into a muscle.

Intravenous: injected into a vein.

Spinal: injected through the meninges into the spinal fluid.

Subcutaneous (SC): injected beneath the skin; hypodermic.

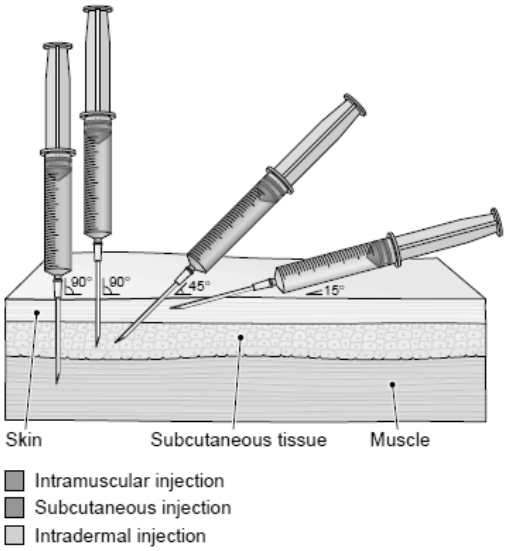


Figure (4): Comparison of the angles of insertion for intramuscular, subcutaneous, and intradermal injections.

Drug Preparations

A. Liquid preparation:

Aerosol: solution dispersed as a mist to be inhaled.

Aqueous solution: substance dissolved in water.

Elixir (elix): a clear, pleasantly flavoured and sweetened hydroalcoholic liquid intended for oral use.

Emulsion: a mixture in which one liquid is dispersed but not dissolved in another liquid.

Lotion: solution prepared for topical use.

Suspension (susp): fine particles dispersed in a liquid; must be shaken before use.

Tincture (tinct): substance dissolved in an alcoholic solution.

B. Semisolid preparation:

Cream: a semisolid emulsion used topically.

Ointment (ung): drug in a base that keeps it in contact with the skin.

C. Solid

Capsule (cap): material in a gelatin container that dissolves easily in the stomach.

Lozenge: a pleasant-tasting medicated tablet or disk to be dissolved in the mouth.

Suppository (supp): substance mixed and molded with a base that melts easily when inserted into a body opening.

Tablet (tab): a solid dosage form containing a drug in a pure state or mixed with a nonactive ingredient and prepared by compression or molding; also called a pill.

Terms referring to injectable drugs

Ampule: a small sealed glass or plastic container used for sterile intravenous solutions.

Bolus: a concentrated amount of a diagnostic or therapeutic substance given rapidly intravenously.

Catheter: a thin tube that can be passed into a body cavity, organ, or vessel.

Syringe: an instrument for injecting fluid.

Vial: a small glass or plastic container.

Exercise

1) Fill in the blanks:

1. Any abnormal and uncontrolled growth of tissue, whether benign or malignant, is called a…….
2. Heat, pain, redness, and swelling are the four major signs of……...
3. A disease of long duration that progresses slowly is described as……...
4. The spreading of cancer to other parts of the body is called ……..
5. Death of tissue is called…….
6. Protrusion of an organ through an abnormal opening is a……

2) Match the following terms

Column A	Column B
Elixir	a. a thin tube that can be passed into a body cavity, organ, or vessel.
Neoplasm	b. a philosophy of treating disease by administering drugs in highly diluted form along with promoting healthy life habits and a healthy environment
Catheter	c. an abnormal and uncontrolled growth of tissue, namely, a tumor; may be benign or malignant.
Exacerbation	d. a clear, pleasantly flavoured and sweetened hydroalcoholic liquid intended for oral use.
Remission	e. fine particles dispersed in a liquid; must be shaken before use.
Intradermal (ID)	f. worsening of disease; increase in severity of a disease or its symptoms.
Intramuscular (IM)	g. injected into the skin.
Suspension	h. injected into a muscle.
Homeopathy	i. A lessening of disease symptoms; the period during which such lessening occurs.

IV. Some common pharmaceutical Latin abbreviations

Table (13): Some common abbreviations

Abbreviation	Meaning of abbreviation
Drugs and drug Formulations	
amp.	Ampoule
cap.	Capsule
elix.	Elixir
Emet.	An emetic
Enem.	An enema
FL.	Liquid
Inj.	An injection
Lot.	Lotion
MED(s)	Medicine(s), medication(s)
NSAID(s)	Nonsteroidal anti-inflammatory drug(s)
OTC	Over-the-counter
Rx	Prescription
SL	Administered under the tongue (sublingual)
supp.	Suppository
susp.	Suspension
tab.	Tablet
tinct.	Tincture
ung	Ointment
Dosages and directions	
a	Before (Latin, ante)
aa	For each (Greek, ana)
ac	Before meals (Latin, ante cibum)
ad lib	As desired (Latin, ad libitum)
aq	Water (Latin, aqua)
b.	Twice (bis)
bid	Twice a day (Latin, bis in die)
c	With (Latin, cum)
cc	Cubic centimeter
d.	A day
d.d	Daily (de die)
D/C, dc	Discontinue
Ds	Double strength
fort.	Strong
gtt	Drop(s) (Latin, gutta)
hs	At bedtime (Latin, hora somni)
IM	Intramuscular
IU	International unit
IV	Intravenous
mcg	Micrograms

Abbreviation	Meaning of abbreviation
m.d.u	To be used as directed (more dicto utendus)
mg	Milligrams
LA	Long-acting
NS	Normal saline
p	After, post
pc	After meals (Latin, post cibum)
po	By mouth (Latin, per os)
pp	Postprandial (after a meal)
prn	As needed (Latin, pro re nata)
qam	Every morning (Latin, quaque ante meridiem)
qd	Every day (Latin, quaque die)
qh	Every hour (Latin, quaque hora)
q……h	Every…..hour
qid	Four times a day (Latin, quater in die)
qod	Every other day (Latin, quaque [other] die)
s	Without (Latin, sine)
SA	Sustained action
solve.	Solve, dissolve
SC, SQ, subcu	Subcutaneous
SR	Sustained release
ss	Half (Latin, semis)
tid	Three times per day (Latin, ter in die)
U	Unit(s)
x	Times
Miscellaneous abbreviations	
aq.	Water (aqua)
aq. ad.	Water up to
aq. dest.	Distilled water (aqua destillata)
aq. mar.	Sea water (aqua marina)
Aur., a	The ear (auris)
BP	British Pharmacopeia
FDA	Food and Drug Administration
USP	United States Pharmacopeia

Exercise

1) Define each of the following abbreviations:

1. Rx
2. IM
3. USP
4. ad lib
5. mg
6. NSAIDs
7. FDA

Case Study

Cardiac disease and crisis

P.L., who has a 4-year history of heart disease, was brought to the emergency room by ambulance with chest pain that radiated down her arm, dyspnea, and syncope. Her routine meds included: Lanoxin to slow and strengthen her heart beat, Inderal to support her heart rhythm, Lipitor to decrease her cholesterol, Catapres to lower her hypertension, nitroglycerin prn for chest pain, Hydro-DIURIL to eliminate fluid and decrease the workload of her heart, Diabinese for her diabetes, and Coumadin to prevent blood clots. She also took Tagamet for her stomach ulcer and several OTC preparations. Shortly after admission, P.L.'s heart rate deteriorated into full cardiac arrest. Immediate resuscitation was instituted with cardiopulmonary resuscitation (CPR), defibrillation, and a bolus of IV epinephrine. Between shocks she was given a bolus of lidocaine and a bolus of diltiazem plus repeated doses of epinephrine every 5 minutes. P.L. did not respond to resuscitation. On the death certificate, her primary cause of death was listed as cardiac arrest.

Case study questions

I. Select the best answer

1. P.L.'s nitroglycerine is ordered: prn SL. This means:
   a. as needed, under the tongue
   b. at bedtime, under the tongue
   c. as needed, on the skin
   d. by mouth, on the skin

2. P.L. took several OTC preparations. OTC means:
   a. on the cutaneous
   b. off the cuff
   c. over the counter
   d. do not need a prescription

3. During P.L.'s resuscitation, epinephrine was given in an IV bolus. This means it was administered:
   a. intramuscular in a continuous drip
   b. intramuscular in a topical solution
   c. intravenously in a continuous drip
   d. intravenously in a rapid concentrated dose

V. Drug Names

Drugs may be cited by either their generic or their trade names. The **generic name** is usually a simple version of the chemical name for the drug and is not capitalized. The **trade name** (brand name, proprietary name) is a registered trademark of the manufacturer and is written with an initial capital letter. The same drug may be marketed by different companies under different trade names.

Where do they get those names?

Drug names are derived in a variety of ways. Some are named for their origin. Adrenaline, for example, is named for its source, the adrenal gland.

Even its generic name, epinephrine, informs us that it comes from the gland that is above the kidney. Pitocin, a drug used to induce labor, is named for its source, the pituitary gland, combined with the chemical name of the hormone, oxytocin. Botox, currently injected into the skin for cosmetic removal of wrinkles, is the toxin from the organism that causes botulism, a type of food poisoning. Aspirin (an anti-inflammatory agent), Taxol (an antitumor agent), digitalis (used to treat heart failure), and atropine (a smooth muscle relaxant) are all named for the plants they come from. For example, aspirin is named for the blossoms of Spiraea, from which it comes. Taxol is named for the genus *Taxus*, of the **yew** from which it comes. Digitalis comes from purple foxglove, genus *Digitalis.* Atropine comes from the plant *Atropa belladonna.*

Some names tell about the drug or its actions. The name for Humulin, which is a form of insulin made by genetic engineering, points up the fact that this is human insulin and not a hormone from animal sources. The name belladonna is from Italian and means "fair lady," because this drug dilates the pupils of the eyes, making women appear more beautiful.

Generic name: The non-proprietary name of a drug, that is, a name that is not privately owned or trademarked; usually a simplified version of the chemical name; not capitalized.

Trade name: The brand name of a drug, a registered trademark of the manufacturer; written with a capital letter.

Common drugs and their actions:

Table (14): Some common drug classes and their actions

Category	Action
analgesics	alleviate pain
narcotic	decrease pain sensation in central nervous system; chronic use may lead to physical dependence
anesthetics	reduce or eliminate sensation
anticoagulants	prevent coagulation and formation of blood clots
anticonvulsants	suppress or reduce the number and/or intensity of seizures
antidiabetics	prevent or alleviate diabetes
antiemetics	relieve symptoms of nausea and prevent vomiting
antihistamines	prevent responses mediated by histamine: allergic and inflammatory reactions
antihypertensives	lower blood pressure by reducing cardiac output, dilating vessels, or promoting excretion of water by the kidneys
anti-inflammatory drugs	counteract inflammation and swelling
corticosteroids	hormones from the cortex of the adrenal gland; used for allergy, respiratory, and blood diseases, injury, and malignancy; suppress the immune system
nonsteroidal anti-inflammatory drugs (NSAIDs)	reduce inflammation and pain by interfering with synthesis of prostaglandins; also antipyretic
antipruritic	an agent that counteracts itching
anti-infective agent	kill or prevent the growth of infectious organisms
antibiotics	effective against bacteria
antifungal	effective against fungi
antiparasitics	effective against parasites
antivirals	effective against viruses
antineoplastics	destroy cancer cells; they are toxic for all cells but have greater effect on cells that are actively growing and dividing
antiarrhythmics	correct or prevent abnormalities of heart rhythm
hypolipidemics	lower cholesterol in patients with high serum level that can't be controlled with diet alone.
CNS stimulants	stimulate the central nervous system

Category	Action
diuretics	promote excretion of water, sodium, and other electrolytes by the kidneys; used to reduce edema and blood pressure
antacid	An agent which counteracts acidity
antidiarrheals	treat or prevent diarrhea
laxatives	promote elimination from the large intestine
antitussives	suppress coughing
antiflatulant	an agent that relieves or prevent flatulence
carminative	an agent that relieves flatulence
bronchodilators	prevent or eliminate spasm of the bronchi (breathing tubes) by relaxing bronchial smooth muscle; used to treat asthma and bronchitis
expectorant	induce productive coughing to eliminate respiratory secretions
mucolytics	loosen mucus to promote its elimination
astringent	an agent that cause contraction, usually locally after topical application
keratolytic	an agent that promotes keratolysis
emollient	an agent that soften or soothes the skin, or soothes an irritated internal surface
antianxiety	reduce anxiety
hypnotic	induce sleep or dull the senses
antidepressant	relieve depression by raising brain levels of neurotransmitters (chemicals active in the nervous system)

Case study

Asthma

E.N., a 20-year-old asthmatic woman, visited the preadmission testing unit one week before her cosmetic surgery to meet with the nurse and anesthesiologist. Her current meds included several bronchodilators, which she takes by mouth and by inhalation, and a tranquilizer that she takes when needed for nervousness. She sometimes receives inhalation treatments with Mucomyst, a mucolytic agent. On E.N.'s preoperative note, the nurse wrote:
Theo-Dur 1 cap tid.
Flovent inhaler 1 spray (50 mcg) each nostril bid.
Ativan (lorazepam) 1 mg po bid.
Albuterol—metered dose inhaler 2 puffs (180 mcg) prn q4-6h for bronchospasm and before exercise.

E.N. stated that she has difficulty with her asthma when she is anxious and when she exercises. She also admitted to occasional use of marijuana, a hallucinogen and mood-altering illegal drug. The anesthesiologist wrote an order for lorazepam 4 mg IV 1 hour preop. The plastic surgeon recommended several herbal products to complement her surgery and her recovery. He ordered high-potency vitamin 3 tabs with breakfast and dinner to support tissue health and healing. He also prescribed Bromelain, an enzyme from pineapple, to decrease inflammation, 1 po qid 3 days before surgery and postoperatively for 2 weeks. Arnica Montana was prescribed to decrease discomfort, swelling, and bruising; 3 tabs sublingual tid the evening after surgery and for the following 10 days.

Case study questions

I. Select the best answer

1. E.N. used a mucolytic drug when needed. This drug's action is to:
   a. increase secretions
   b. decrease spasm
   c. loosen mucus secretions
   d. simulate mucus

2. E.N.'s Flovent inhaler is indicated as 1 spray of 50 mcg in each nostril bid. How many micrograms (mcg) does she get in 1 day?
   a. 100 mcg
   b. 200 mcg
   c. 250 mcg
   d. 500 mcg

3. Ativan that E.N. takes for nervousness is a (n) …….drug.
   a. anxiolytic
   b. potentiating
   c. antiemetic
   d. analgesic

4. Arnica Montana was prescribed 3 tabs SL tid. How many tabs would E.N. take in 1 day?
   a. 6
   b. 9
   c. 12
   d. 21
5. Flovent is administered as an inhalant. The form in which the drug is prepared is called a (n) ……..
   a. emulsion
   b. elixir
   c. aerosol
   d. suspension

VI. Body structure

a. Directional terms

In describing the location or direction of a given point in the body, it is always assumed that the subject is in the **anatomical position**, that is, upright, with face front, arms at the sides with palms forward, legs parallel, and toes pointed forward as shown in the following diagram (fig. 5).

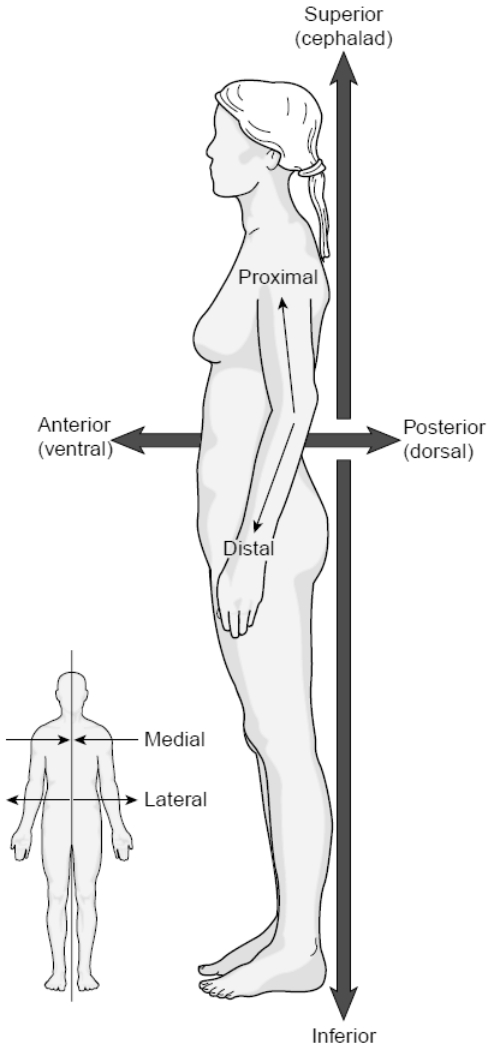


Figure (5): directional terms.

Table (15): Anatomical direction

Term	Definition
anterior (ventral)	toward the front (belly) of the body
posterior (dorsal)	toward the back of the body
medial	toward the midline of the body
lateral	toward the side of the body
proximal	nearer to the point of attachment or to a given reference point
distal	farther from the point of attachment or from a given reference point
superior	above
inferior	below
cephalad (cranial)	toward the head

b. <u>Body Cavities</u>

Internal organs are located within dorsal and ventral cavities. The dorsal cavity contains the brain in the cranial cavity and the spinal cord in the spinal cavity (canal). The uppermost ventral space, the thoracic cavity, is separated from the abdominal cavity by the diaphragm. There is no anatomical separation between the abdominal cavity and the pelvic cavity, which together make up the abdominopelvic cavity. The large membrane that lines the abdominopelvic cavity and covers the organs within it is the peritoneum.

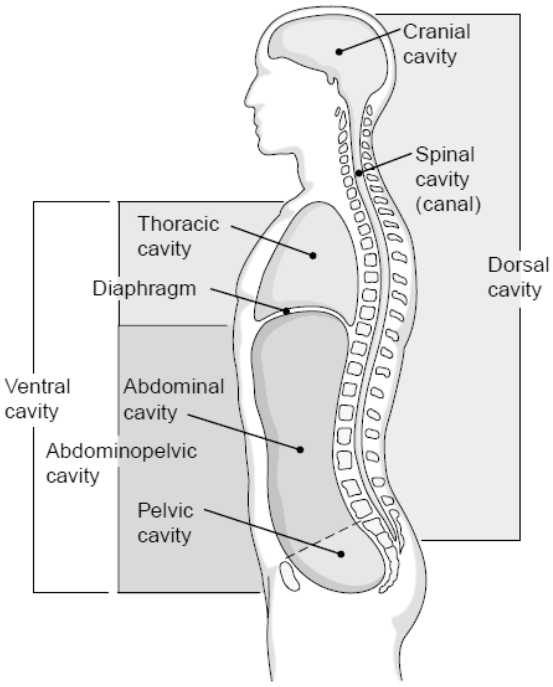


Figure (6): Side view of the body cavities.

c. Body Regions

For orientation, the abdomen can be divided by imaginary lines into nine regions, which are shown in Fig. 7.

The sections down the midline are the:

- epigastric region, located above the stomach,
- umbilical region, named for the umbilicus,
- hypogastric region, located below the stomach.

The lateral regions are the:

- right and left hypochondriac regions, named for their position near the ribs, specifically near the cartilages (root chondr/o) of the ribs,
- right and left lumbar regions, which are located near the small of the back (lumbar region of the spine),
- right and left iliac regions, named for the upper bone of the hip, the ilium. These regions are also called the inguinal regions, with reference to the groin.

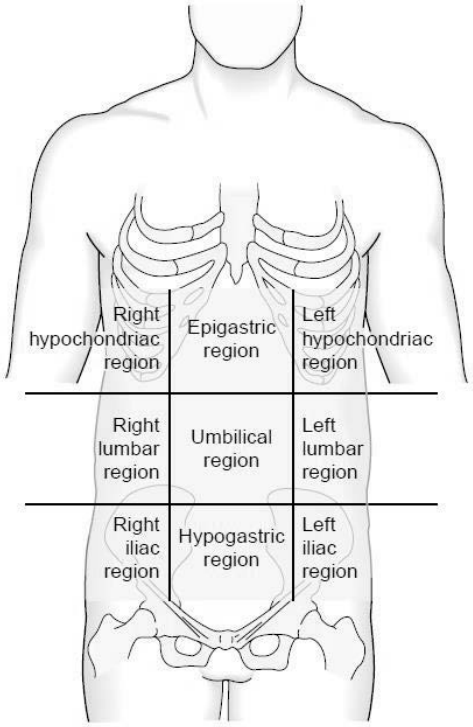


Figure (7): The nine region of the abdomen

More simply, but less precisely, the abdomen can be divided by a single vertical line and a single horizontal line into four sections (Fig. 8), designated the right upper quadrant (RUQ), left upper quadrant (LUQ), right lower quadrant (RLQ), and left lower quadrant (LLQ).

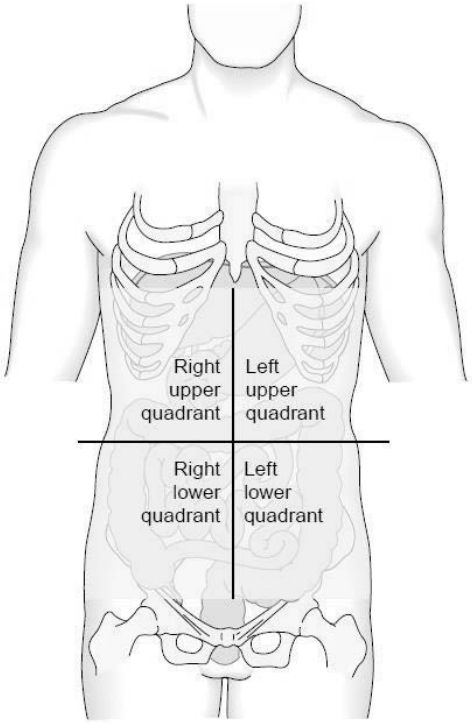


Figure (8): Quadrant of the abdomen

d. Word parts referring to body structure

Table (16): Roots for the region of head, neck and extremities

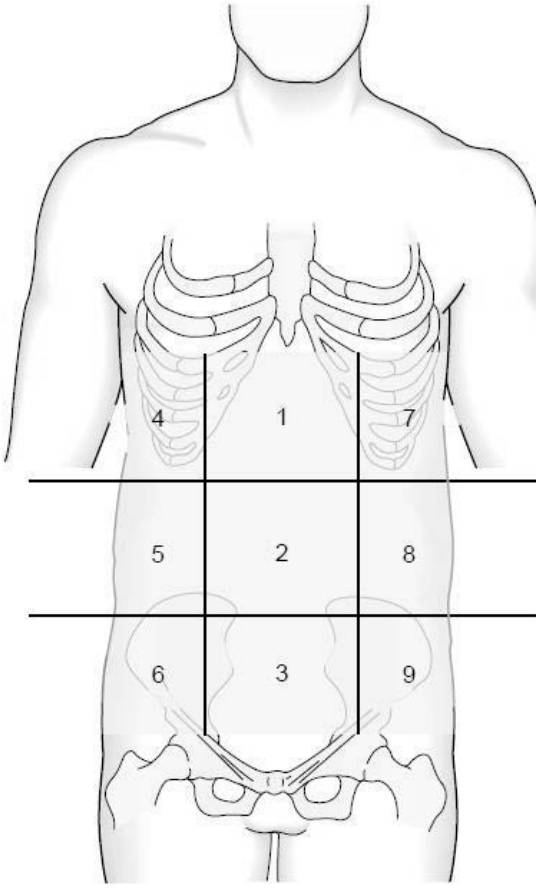
Root	Meaning
cephal/o	head
cervic/o	neck
thorac/o	chest, thorax
abdomin/o	abdomen
celi/o	abdomen
lapar/o	abdominal wall
lumb/o	lumbar region, lower back
periton, peritone/o	peritoneum
acro	extremity, end
brachi/o	arm
dactyl/o	finger, toe
pod/o, ped/o	foot

Exercise

1) Fill in the blanks:

1. Acrokinesia is excess motion (-kinesia) of the …….
2. Animals that brachiate, such as monkeys, swing from place to place using their……...
3. A dactylospasm is a cramp (spasm) of the…….
4. The term brachiocephalic refers to the ……...
5. Podiatry is a specialty that treats problems of the……..
6. A bipedal animal has two ……..
7.

2) You are provided with a diagram showing the nine abdominal regions; write the name of each numbered part.



VII. Body systems

1) Circulation: cardiovascular and lymphatic system

A. Introduction:

Blood circulates throughout the body in the cardiovascular system, which consists of the heart and the blood vessels. This system forms a continuous circuit that delivers oxygen and nutrients to all cells and carries away waste products. Also functioning in circulation is the lymphatic system, which drains fluid and proteins from the tissues and returns them to the bloodstream.

The main components of the human cardiovascular system are the heart and the vascular system. The **heart** is located between the lungs, with its point or **apex** directed toward the left. The thick muscle layer of the heart wall is the **myocardium.** This is lined on the inside with a thin **endocardium** and is covered on the outside with a thin **epicardium.** The heart is contained within a fibrous sac, the **pericardium.** The heart consists of four chambers. Each of the upper receiving chambers of the heart is an **atrium** (plural, atria). Each of the lower pumping chambers is a **ventricle** (plural, ventricles). The vascular system consists of:

1. **Arteries** that carry oxygenated blood away from the heart. **Arterioles** are small arteries that lead into the capillaries.
2. **Capillaries,** the smallest vessels, through which exchanges take place between the blood and the tissues.
3. **Veins** that carry deoxygenated blood back to the heart. The small veins that receive blood from the capillaries and drain into the veins are **venules.**

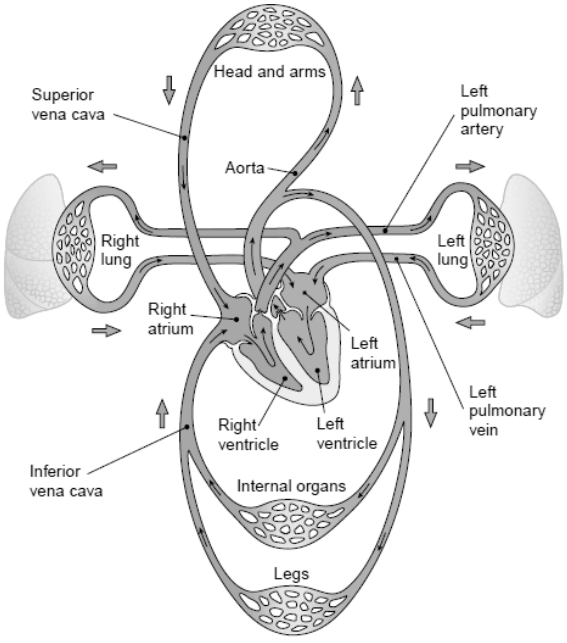


Figure (9): The cardiovascular system

The circulatory system of the blood has two components, a systemic circulation and a pulmonary circulation.

Systemic circulation

It is the portion of the cardiovascular system which transports oxygenated blood away from the heart, to the rest of the body, and returns oxygen depleted blood back to the heart.

Pulmonary circulation

The pulmonary circulation is the portion of cardiovascular system which transports oxygen depleted blood away from the heart, to the lungs, and returns oxygenated blood back to the heart.

Heart beat

Each contraction of the heart, termed systole, is followed by a relaxation phase, diastole, during which the chambers fill. Each time the heart beats, both atria contract and immediately thereafter both ventricles contract.

Blood pressure

Blood pressure is the force exerted by blood against the wall of a blood vessel. It is commonly measured in a large artery with a blood pressure apparatus called a **sphygmomanometer**. Both systolic and diastolic pressures are measured and reported as systolic then diastolic separated by a slash, such as 120/80.

The lymphatic system

The lymphatic system is a widely distributed system with multiple functions. Its role in circulation is to return excess fluid and proteins from the tissues to the bloodstream. The fluid carried in the lymphatic system is called lymph. Another function of the lymphatic system is to absorb digested fats from the small intestine. These fats are then added to the blood near the heart. One other major function of the lymphatic system is to protect the body from impurities and invading microorganisms. Along the path of the lymphatic vessels are small masses of lymphoid tissue, the **lymph nodes**. Their function is to filter the lymph as it passes through. Other organs and tissues of the lymphatic system include the **tonsils,** located in the throat, the **thymus gland** in the chest, and the **spleen** in the upper left region of the abdomen.

Table (17): Roots referring to the cardiovascular and lymphatic systems

Root	Meaning	example	Definition of example
cardi/o	heart	cardiomyopathy	any disease of the heart muscle
atri/o	atrium	atriotomy	surgical incision of an atrium
ventricul/o	cavity, ventricle	supraventricular	above a ventricle
valv/o, valvul/o	valve	valvectomy	surgical removal of a valve
angi/o	vessel	angiopathy	any disease of blood vessels
vas/o, vascul/o	vessel, duct	vasodilation	widening of a blood vessel
arter/o, arteri/o	artery	endarterial	within an artery
arteriol/o	arteriole	arteriolar	referring to an arteriole
aort/o	aorta	aortostenosis	narrowing of the aorta
ven/o, ven/i	vein	venous	referring to a vein
lymph/o	lymph, lymphatic system	lymphoid	resembling lymph or lymphatic tissue
lymphaden/o	lymph node	lymphadenectomy	surgical removal of a lymph node
lymphangi/o	lymphatic vessel	lymphangioma	tumor of lymphatic vessels
splen/o	spleen	splenomegaly	enlargement of the spleen
thym/o	thymus gland	athymia	absence of the thymus gland
tonsill/o	tonsil	tonsillar	referring to a tonsil

Some circulatory system diseases:

Atherosclerosis

The accumulation of fatty deposits within the lining of an artery is termed atherosclerosis. This type of deposit, called a plaque, begins to form when a vessel receives tiny injuries, usually at a point of branching. Plaques gradually thicken and harden with fibrous material, cells, and other deposits, restricting the lumen (opening) of the vessel and reducing blood flow to the tissues, a condition known as ischemia.

Thrombosis and embolism

Atherosclerosis predisposes a person to **thrombosis,** the formation of a blood clot within a vessel. The clot, called a **thrombus,** interrupts blood flow to the tissues supplied by that vessel, resulting in necrosis (tissue death). Blockage of a vessel by a thrombus or other mass carried in the bloodstream is an **embolism,** and the mass itself is called an **embolus.** If the blood supply to

a major organ – such as the brain, heart or lungs – is blocked, the organ will lose some or all of its function. Two of the most serious conditions caused by an embolism are: stroke – where the blood supply to the brain is cut off- and pulmonary embolism – where a foreign body blocks the artery that carries blood from the heart to the lungs (the pulmonary artery).

Aneurysm

An arterial wall weakened by atherosclerosis, malformation, injury, or other causes may balloon out, forming an **aneurysm.** If an aneurysm ruptures, hemorrhage results. Aneurism may be defined as localized abnormal dilation of a blood vessel, usually an artery, caused by weakness of the vessel wall; may eventually burst.

Hypertension

Hypertension is defined as a systolic pressure greater than 140 mm Hg or a diastolic pressure greater than 90 mm Hg. Hypertension causes the left ventricle to enlarge (hypertrophy) as a result of increased work. Some cases of HTN are secondary to other disorders, such as kidney malfunction or endocrine disturbance, but most of the time the causes are unknown, a condition described as primary or essential hypertension.

Changes in diet and life habits are the first line of defense in controlling HTN. Drugs that are used include diuretics to eliminate fluids, vasodilators to relax the blood vessels, and drugs that prevent the formation or action of angiotensin, a substance in the blood that normally acts to increase blood pressure.

Heart Disease

- **Coronary artery disease**

Coronary artery disease (CAD), which results from atherosclerosis of the vessels that supply blood to the heart muscle, is a leading cause of death in industrialized countries. An early sign of CAD is the type of chest pain known as **angina pectoris.** This is a feeling of constriction around the heart or pain that may radiate to the left arm or shoulder, usually brought on by exertion. Often there is anxiety, **diaphoresis** (profuse sweating), and **dyspnea** (difficulty in breathing).

Early identification of angina pectoris may prevent the disorder from progressing into **myocardial infarction**. Myocardial infarction is a medical emergency more commonly called a heart attack. It is an outcome of the destruction or death of myocardial cells that is due to the insufficiency of oxygen supply. The resultant area of myocardial necrosis is termed an **infarct**, and the process is known as **myocardial infarction** (MI), the "heart attack" that may cause sudden death. Symptoms of MI include pain over the heart (precordial pain) or upper part of the abdomen (epigastric pain) that may extend to the jaw or arms, pallor (paleness), diaphoresis, nausea, and dyspnea. There may be a burning sensation similar to indigestion or heartburn.

CAD is diagnosed by **electrocardiography** (ECG), study of the electrical impulses given off by the heart as it functions, stress tests, **coronary angiography** (imaging), **echocardiography,** and other tests.

- **Arrhythmia**

Arrhythmia is any irregularity of heart rhythm, such as a higher- or lower-than-average heart rate, extra beats, or an alteration in the pattern of the beat. Bradycardia is a slower-than-average rate, and tachycardia is a higher-than-average rate. In cases of MI, there is often fibrillation, an extremely rapid, ineffective beating of the heart.

- **Heart failure**

The general term **heart failure** refers to any condition in which the heart fails to empty effectively. The resulting increased pressure in the venous system leads to **edema,** often in the lungs (pulmonary edema). Other symptoms of congestive heart failure are **cyanosis,** dyspnea, and **syncope**-a temporary loss of consciousness caused by inadequate blood flow to the brain. Heart failure is one cause of **shock,** a severe disturbance in the circulatory system resulting in inadequate delivery of blood to the tissues. Heart failure is treated with rest, drugs to strengthen heart contractions, diuretics to eliminate fluid, and restriction of salt in the diet.

- **Congenital heart disease**

A congenital defect is any defect that is present at birth. The most common type of congenital heart defect is a hole in the septum (wall) that separates the atria or the ventricles. Symptoms of septal defect include cyanosis (leading to the description "blue baby"), syncope, and **clubbing** of the fingers. Most such congenital defects can be corrected surgically.

Lymphatic disorders

Changes in the lymphatic system often are related to infection and may consist of inflammation and enlargement of the nodes, called lymphadenitis, or inflammation of the vessels, called lymphangiitis. Obstruction of lymphatic vessels because of surgical excision or infection results in tissue swelling, or lymphedema. Any neoplastic disease involving lymph nodes is termed lymphoma. These neoplastic disorders affect the white cells found in the lymphatic system.

Some drugs acting on cardiovascular system

- **Anticoagulant**
- **Antiarrhythmic agents**
- **Antihypertensive agents**
- **Hypolipidemic agents**
- **Vasodilators**

Exercise

1) Fill in the blanks:

1. Vasospasm means sudden contraction of a (n) ……..
2. Endarterectomy is removal of the inner lining of a (n)…….....
3. Aortosclerosis is hardening of the……..
4. Arteriolitis is inflammation of a (n)…….

2) Use the appropriate root to write a word with each of the following meanings:

1. Inflammation of lymphatic vessels.
2. A tumor of lymphatic tissue.
3. Any disease of the lymph nodes.
4. Pain in the spleen.
5. Inflammation of a tonsil.

3) Match the following terms

Column A	Column B
Pericardium	a. lymphoid organ in the chest
Atherosclerosis	b. fibrous sac around the heart
Thymus	c. inflammation of the heart muscle
Myocarditis	d. localized dilatation of a blood vessel
Aneurysm	e. absence of a heartbeat
Asystole	f. accumulation of fatty deposits in the lining of a blood vessel

Case study

Cardiac disease

A.L., a 68-year-old woman, was admitted to the cardiac care unit (CCU) with chest pain, dyspnea, diaphoresis, syncope, and nausea. She had taken three sublingual doses of nitroglycerine tablets within a 10-minute time span without relief before dialling 123. A previous stress test suggested cardiac disease. Her family history was significant for cardiovascular disease. Her father died at the age of 62 of an acute myocardial infarction. Her mother died at the age of 72 of congestive heart failure. A.L.'s older sister died from a ruptured aortic aneurysm at the age of 65. On admission her skin color was dusky to cyanotic on her lips and fingertips. Her admitting diagnosis was possible coronary artery disease, acute myocardial infarction, and valvular disease.

Case study questions

I. Write the word or phrase from the case study that has the same meaning as each of the following words or phrases:

1. The state of profuse perspiration.
2. Under the tongue.
3. Test of cardiac function during physical exertion.
4. Disease that includes both heart and blood vessel pathology.
5. Bluish discoloration of the skin; sign of anoxia.

II. Select the best answer

1. Acute myocardial infarction is characterized by all of the following **EXCEPT**
    a. It is known as heart attack.
    b. It may cause death.
    c. Symptoms of myocardial infarction include epigastric pain.
    d. If not treated, it may progress into angina pectoris.
2. Aneurysm is defined as:
    a. localized abnormal dilation of a blood vessel, usually an artery, caused by weakness of the vessel wall; may eventually burst.
    b. death of myocardial cells due to oxygen deficiency.
    c. blockage of a vessel by a thrombus or other mass carried in the bloodstream.
    d. a condition caused by the inability of the heart to maintain adequate circulation of blood.

2) The nervous systems

As shown in figure (10), The nervous system may be divided into the central nervous system (CNS), consisting of the brain and spinal cord, and the peripheral nervous system (PNS), consisting of all nervous tissue outside the brain and spinal cord. Functionally, the nervous system can be divided into the **somatic nervous system**, which controls skeletal muscles and the visceral or **autonomic nervous system** (ANS), which controls smooth muscle, cardiac muscle, and glands. The ANS regulates responses to stress and helps to maintain homeostasis.

The Neuron

The neuron is the basic functional unit of the nervous system (Fig. 11). Each neuron has two types of fibers extending from the cell body: the **dendrite**, which carries impulses toward the cell body, and the **axon**, which carries impulses away from the cell body.

Some axons are covered with **myelin**, a whitish, fatty material that insulates and protects the axon and speeds electric conduction. Axons so covered are described as myelinated, and they make up the **white matter** of the nervous system. Unmyelinated tissue makes up the **gray matter** of the nervous system.

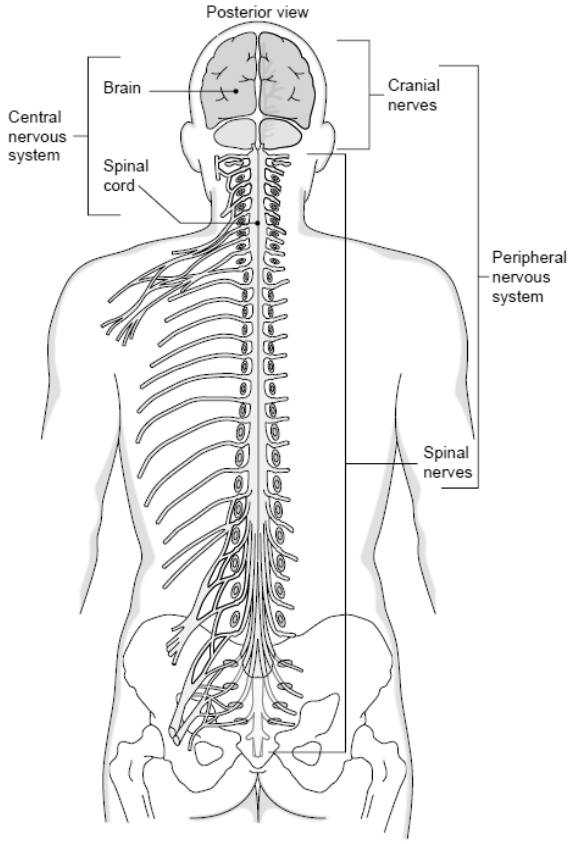


Figure (10): Anatomic divisions of the nervous system

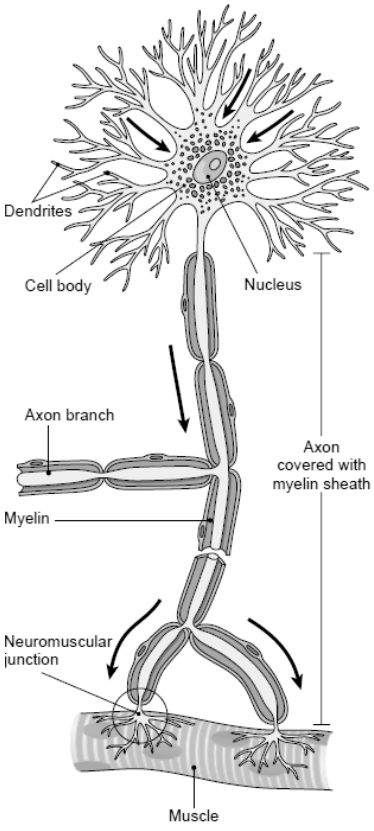


Figure (11): Motor neuron

Each neuron is part of a relay system that carries information through the nervous system. A neuron that transmits impulses toward the CNS is a **sensory** neuron; a neuron that transmits impulses away from the CNS is a **motor** neuron. There are also connecting neurons within the CNS. The point of contact between two nerve cells is the **synapse**. At the synapse, energy is passed from one cell to another by means of a chemical **neurotransmitter**.

The autonomic nervous system

The autonomic nervous system (ANS) is the division of the nervous system that controls the involuntary actions of muscles and glands. The ANS itself has two divisions: the sympathetic nervous system and the parasympathetic nervous system. The sympathetic nervous system motivates our response to stress, the so-called "fight-or-flight" response. It increases heart rate and respiration rate, stimulates the adrenal gland, and delivers more blood to skeletal muscles. The parasympathetic system returns the body to a steady state and stimulates maintenance activities, such as digestion of food. Most organs are controlled by both systems and, in general, the two systems have opposite effects on a given organ.

Table (18): Roots referring to the nervous system

Root	Meaning	example	Definition of example
neur/o, neur/i	nervous system, nervous tissue, nerve	neurotoxic	harmful or poisonous to a nerve or nervous tissue
gangli/o, ganglion/o	ganglion, a collection of nerve cell bodies outside the CNS	ganglionectomy	surgical removal of a ganglion
mening/o, meninge/o	meninges	meningitis	inflammation of the membranes around the brain (meninges)
myel/o	spinal cord (also bone marrow)	myelodysplasia	abnormal development of the spinal cord
encephal/o	brain	encephalomalacia	softening of brain tissue
psych/o	mind	psychosomatic	referring to the mind and body (soma)
narc/o	unconsciousness	narcotic	state of stupor induced by drugs
somn/o, somn/i	sleep	insomnia	a sleep disorder that is characterized by difficulty falling and/or staying asleep

Table (19): Suffixes for the nervous system

Root	Meaning	example	Definition of example
-plegia	paralysis	tetraplegia	paralysis of all four limbs
-lepsy	seizure	narcolepsy	condition marked by sudden episodes of sleep
-phobia	persistent, irrational fear	agoraphobia	fear of being in a public place (from Greek *agora*, meaning "marketplace")
-mania	excited state, obsession	megalomania	exaggerated self-importance; "delusions of grandeur"

Some diseases related to the nervous system

Vascular disorders

The term cerebrovascular accident (CVA), or stroke, applies to any occurrence that deprives brain tissue of oxygen. These events include blockage in a vessel that supplies the brain, a ruptured blood vessel, or some other damage that leads to hemorrhage within the brain.

Infection

Inflammation of the meninges, or **meningitis**, is usually caused by bacteria that enter through the ear, nose, or throat or are carried by the blood. A stiff neck is a common symptom. The presence of pus or lymphocytes in spinal fluid is also characteristic.

Behavioural disorders

a. Anxiety disorders

Anxiety is a feeling of fear, worry and uneasiness. It may be associated with physical problems or drugs and is often prompted by feelings of helplessness or loss of self-esteem. Panic disorder is a form of anxiety disorder marked by episodes of intense fear. A person with **panic disorde**r may isolate himself or herself or avoid social situations for fear of having a panic attack or in response to attacks. **A phobia** is an extreme, persistent fear of a specific object or situation. It may center on social situations; particular objects, such as animals or blood; or activities, such as flying or driving through tunnels.

Obsessive-compulsive disorder (OCD) is a condition marked by recurrent thoughts or images that are persistent and intrusive. To relieve anxiety about these thoughts or images, the person with OCD engages in repetitive behaviour that interferes with normal daily activities, although he or she knows that such behaviour is unreasonable. OCD is associated with perfectionism and rigidity in behaviour.

b. Depression

Depression is a mental state characterized by profound feelings of sadness, emptiness, hopelessness, and lack of interest or pleasure in activities, often accompanied by suicidal tendencies. Depression frequently coexists with other physical or emotional conditions.

Some drugs acting on the nervous system

- Anaesthetics
- Anxiolytics
- Antidepressant
- Sedatives
- CNS stimulant

Exercise

1) Fill in the blanks:

1. Epilepsy is a disease characterized by……..
2. Another term for quadriplegia is……..
3. An electroencephalogram (EEG) is a record of the electric activity of the……..
4. The term cerebrovascular refers to the blood vessels in the……....
5. A narcotic is a drug that causes ……

2) Write a word for each of the following definitions:

1. Study of the nervous system.
2. Any disease of the nervous system.
3. Inflammation of the spinal cord and meninges.
4. Paralysis of one side of the body.
5. Fear of water.

3) Match the following terms:

Column A	Column B
Axon	a. unmyelinated tissue
Ganglion	b. nerve fiber that carries impulses toward the cell body
Myelin	c. nerve fiber that carries impulses away from the cell body
Dendrite	d. collection of nerve cell bodies outside the CNS
Gray matter	e. fatty material that covers some axons

3) Digestive system

The function of the digestive system is to prepare food for intake by body cells. Nutrients must be broken down by mechanical and chemical means into molecules that are small enough to be absorbed into the circulation. Within cells, the nutrients are used for energy and for rebuilding vital cell components. Digestion takes place in the digestive tract, also called the alimentary canal or gastrointestinal (GI) tract. Also contributing to the digestive process are several accessory organs that release secretions into the small intestine. Food is moved through the digestive tract by peristalsis, wavelike contractions of the organ walls. Peristalsis also moves undigested waste material out of the body.

Major organs of the digestive system

The **digestive system** is also called the **digestive tract**, the **alimentary** canal, and the **gastrointestinal (GI) tract**. The digestive tract consists of a long, hollow tube that extends from the **pharynx**, more commonly known as the *throat*, to the anus. Major organs of the GI tract include the mouth, oesophagus, stomach, small intestine, large intestine (colon), rectum, and anus. The liver, gallbladder, pancreas, salivary glands, and teeth are accessory organs that aid in digestion.

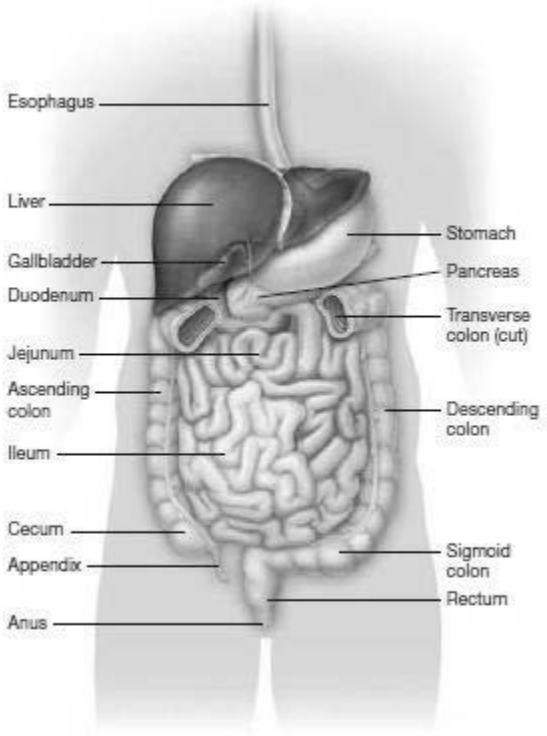


Figure (12): Digestive system

Main functions of the digestive system

Digestion begins in the mouth, where food is chewed into small bits by the teeth. In the process of chewing, or mastication, the tongue and the palate, the roof of the mouth, help to break up the food and mix it with saliva, a secretion that moistens the food and begins the digestion of starch. The moistened food is then passed into the pharynx (throat) and through the oesophagus into the stomach. Here it is further broken down by mixing with the enzyme pepsin and with powerful hydrochloric acid (HCl), both of which break down proteins. The partially digested food passes through the lower portion of the stomach, the **pylorus,** into the first part of the small intestine, the **duodenum**. As the food continues through the **jejunum** and **ileum**, the remaining sections of the small intestine, digestion is completed. The substances active in digestion in the small intestine include enzymes from the intestine itself and secretions from the accessory organs of digestion. The digested nutrients, as well as water, minerals, and vitamins, are absorbed into the circulation, aided by small projections in the lining of the small intestine called **villi**.

The accessory organs

The liver is a large gland with many functions. A major part of its activity is to process blood brought to it by a special circulatory pathway called the hepatic portal system. Its role in digestion is the secretion of bile, which breaks down fats. Bile is stored in the gallbladder until needed. The common hepatic duct from the liver and the cystic duct from the gallbladder merge to form the common bile duct, which empties into the duodenum. The pancreas produces a mixture of digestive enzymes that is delivered into the duodenum through the pancreatic duct.

The large intestine

Undigested food, water, and digestive juices pass into the large intestine. This part of the digestive tract begins in the lower right region of the abdomen with a small pouch, the cecum, to which the appendix is attached. The large intestine continues as the colon, a name that is often used to mean the large intestine because the colon constitutes such a large portion of that organ. The colon travels upward along the right side of the abdomen as the ascending colon, crosses below the stomach as the transverse colon, and then continues down the left side of the abdomen as the descending colon. As food is pushed through the colon, water is reabsorbed and stool or feces is formed. This waste material passes into the sigmoid colon and is stored in the rectum until eliminated through the anus.

Table (20): Roots referring to digestive system

Root	Meaning	example	Definition of example
or/o	mouth	perioral	around the mouth
stoma, stomat/o	mouth	stomatitis	inflammation of the mouth
lingu/o	tongue	sublingual	under the tongue
gloss/o	tongue	glossopharyngeal	referring to the tongue and pharynx
gingiv/o	gum (gingiva)	gingivectomy	excision of gum tissue
dent/o, dent/i	tooth, teeth	dental	referring to teeth
oesophag/o	oesophagus	oesophageal	referring to the oesophagus
gastr/o	stomach	gastroparesis	partial paralysis of the stomach
enter/o	intestine	dysentery	infectious disease of the intestine
hepat/o	liver	hepatocyte	liver cell
bili	bile	biliary	referring to o the bile or bile ducts
cholangi/o	bile duct	cholangiogram	radiograph of the bile ducts
cholecyst/o	gall bladder	cholecystectomy	surgical removal of the gall bladder.
pancreat/o	pancrease	pancreatolithiasis	stones in the pancreas

Some diseases related to digestive system

Infection

A variety of organisms can infect the gastrointestinal tract, from viruses and bacteria to protozoa and worms. Some produce short-lived upsets with gastroenteritis, nausea, diarrhea, and emesis (vomiting). Others, such as typhoid, cholera, and dysentery, are more serious, even fatal.

Ulcers

An ulcer is a lesion of the skin or a mucous membrane marked by inflammation and tissue damage. Ulcers caused by the damaging action of gastric, or peptic, juices on the lining of the GI tract are termed peptic ulcers.

Most peptic ulcers appear in the first portion of the duodenum. The origins of such ulcers are not completely known, although infection with a bacterium, *Helicobacter pylori*, has been identified as a major cause. Heredity and stress may be factors as well as chronic inflammation and exposure to damaging drugs, such as aspirin, or to irritants in food and drink.

Appendicitis

Appendicitis results from infection of the appendix, often secondary to its obstruction. Surgery is necessary to avoid rupture and peritonitis, infection of the peritoneal cavity.

Some diseases related to accessory organs of the digestive system

- **Hepatitis**

The name hepatitis simply means "inflammation of the liver," but this disease also causes necrosis (death) of liver cells. **Hepatitis** is most often caused by viral infection .Hepatitis also may be caused by other infections and by drugs and toxins. Liver function tests performed on blood serum are important in diagnosis.

- **Cirrhosis**

Cirrhosis is a chronic, irreversible liver disease in which normal liver cells are replaced with hard, fibrous scar tissue. Cirrhosis is characterized by hepatomegaly, edema, ascites- accumulation of fluid in the abdominal cavity-, and jaundice- a yellowish color of the skin, mucous membranes, and whites of the eye caused by bile pigments in the blood.

- **Gallstones**

Cholelithiasis refers to the presence of stones in the gallbladder or bile ducts, which is usually associated with cholecystitis, inflammation of the gallbladder. Most of these stones are composed of cholesterol, an ingredient of bile. Gallstones form more commonly in women than in men, especially in women on oral contraceptives and in those who have had several pregnancies. The condition is characterized by biliary colic (pain) in the right upper quadrant (RUQ), nausea, and vomiting. Drugs may be used to dissolve gallstones, but often the cure is removal of the gallbladder in a cholecystectomy.

Exercise

1) Fill in the blanks:

1. Hepatomegaly is enlargement of the…….. ……
2. A word that means inflammation of the liver is……
3. A pancreatotropic substance acts on the……..
4. Stomatosis is any disease condition of the…….
5. The organ that produces bile is the ……
6. The organ that stores bile is the……..

2) Use the suffix *-graphy* to write a word for each of the following definitions:

1. Radiographic study of the bile ducts
2. Radiographic study of the liver
3. Radiographic study of the gallbladder
4. Radiographic study of the pancreas

3) Select the best answer

I. Disorder resulting from breakdown of the mucosal lining in the stomach or duodenum due to chronic irritation

a. hiatal hernia
b. gastroesophageal reflux disease
c. Crohn's disease
d. ulcer

II. Chronic, irreversible liver disease in which normal cells are replaced with hard, fibrous scar tissue; associated with long-term alcoholism

a. hepatitis
b. cirrhosis
c. Crohn's disease
d. peptic ulcer

III. Inflammation of the liver that causes abdominal pain, nausea, vomiting, and jaundice

a. bulimia nervosa
b. cirrhosis
c. hepatitis
d. Crohn's disease

4) Urinary system

The urinary system consists of two kidneys, two ureters, the urinary bladder, and a urethra (Fig.13). This system forms and eliminates urine, which contains metabolic waste products. The kidneys, the organs of excretion, also regulate the composition, volume, and acid–base balance (pH) of body fluids. Thus they are of critical importance in maintaining the state of internal balance known as homeostasis.

In addition, they produce two substances that act on the circulatory system. Erythropoietin (EPO) is a hormone that stimulates the production of red blood cells in the bone marrow. Renin is an enzyme that functions to raise blood pressure.

The working units of the kidneys are the **nephrons.** There are more than 1 million nephrons in each kidney.

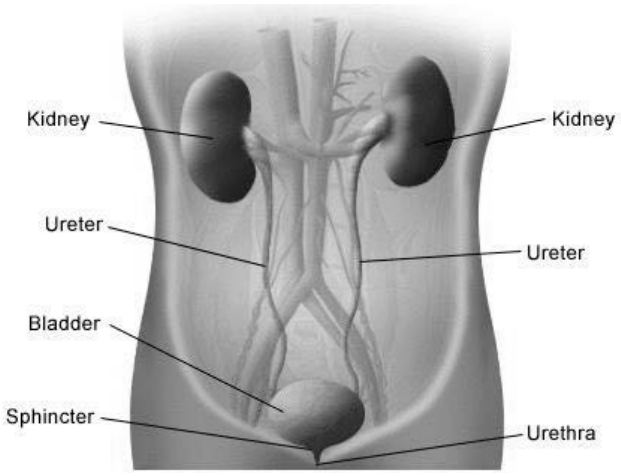


Figure (13): Urinary system

Table (21): Roots referring to urinary system

Root	Meaning	example	Definition of example
ren/o	kidney	infrarenal	below the kidney
nephr/o	kidney	nephrosis	any noninflammatory disease condition of the kidney
ur/o	urine, urinary tract	urosepsis	generalized infection that originates in the urinary tract
urin/o	urine	urination	discharge of urine
ureter/o	ureter	ureterostenosis	narrowing of the ureter
cyst/o	urinary bladder	cystotomy	incision of the bladder
urethr/o	urethra	urethroscopy	endoscopic examination of the urethra

Some diseases related to urinary system

Infections

Organisms that infect the urinary tract generally enter through the urethra and ascend toward the bladder. Infection of the urinary bladder produces **cystitis**. The infecting organisms are usually colon bacteria carried in feces, particularly *Escherichia coli*. Cystitis is more common in females than in males because the female urethra is shorter than the male urethra and the opening is closer to the anus.

Glomerulonephritis

Glomerulonephritis is a specific disorder that occurs after an immunologic reaction. It is usually a response to infection in another system, commonly a streptococcal infection of the respiratory tract or a skin infection. It may also accompany autoimmune diseases. The symptoms are hypertension, edema, and oliguria, the passage of small amounts of urine. This urine is highly concentrated. Because of damage to kidney tissue, blood and proteins escape into the nephrons, causing hematuria, blood in the urine, and proteinuria, protein in the urine.

Acute renal failure

Injury, shock, exposure to toxins, infections, and other renal disorders may cause damage to the nephrons, resulting in acute renal failure (ARF). There is rapid loss of kidney function with oliguria and accumulation of nitrogenous wastes in the blood. Failure of the kidneys to eliminate potassium leads to hyperkalemia, along with other electrolyte imbalances and acidosis. When destruction (necrosis) of kidney tubules is involved, the condition may be referred to as acute tubular necrosis (ATN).

Urinary stones

Urinary lithiasis (condition of having stones) may be related to infection, irritation, diet, or hormone imbalances that lead to an increased level of calcium in the blood. Most urinary stones, or calculi, are formed of calcium salts, but they may be composed of other materials as well. Causes of stone formation include dehydration, infection, abnormal pH of urine, urinary stasis, and metabolic imbalances. The stones generally form in the kidney and may move to the bladder. This results in great pain, termed **renal colic**, and obstruction that can promote infection.

Exercise

1) Use the root *ur/o* to write a word that has the same meaning as each of the following definitions:

1. Radiography of the urinary tract
2. A urinary calculus (stone)
3. Study of the urinary tract
4. Presence of urinary waste products in the blood (-emia)

2) The root *ur/o-* is used in the suffix *–uria,* which means "condition of urine or of urination." Use *-uria* to write a word that has the same meaning as each of the following definitions:

1. Presence of proteins in the urine.
2. Lack of urine.
3. Formation of excess urine.
4. Presence of blood in the urine.

3) Match the following terms

Column A	Column B
Proteinuria	a. maintaining the state of internal balance.
Renin	b. hormone that stimulates the production of red blood cells in the bone marrow.
Homeostasis	c. an enzyme that functions to raise blood pressure.
Erythropoietin	d. high level of potassium ion in blood
Hematuria	e. presence of protein in urine.
Hyperkalemia	f. presence of blood in urine.

5) Respiratory system

The main function of the respiratory system is to provide oxygen to body cells for energy metabolism and to eliminate carbon dioxide, a by-product of metabolism. Because these gases must be carried to and from the cells in the blood, the respiratory system works closely with the cardiovascular system to accomplish gas exchange. Exchange of gases between the atmosphere and the blood takes place in the lungs, two cone-shaped organs located in the thoracic cavity. A double membrane, the pleura, covers the lungs and lines the thoracic cavity. The outer layer that is attached to the wall of the thoracic cavity is the parietal pleura; the inner layer that is attached to the surface of the lungs is the visceral pleura. The very thin, fluid-filled space between the two layers of the pleura is the pleural space. The human respiratory system consists of the respiratory tract and the lungs (fig. 14).

Respiratory tract

The respiratory tract cleans, warms, and moistens air during its trip to the lungs. The tract can be divided into an upper and a lower part. The upper tract includes the nose, nasal cavities, sinuses, pharynx and the upper part of the larynx. The lower tract includes the lower part of the larynx, the trachea, bronchi, bronchioles and the alveoli.

Upper respiratory tract:

Air enters through the nose, where it is warmed, filtered, and moistened as it passes over the hair-covered mucous membranes of the nasal cavity. Cilia, microscopic hairlike projections from the cells that line the nose, sweep dirt and foreign material toward the throat for elimination. Material that is eliminated from the respiratory tract by coughing or clearing the throat is called **sputum**. In the bones of the skull and face near the nose are air-filled cavities lined with mucous membranes that drain into the nasal cavity. These chambers lighten the bones and provide resonance for speech production. Each of these cavities is called a **sinus.**

Inhaled air passes into the throat, or **pharynx**. The pharynx, also known as the throat, is a muscular funnel that extends from the posterior end of the nasal cavity to the superior end of the oesophagus and larynx. The pharynx is divided into 3 regions: the nasopharynx, oropharynx, and laryngopharynx. The nasopharynx is the superior region of the pharynx found in the posterior of the nasal cavity. Inhaled air from the nasal cavity passes into the nasopharynx and descends through the oropharynx, located in the posterior of the oral cavity. Air inhaled through the oral cavity enters the pharynx at the oropharynx. The inhaled air then descends into the laryngopharynx, where it is diverted into the opening of the larynx by the epiglottis. The epiglottis is a flap of elastic cartilage that acts as a switch between the trachea and the oesophagus. Because the pharynx is also used to swallow food, the epiglottis ensures that air passes into the trachea by covering the opening to the oesophagus. During the process of

swallowing, the epiglottis moves to cover the trachea to ensure that food enters the oesophagus and to prevent choking.

Lower respiratory tract:

The pharynx conducts air into the trachea. Cilia in the lining of the trachea move impurities up toward the throat, where they can be eliminated by swallowing or by expectoration. At its lower end, the trachea divides into a right and a left main stem **bronchus** that enter the lungs. Further divisions produce an increasing number of smaller tubes that supply air to smaller subdivisions of lung tissue. The smallest of the conducting tubes, the **bronchioles**, carry air into the microscopic air sacs, the **alveoli**, through which gases are exchanged between the lungs and the blood. It is through the ultrathin walls of the alveoli and their surrounding capillaries that oxygen diffuses into the blood and carbon dioxide diffuses out of the blood for elimination

Breathing

Air is moved into and out of the lungs by the process of breathing, technically called **ventilation**. This consists of a steady cycle of **inspiration** (inhalation) and **expiration** (exhalation), separated by a period of rest.

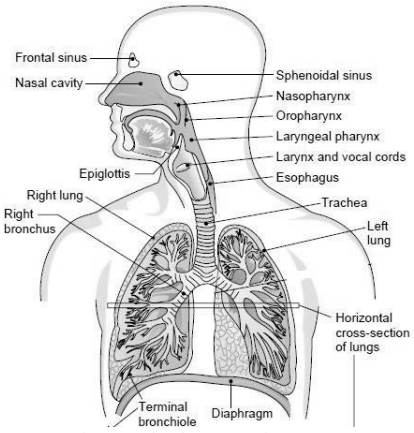


Figure (14): Respiratory system

Table (22): Suffix referring to respiratory system

suffix	Meaning	example	Definition of example
-pnea	breathing	orthopnea	difficulty in breathing except in an upright (-ortho) position
-oxia	level of oxygen	hypoxia	decreased amount of oxygen in the tissues
-capnia	level of carbon dioxide	hypercapnia	increased carbon dioxide in the tissues
-phonia	voice	dysphonia	difficulty in speaking

Table (23): Roots referring to respiratory system

Root	Meaning	Example	Definition
nas/o	nose	nasal	referring to the nose
rhin/o	nose	rhinorrhea	discharge from the nose
pharyng/o	pharynx	pharyngeal	referring to the pharynx
laryng/o	larynx	laryngoscopy	endoscopic examination of the larynx
trache/o	trachea	tracheostomy	surgical creation of an opening into the trachea to form an airway or to prepare for the insertion of a tube for ventilation
bronch/o, bronch/i	bronchus	bronchogenic	originating in a bronchus
phren/o	diaphragm	phrenic	referring to the diaphragm
pleur/o	pleura	pleurodesis	fusion of the pleura
pulm/o, pulmon/o	lungs	intrapulmonary	within the lungs
pneumon/o	lung	pneumonectomy	surgical removal of a lung or lung tissue (pneumectomy and pulmonectomy also used)
pneum/o, pneumat/o	air, gas; also respiration, lung	pneumatocardia	presence of air in the heart
spir/o	breathing	spirometer	instrument for measuring breathing

Some diseases of the respiratory system

Infections

Pneumonia is caused by several different microorganisms, most commonly bacteria and viruses. Pneumonia usually can be treated successfully in otherwise healthy people, but in debilitated patients it is a leading cause of death. The term pneumonia is also applied to inflammation of the lungs caused by noninfectious causes, such as asthma, allergy, or inhalation of irritants. In these cases, however, the more general term pneumonitis is often used.

Emphysema

Emphysema is a chronic disease associated with overexpansion and destruction of the alveoli. Common causes are exposure to cigarette smoke and other forms of pollution as well as chronic infection. Emphysema is the main disorder included under the heading of chronic obstructive pulmonary disease (COPD) (also called COLD, chronic obstructive lung disease). Other conditions included in this category are asthma and chronic bronchitis.

Asthma

Attacks of **asthma** result from narrowing of the bronchial tubes. This constriction, along with edema (swelling) of the bronchial linings and accumulation of mucus, results in wheezing,

extreme **dyspnea** (difficulty in breathing), and **cyanosis**. Asthma is most common in children. Although its causes are uncertain, a main factor is irritation caused by allergy. Heredity may also play a role.

Respiratory distress syndrome (RDS)

Respiratory distress syndrome of the newborn occurs in premature infants and is the most common cause of death in this group. It results from a lack of surfactant in the lungs, which reduces compliance. Acute respiratory distress syndrome (ARDS), also known as shock lung, may result from trauma, allergic reactions, infection, and other causes. It involves edema that can lead to respiratory failure and death if untreated.

Cystic Fibrosis

An inherited disease that affects the pancreas, respiratory system, and sweat glands. Characterized by mucus accumulation in the bronchi causing obstruction and leading to infection.

Exercise

1) Fill in the blank

1. The double membrane that covers the lungs and lines the thoracic cavity is the…….
2. The scientific name for the throat is the …….
3. The small air sacs in the lungs through which gases are exchanged between the atmosphere and the blood are the …….
4. A pneumotropic virus is one that invades the ……..
5. A person suffering from orthopnea can breathe comfortably only in a position that is……
6. A mucolytic agent dissolves……..

2) Write a word for each of the following definitions:

1. Inflammation of the throat
2. Inflammation of the bronchioles
3. Spasm of a bronchus

3) Write the plural form for each of the following words:

1. Bronchiole
2. Alveolus
3. Bronchus

4) Write the adjective form for each of the following words:

1. Alveolus
2. Pharynx
3. Pleura
4. Nose
5. Trachea
6. Bronchus

Case study

Terminal Dyspnea

N.A., a 76-year-old woman, was in the ICU in the terminal stage of multisystem organ failure. She had been admitted to the hospital for bacterial pneumonia, which had not resolved with antibiotic therapy. She had a 20-year history of COPD. She was not conscious and was unable to breathe on her own. Her arterial blood gases were abnormal, and she was diagnosed with refractory ARDS. The decision was made to support her breathing with endotracheal intubation and mechanical ventilation. After 1 week and several unsuccessful attempts to wean her from the ventilator, the pulmonologist suggested a permanent tracheostomy and family consideration of continuing or withdrawing life support. Her physiologic status met the criteria of remote or no chance for recovery. N.A.'s family discussed her condition and decided not to pursue aggressive life-sustaining therapies. After the written orders were read and signed by the family, the endotracheal tube, feeding tube, pulse and ECG electrodes were removed and a morphine IV drip was started with prn boluses ordered to promote comfort and relieve pain and other symptoms of dying. The family sat with N.A. for many hours while her breaths became shallow and she died surrounded by her family.

Case study questions

I. Select the best answer

1. The root *pulmon,* as in pulmonologist, means:
   a. chest
   b. air
   c. lung
   d. breath sound

2. An endotracheal tube is placed:
   a. under the trachea
   c. within the bronchus
   d. around the airway
   e. within the trachea

3. For pain relief, extra morphine doses were administered IV as prn boluses, This means it was administered:
   a. as needed, intravenously in a rapid concentrated dose
   b. at bedtime, intravenously in a continuous drip
   c. as needed, intramuscular in a continuous drip
   d. at bed time, by mouth

II. Define the following abbreviations:

a. COPD
b. ARDS

III. Write the word from the case with each of the following meanings:

a. A lung infection
b. Medical specialist who treats diseases of the respiratory system
c. Surgical creation of an opening into the trachea to form an airway or to prepare for the insertion of a tube for ventilation

6) Endocrine system

The endocrine system consists of a widely distributed group of glands that secretes regulatory substances called hormones. Because these substances are released directly into the blood, the endocrine glands are known as the ductless glands. Despite the fact that hormones in the blood reach all parts of the body, only certain tissues respond. The tissue that is influenced by a specific hormone is called the target tissue. The cells that make up this tissue have specific receptors on their membranes to which the hormone attaches, enabling it to act on the cells. The main endocrine glands, the main hormones secreted by each and their functions are summarized in table (24) and figure (15).

Table (24): The endocrine glands and their hormones

Gland	Hormone	Principal functions
Anterior pituitary	GH (growth hormone), also called somatotropin	promotes growth of all body tissues
	TSH (thyroid-stimulating hormone)	stimulates thyroid gland to produce thyroid hormones
	ACTH (adrenocorticotropic hormone)	stimulates adrenal cortex to produce cortical hormones; aids in protecting body in stress situations
	FSH (follicle-stimulating hormone)	stimulates growth and hormone activity of ovarian follicles; stimulates growth of testes; promotes development of sperm cells
	LH (luteinizing hormone); ICSH (interstitial cell-stimulating hormone)	in females: plays a role in ovulation and secretion of progesterone. in males: testosterone secretion
	PRL (prolactin)	stimulates secretion of milk by mammary glands
Posterior Pituitary (Releases two hormones that are actually produced in the hypothalamus- a portion of the brain that controls the pituitary gland-. These hormones, are stored in the posterior pituitary until nervous signals arrive from the hypothalamus to trigger their release)	ADH (antidiuretic hormone; vasopressin)	promotes reabsorption of water in kidney tubules; stimulates smooth muscle tissue of blood vessels to constrict
	oxytocin	causes contraction of uterus; causes ejection of milk from mammary glands

Gland	Hormone	Principal functions
Thyroid gland	thyroid hormone: thyroxine or tetraiodothyronine (T4) and triiodothyronine (T3)	increases metabolic rate and production of body heat, influencing both physical and mental activities; required for normal growth
	calcitonin	decreases calcium level in blood
Parathyroids	parathyroid hormone	regulates exchange of calcium between blood and bones; increases calcium level in blood
Adrenal medulla	epinephrine (adrenaline) and norepinephrine (noradrenaline)	active in response to stress; increases respiration, blood pressure, and heart rate
Adrenal cortex	cortisol (hydrocortisone)	aids in metabolism of carbohydrates, proteins, and fats; active during stress
	aldosterone	aids in regulating electrolytes and water balance
	sex hormones	may influence secondary sexual characteristics
Pancreatic islets	insulin	aids transport of glucose into cells; required for cellular metabolism of foods, especially glucose; decreases blood sugar levels
	glucagon	stimulates liver to release glucose, thereby increasing blood sugar levels
Testes	testosterone	stimulates growth and development of sexual organs plus development of secondary sexual characteristics; stimulates maturation of sperm cells
Ovaries	estrogen	stimulate growth of primary sexual organs and development of secondary sexual characteristics
	progesterone	stimulates development of secretory parts of mammary glands; prepares uterine lining for implantation of fertilized ovum; aids in maintaining pregnancy
Thymus	Thymosin	important in development of T cells needed for immunity and in early development of lymphoid tissue

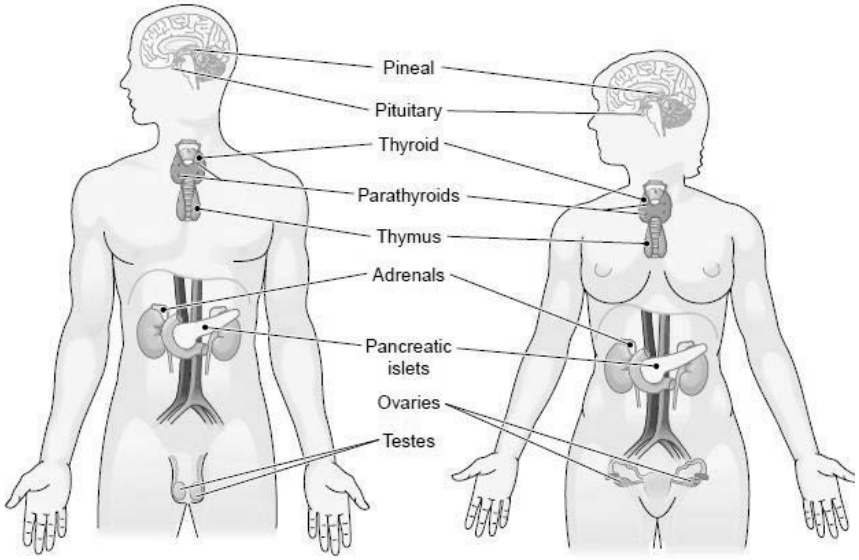


Figure (15): The endocrine glands

Table (25): Roots referring to the endocrine system

Root	Meaning	Example	Definition
endocrin/o	endocrine glands or system	endocrinopathy	any disease of the endocrine glands
pituitar	pituitary gland	pituitarism	condition caused by any disorder of pituitary function
thyr/o, thyroid/o	thyroid gland	thyrotropic	acting on the thyroid gland
parathyr/o, parathyroid/o	parathyroid gland	parathyroidectomy	excision of a parathyroid gland
adren/o, adrenal/o	adrenal gland, epinephrine	adrenergic	activated (erg-) by or related to epinephrine (adrenaline)
adrenocortic/o	adrenal cortex	adrenocortical	referring to the adrenal cortex
insul/o	pancreatic islets	insuloma	tumor of islet cells

Some disorders related to the endocrine system

Endocrine diseases usually result from the overproduction (hypersecretion) or underproduction (hyposecretion) of hormones. They also may result from secretion at the wrong time or from failure of the target tissue to respond. The causes of abnormal secretion may originate in the gland itself or may result from failure of the hypothalamus or the pituitary to release the proper amount of hormone stimulators.

Table (26): Some common disorders associated with endocrine dysfunction

Hormone	Hypersecretion	Hyposecretion
Growth hormone	a) **Gigantism (children):** overgrowth caused by an excess of growth hormone from the pituitary during childhood; also called giantism b) **Acromegaly (adults):** overgrowth of bone and soft tissue, especially in the hands, feet, and face, caused by an excess of growth hormone in an adult. The name comes from *acro* meaning "extremity" and *megal/o* meaning "enlargement."	**Dwarfism (children):** is restricted growth due to deficiency in growth hormone. The condition is typically characterized by a short stature
Antidiuretic hormone	**Syndrome of inappropriate ADH (SIADH):** is defined by the hyponatremia and hypo-osmolality resulting from inappropriate, continued secretion or action of the antidiuretic hormone, which results in impaired water excretion.	**Diabetes insipidus:** disorder caused by insufficient release of ADH from the posterior pituitary. It results in excessive thirst and production of large amounts of very dilute urine. The word *insipidus* means "tasteless," referring to the dilution of the urine.
Thyroid hormone	**Graves' disease:** an autoimmune disease resulting in hyperthyroidism. A prominent symptom is exophthalmos (protrusion of the eyeballs). Also called exophthalmic goiter (goiter is defined as enlargement of the thyroid gland).	a. **Congenital hypothyroidism (children):** a condition caused by congenital lack of thyroid secretion and marked by arrested physical and mental development; formerly called **cretinism** **b. Myxedema (adults):** A condition caused by hypothyroidism in an adult. There is dry, waxy swelling most notable in the face.

Hormone	Hypersecretion	Hyposecretion
Insulin	**Hypoglycaemia:** abnormally low level of glucose in the blood	**Diabetes mellitus:** is a disorder of glucose metabolism caused by deficiency of insulin production or failure of the tissues to respond to insulin. Type 1 is juvenile-onset or insulin-dependent diabetes mellitus (IDDM); type 2 is adult-onset or non–insulin-dependent diabetes mellitus (NIDDM). The word *mellitus* comes from the Latin root for honey, referring to the sugar content of the urine.

Exercise

I. Define each of the following words:

1. Hypopituitarism
2. Adrenalectomy
3. Hyperthyroidism
4. Endocrinologist
5. Adrenocortical

II. Use the full name of the gland as the root to write a word for each of the following definitions:

1. Removal of one half (hemi-) of the thyroid gland
2. Inflammation of the thyroid gland
3. Surgical removal of parathyroid gland

III. Match the following terms

Column A	Column B
Iodine	a. ingredient in thyroid hormone
Oxytocin	b. pancreatic hormone that regulates sugar metabolism
Hydrocortisone	c. hormone produced by the adrenal medulla
Glucagon	d. hormone that produces uterine contractions
Epinephrine	e. hormone produced by the adrenal cortex

7) Reproductive system

The function of the gonads (sex glands) in both males and females is to produce the reproductive cells, the gametes, and to produce hormones. The sex hormones aid in the manufacture of the gametes, function in pregnancy and lactation, and also produce the secondary sex characteristics such as the typical size, shape, body hair, and voice that we associate with the male and female genders. The reproductive tract develops in close association with the urinary tract. In females, the two systems become completely separate, whereas the male reproductive and urinary tracts share a common passage, the urethra. Thus, the two systems are referred to together as the genitourinary (GU) or urogenital (UG) tract.

The major organs of the human reproductive system include the external genital (penis in male and vulva in female) as well as a number of internal organs including the gametes producing gonads (testes in male and ovaries in female).

Table (27): Roots referring to male reproductive system

Root	Meaning	Example	Definition
test/o	testis, testicle	testicular	referring to a testicle
orchi/o, orchid/o	testis	anorchism	absence of testis
semin	semin	seminal	referring to semen
sperm/i, spermat/o	sperm/i, spermat/o	oligospermia	deficiency of spermatozoa
prostat/o	prostat/o	prostatometer	instrument for measuring the prostate

Table (28): Roots referring to female reproductive system

Root	Meaning	Example	Definition
gyn/o, gynec/o	woman	gynecology	study of diseases of women
men/o, mens	month, menstruation	premenstrual	before a menstrual period
oo	ovum, egg cell	oocyte	cell that gives rise to an ovum
ov/o	ovum, egg cell	ovulation	release of an ovum from the ovary
ovari/o	ovary	ovarian	referring to an ovary
oophor/o	ovary	oophorotomy	incision of an ovary
uter/o	uterus	uterine	referring to the uterus
metr/o, metr/i	uterus	metrorrhagia	abnormal uterine bleeding
hyster/o	uterus	hysteroscopy	endoscopic examination of the uterus
mamm/o	breast, mammary gland	mammoplasty	plastic surgery of the breast
mast/o	breast, mammary gland	amastia	absence of the breasts

Table (29): Roots referring to pregnancy and birth

Root	Meaning	Example	Definition
amnio	amnion, amniotic sac	diamniotic	developing in separate amniotic sacs
embry/o	embryo	embryonic	referring to the embryo
fet/o	fetus	fetoscope	endoscope for examining the fetus
toc	labor	eutocia	normal labor
nat/i	birth	neonate	newborn
lact/o	milk	lactation	secretion of milk
galact/o	milk	galactogogue	agent that promotes (-agogue) the flow of milk
gravida	pregnant woman	multigravida	woman who has been pregnant two or more times

Some diseases related to male reproductive system

Benign prostatic hyperplasia (PBH)

As men age, the prostate gland commonly enlarges, a condition known as benign prostatic hyperplasia (BPH). Although not cancerous, this overgrown tissue can press on the urethra near the bladder and interfere with urination. Urinary retention, infection, and other complications may follow if an obstruction is not corrected.

Infertility

An inability or a diminished ability to reproduce is termed infertility. Its causes may be hereditary, hormonal, disease-related, or the result of exposure to chemical or physical agents. The most common causes of infertility are sexually transmitted diseases (STDs).

Erectile dysfunction

Erectile dysfunction, also called impotence, is the male lack of ability to perform intercourse because of failure to initiate or maintain an erection, stiffening or hardening of the penis, until ejaculation- ejection of semen from the male urethra-. The disorder may be broadly characterized as psychogenic, in which case it is caused by emotional factors, or organic, caused by some physical problem such as an anatomic defect or circulatory problem.

Some diseases related to female reproductive system

Menstrual disorders

Menstrual abnormalities include flow that is too scanty **(oligomenorrhea)** or too heavy (menorrhagia), and the absence of monthly periods **(amenorrhea)**. **Dysmenorrhea**, when it occurs, usually begins at the start of menstruation and lasts 1 to 2 days. Together these disorders are classified as dysfunctional uterine bleeding **(DUB)**. These responses may be caused by hormone imbalances, systemic disorders, or uterine problems.

Mastitis

Inflammation of the breast, or **mastitis**, may occur at any time but usually occurs in the early weeks of breastfeeding. It is commonly caused by staphylococcus or streptococcus bacteria that enter through cracks in the nipple. The breast becomes red, swollen, and tender, and the patient may experience chills, fever, and general discomfort.

Exercise

1) Define each of the following terms:

1. Seminal
2. Prostatometer
3. Hysterectomy
4. Gynecopathy
5. Oogenesis
6. Oophoritis
7. Embryology
8. Postnatal
9. Neonatal
10. Monoamniotic

2) The word menorrhea means "menstruation." Add a prefix to menorrhea to form a word with each of the following meanings:

1. Absence of menstruation
2. Painful or difficult menstruation
3. Scanty menstrual flow

3) Write the meaning of each of the following abbreviations:

1. STD
2. BPH

8) The Skeleton

The skeleton forms the framework of the body, protects vital organs, and works with the muscular system to produce movement. The human adult skeleton is composed of 206 bones. It is divided for study into the axial skeleton and the appendicular skeleton. The axial skeleton consists of the skull, the spinal column, the ribs, and the sternum. The appendicular skeleton consists of the bones of the arms and legs, the shoulder bone, and the pelvis.

Bone Formation

Bone is formed by the gradual addition of calcium and phosphorus salts to cartilage, a type of dense connective tissue. This process of ossification begins before birth and continues to adulthood. Although bone appears to be inert, it is actually living tissue that is constantly being replaced and remodeled throughout life. Three types of bone cells are involved in these changes: **osteoblasts** are the cells that produce bone; **osteocytes** are mature bone cells; and **osteoclasts** are involved in the breakdown of bone tissue to release needed minerals or to allow for reshaping and repair. The process of destroying bone so that its components can be taken into the circulation is called **resorption**. This process occurs normally throughout life; in disease states, resorption may occur more rapidly or more slowly than bone production.

Joint

The point at which two or more bones are connected is called a **joint**. In all joints, the bones are kept from grinding against each other by a lining called **cartilage**. Bones are joined to bones by strong, elastic bands of connective tissue called **ligaments**. Muscles are connected to bones by fibrous band of connective tissue called **tendons**. Tendons connect muscles to bones to produce movement at the joint.

Freely moveable joints are subject to wear and tear, and they therefore have some protective features such as; the **synovial fluid**, which cushions and lubricates the joint. This fluid is produced by the synovial membrane that lines the joint cavity. **A bursa** is a small sac of synovial fluid that cushions the area around a joint. Bursae are found at stress points between tendons, ligaments, and bones.

Table (30): Roots referring to the skeleton, bones, and joints

Root	Meaning	Example	Definition
oste/o	bone	osteolytic	destroying or dissolving bone
myel/o	bone marrow; also, spinal cord	myeloblast	immature bone marrow cell
chondr/o	cartilage	chondromalacia	softening of cartilage
arthr/o	joint	arthritis	inflammation of a joint
synov/i	synovial fluid, joint, or membrane	asynovia	lack of synovial fluid
burs/o	bursa	bursotomy	incision into a bursa
crani/o	skull, cranium	cranial	referring to the skull

Root	Meaning	Example	Definition
spondyl/o	vertebra	spondylolysis	destruction and separation of a vertebra
vertebr/o	vertebra, spinal column	paravertebral	before or in front of the spinal column
cost/o	rib	costochondral	referring to a rib and its cartilage

Some disorder related to the skeleton

Fractures

A fracture is a break in a bone, usually caused by trauma. The effects of a fracture depend on the location and severity of the break; the amount of associated injury; possible complications, such as infections; and success of healing, which may take months. In a closed or simple fracture, the skin is not broken. If the fracture is accompanied by a wound in the skin, it is described as an open fracture.

Metabolic bone diseases

Osteoporosis is a loss of bone mass that results in weakening of the bones. A decrease in oestrogens after menopause makes women over age 50 most susceptible to the effects of this disorder.

Other conditions that can lead to osteoporosis include nutritional deficiencies; disuse, as in paralysis or immobilization in a cast; and excess steroids from the adrenal cortex. Over activity of the parathyroid glands also leads to osteoporosis because parathyroid hormone releases calcium from bones to raise blood calcium levels. Certain drugs, smoking, lack of exercise, and high intake of alcohol, caffeine, and proteins may also contribute to the development of osteoporosis.

In **osteomalacia** there is a softening of bone tissue because of lack of formation of calcium salts. Possible causes include deficiency of vitamin D, needed to absorb calcium and phosphorus from the intestine; renal disorders; liver disease; and certain intestinal disorders. When osteomalacia occurs in children, the disease is called **rickets**. Rickets is usually caused by a deficiency of vitamin D.

Paget disease (osteitis deformans) is a disorder of aging in which bones become overgrown and thicker, but deformed. The disease results in bowing of the long bones and distortion of the flat bones, such as those of the skull. Paget disease usually involves the bones of the axial skeleton, causing pain, fractures, and hearing loss. With time, there may be neurologic signs, heart failure, and predisposition to cancer of the bones.

Arthritis

In general, arthritis means inflammation of a joint. The most common form is **osteoarthritis** or degenerative joint disease (DJD). This is a gradual degeneration of articular (joint) cartilage caused by wear and tear. It usually appears at midlife and beyond and involves the weight-bearing joints and joints of the fingers.

Rheumatoid arthritis is a systemic inflammatory disease of the joints that commonly appears in young adult women. Its exact causes are unknown, but it may involve immunologic reactions. There is an overgrowth of the synovial membrane that lines the joint cavity. As this membrane covers and destroys the joint cartilage, synovial fluid accumulates, causing swelling of the joint. There is degeneration of the underlying bone eventually causing fusion of the bones, or **ankylosis**.

Gout is caused by an increased level of uric acid in the blood, salts of which are deposited in the joints. It mostly occurs in middle-aged men and almost always involves pain at the base of the great toe. Gout may result from a primary metabolic disturbance or may be a secondary effect of another disease, as of the kidneys.

Exercise

1) Fill in the blanks:

1. The term osteoid means resembling……..
2. A chondrocyte is a cell found in ……..
3. A bursolith is a stone in a (n) …….
4. The type of tissue that covers the ends of the bones at the joints is ……...
5. The fluid that fills a freely movable joint is……..
6. A band of connective tissue that connects a bone to another bone is a (n)…….

2) Define each of the following words:

1. Chondroma
2. Arthroplasty
3. Myeloid

3) Write a word for each of the following definitions:

1. Inflammation of bone and bone marrow
2. Any disease of a joint
3. Tumor of bone marrow
4. Death (-necrosis) of bone tissue
5. Inflammation of bone marrow
6. Tumor of bone and cartilage
7. Surgical excision of cartilage
8. Narrowing of a joint
9. Instrument for examining the inside of a joint
10. Radiographic image of a joint
11. Stone in a bursa
12. Referring to a vertebra (use vertebr/o) and a rib
13. Inflammation of a joint

9) The Muscular system

The main characteristic of muscle tissue is its ability to contract. When stimulated, muscles shorten to produce movement of the skeleton, vessels, or internal organs.

Types of Muscle

There are three types of muscle tissue in the body:

- Smooth (visceral) muscle: This makes up the walls of the hollow organs and the walls of ducts, such as the blood vessels and bronchioles. This muscle operates involuntarily and is responsible for peristalsis, the wavelike movements that propel materials through the systems.
- Cardiac muscle: This makes up the myocardium of the heart wall. It functions involuntarily and is responsible for the pumping of the heart.
- Skeletal muscle: This is attached to the bones of the skeleton and is responsible for voluntary movement. It also maintains posture and generates a large proportion of body heat. All of these voluntary muscles together make up the muscular system.

Table (31): Roots referring to muscles

Root	Meaning	Example	Definition
my/o	muscle	myogenesis	the formation of muscular tissue
muscul/o	muscle	musculoskeletal	referring to muscle and skeleton
in/o	fiber	inotropic	acting on muscle fibers
ten/o, tendin/o	tendon	tenorrhaphy	suture of a tendon
ton/o	tone	cardiotonic	having a strengthening action on the heart
kine, kinesi/o, kinet/o	movement	dyskinesia	abnormality of movement

Some diseases related to muscular system

Muscle function may be affected by disorders elsewhere, particularly in the nervous system and connective tissue. Any disorder of muscles is described as a **myopathy**.

Muscular Dystrophy

Muscular dystrophy refers to a group of hereditary diseases involving progressive, noninflammatory degeneration of muscles. There is weakness and wasting of muscle tissue with gradual replacement by connective tissue and fat. There also may be cardiomyopathy (disease of cardiac muscle) and mental impairment.

Myasthenia Gravis

Myasthenia gravis is an acquired autoimmune disease in which antibodies interfere with muscle stimulation at the neuromuscular junction. There is a progressive loss of muscle power, especially in the external eye muscles and other muscles of the face.

10) The skin

The skin and its associated structures make up the **integumentary system**. This body-covering system protects against infection, dehydration, ultraviolet radiation, and injury. Extensive damage to the skin, such as by burns, can result in dangerous complications. The skin also serves in temperature regulation and sensory perception.

Associated skin structures

- **The sweat glands** act mainly in temperature regulation by releasing a watery fluid that evaporates to cool the body.
- **The sebaceous glands** release an oily fluid, sebum that lubricates the hair and skin and prevents drying.
- **Hair** is widely distributed over the body. Each hair develops within a sheath or hair follicle and grows from its base within the deep layers of the skin. Both hair and nails function in protection. Hair and nails are composed of nonliving material consisting mainly of keratin.

Table (32): Roots referring to the skin

Root	Meaning	Example	Definition
derm/o, dermat/o	skin	dermabrasion	surgical procedure used to resurface the skin and remove imperfections
kerat/o	keratin, horny layer of the skin	keratosis	horny growth of the skin
melan/o	dark, black, melanin	melanosome	a small body in the cell that produces melanin
hidr/o, idr/o	sweat, perspiration	hyperhidrosis	abnormally high production of sweat
seb/o	sebum, sebaceous gland	seborrhea	excess flow of sebum
trich/o	hair	trichomycosis	fungal infection of the hair
onych/o	nail	onychia	inflammation of the nail and nail bed

Some diseases related to the skin

Dermatitis

Dermatitis is inflammation of the skin, which may be acute or chronic. A chronic allergic form of this disorder that appears early in childhood is called **eczema** or **atopic dermatitis.** Although its exact cause is unknown, atopic dermatitis is made worse by allergies, infection, temperature extremes, and skin irritants. Other forms of dermatitis include contact dermatitis, caused by chemical irritants.

Psoriasis

Psoriasis is a chronic overgrowth (hyperplasia) of the epidermis, producing large, erythematous (red) plaques with silvery scales. The cause is unknown but there is sometimes a hereditary pattern, and autoimmunity may be involved.

Exercise

1) Fill in the blanks:

1. Myoedema is accumulation of fluid in a (n)…….
2. Dystonia is abnormal muscle……..
3. Kinesitherapy is treatment by means of …….
4. Dermatopathology refers to any disease of……
5. Dyskeratosis is an abnormality in the skin's formation of……
6. A melanocyte is a cell that produces ……

2) Define each of the following terms:

1. Myalgia
2. Musculotendinous
3. Tendinitis or tenositis
4. Hypermyotonia
5. kinesiology
6. Tenomyoplasty
7. Myonecrosis
8. Xeroderma
9. Hypertrichosis

3) Write a word that has the same meaning as each of the following definitions:

1. Inflammation of many (poly-) muscles.
2. Any disease of muscle.
3. Incision of a tendon (use ten/o).
4. Inflammation of a muscle and its tendon (use ten/o).
5. Study of hair.
6. Insufficient production of melanin.