Medical Language For Modern Health Care

Fifth Edition

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PREFACE

Medical terminology is not just another subject for which you memorize the facts and then forget them when you move on to your next course. Medical language will be used throughout your studies, as well as every day on your job. Health care professionals use specific terms to describe and talk about objects and situations they encounter each day.

Like every language, medical terminology changes constantly as new knowledge is discovered. Modern medical terminology is a language constructed over centuries, using words and elements from Greek and Latin origins as its building blocks. Some 15,000 or more words are formed from 1,200 Greek and Latin roots. It serves as an international language, enabling medical scientists from different countries and in different medical fields to communicate with a common understanding.

In your world as a health care professional, medical terminology enables you to communicate with your team leader, with other health care professionals on your team, and with other professionals in different disciplines outside your team. Understanding medical terminology also enables you to translate the medical terms into language your patients can understand, thus improving the quality of their care and demonstrating your professionalism. Your understanding of medical terminology will make you a successful student and health professional.

ORGANIZATION OF CONTENT

In this new edition, chapters have been organized for consistency and continuity to enhance student retention. For all major organ systems, the chapters will be placed in sections and will begin with an overview of the anatomy and physiology of the system. The following section will cover the common pathology associated with that organ system. The final sections will cover diagnostic and therapeutic procedures along with pharmacology. Each chapter is structured around a consistent and unique framework of learning devices including illustrations, Word Analysis and Definition (WAD) tables, and end-of-section Checkpoints. Regardless of the organ system being covered, the structure enables you to develop a consistent learning strategy, making the fifth edition of Medical Language For Modern Health Care a superior learning tool.

Word Analysis and Definition Boxes and Case Reports

The medical terms covered in each lesson are introduced in context and then to facilitate easy reference and review, the terms also are listed in boxes as a group. The **Word Analysis and Definition (WAD) boxes** list the term and its pronunciation, elements, and definition in a concise, color-coded, at-a-glance format. **Case Reports** can be found within Checkpoints and Chapter-End exercises providing the students opportunities to apply and reinforce their knowledge of medical terms.

Section and Chapter-End Exercises

Each section ends with exercises designed to allow you to check your basic understanding of the terms you just learned. These checkpoints can be used by instructors as assignments or in-class activities or by students for self-evaluation.

At the end of each chapter, you will find chapter review of exercises that ask you to apply what you learned in all the lessons of a chapter. These exercises reinforce learning of each chapter's terms and help you go beyond mere memorization to think critically about the

medical language you use. In addition to reviewing and recalling the definitions of terms learned in the chapter, you will be asked to use medical terms in new and different ways.

Additional Learning Tools

Did you know? boxes appear throughout each chapter and provide additional interesting pieces of information that related to the chapter content. Each chapter also includes an abbreviation table and a Disorder or Disease table.

NEW TO THE FIFTH EDITION:

- Learning outcomes have been streamlined for each chapter for easy organization and assessment.
- Every chapter has been reorganized into sections that are consistent across all chapters.
- Chapters have been updated with the latest trends in medicine, including COVID-19.
- The case studies have been enhanced to support practical application of the terms learned.
- Pronunciation questions have been added to each chapter to develop effective communication.
- Multiple new activities have been added to the instructor manual to enhance in-person and online learning.

NEW TO CONNECT WITH THE FIFTH EDITION:

- All Connect questions are now tagged to CAAHEP and ABHES requirements for easy assessment and reporting for accreditation.
- All new activities were added to support medical terminology fundamentals for each organ system.
- New Application-Based Activities bring pathology to life for your students.

INSTRUCTOR RESOURCES

The following materials are available to help you and your students work through the material in the book; all are available in the Instructor Resources under the Library tab in Connect (available only to instructors who are logged in to Connect).

- Instructor's Manual
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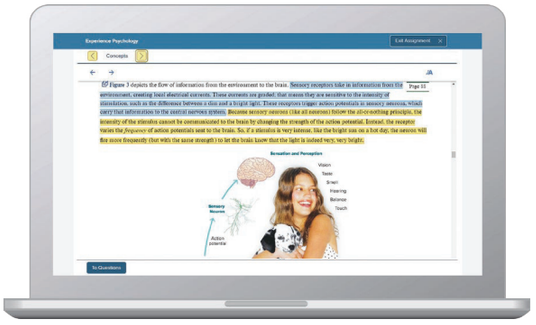

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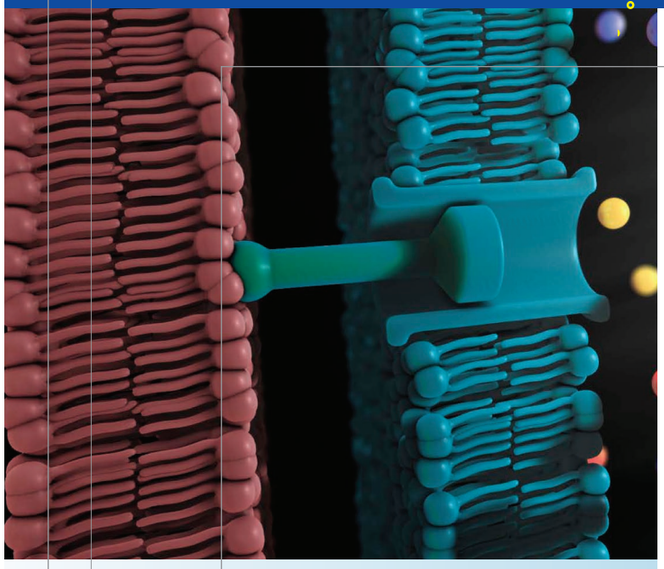

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CHAPTER

1

The Anatomy of Medical Terms

The Foundation of Medical Language

Chapter Sections

Chapter Learning Outcomes

LO 1.1 Identify and utilize the **roots** and **combining forms** to form medical terms.

LO 1.2 Identify and utilize **suffixes** and **prefixes** to build medical terms.

LO 1.3 Recognize medical terms taken directly from Greek, Latin, or Old English words.

LO 1.4 Differentiate between medical terms that are spelled and/or pronounced similarly.

The technical language of medicine has been developed logically from Latin and Greek roots because it is in Latin and Greek cultures that the concept of treating patients began. This medical language provides all the health professionals involved in the care of a patient with the ability to communicate with each other by using medical terms with precise meanings. To be a qualified health professional it is necessary to be able to speak the language of medicine.

Medical terms are built from individual parts, or elements, that form the anatomy of the word. Upon completion of this chapter, you will be able to.

Section 1.1 Roots and Combining Forms

The Logic of Medical Terminology

Understanding and being comfortable with the technical language of medicine are keys to a successful career as a health professional. Your ability to use and understand the technical language to communicate verbally and in writing are essential for patient safety, high-quality patient care, precise interaction with other health professionals, and your own self-esteem as a health professional.

Your confidence in using medical terms will increase as you understand the logic of how each term is built from its individual parts, or elements. In addition, understanding the logic of this process will help you analyze or deconstruct an unknown medical term and break it down into its elements so that its meaning can be understood.

The **elements** of a medical term are its **roots**, **suffixes**, and **prefixes**, and the vast majority of these elements are derived from Latin and Greek origins. Throughout this book, when words are broken down, the elements will be color coded.

Throughout this book, look for the following patterns:

- **Roots**, **combining forms**, and **combining vowels** will be colored **pink**.
- **Prefixes** will be colored **green** and come before the root.
- **Suffixes** will be colored **blue** and come after the root.

This will be discussed in greater length.

Roots

Every medical term has a **root**—the element that provides the core meaning of the word. A **root** is the constant foundation and core of a medical term.

- **Roots** are usually of Greek or Latin origin.
- All medical terms have one or more **roots**.
- A **root** can appear anywhere in the term.
- More than one **root** can have the same meaning.
- A **root** plus a **combining vowel** creates a **combining form**.
- The word *pneumonia* has the **root *pneumon-***, taken from the Greek word meaning *lung* or *air.* The Greek **root *pneum-*** also means lung or air. *Pneumonia* is an infection of the lung tissue.
- The **root *pulmon-*** is taken from the Latin word meaning *lung.* A *pulmonologist* is a specialist who treats lung diseases.

Combining Forms

Roots are often joined to other elements in a medical term by adding a **combining vowel**, such as the letter "**o**," to the end of the **root**, like ***pneum-***, to form **pneum/o-**.

Throughout this book, whenever a term is presented, a **slash (/)** will be used to separate the combining vowel from the **root**. Other examples of this approach are as follows:

- Adding the **combining vowel "o"** to the Latin **root *pulmon-*** makes the **combining form *pulmon/o-***.

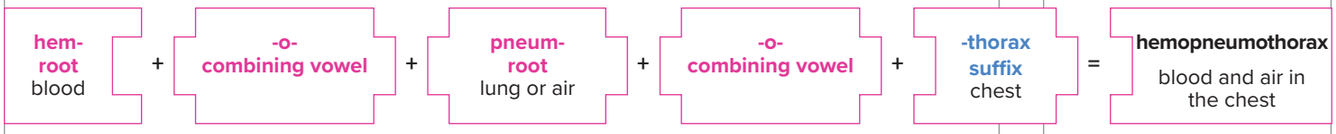
Any vowel, "a," "e," "i," "o," or "u," can be used as a **combining vowel**.

- The **root** ***respir-*** means *to breathe.* Adding the **combining vowel** "**a**" makes the **combining form** ***respir/a-***.

- The **root** ***bronch-*** is derived from the Greek word for *windpipe* and is one of the two subdivisions of the trachea that carry air to and from the lungs. Adding the **combining vowel** "**o**" to the **root** ***bronch-*** makes the **combining form** ***bronch/o-***.

Many medical terms contain more than one **root**; when two roots occur together, they are always joined by a **combining vowel**, as in the following example:

- The word **hemopneumothorax** has the **root** ***hem-***, from the Greek word meaning *blood;* the **root** ***pneum-***, from the Greek word meaning *air* or *lung;* and the **suffix -thorax**, from the Greek word meaning *chest.* The **combining vowel** "**o**" is added to these two roots to make the **combining forms** ***hem/o*** and ***pneum/o-***. A combining vowel is used to join a root (***pneum-***) to a suffix that begins with a consonant (**-thorax**). A **hemopneumothorax** is the presence of air and blood in the space that surrounds the lungs in the chest. As blood and air fill the pleural cavity, the lungs cannot expand and respiration is not possible, thus forcing the affected lung to collapse.



- Different **roots** can have the same meaning. ***Pulmon-*** and ***pneumon-*** both mean *lung, air.*

Check Point Section 1.1

A. Review what you have just learned about roots and combining forms. *Select the correct answer to the statement.* **LO 1.1, 1.2**

root **combining form** **combining vowel** **suffix** **prefix**

1. Roots and combining forms can go before a _____.

2. This element does not have a meaning; it serves to make the word easier to pronounce: _____.

3. A _____ can go before a root.

4. The _____ is the root plus a combining vowel.

B. Identify the word parts of a medical term. *Use the provided medical term to correctly answer the questions.* **LO 1.1**

1. In the word **pneumonia,** the root is:

a. *pneum-* **b.** *pneumon-* **c.** *-ia* **d.** *-nia*

2. In the medical term **pulmonologist,** the root is:

a. *pulm-* **b.** *pulmon-* **c.** *-logist* **d.** *-gist*

3. The combining vowel in the medical term **respiratory** is:

a. *-a-* **b.** *-o-* **c.** *-i-* **d.** *-e-*

Section 1.2 Suffixes

▲ **Figure 1.1 Dermatitis due to a latex glove.**
Dr. P. Marazzi/Science Source

A **suffix** is a group of letters positioned at the end of a medical term. It attaches to the end of a **root** or **combining form**. **Suffixes** can have more than one meaning. If a suffix begins with a consonant, add a **combining vowel** to the **root**. If a **suffix** starts with a vowel, no **combining vowel** is needed. An occasional medical term can have two **suffixes**. For example, the **root gene-**, meaning origin or gene, is teamed with the **suffix -tic**, which means pertaining to, to form the word genetic, *pertaining to a gene.* Again, the **root gene-** is teamed with the **suffix -tics**, which means *knowledge of,* to form the word genetics, *the knowledge of or the science of the inheritance of characteristics.* Also, the **root gene-** can be teamed with two **suffixes**, **-tic**, *pertaining to,* and -ist, *a specialist,* to form the word gene**ticist**, *pertaining to a specialist in genetics.* There can be more than one **suffix** in a single word.

Using the combining form of **cardi/o**, in the medical specialty of cardiol**ogy**, a cardiol**ogist** will often diagnose a cardio**pathy**. The **suffix -logy**, which means *study of;* the **suffix -logist**, which means *one who studies* or *a specialist;* and the suffix **-pathy**, which means *disease,* all give different meanings in the sentence "in the specialty of cardiol**ogy**, a cardiol**ogist** will often diagnose a cardio**pathy**."

Another example of the use of **suffixes** is in the medical specialty of dermatology, when a dermatologist will often diagnose a case of dermatitis *(Table 1.1, Figure 1.1).*

Table 1.1 Use of Suffixes

Complete Word	Root or Combining Form	Suffix	Meaning of Suffix	Meaning of Word
dermatitis	**dermat-**	**-itis**	*inflammation*	*inflammation of the skin*
dermatologist	**dermat/o-**	**-logist**	*one who studies*	*one who studies the skin, specialist in dermatology*
dermatology	**dermat/o-**	**-logy**	*study of*	*study of the skin*

In *dermatitis,* the **suffix -itis** starts with a vowel, so there is no need for a **combining vowel**, and the **suffix** is attached directly to the **root**.

In a different example of the use of **suffixes**, an orthopedic surgeon operating on a joint can perform an arthro**scopy**, an arthro**desis**, or an arthro**plasty**, all different operations with different outcomes, as shown in *Table 1.2.*

Table 1.2 Different Meanings of Suffixes

Complete Word	Combining Form	Suffix	Meaning of Suffix	Meaning of Word
arthroscopy	**arthr/o-**	**-scopy**	*visual examination*	*visual examination of a joint*
arthrodesis	**arthr/o-**	**-desis**	*fixation*	*fixation of a joint*
arthroplasty	**arthr/o-**	**-plasty**	*surgical repair*	*repair of a joint*

You always need a **combining vowel** before a **suffix** that begins with a consonant (e.g., dermatology, arthr**o**plasty).

Classification of Suffixes

One strategy to help you understand medical terms is to divide **suffixes** into different types, such as diagnostic, surgical, pathologic, and descriptive or adjectival.

Diagnostic Suffixes

This group of **suffixes**, when added to a **root** or **combining form**, produces a medical term that is a diagnosis or a procedure or test to identify the nature of an illness.

The **roots/combining forms hem/o** and **hemat/o** both mean *blood.* Adding diagnostic suffixes can produce a variety of diagnostic medical terms throughout the body systems *(Table 1.3).*

Table 1.3 Diagnostic Suffixes

Diagnostic Suffix	Meaning of Suffix	Word Example	Meaning of Word Example
-chezia	*pass a stool*	**hemat/o**chezia	*passage of a bloody stool*
-crit	*to separate*	**hemat/o**crit	*percentage of red blood cells in the blood*
-gram	*record*	**cardi/o**gram	*record derived from the heart*
-graph	*instrument for recording*	**cardi/o**graph	*instrument for recording the heart*
-lysis	*destruction*	**hem/o**lysis	*destruction of red blood cells*
-oma	*tumor, mass*	**hemat**oma *(Figure 1.2)*	*collection of blood in a tissue*
-philia	*attraction*	**hem/o**philia	*an inherited blood disease*
-ptysis	*spit*	**hem/o**ptysis	*to cough up bloody sputum*
-rrhage	*to flow profusely*	**hem/o**rrhage	*to bleed profusely*
-rrhoid	*to flow*	**hem/o**rrhoid	*painful anal swelling of venous blood*
-uria	*urine*	**hemat**uria	*blood in the urine*

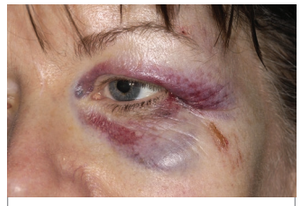
As you go through each body system in the book, there will be additional diagnostic **suffixes** you will learn in relation to the actual diagnoses made at that point in the book.

Surgical Suffixes

When added to a **root** or **combining form**, surgical **suffixes** produce medical terms that describe the invasive surgical procedure performed on the body *(Table 1.4).*

Table 1.4 Surgical Suffixes

Surgical Suffix	Meaning of Suffix	Word Example	Meaning of Surgical Procedure
-centesis	*surgical puncture*	**arthr/o**centesis	*surgical puncture of a joint space with a needle*
-desis	*fixation*	**arthr/o**desis	*surgical fixation of the bones of a joint*
-ectomy	*surgical removal*	**appendectomy**	*surgical removal of the appendix*
-plasty	*surgical repair*	**rhin/o**plasty	*surgical repair of the nose*
-rrhaphy	*surgical suture*	**herni/o**rrhaphy	*surgical suture of a hernia*
-stomy	*surgical formation of an opening*	**trache/o**stomy	*surgical formation of an artificial opening into the trachea into which a tube is inserted*
-tomy	*surgical incision*	**trache/o**tomy	*surgical incision into the trachea*
-tripsy	*crushing*	**lith/o**tripsy	*crushing of a stone (calculus), for example, in the ureters*



▲ **Figure 1.2 Hematoma (black eye) following a fall.**
Dr. P. Marazzi/Science Source

Pathologic Suffixes

When added to a **root** or **combining form**, this type of **suffix** produces a medical term that describes a symptom or sign of a disease process *(Table 1.5)*.

Table 1.5 Pathologic Suffixes

Pathologic Suffix	Meaning of Suffix	Word Example	Meaning of Pathologic Term
-algia	*pain*	**arthr**algia	*pain in a joint(s)*
-ectasis	*dilation*	**bronchi**ectasis	*chronic dilation of bronchi*
-edema	*accumulation of fluid in tissues*	**lymphe**dema	*swelling in tissues as a result of obstruction of lymphatic vessels*
-emesis	*vomiting*	**hemat**emesis	*vomiting of blood*
-genesis	*form, produce*	**oste/o**genesis	*formation of new bone*
-itis	*inflammation*	**cyst**itis	*inflammation of the urinary bladder*
-oma	*tumor, mass*	**hemat**oma	*mass of blood leaked outside blood vessels into tissues*
-osis	*abnormal condition*	**cyan**osis	*dark blue coloration of blood due to lack of oxygen*
-pathy	*disease*	**neur/o**pathy	*any disease of the nervous system*
-penia	*deficiency, lack of*	**erythr/o**penia	*decrease in red blood cells*
-phobia	*fear of*	**agora**phobia	*an unfounded fear of public places that arouses a state of panic*
-stenosis	*narrowing*	**arteri/o**stenosis	*abnormal narrowing of an artery*

Adjectival Suffixes

As you learn new medical terms in each body system chapter in this book, you will see that there are 28 **suffixes** that mean *pertaining to.* These **suffixes** are used as adjectives to describe the root. Examples of adjectival **suffixes** are:

- **-ac cardi**ac pertaining to the heart
- **-ary pulmon**ary pertaining to the lungs
- **-ior poster**ior pertaining to the back of the body

Those 28 suffixes are **-ac, -al, -ale, -alis, -ar, -aris, -ary, -atic, -ative, -eal, -ent, -etic, -ial, -ic, -ica, -ical, -ine, -ior, -iosum, -ious, -istic, -ius, -nic, -ous, -tic, -tiz, -tous, -us**.

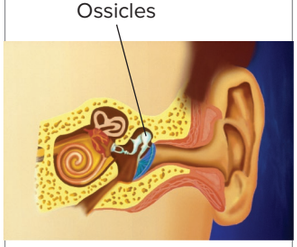
Noun Suffixes

Several **suffixes** do not fall under any of the earlier classifications but maintain the root or combining form as a noun *(Table 1.6)*.

Table 1.6 Noun Suffixes

Noun Suffix	Meaning of Suffix	Word Example	Meaning of Word Example
-iatry	*treatment, medical specialty*	**psych**iatry	*diagnosis and treatment of mental disorders*
-ician	*expert, specialist*	**pediatr**ician	*medical specialist in children's development and disorders*
-icle	*small, minute*	**oss**icle *(Figure 1.3)*	*small bone, relating to the three small bones in the middle ear*
-ist	*expert, specialist*	**dent**ist	*specialist in disorders of the orofacial complex*
-istry	*medical specialty*	**dent**istry	*specialty in disorders of the orofacial complex*
-ole	*small, minute*	**arteri**ole	*small artery*
-ule	*small, minute*	**ven**ule	*small vein*

Note that in *Table 1.6,* three **suffixes** mean "small," two **suffixes** mean "specialist," and two **suffixes** mean "medical specialty."



▲ **Figure 1.3 Ossicles of the middle ear.** BSIP SA/ Alamy Stock Photo

Check Point Section 1.2

A. Building onto the elements of roots, combining vowels, and combining forms are the prefixes and suffixes of medical terminology. *Prefixes and suffixes are additional word elements that give further meaning to a root or combining form. Develop your knowledge of more word elements with the following exercise. Choose T if the statement is true. Choose F if the statement is false.* **LO 1.1, 1.2**

1. In a medical term, the suffix will always appear at the end. T F
2. In the terms **arthroscopy** and **arthrodesis,** the combining form is the same, but the suffix is different. T F
3. If a suffix begins with a consonant, you will need a combining vowel before it. T F

B. Identify the meaning of the word by the suffix. *The medical terms below are commonly used by people who are not necessarily in the medical field. Using what you may already know, identify the meaning of the suffix of medical terms. Match the definition on the left with the correct term it is describing on the right.* **LO 1.2**

1. _____ a specialist
2. _____ afraid of
3. _____ study of
4. _____ removal of
5. _____ inflammation of

a. agoraphobia
b. pneumonectomy
c. dentist
d. dermatitis
e. biology

Section 1.3 Prefixes

Prefixes can be one letter or a group of letters. **Prefixes** are added directly to the beginning of the term, to the **root** or **combining form** and do not require **combining vowels**. An occasional medical term can have two **prefixes**. **Prefixes** can have more than one meaning. That being said, every medical term will not have a prefix.

For example, you can add the different prefixes **peri-** and **endo-** to the same root, cardi-, to produce the different words **peri**cardium and **endo**cardium, which have very different meanings, as shown in *Table 1.7.*

Table 1.7 Use of Prefixes

Complete Word	Prefix	Meaning of Prefix	Meaning of Word
pericardium	**peri-**	*around*	*structure around the heart*
endocardium	**endo-**	*inside*	*structure inside the heart*

Note that **-um** is a **suffix** meaning *structure.*

Similarly, **epi**gastric, **hypo**gastric, and **endo**gastric all have the same root, gastr-, but because of the different prefixes, **epi-, hypo-,** and **endo-,** have very different meanings, as shown in *Table 1.8.*

Table 1.8 Different Meanings of Prefixes

Complete Word	Prefix	Meaning of Prefix	Meaning of Word
epigastric	**epi-**	*above*	*pertaining to above the stomach*
hypogastric	**hypo-**	*below*	*pertaining to below the stomach*
endogastric	**endo-**	*inside*	*pertaining to inside the stomach*

Note that **-ic** is a **suffix** meaning *pertaining to.*

Figure 1.4 Intradermal injection. Andrew Aitchison/Contributor/Getty Images

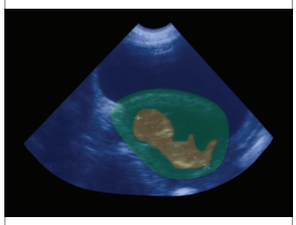


Figure 1.5 Obstetric ultrasonography of a 22-year-old woman. The 12-week-old fetus is *in brown.* The placenta is *in green.* Warrick G./Science Source

Classification of Prefixes

Many **prefixes** can be classified into **prefixes** of position, **prefixes** of number or measurement, and **prefixes** of direction (*Tables 1.9, 1.10, 1.11).*

Table 1.9 Prefixes of Position

Position Prefix	Meaning of Prefix	Word Example	Meaning of Medical Term
ante-	*before, forward*	antevert	*to tilt forward, as a uterus can*
anti-	*against*	antibiotic	*an agent that can destroy bacteria and other microorganisms*
circum-	*around*	circumcision	*to cut around the penis to remove the foreskin*
endo-	*inside, inner*	endocrine	*a gland that secretes directly into the blood*
epi-	*above, over, upon*	epidermis	*the top layer of the skin*
exo-	*outside, outward*	exocrine	*a gland that excretes outwardly through ducts*
hyper-	*above, excessive*	hypertrophy	*increase in size*
hypo-	*below*	hypodermis	*tissue layer below the top layer of the skin*
inter-	*between*	intercostal	*the space between two ribs*
intra-	*inside, within*	intradermal *(Figure 1.4)*	*within the skin*
para-	*adjacent, alongside*	paranoid	*having delusions of persecution*
peri-	*around*	perinatal	*around the time of birth*
post-	*after*	postnatal	*after the time of birth*
pre-	*before*	prenatal	*before the time of birth*
retro-	*backward*	retrovert	*to tilt backward, as a uterus can*
supra-	*above, excessive*	suprapubic	*above the pubic bone*
trans-	*across, through*	transdermal	*going across or through the skin*
ultra-	*higher, beyond*	ultrasound *(Figure 1.5)*	*very high-frequency sound waves*

Table 1.10 Prefixes of Number and Measurement

Measurement Prefix	Meaning of Prefix	Word Example	Meaning of Medical Term
bi-	*two, twice, double*	bilateral	*pertaining to or related to two sides of the body*
brady-	*slow*	bradycardia	*slow heart rate*
di-	*two*	diplegia	*paralysis of corresponding parts on both sides of the body*
eu-	*normal*	eupnea	*normal breathing*
hemi-	*half*	hemiparesis	*weakness of one side (half) of the body*
macro-	*large*	macrocyte	*large red blood cell*
micro-	*small*	microcyte	*small red blood cell*
mono-	*single, one*	monocyte	*white blood cell with a single nucleus*
multi-	*many*	multipara	*woman who has given birth at least twice*
pan-	*all*	pancytopenia	*deficiency of all types of blood cells*
poly-	*excessive*	polyuria	*excessive production of urine*
primi-	*first*	primipara	*woman who has given birth for the first time*
quadri-	*four*	quadriplegia	*paralysis of all four limbs*
tachy-	*rapid*	tachycardia	*rapid heart rate*
tri-	*three*	tricuspid	*having three points—a tricuspid heart valve has three flaps*
uni-	*single, one*	unipolar	*pertaining to one pole; neuron having a single process*

Table 1.11 Prefixes of Direction and Location

Directional Prefix	Meaning of Prefix	Medical Term Example	Meaning of Medical Term
ab-	*away from*	abduction	*action of moving away from the midline*
ad-	*toward*	adduction	*action of moving toward the midline*
ante-	*coming before, in front of*	antevert	*to tilt forward*
post-	*coming after, behind*	postnatal	*occurring after birth*
sub-	*under, beneath*	subdural	*in the space under the dura mater*
syn-	*coming together*	synapse	*junction between two nerve cells*

Check Point Section 1.3

A. Review the prefixes and terms in Table 1.9. *Select the correct answer to complete each statement.* LO 1.2

1. The location of the tumor was *above the pubic bone.* The tumor is located _____.
   a. hypogastric **b.** transdermal **c.** suprapubic **d.** ultrasonic
2. The *transdermal* route of drug administration goes:
   a. through the skin. **b.** in an IV. **c.** through the mouth. **d.** in the rectum.
3. *Postpartum* occurs
   a. before delivery. **b.** during delivery. **c.** after delivery.
4. *Retroverted* means
   a. tilted sideways. **b.** tilted forward. **c.** tilted backward.

B. Answer the following questions regarding the proper use of prefixes. *Choose T if the statement is True. Choose F if the statement is False.* LO 1.2

1.	They usually appear in the beginning of a term.	T	F
2.	They can attach to a root or combining form.	T	F
3.	Every term must have a prefix.	T	F
4.	Some terms can have more than one prefix.	T	F
5.	Prefixes can be classified into prefixes of position, number or measurement, or direction.	T	F

Section 1.4 Unique Medical Words

Greek, Latin, and Old English Words

Some medical terms are solid and cannot be broken down into elements. Examples are virus, a Latin word meaning poison, and toxin, a Greek word meaning poison. Though they have the same meaning in their original language, when they are converted to modern medical language, they have very different meanings. These solid words have to be recognized and their meanings memorized.

- **medical,** from a Latin term meaning *to heal;* it means *pertaining to the practice of medicine.*
- **care,** an Old English word meaning *to worry;* when you care for your patients, you look after them and are concerned about them.
- **breath,** an Old English word meaning *a single cycle of inhaling and exhaling.*
- **cough,** an Old English word meaning *to expel breath from the lungs.*
- **mucus,** a Latin word for *a clear, sticky secretion.*
- **record,** a Latin word meaning *to remember;* a medical *record* is a written account of a patient's medical history.

- **patient,** an Old English term meaning *to suffer* or *undergo;* the term refers to a person who is under medical or surgical treatment.
- **knee,** an Old English word meaning *an angular shape;* today it refers to the **joint** (a Latin word for junction) between the upper and lower leg.
- **apex,** a Latin word meaning *tip* or *summit* (as in Mount Everest); the apex of the heart is the downward-pointing tip of the cone-shaped heart.
- **patent,** a Latin word meaning *open* or *exposed;* a *patent* blood vessel is open to the circulation of freely flowing blood (Note the difference in the word **patient**).
- **quadrant,** a Latin word meaning *a quarter;* the abdomen is divided into four *quadrants* by horizontal and vertical planes that intersect at the umbilicus.
- **umbilicus,** which is a Latin word for the *navel or belly button.*
- **toxin,** a Greek word meaning *poison;* a *toxin* is a poisonous substance formed by a cell, such as a bacterium.
- **lymph,** a Latin word meaning *clear spring water; lymph* is a clear, shimmering fluid collected from the body tissues.
- **breech,** an Old English word meaning *buttocks;* in obstetrics, a fetus is in a *breech* presentation when the buttocks, rather than the head, are the presenting part at delivery.
- **specialist,** a Latin word meaning *of a given species;* a *specialist* devotes professional attention to a particular subject area.

Terms That Are Alike

Precision in both written and verbal communication is essential for a health professional, with great attention given to detail. There are many words in the medical language that are very similar to each other in both their spelling and pronunciation. Examples are:

- **ilium,** pronounced **ill**-ee-um, a bone in the pelvis
- **ileum,** pronounced the same way, **ill**-ee-um, a segment of the small intestine
- **ureter,** the tube from the kidney to the bladder
- **urethra,** the tube from the bladder to the outside
- **trapezius,** a muscle in the back
- **trapezium,** a bone in the wrist
- **malleus,** a small bone in the middle ear
- **malleolus,** a bony protuberance at the ankle
- **neurology,** the study of diseases of the nervous system
- **urology,** the study of diseases of the kidney and bladder

Check Point Section 1.4

A. The following medical terms are all of Greek or Latin origin. *Match the definition on the left with the correct term it is describing on the right.* **LO 1.3**

_____ **1.** tip or summit	**a.** patent
_____ **2.** buttocks	**b.** mucus
_____ **3.** poison	**c.** apex
_____ **4.** clear, sticky secretion	**d.** breech
_____ **5.** open	**e.** toxin

B. Choose the correct spelling of medical terms taken directly from Greek, Latin, or Old English words. LO 1.3, 1.4

1. A tube from the bladder to the outside.

- **a.** ureethra
- **b.** urethra
- **c.** ureter
- **d.** ureetere

2. The study of the diseases of the nervous system.

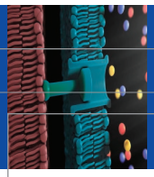
- **a.** urology
- **b.** ureology
- **c.** neurlogy
- **d.** neurology

3. A muscle in the back.

- **a.** ilium
- **b.** ileum
- **c.** trapezius
- **d.** trapezium

4. A small bone in the middle ear.

- **a.** ileum
- **b.** ilium
- **c.** malleolus
- **d.** malleus



Chapter 1 Review

Nucleus Medical Media

The Anatomy of Medical Terms

Challenge Your Knowledge

A. Identify the statements below as either true or false. Choose T if the statement is true. Choose F if the statement is false. **LO 1.1**

1. A term never has more than one root.	T	F
2. Some terms will have no combining vowel.	T	F
3. A combining vowel changes the meaning of the word.	T	F
4. A vowel must always be present in a combining form.	T	F

B. The root/combining form is the core meaning of the word. Choose the correct definition for the root/combining form for each term. **LO 1.1**

1. The term *hypogastric* relates to under or below the

a. chest. **c.** stomach.

b. skin. **d.** lungs.

2. The term *neuralgia* means pain in a

a. nerve. **c.** heart.

b. joint. **d.** cell.

3. The term *subdermal* means pertaining to below the

a. chest. **c.** stomach.

b. skin. **d.** lungs.

4. The term *cardiac* means pertaining to the

a. lungs. **c.** kidneys.

b. joints. **d.** heart.

5. The term *arthritis* means inflammation of the

a. lungs. **c.** kidneys.

b. joints. **d.** heart.

6. The term *erythrocyte* means cell that is

a. large. **c.** red.

b. round. **d.** swollen.

7. The term *bronchitis* means inflammation of a

a. kidney. **c.** bronchus.

b. eye. **d.** joint.

8. The term *hematology* means the study of

a. blood. **c.** the heart.

b. skin. **d.** the mind.

C. Match the Greek/Latin elements in the first column with their meanings in the second column. **LO 1.1, 1.4**

_____ **1.** pneum	**a.** to breathe
_____ **2.** hemat	**b.** open
_____ **3.** lymph	**c.** clear, sticky secretion
_____ **4.** thorax	**d.** tip or summit
_____ **5.** arthr	**e.** buttocks
_____ **6.** respir	**f.** chest
_____ **7.** mucus	**g.** skin
_____ **8.** patent	**h.** joint

_____ **9.** toxin	**i.** blood
_____ **10.** apex	**j.** air, lung
_____ **11.** dermat	**k.** clear spring water
_____ **12.** breech	**l.** poison

D. Spelling is most important in medical terminology. For example, **ilium** and **ileum** may be similar in appearance and sound, but the difference of one letter makes each a different body part. Select the correct spelling for the following terms. **LO 1.3, 1.4**

1. The _____ of the small intestine was infected.

a. ileum **b.** ilium **c.** illium

2. The _____ system keeps you breathing.

a. respieratory **b.** respiratory **c.** resspiratory

3. Inflammation of the heart is _____.

a. carditus **b.** carditis **c.** cardiitis

4. A muscle in the back is the _____.

a. trapeze **b.** trapezium **c.** trapezius

5. A bony protuberance in your ankle is the _____.

a. maleus **b.** malius **c.** malleolus

E. Use your newly acquired knowledge of medical language to correctly answer the following questions. Let the roots and combining forms be your guide. Choose the correct answer to complete each statement. **LO 1.1**

1. This term means one who studies the skin.

a. dermatologist

b. urologist

c. neurologist

2. This term relates to the intestines and the stomach.

a. gastroenterology

b. cardiology

c. dermatology

3. This term relates to the process of breathing.

a. apex

b. toxic

c. respiratory

4. This term relates to the stomach.

a. gastritis

b. gynecology

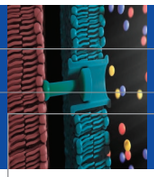
c. dermatitis

5. This term relates to a joint.

a. urethritis

b. arthritis

c. neuralgia



Chapter 1 Review

Nucleus Medical Media

F. Use the correct medical term to complete the sentence. Use the words to complete each sentence below. Fill in the blanks. LO 1.1, 1.2, 1.3

bladder breech cardiologist ileum ilium kidney lymph malleolus trapezium ureter urethra

1. A _____ is a specialist in the care of the heart.
2. The _____ is a tube from the kidney to the bladder.
3. Urology is the study of diseases of the _____ and _____.
4. A segment of the small intestine is the _____.
5. _____ means the buttocks, not the head, present first at delivery.
6. _____ is the tube from the bladder to the outside.
7. _____ is a fluid collected from body tissues.
8. A bone in the wrist is the _____.
9. The bony protuberance at the ankle is the _____.
10. The _____ is a bone in the pelvis.

G. Because much of clinical documentation centers on surgeries, knowledge of surgical suffixes is most important—especially for coders. LO 1.2

Matching
Match the definition in the first column with the correct term it is describing in the second column.

Term	Meaning
_____ **1.** scopy	**A.** surgical repair
_____ **2.** desis	**B.** visual examination
_____ **3.** plasty	**C.** surgical fixation

Combine these suffixes with the combining form arthr/o and fill in the blanks with the correct medical term.

4. The surgeon wants a closer look inside Mr. Parker's knee so he is scheduled for an _____ tomorrow morning.
5. Mary Collins has torn her knee ligaments playing high school basketball. Her treatment plan includes scheduling an _____ to reattach them. (fixation)
6. June Larkin had a bad skiing accident while on vacation. Her tendons and ligaments in her knee will require extensive surgery to get her walking again without crutches. She needs an _____. (repair)

Case Reports

A. Case Reports demonstrate how medical terminology is used in context. Using the skills of identifying the meaning of the prefix, root/combining form, and suffix will help you learn the meaning of each term. Correctly answer the following questions. **LO 1.1, 1.2**

Case Report (CR) 1.1

You are

. . . a **respiratory therapist** working with Tavis Senko, MD, a **pulmonologist** at Fulwood Medical Center.

You are communicating with

. . . Mrs. Sandra Schwartz, a 43-year-old woman referred to Dr. Senko by her primary care physician, Dr. Andrew McDonald, an **internist.** Mrs. Schwartz has a persistent abnormality on her chest x-ray. You have been asked to determine her **pulmonary** function prior to a scheduled **bronchoscopy.**

This summary of a Case Report

. . . illustrates for you the use of some simple medical terms. Modern health care and medicine have their own language. The medical terms all have precise meanings, which enable you, as a health professional, to communicate clearly and accurately with other health professionals involved in the care of a patient. This communication is critical for patient safety and the delivery of high-quality patient care.

From her medical records, you can see that 2 months ago Mrs. Schwartz developed a right upper lobe (RUL) **pneumonia.** After treatment with an **antibiotic,** a follow-up chest x-ray (CXR) showed some residual collapse in the right upper lobe and a small right **pneumothorax.** Mrs. Schwartz has smoked a pack a day since she was a teenager. Dr. Senko is concerned that she has lung cancer and has scheduled her for a **bronchoscopy.**

1. Dr. Senko is a specialist in the treatment of the:

a. heart. **b.** kidneys. **c.** lungs. **d.** ear, nose, and throat.

2. The _____ of the term *bronchoscopy* means windpipe.

a. combining form **b.** root **c.** prefix **d.** suffix

3. In the medical term *antibiotic,* the prefix is:

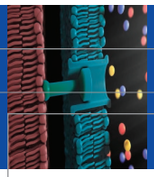
a. an- **b.** ant- **c.** anti-

4. The word element *respir* is a:

a. combining form. b. root. **c.** prefix. **d.** suffix.

5. Identify the terms that have word elements that mean *lung.* (Choose all that apply)

a. Pneumonia **b.** Bronchoscopy **c.** Internist **d.** Pulmonologist **e.** Therapist



Chapter 1 Review

Nucleus Medical Media

B. This Case Report has several terms using the same root element but with different suffixes. Correctly answer the following questions. **LO 1.1, 1.2**

Case Report (CR) 1.2

You are

. . . a **genetic** nurse working with **geneticist** Ingrid Hughes, MD, PhD, in the **Genetics** Department at Fulwood Medical Center.

Your patient is

. . . Mrs. Geraldine Long, a 37-year-old administrative assistant who has been referred by primary care **physician** Susan Lee, MD. Mrs. Long has twin girls who are 12 years old. She is an award-winning ballroom dancer who does not smoke, drinks alcohol occasionally, and rehearses her dance routines four or five days each week. Her mother, aged 62, is being treated for ovarian cancer. Her mother's sister is being treated for breast cancer and has been found to carry a **gene mutation** associated with breast cancer. Mrs. Long's **mammogram** is normal. She has requested **genetic screening.**

1. Identify the suffixes that mean specialist. (Choose all that apply)

a. -ist **b.** -ics **c.** -ician **d.** -tic

2. Provide the medical term that has two suffixes: _____

3. The root of the term *geneticist* means:

a. pertaining to. **b.** specialist. **c.** origin. **d.** cancer.

C. This Case Report focuses on medical terms that are based in Greek, Latin, and Old English. Correctly answer the following questions. **LO 1.1, 1.3**

Case Report (CR) 1.3

You are

. . . a **medical** assistant working for Russell Gordon, MD, a primary **care** physician at Fulwood Medical Center.

Your patient is

. . . Mr. William Doyle, a 72-year-old retired long-distance truck driver and a lifetime pack-a-day smoker. He is complaining of shortness of **breath,** increased **cough,** and production of sticky yellow **mucus.** In his medical **record,** you see that he has had stones in both ureters and is frequently a **patient** in the urology department, and that he has had both **knees** replaced. You begin to examine him.

1. Provide the medical term that refers to a *joint:* _____

2. Provide the medical term that means *to suffer:* _____

3. Mr. Williams has a problem inhaling and exhaling air. He has a problem with his:

a. breath. **b.** cough. **c.** kidneys. **d.** mucus. **e.** knees.

D. Read Case Report 1.4 and correctly answer the questions that follow. **LO 1.3**

Case Report (CR) 1.4

You are

. . . a medical assistant employed by Russell Gordon, MD, a primary care physician at Fulwood Medical Center.

Your patient is

. . . Mrs. Connie Bishop, a 55-year-old woman who presents with a swelling in her lower abdomen and shortness of breath. She has no gynecologic or gastroenterologic symptoms. Her previous medical history shows recurrent dermatitis of her hands since a teenager and an arthroscopy for a knee injury at age 40. Physical examination reveals a circular mass 6 inches in diameter in the left lower quadrant of her abdomen. There is no abnormality in her respiratory or cardiovascular system.

Your role is to maintain her medical record and document her care, assist Dr. Gordon during his examinations, explain the examination and treatment procedures to Mrs. Bishop, and facilitate her referral for specialist care.

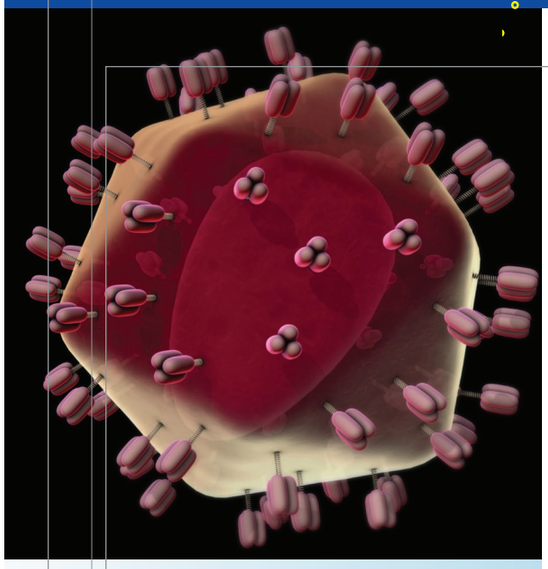
1. What type of skin problem has Mrs. Bishop had since she was a teenager? _____

2. Which term in the case study means pertaining to the stomach and small intestines? _____

3. Her knee injury required what type of procedure? _____

4. Does she have any issues with her lungs or heart? (yes or no) _____

5. Do her symptoms indicate a possible problem with her ileum? (yes or no) _____



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CHAPTER

2

Word Analysis and Communication

The Language of Health Care

Chapter Sections

Chapter Learning Outcomes

LO 2.1 Deconstruct a medical term into its basic elements.
LO 2.2 Use word elements to identify or construct a medical term.
LO 2.3 Connect the singular and plural components of medical terms.
LO 2.4 Employ the phonetic system used to pronounce medical terms.
LO 2.5 Communicate with precision in both written and verbal forms.

Section 2.1 Word Analysis and Definition

Word Analysis and Definition

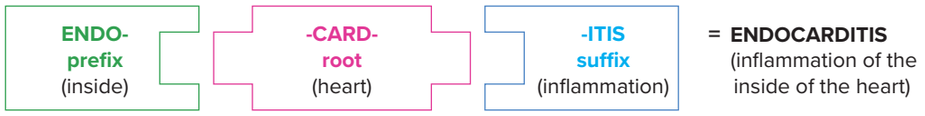
When you see a medical term you do not understand, the first step you can take to analyze, decipher, or deconstruct the term is to break it down into its component elements, or parts.

For words you need to define, first identify the **suffix**. Then, go to the front of the word and define the elements, moving from the front of the word to the suffix.

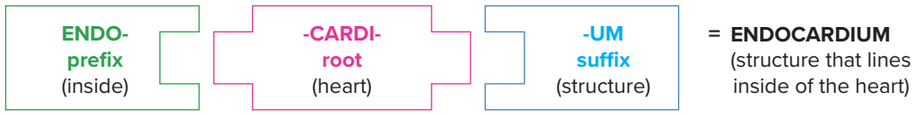
For example, in the term **endocarditis,** the **suffix** at the end of the word is **-itis**, which means *inflammation.*

That leaves **endocard-**. The first word element is **endo-**, a **prefix** meaning *inside*. The next element is **-card-**, a **root** meaning *heart.* Now you can assemble the pieces together to form the word meaning *inflammation of the heart.*

That leaves **endo-**, a **prefix** meaning *inside.* Now you can assemble the pieces together to form the word meaning *inflammation of the inside of the heart:*

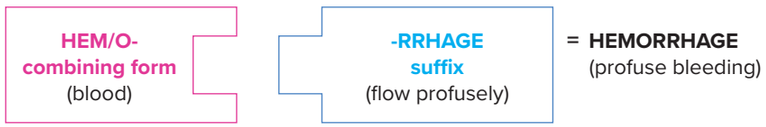


You also have learned that the **suffix -um** means *a structure.* So changing the word to **endocardium** would be the structure that lines the inside of the heart.



Therefore, you can understand that **endocarditis** is used to mean that the endocardium lining the heart has become inflamed or infected. Both **-card-** and **-cardi-** are **roots** meaning *heart.*

Another example is the word **hemorrhage.** The **suffix -rrhage** following the **combining vowel "o"** is borrowed from the Greek word meaning *to flow profusely.* The **combining form hem/o-** is from the Greek word for *blood.* The elements of the medical term **hemorrhage** are assembled together and used to mean *profuse bleeding.*



In this book, when the medical terms are broken down into their elements, a hyphen is used to isolate each major element and to identify its position in the whole word.

When a **combining form** is used, the **combining vowel** is separated from the **root** by a slash (/).

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
diagnosis (noun)	die-ag-**NO**-sis	P/ R/	**dia-** *complete* **-gnosis** *knowledge*	The determination of the cause of a disease, injury or congenital defect
diagnoses (pl)	die-ag-**NO**-seez			
diagnostic (adj) (***Note:*** The "is" in gnosis is deleted to allow the word to flow.)	die-ag-**NOS**-tik	S/	**-tic** *pertaining to*	Pertaining to or a diagnosis
diagnose (verb)	die-ag-**NOSE**	R/	**-gnose** *recognize an abnormal condition*	To make a diagnosis
endocarditis (***Note:*** The root "-card-" is the root used when the heart condition is **cardi-tis** or a type of **carditis.**)	**EN**-doh-kar-**DIE**-tis	S/ P/ R/	**-itis** *inflammation, infection* **endo-** *within, inner, inside* **-card-** *heart*	Inflammation of the lining of the heart
endocardium	**EN**-doh-**KAR**-dee-um	S/ P/ R/	**-um** *structure* **endo-** *within, inner* **-cardi-** *heart*	The inside lining of the heart
hemorrhage	**HEM**-oh-raj	S/ R/CF	**-rrhage** *to flow profusely* **hem/o-** *blood*	To bleed profusely

Check Point Section 2.1

A. To analyze a medical term, simply break the elements down (deconstruct them) into their basic forms. *To construct a new term, take the appropriate elements, put them in the correct position in the term, and build your term.* ***Note:*** *Remember that not every term will have all elements present at the same time.* **LO 2.1, 2.2**

1. **To deconstruct:** Take the medical term **endocarditis** and break it down into elements.

   The prefix _____ means _____.

   The root _____ means _____.

   The suffix _____ means _____.

2. **To deconstruct:** Take the medical term **hemorrhage** and break it down into elements.

   The prefix _____ means _____.

   The root _____ means _____.

   The suffix _____ means _____.

3. **To deconstruct:** Take the medical term **endocardium** and break it down into elements.

   The prefix _____ means _____.

   The root _____ means _____.

   The suffix _____ means _____.

Section 2.2 Plurals and Pronunciation

Plurals

When you change a medical term from singular to plural, it is not as simple as adding an *s,* as you often can in the English language. Unfortunately, in medical terms, the end of the word changes in ways that were logical in Latin and Greek but have to be learned by memory in English. This is shown in *Table 2.1.*

Table 2.1 Singular and Plural Forms

Singular Ending	Plural Ending	Examples	Singular Ending	Plural Ending	Examples
-a		axilla	-on		ganglion
	-ae	axillae		-a	ganglia
-ax		thorax	-um		septum
	-aces	thoraces		-a	septa
-en		lumen	-us**		viscus
	-ina	lumina		-era	viscera
-ex		cortex	-us**		villus
	-ices	cortices		-i	villi
-is*		diagnosis	-us**		corpus
	-es	diagnoses		-ora	corpora
-is*		epididymis	-x		phalanx
	-ides	epididymides		-ges	phalanges
-ix		appendix	-y		ovary
	-ices	appendices		-ies	ovaries
-ma		carcinoma	-yx		calyx
	-mata	carcinomata		-yces	calyces

**Note:* *Both singular terms can end in -is. You have to know on a case-by-case basis which singular terms change to -es and which ones change to -ides.*
***The same applies to the singular terms ending in -us—some will form plurals with -era, -i, or -ora.*

Pronunciation

In your role as a health professional, pronouncing medical terms correctly and precisely is not only about understanding conversations with your peers or a physician. It is also a matter of ensuring patient safety and providing high-quality patient care.

Correct pronunciation is essential so that other health professionals with whom you are working can understand what you are saying. Throughout this textbook, the pronunciation of each medical term will be written out phonetically using modern English forms. The part(s) of the word to which you give the strongest, or primary, emphasis is (are) written in bold, uppercase letters.

For example, the term **gastroenterology** will be phonetically written **GAS**-troh-en-ter-**OL**-oh-jee, whereas the term **gastritis,** which means *inflammation of the stomach,* will be phonetically written as gas-**TRY**-tis. **Hemorrhage** will be written as **HEM**-oh-raj, whereas the term **hemostasis,** which means *the stopping of bleeding,* will be written he-moh-**STAY**-sis.

The only way you can learn how to pronounce medical terms is to say them repeatedly and have your pronunciation checked against a standard, which is found in McGraw-Hill Connect.

Check Point Section 2.2

A. Forming plurals of medical terms will be less difficult if you follow the rules and apply them correctly. *The rules are given to you in the following chart—practice changing the medical terms from singular to plural. Fill in the chart.* **LO 2.3**

Singular	Plural	Singular Term	Plural Term
-a	-ae	axilla	**1.**
-um	-a	septum	**2.**
-ax	-aces	thorax	**3.**
-en	-ina	lumen	**4.**
-ex	-ices	cortex	**5.**
-is	-es	diagnosis	**6.**
-on	-a	ganglion	**7.**
-us	-i	villus	**8.**
-ix	-ices	appendix	**9.**
-x	-ges	phalanx	**10.**

Section 2.3 Precision in Communication

Precision in Communication

This year in the United States, more than 400,000 people will die because of drug reactions and medical errors. Many of these deaths are due to inaccurate or imprecise written or verbal communications between the different members of the health care team.

Being a health professional requires the utmost attention to detail and precision, both in written documentation and in verbal communication. A patient's life could be in your hands. In addition, the medical record in which you document a patient's care and your actions is a legal document. It can be used in court as evidence in professional medical liability cases.

When you understand the individual word elements that make up a medical term, you are better able to clearly understand the medical terms you are using. For example, if **hypotension** (low blood pressure) is confused with **hypertension** (high blood pressure), incorrect treatments could be prescribed. Confusing the terms **ureter** (the tube from the kidney to the bladder) with **urethra** (the tube from the bladder to the outside) could lead to disastrous consequences.

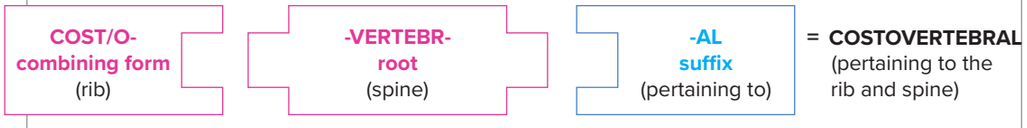
Each chapter will end with a Case Report for you to practice precision in written and verbal communication. Your review may require you to interpret medical terms, identify word elements within them, and their meanings. Correct interpretation of medical terms is important when communicating with patients and their families.

Use of Word Analysis

Ureter (you-**REET**-er) and **urethra** (you-**REE**-thra) are both simple words with no **prefix**, **combining vowel**, or **suffix**. They are derived from the Greek word for *urine.* They are similar words but have very different anatomic locations (*Chapter 6*).

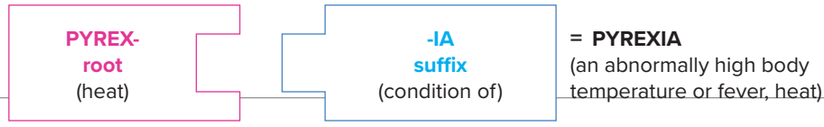
To deconstruct the word **hypotension** (**HIGH**-poh-**TEN**-shun), start with the **suffix -ion**, which means *a condition.* Next, the **prefix hypo-** means *below* or *less than normal.* The **root -tens-** is from the Latin word for *pressure.* Place the pieces together to form a word meaning *condition of below-normal pressure,* or low blood pressure.

To deconstruct the term **costovertebral** (kos-toe-**VER**-teh-bral), start with the **suffix -al**, which means *pertaining to.* Separated by the **combining vowel** "**o**" are two **roots**, **cost-** and **-vertebr-**. The **combining form cost/o-** is from the Latin word for *a rib.* **-Vertebr-** is from the Latin word for *backbone or spine.* So you have *pertaining to the rib and the spine.*



It is common that Greek and Latin terms have suffixes attached to them. These suffixes often mean *pertaining to.* For example, abdominal has the suffix -al changing the meaning of abdomen to *pertaining to the abdomen.* In proper documentation, a physician would order an abdominal x-ray rather than an abdomen x-ray.

Learning the meaning of word elements guides you to the meaning of medical terms. Instead of memorizing the meaning of each word, look for the word element you are familiar with. You might be familiar with the term insomnia which means *the inability to sleep.* The suffix -ia means *condition of.* Learning the meaning of the suffix can help you learn the meaning of other terms with the same suffix. For example, the term pyrexia. Because you know the suffix -ia means *condition of,* all you will need to learn is the meaning of the root element. The root element is pyrex-, which means *fever, heat.* Putting the elements together, pyrexia means *condition of fever or heat.* A condition of fever or heat is abnormal; therefore, the definition of pyrexia is *an abnormally high body temperature or fever.*



Word Introduction
Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
abdomen	**AB**-doh-men		Latin *abdomen*	The part of the trunk that lies between the thorax and the pelvis
abdominal	ab-**DOM**-in-al	S/ R/	**-al** *pertaining to* **abdomin-** *abdomen*	Pertaining to the abdomen
costovertebral	kos-toe-**VER**-teh-bral	S/ R/CF R/	**-al** *pertaining to* **cost/o-** *rib* **-vertebr-** *vertebra*	Pertaining to the rib and spine
hypertension	**HIGH**-per-**TEN**-shun	S/ P/ R/	**-ion** *action, condition* **hyper-** *excessive* **-tens-** *pressure*	Persistent high arterial blood pressure
hypotension	**HIGH**-poh-**TEN**-shun	P/	**hypo-** *low, below*	Persistent low arterial blood pressure
pyrexia	pie-**REK**-see-ah	S/ R/	**-ia** *condition* **pyrex-** *fever, heat*	An abnormally high body temperature or fever
ureter (***Note:*** Two "e" s = two tubes.)	you-**REET**-er		Greek *urinary canal*	Tube that connects the kidney to the urinary bladder
urethra	you-**REE**-thra		Greek *urethra*	Canal leading from the urinary bladder to the outside

Check Point Section 2.3

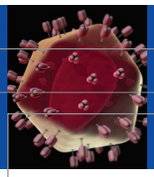
A. Precision in communication. *Verbal and written communication must always be precise and accurate for patient safety and legal requirements. Develop your eyes' and ears' ability to distinguish correct pronunciations, word choice, and spelling to ensure documentation and communication accuracy. Fill in the following blanks:* **LO 2.2, 2.5**

1. If the doctor tells you a patient's blood pressure readings are elevated, does the patient have **hypertension** or **hypotension?**

2. When describing a person's pain, would you say that a person has **abdomen** pain or **abdominal** pain?

3. Does urine travel from a kidney to the bladder through a **ureter** or **urethra?**

4. In the term **costovertebral,** the word element cost/o refers to which body part?



Chapter 2 Review

Word Analysis and Communication

Challenge Your Knowledge

A. Select the correct answer to the following statement. LO 2.3, 2.5

1. *Costovertebral* pertains to the

a. rib and colon.
b. heart and rib cage.
c. rib and spine.
d. lung and rib.
e. rib and kidney.

B. Recall your pronunciation. Select the correct answer that completes each statement. LO 2.4, 2.5

1. What is the correct pronunciation of *pyrexia*?

a. pie-**RECK**-si-a
b. **PIE**-**RECK**-ci-a
c. **PY**-rek-sia
d. pie-**REK**-see-ah
e. py-rek-**SEE**-ah

2. What is the correct pronunciation of *costovertebral*?

a. **KOSTO**-ver-**TREE**-bral
b. cost-o-VER-tre-bal
c. kos-toe-VER-teh-bral
d. **COSTO**-ver-tree-bral
e. kosto-ver-tree-**BAL**

3. What is the correct pronunciation of abdominal?

a. ab-**DOM**-in-al
b. ab-**DOME**-i-nal
c. **AB**-doh-men
d. ab-**DOH**-min-el
e. **AB**-dom-**IN**-el

C. To help you master plurals, practice changing singular endings to plural and plural endings to singular in the following exercise. If you are given a singular word, change it to plural. If you are given a plural word, change it to singular. The first one is done for you. LO 2.3

Word	Singular	Plural
1. carcinomata	carcinoma	_____
2. ovaries	_____	_____
3. ganglia	_____	_____
4. lumen	_____	_____
5. villi	_____	_____
6. cortices	_____	_____
7. calyx	_____	_____

8. epididymis _____ _____
9. axilla _____ _____
10. viscus _____ _____
11. appendices _____ _____
12. corpora _____ _____
13. diagnoses _____ _____
14. thoraces _____ _____

D. Precision in documentation means using the correct form of the term, as well as the correct term. Medical terms can take the forms of noun (thing), verb (action), or adjective (description). Fill in the blank with the correct term. **LO 2.5**

diagnosis **diagnose** **diagnostic** **diagnoses**

1. After performing several _____ tests, the physician has confirmed his _____.
2. In addition to her diabetes, the patient has several other _____.
3. The physician was unable to _____ the patient's condition because the patient refused the prescribed tests.

E. Use the appropriate medical language to answer the questions. Select the correct answer that completes each statement or answers each question. **LO 2.1, 2.2**

1. Which one of the following terms would describe the condition of a person with an increased body temperature?

   a. pyrexia **d.** villus
   b. fainting **e.** endocardium
   c. hemorrhage

2. Inflammation of the lining of the heart is

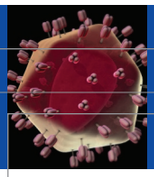
   a. cardiology. **d.** cardiologist.
   b. cardiac. **e.** endocardium.
   c. endocarditis.

3. Which term might be used to describe an area of the ribcage?

   a. hypertensive **d.** costovertebral
   b. urethra **e.** ureter
   c. hypotensive

4. Which one of the following terms would a heart specialist use to describe a heart condition?

   a. cortices **d.** abdominal
   b. urethra **e.** dermatitis
   c. endocarditis



Chapter 2 Review

F. Use the word elements to identify the correct medical term. Select the correct answer to answer each question. **LO 2.2**

1. Which medical term has an element meaning *to flow profusely?*

a. corpora
b. endocardium
c. hemorrhage
d. pyrexia
e. diagnosis

2. Which medical term has an element meaning *a structure?*

a. endocarditis
b. cardiologist
c. endocardium
d. appendix
e. cardiology

3. Which medical term has an element meaning *condition?*

a. pyrexia
b. carcinoma
c. diagnoses
d. hemostasis
e. gastroenterology

4. Which medical term has an element meaning *inflammation?*

a. gastroenterologist
b. gastritis
c. gastrologist
d. gastric
e. gastrology

5. Which medical term has an element meaning *knowledge of an abnormal condition?*

a. cortices
b. diagnosis
c. convulsion
d. seizure
e. pyrexia

G. Speak and spell with precision in medical communication. All terms presented are spelled phonetically to make them easier for you to learn to pronounce. Be sure you can speak them correctly as well as spell them correctly! Practice, practice, practice. Choose the best answer, and then fill in the blanks. **LO 2.4, 2.5**

1. The correct pronunciation for an inflammation of the heart is

a. **EN**-do-kar-di-tis
b. en-**DO**-kard-itis
c. **EN**-doh-kar-**DIE**-tis

The correct spelling of this term is _____.

2. An abnormally high body temperature is

a. pie-**REK**-see-ah

b. **PIE**-rek-seeah

c. pie-**REK**-see-**AH**

The correct spelling of this term is _____.

3. Profuse bleeding is termed a

a. **HEM**-oh-raj

b. hem-**OH**-raj

c. **HEM**-oh-**RAJ**

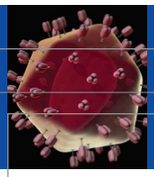
The correct spelling of this term is _____.

H. Spelling comprehension. Select the correct spelling of the term. **LO 2.5**

1.	**a.** pyrexcia	**b.** pyrexia	**c.** pirixia	**d.** pyrixea	**e.** pirexia
2.	**a.** endocardites	**b.** endocarditis	**c.** endocaritis	**d.** endoarites	**e.** endacardites
3.	**a.** hemorrhege	**b.** hemorrage	**c.** hemmorrhage	**d.** hemmorage	**e.** hemorrhage
4.	**a.** diagnosis	**b.** deagnossis	**c.** diagnnosis	**d.** diaggnosis	**e.** diagnosiss
5.	**a.** hypotenssion	**b.** hopotension	**c.** hypotension	**d.** hypotennsion	**e.** hipotension
6.	**a.** costovertebrral	**b.** costovertebral	**c.** costoverrtibral	**d.** castovertebal	**e.** costovertebal
7.	**a.** hemostassis	**b.** hemostasis	**c.** hematsasis	**d.** hemmostassis	**e.** hemastasis
8.	**a.** urethrra	**b.** ureathra	**c.** urettra	**d.** ureathrra	**e.** urethra

I. Provide the correct term based on the meaning provided below. Fill in the blank with the correct term. **LO 2.2**

Meaning	**Term**
1. abnormally high fever	_____
2. pertaining to the ribs and spine	_____
3. stopping bleeding	_____
4. more than one carcinoma	_____
5. low blood pressure	_____
6. canal leading from the urinary bladder to the outside	_____
7. determination of the cause of a disease	_____
8. to bleed profusely	_____
9. inflammation of the inside of the heart	_____
10. more than one appendix	_____



Chapter 2 Review

Case Reports

A. After reading the following Case Report, correctly answer the following questions. The answers to the questions may not be in the Case Report itself but can be found in the chapter content. **LO 2.1, 2.2, 2.3**

Case Report (CR) 2.1

You are

. . . an EMT employed in the Emergency Department at Fulwood Medical Center.

Your patient is

. . . Barbara Rotelli, a 17-year-old woman, who presents with **pyrexia** and shaking chills. On her medical record, you read that her physical examination reveals splinter **hemorrhages** under her fingernails and a heart murmur. There is blood in her urine. She had dental surgery four days ago. A provisional **diagnosis** is made of acute **endocarditis.** You are to prepare her for admission to intensive care.

1. *Pyrexia* has an element that means *fever* or *heat.* What is that element? _____

2. If Ms. Rotelli had more than one diagnosis, how would you document that term? _____

3. *Endocarditis* has a prefix that means _____.

B. After reading the following Case Report, correctly answer the following questions. The answers to the questions may not be in the Case Report itself but can be found in the chapter content. **LO 2.2**

Case Report (CR) 2.2

You are

. . . a radiology technician working in the Radiology Department of Fulwood Medical Center.

Your patient is

. . . Mrs. Matilda Morones, a 38-year-old woman who presents with sudden onset of severe, colicky right-flank pain and pain in her **urethra** as she passes urine.

The physical examination revealed that Mrs. Morones is in severe distress, with marked tenderness in the right **costovertebral** angle and in the right lower quadrant of her **abdomen.** Microscopy of her urine showed numerous red blood cells. The **stat abdominal** x-ray you have taken reveals a radiopaque stone in the right **ureter.** She has now become faint and is in **hypotension.**

How are you going to communicate Mrs. Morones's condition as you ask for help and then document her condition and your response?

1. The location of Mrs. Morones's stone is _____ her urinary bladder.

a. above

b. below

2. The x-ray was ordered to be taken:

a. in the order it was received.

b. tomorrow in the early morning.

c. before midnight.

d. immediately.

3. Identify the phrase that best describes her condition.

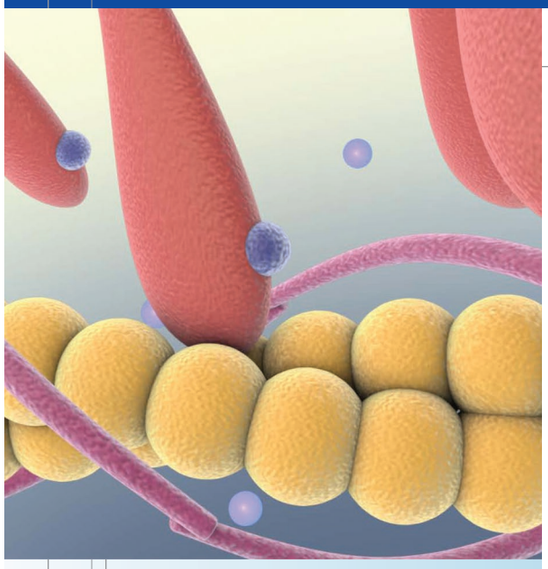
a. The position of the stat x-ray caused Mrs. Morones to vomit.

b. Mrs. Morones's has intense pain in her chest and she fainted.

c. The red blood cells in her urine caused high blood pressure.

d. There is a stone in her kidney causing blood in her urine.

e. Mrs. Morones has low blood pressure and she has lost consciousness.



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CHAPTER

3

The Body as a Whole

The Language of Anatomy

Chapter Sections

Chapter Learning Outcomes

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

LO 3.1 Use roots, combining forms, suffixes, and prefixes to construct and analyze medical terms related to the anatomy and physiology of the body as a whole.

LO 3.2 Spell and pronounce medical terms related to the body as a whole.

LO 3.3 Identify the elements that compose the body and discuss the structure and functions of cells.

LO 3.4 Describe the four primary tissue groups found in the body.

LO 3.5 Distinguish between the different organ systems and their major organs.

LO 3.6 Discuss the roles of DNA, genes, and medical genetics and its applications in modern medicine.

LO 3.7 Describe the different anatomical positions, planes, and directions of the body.

LO 3.8 Map the body cavities and describe the abdominal quadrants and the nine regions of the abdomen.

LO 3.9 Apply knowledge of medical terms relating to the body as a whole in documentation, medical records, and communication.

LO 3.10 Identify and correctly use abbreviations of terms used in anatomy and physiology related to the body as a whole.

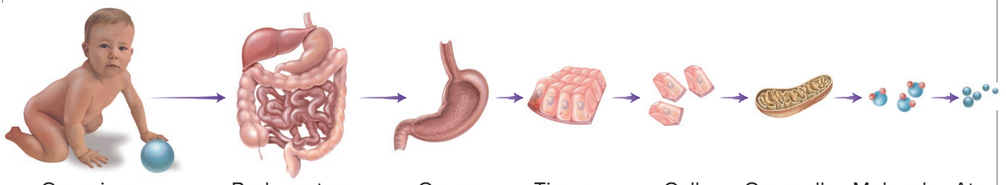
Human life starts with a single zygote, which as it grows divides into new cells. As the cells continue dividing, they specialize into all the different organs and tissues of the body. Effective medical diagnosis and treatment recognizes that a cell in our body should function in harmony with every other cell. Understanding all the systems of the body is critical for accurate diagnosis of pathology and identifying an effective treatment.

Section 3.1 Organization of the Body

The Body's Levels of Organization

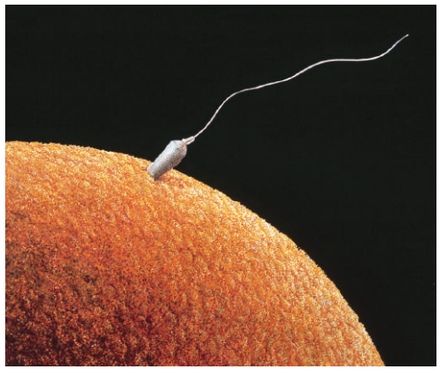
All the elements of your body interact with one another to enable your body to be in constant change as it reacts to the environment, to the nourishment you give it, and to the thoughts and emotions that you express to it.

- The whole body or organism is composed of **organ** systems.
  - Organ systems are composed of **organs.**
    - Organs are composed of **tissues.**
      - Tissues are composed of **cells.**
        - Cells are composed in part of **organelles.**
          - Organelles are composed of **molecules.**
            - Molecules are composed of **atoms.**
              - The **nucleus** of a cell directs all the activities of a cell.



The Cell

This single fertilized cell, the **zygote,** is the result of the **fertilization** of an egg **(oocyte)** by a sperm and is the origin of every cell in your body *(Figure 3.1).* The oocyte divides and multiplies into millions of cells that are the basic unit of every tissue and organ. The structure and all of the functions of your tissues and organs are due to their cells. The **cell** is the basic unit of life. **Cytology** is the study of this cell structure and function. Your understanding of the cell will form the basis for your knowledge of the anatomy and physiology of every tissue and organ.



▲ **Figure 3.1 Fertilization of egg by single sperm.** Francis Leroy, Biocosmos/Science Source

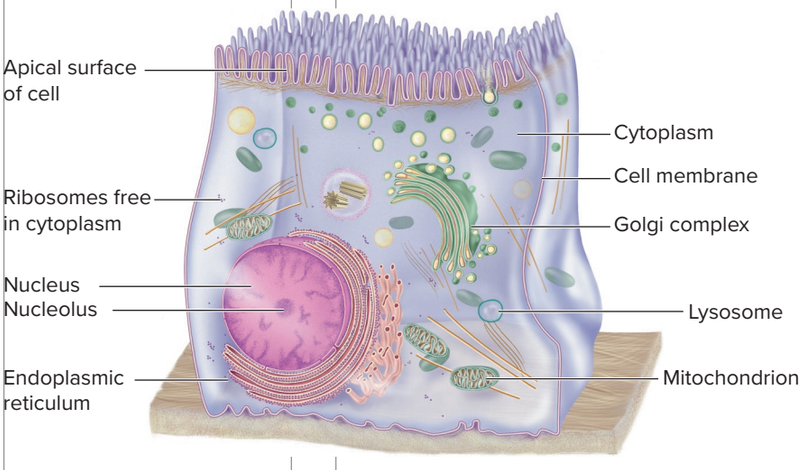
Did you know...

- Estimates of the total number of cells in the human body vary from 50 trillion to 70 trillion cells.
- The number of cells in your own body is constantly changing, as cells die and new cells take their place.
- In addition to your own cells, there are 10 times as many microorganisms (bacterial and fungal cells) residing on the skin, in saliva, in the conjunctiva, in the vagina, and in the gastrointestinal tract.
- These microorganisms (normal flora) participate in maintaining normal health, and under normal circumstances do not cause disease.

Word Analysis and Definition: The Cell

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
atom	**AT**-om		Greek *indivisible*	A small unit of matter
cell **cellular (adj)**	SELL **SELL**-you-lar	 S/ R/	Latin *a storeroom* **-ar** *pertaining to* **cellul-** *small cell*	The smallest unit capable of independent existence Pertaining to a cell
cytology **cytologist**	sigh-**TOL**-oh-jee sigh-**TOL**-oh-jist	S/ R/CF S/	**-logy** *study of* **cyt/o-** *cell* **-logist** *one who studies*	Study of the cell Specialist in the study of cells
fertilization **fertilize (verb)**	**FER**-til-eye-**ZAY**-shun **FER**-til-ize	S/ R/	**-ation** *process* **fertiliz-** *to bear*	Union of a male sperm and a female egg
molecule **molecular (adj)** (***Note:*** The two suffixes are joined by two vowels, therefore the *e* in *ule* is not used.)	**MOLL**-eh-kyul mo-**LEK**-you-lar	S/ R/ S/	**-ule** *small* **molec-** *mass* **-ar** *pertaining to*	Very small particle consisting of two or more atoms held tightly together
oocyte	**OH**-oh-site	S/ R/CF	**-cyte** *cell* **o/o-** *egg*	Female egg cell
organ **organelle**	**OR**-gan **OR**-gah-nell	 S/ R/	Latin *instrument, tool* **-elle** *small* **organ-** *organ*	Structure with specific functions in a body system Part of a cell having a specialized function(s)
tissue	**TISH**-you		Latin *to weave*	Collection of similar cells
zygote	**ZYE**-goht		Greek *yoked*	Cell resulting from the union of the sperm and egg



▲ **Figure 3.2** Structure of a representative cell.

Structure and Functions of Cells

As the zygote divides, every cell derived from it becomes a small, complex factory that carries out these **basic functions of life:**

- Manufacture of proteins and lipids
- Production and use of energy
- Communication with other cells
- Replication of **deoxyribonucleic acid (DNA)**
- Reproduction

All your cells contain a fluid called **cytosol** (**intracellular** fluid) surrounded by a **cell membrane** *(Figure 3.2).* A single cell may have 10 billion protein molecules inside it.

The cell membrane is made of proteins and lipids and allows water, oxygen, glucose, **electrolytes, steroids,** and alcohol to pass through it. On the outside of the cell membrane are receptors that bind to chemical messengers, such as **hormones** sent by other cells. These are the chemical signals by which your cells communicate with each other. The **cytoplasm** is a clear, gelatinous substance containing

cytosol and crowded with different organelles. **Organelles** are small structures that carry out special **metabolic** tasks, the chemical processes that occur in the cell. Examples of organelles are:

- **Nucleus**
- Endoplasmic reticulum
- Golgi complex or apparatus
- **Mitochondria**
- **Nucleolus**
- Ribosomes
- Lysosomes

Organelles

The **nucleus** is the largest organelle and located between the cell membrane and the cytoplasm *(Figure 3.2)*. It directs all the activities of the cell. Most of your cells have one nucleus; red blood cells have none, and some liver cells and muscle cells contain many nuclei. The nucleus is surrounded by its own membrane, which has small openings called *pores.* Every minute, hundreds of molecules pass through the pores. These molecules include the raw materials for the DNA and ribonucleic (RNA) synthesis that is ongoing inside the nucleus. Forty-six molecules of DNA and their associated **proteins** are packed into each nucleus as thin strands called **chromatin.** When cells divide, the chromatin condenses to form 46 more densely coiled bodies called **chromosomes.**

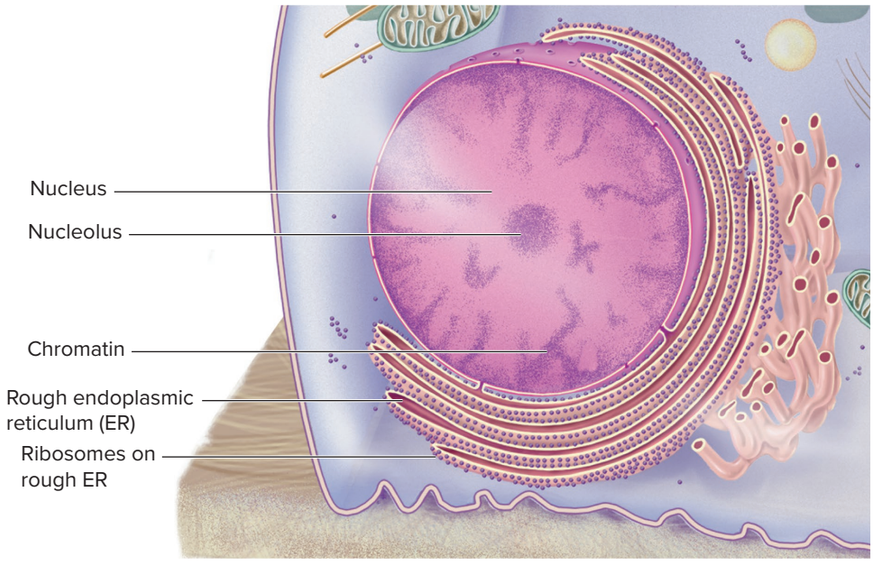
Word Analysis and Definition: The Cell

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
chromatin	**KROH**-ma-tin	S/ R/	**-in** *substance, chemical compound* **chromat-** *color*	Substance composed of DNA that forms chromosomes during cell division
chromosome	**KROH**-moh-sohm	S/ R/CF	**-some** *body* **chrom/o-** *color*	Body in the nucleus that contains DNA and genes
cytoplasm	**SIGH**-toh-plazm	S/ R/CF	**-plasm** *something formed* **cyt/o-** *cell*	Clear, gelatinous substance that forms the substance of a cell except for the nucleus
cytosol	**SIGH**-toh-sawl	S/ R/CF	**-sol** *solution* **cyt/o-** *cell*	Liquid portion of the cell
deoxyribonucleic acid (DNA)	dee-**OCK**-see-**RYE**-boh-noo-**KLEE**-ik **ASS**-id		**deoxyribose** *sugar* **nucleic acid** *protein*	Source of hereditary characteristics found in chromosomes
electrolyte	ee-**LEK**-troh-lite	S/ R/CF	**-lyte** *soluble* **electr/o-** *electric*	Substance that, when dissolved in a suitable medium, forms electrically charged particles
hormone **hormonal (adj)**	**HOR**-mohn hor-**MOHN**-al	 S/	Greek *set in motion* **-al** *pertaining to*	Chemical formed in one tissue or organ and carried by the blood to stimulate or inhibit a function of another tissue or organ Pertaining to a hormone
intracellular	in-trah-**SELL**-you-lar	S/ P/ R/	**-ar** *pertaining to* **intra-** *within* **-cellul-** *small cell*	Within the cell
membrane **membranous (adj)**	**MEM**-brain **MEM**-brah-nus	 S/	Latin *parchment* **-ous** *pertaining to*	Thin layer of tissue covering a structure or cavity Pertaining to a membrane
metabolism **metabolic (adj)**	meh-**TAB**-oh-lizm met-ah-**BOL**-ik	S/ R/ S/	**-ism** *condition* **metabol-** *change* **-ic** *pertaining to*	The constantly changing physical and chemical processes occurring in the cell Pertaining to metabolism
nucleolus	nyu-**KLEE**-oh-lus	S/ R/CF	**-lus** *small* **nucle/o-** *nucleus*	Small mass within the nucleus
nucleus **nuclei (pl)** **nuclear (adj)**	**NYU**-klee-us **NYU**-klee-eye **NYU**-klee-ar	 S/ R/	Latin *kernel* **-ar** *pertaining to* **nucle-** *nucleus*	Functional center of a cell or structure Pertaining to the nucleus
steroid **steroidal (adj)**	**STER**-oyd **STER**-oy-dal	S/ R/	**-oid** *resemble* **ster-** *solid*	Large family of chemical substances found in many drugs, hormones, and body components
synthesis	**SIN**-the-sis	P/ R/	**syn-** *together* **-thesis** *to arrange*	The process of building a compound from different elements

Ribosomes are organelles involved in the manufacture of **protein** from simple materials. This process is called **anabolism.**

Each nucleus (*Figure 3.3*) contains a **nucleolus,** a small dense body composed of RNA and protein. It manufactures ribosomes that migrate through the nuclear membrane pores into the cytoplasm.



▲ **Figure 3.3** The nucleus.

Did you know...

The nucleus directs all activities of the cell. The nucleolus manufactures ribosomes, which manufacture protein.

- Metabolism—the sum of the physical and chemical processes in a cell.
- Anabolism—constructive metabolism, the buildup from simple substances to complex substances needed in the cell.
- Catabolism—destructive metabolism, the breakdown of complex substances to release energy.

The **endoplasmic reticulum** is an organelle that manufactures steroids, cholesterol and other lipids, and proteins. It also detoxifies alcohol and other drugs.

Lysosomes are organelles that are the garbage disposal units of the cell. They digest and dispose of worn-out organelles as part of the process of cell death. They also digest foreign particles and bacteria.

Mitochondria (**mitochondrion,** singular**)** are the powerhouses of the cells. They extract energy by breaking down compounds such as glucose and fat. This process is called **catabolism.** The energy is used to do the work of the cell: for example, to make a muscle contract.

Tissues

Did you know...

Different tissues are made of specialized cells with unique materials around them that are manufactured by the cells.

The knee contains examples of all the different major groups of tissue and will be used to illustrate the relation of structure to function in the different tissues. Tissues hold your body together. The many tissues of your body have different structures for specialized functions. The different tissues are made of similar cells with unique materials around them that are manufactured by the cells. **Histology** is the study of the structure and function of tissues. The four primary tissue groups are outlined in *Table 3.1.*

Table 3.1 The Four Primary Tissue Groups

Type	Function	Location
Connective	Bind, support, protect, fill spaces, store fat	Widely distributed throughout the body; for example, in blood, bone, cartilage, and fat
Epithelial	Protect, **secrete,** absorb, **excrete**	Cover body surface, cover and line internal organs, compose glands
Muscle	Movement	Attached to bones, in the walls of hollow internal organs, and in the heart
Nervous	Transmit impulses for coordination, sensory reception, motor actions	Brain, spinal cord, nerves

Word Analysis and Definition: Cells and Tissues

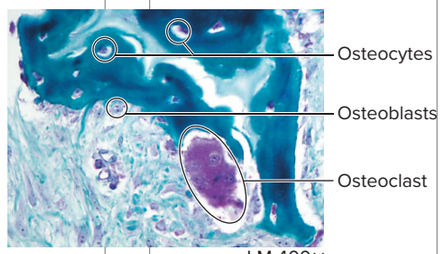
S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION		ELEMENTS	DEFINITION
anabolism	an-**AB**-oh-lizm	S/ R/	**-ism** *condition* **anabol-** *build up*	The buildup of complex substances in the cell from simpler ones as a part of metabolism
catabolism	kah-**TAB**-oh-lizm	S/ R/	**-ism** *condition* **catabol-** *break down*	Breakdown of complex substances into simpler ones as a part of metabolism
epithelium	ep-ih-**THEE**-lee-um	S/ P/ R/CF	**-um** *structure* **epi-** *upon* **-thel/i-** *nipple*	Tissue that covers surfaces or lines cavities
epithelial (adj)	ep-ih-**THEE**-lee-al	S/	**-al** *pertaining to*	Pertaining to epithelium
excrete **excretion (noun)**	eks-**KREET** eks-**KREE**-shun		Latin *separate*	To pass waste products of metabolism out of the body Removal of waste products of metabolism out of the body
histology **histologist**	his-**TOL**-oh-jee his-**TOL**-oh-jist	S/ R/CF S/	**-logy** *study of* **hist/o-** *tissue* **-logist** *one who studies*	Structure and function of cells, tissues, and organs Specialist in the structure and function of cells, tissues, and organs
lysosome	**LIE**-soh-sohm	S/ R/CF	**-some** *body* **lys/o-** *decompose*	Enzyme that digests foreign material and worn-out cell components
mitochondrion **mitochondria (pl)**	my-toe-**KON**-dree-on my-toe-**KON**-dree-ah	S/ R/CF R	**-ion** *action, condition* **mit/o-** *thread* *-chondr- cartilage, rib, granule*	Organelle that generates, stores, and releases energy for cell activities
protein	**PRO**-teen	S/ R/CF	**-in** *substance, chemical compound* **prot/e-** *first*	Class of food substances based on amino acids
ribosome	**RYE**-bo-sohm	S/ R/CF	**-some** *body* **rib/o-** *like a rib*	Structure in the cell that assembles amino acids into protein
secrete **secretion (noun)**	se-**KREET** se-**KREE**-shun		Latin *release*	To produce a chemical substance in a cell and release it from the cell

Connective Tissues in the Knee Joint

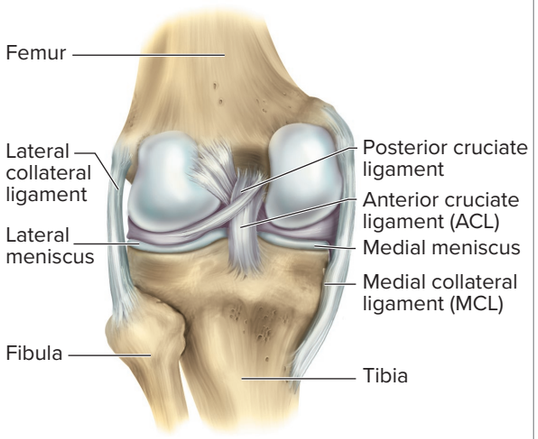
The knee joint provides an excellent example of how different types of tissues form the knee joint to allow for the functions of walking, bending, and running. These tissues and roles are listed below:

- **Bone** is the hardest connective tissue due to the presence of calcium mineral salts, mostly calcium phosphate. Cells that make up bone tissue are
  - **Osteoblasts** deposit bone **matrix** *(Figure 3.4)* in concentric patterns around a central canal containing a blood vessel. As a result, every osteoblast is close to a supply of **nutrients** from the blood.
  - **Osteocytes** are former osteoblasts that maintain the bone matrix.
  - **Osteoclasts** dissolve the bone matrix to release calcium and phosphate into the blood when these chemicals are needed elsewhere.
- **Cartilage** has a flexible, rubbery matrix that allows it, as a meniscus, to function as a shock absorber and as a gliding surface where two bones meet to form a joint. Cartilage also forms the shape of your ear, the tip of your nose, and your larynx. Cartilage has very few blood vessels and heals poorly or not at all. Cells of cartilage include
  - Chrondroblasts, which deposit the cartilage matrix.
  - Chrondrocytes, which are former chondroblasts that maintain the cartilage matrix.
  - Fibers, which give the cartilage strength and flexibility.



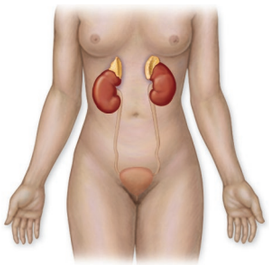
▲ **Figure 3.4** **Bone tissue.**
Al Telser/McGraw Hill

- **Ligaments** are strips or bands of fibrous connective tissue *(Figure 3.5).* Cells called **fibroblasts** form a gelatinous (jellylike) matrix and closely packed, parallel **collagen** fibers. These fibers provide the strength the ligament needs. Their blood supply is poor, so they do not heal well without surgery.
- **Tendons** are thick, strong ligaments that attach muscles to bone.
- The **joint capsule** of the knee joint is attached to the tibia and femur, encloses the joint cavity, and is made of thin, collagenous fibrous connective tissue. It is strengthened by fibers that extend over it from the ligaments and muscles surrounding the knee joint. These features are common to most joints.
- The inner surface of many joint capsules is lined with **synovial membrane,** which secretes **synovial fluid.** This fluid is a slippery lubricant retained in the joint cavity by the capsule. It has a texture similar to raw egg white. It makes joint movement almost friction-free and distributes nutrients to the cartilage on the joint surfaces of bone.
- **Muscle** tissue stabilizes the knee joint. Extensions of the tendons of the *quadriceps femoris,* the large muscle in front of the thigh, and of the *semimembranosus muscle* on the rear of the thigh, are major stabilizers. The muscles themselves respectively extend and flex the joint. The structure and functions of these and other skeletal muscles are described in *Chapter 14.*
- **Nervous** tissue extensively supplies all the knee structures, which is why a knee injury is excruciatingly painful. The structure and functions of nervous tissue are described in *Chapter 9.*



Posterior view

▲ **Figure 3.5** **Ligaments of the knee joint.**



▲ **Figure 3.6** **Organs of the urinary system.**

Organs and Organ Systems

Organs

An **organ** is a structure composed of several tissues that work together to carry out specific functions. For example, the skin is an organ that has different tissues in it such as epithelial cells, hair, nails, and glands.

Each organ has well-defined anatomic boundaries separating it from adjacent structures and performs a particular function. The different organs in an organ system are usually interconnected. For example, in the urinary organ system, the organs are the kidneys, ureters, bladder, and urethra, and they are all connected (*Figure 3.6*) as they work to eliminate fluid waste from the body. See *Table 3.2* to review the organs of each body system.

Organ Systems

An **organ system** is a group of organs with a specific collective function, such as digestion, circulation, or respiration. For example, the nose, pharynx, larynx, trachea, and bronchi work together to achieve the total function of respiration.

The body has 11 organ systems, shown in *Table 3.2.* The muscle and skeleton can be considered one organ system, the musculoskeletal system.

Word Analysis and Definition: Connective Tissue and Anatomy

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
capsule **capsular (adj)**	**KAP**-syul **KAP**-syu-lar	S/ R/ S/	**-ule** *little* **caps-** *box* **-ar** *pertaining to*	Fibrous tissue layer surrounding a joint or some other structure Pertaining to a capsule
cartilage	**KAR**-tih-lij		Latin *gristle*	Nonvascular firm, connective tissue found mostly in joints
chondroblast **chondrocyte**	**KON**-droh-blast **KON**-droh-site	S/ R/CF S/	**-blast** *germ cell* **chondr/o-** *cartilage* **-cyte** *cell*	Cartilage-forming cell Cartilage cell
collagen	**KOL**-ah-jen	S/ R/CF	**-gen** *produce, form* **coll/a-** *glue*	Major protein of connective tissue, cartilage, and bone
fibroblast	**FIE**-bro-blast	S/ R/CF	**-blast** *germ cell* **fibr/o-** *fiber*	Cell that forms collagen fibers
matrix	**MAY**-triks		Latin "mater" *mother*	Substance that surrounds cells, is manufactured by the cells, and holds them together
nutrient	**NYU**-tree-ent	S/ R/	**-ent** *end result* **nutri-** *nourish*	A substance in food required for normal physiologic function
osteoblast **osteoclast** **osteocyte**	**OS**-tee-oh-blast **OS**-tee-oh-klast **OS**-tee-oh-site	S/ R/CF S/ S/	**-blast** *germ cell* **oste/o-** *bone* **-clast** *break* **-cyte** *cell*	Bone-forming cell Bone-removing cell Bone-maintaining cell
synovia (***Note:*** The fluid resembles the white of an egg) **synovial (adj)**	so-**NOH**-vee-uh sih-**NOH**-vee-al	S/ P/ R/ S/ R/CF	**-ia** *pertaining to* **syn-** *together* **-ov-** *egg* **-al** *pertaining to* **synov/i-** *synovial membrane*	Pertaining to the fluid in a joint. Pertaining to synovial fluid and synovial membrane
tendon	**TEN**-dun		Latin *sinew*	Fibrous band that connects muscle to bone

All your organ systems work together to ensure that your body's internal environment remains relatively constant. This process is called **homeostasis.** For example, your digestive, respiratory, and circulatory organ systems work together so that (a) every cell in your body receives adequate nutrients and oxygen and (b) waste products from the breakdown of these nutrients during cell metabolism are removed. Your cells can then function normally. Disease affecting an organ or organ system disrupts this game plan of homeostasis.

Table 3.2 Organ Systems

Organ System	Major Organs	Major Functions
Integumentary	Skin, hair, nails, sweat glands, sebaceous glands	Protect tissues, regulate body temperature, support sensory receptors
Skeletal	Bones, ligaments, cartilages, tendons	Provide framework, protect soft tissues, provide attachments for muscles, produce blood cells, store inorganic salts
Muscular	Muscles	Cause movements, maintain posture, produce body heat
Nervous	Brain, spinal cord, nerves, sense organs	Detect changes, receive and interpret sensory information, stimulate muscles and glands
Endocrine	Glands that secrete hormones: pituitary, thyroid, parathyroid, adrenal, pancreas, ovaries, testes, pineal, thymus	Control metabolic activities of organs and structures
Cardiovascular	Heart, blood vessels	Move blood and transport substances throughout body
Lymphatic	Lymph vessels and nodes, thymus, spleen	Return tissue fluid to the blood, carry certain absorbed food molecules, defend body against infection
Digestive	Mouth, tongue, teeth, salivary glands, pharynx, esophagus, stomach, liver, gallbladder, pancreas, small and large intestines	Receive, break down, and absorb food; eliminate unabsorbed material
Respiratory	Nasal cavity, pharynx, larynx, trachea, bronchi, lungs	Control Intake and output of air, exchange gases between air and blood
Urinary	Kidneys, ureters, urinary bladder, urethra	Remove wastes from blood, maintain water and electrolyte balance, store and transport urine
Reproductive	*Male:* scrotum, testes, epididymides, vas deferens, seminal vesicles, prostate, bulbourethral glands, urethra, penis	Produce and maintain sperm cells, transfer sperm cells into female reproductive tract, secrete male hormones
	Female: ovaries, uterine (fallopian) tubes, uterus, vagina, vulva	Produce and maintain egg cells, receive sperm cells, support development of an embryo, function in birth process, secrete female hormones

Word Analysis and Definition: The Organ Systems

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
cardiovascular	**KAR**-dee-oh-**VAS**-kyu-lar	S/ R/CF R/	**-ar** *pertaining to* **cardi/o-** *heart* **-vascul-** *blood vessel*	Pertaining to the heart and blood vessels
digestive	die-**JEST**-iv	S/ R/	**-ive** *nature of* **digest-** *to break down*	Pertaining to the breakdown of food into elements suitable for cell metabolism
endocrine	**EN**-doh-krin	P/ R/CF	**endo-** *within* **-crin/e** *secrete*	Pertaining to a gland that produces an internal or hormonal secretion
homeostasis (***Note:*** *Hemo*stasis is very different.)	ho-mee-oh-**STAY**-sis	S/ R/CF	**-stasis** *stand still, control* **home/o-** *the same*	Stability or equilibrium of a system or the body's internal environment
integumentary	in-**TEG**-you-**MEN**-tah-ree	S/ R/	**-ary** *pertaining to* **integument-** *covering of the body*	Pertaining to the covering of the body (the skin)
lymphatic	lim-**FAT**-ik	S/ R/	**-atic** *pertaining to* **lymph-** *lymph*	Pertaining to lymph or the lymphatic system
muscular	**MUSS**-kyu-lar	S/ R/	**-ar** *pertaining to* **muscul-** *muscle*	Pertaining to muscle or muscles
nervous	**NER**-vus		Latin *nerve*	Pertaining to a nerve
organ	**OR**-gan		Greek *instrument*	Structure with specific functions in a body system
reproductive	ree-pro-**DUC**-tiv	S/ P/ R/	**-ive** *nature of, pertaining to* **re-** *again* **-product-** *lead forth*	Relating to the process by which organisms produce offspring
respiratory	**RES**-pir-ah-**TOR**-ee		Latin *breathing*	Relating to the process of exchanging oxygen and carbon dioxide
skeletal	**SKEL**-eh-tal	S/ R/	**-al** *pertaining to* **-skelet-** *skeleton*	Pertaining to the bony skeleton
urinary	**YUR**-in-air-ee	S/ R/	**-ary** *pertaining to* **urin-** *urine*	Pertaining to urine

Check Point Section 3.1

A. As you begin your study of *medical language, it is important to realize the logic of how terms are formed.* *Elements are building blocks. There is always a root, but you may not see the root in the same position in every term. Not every term requires a prefix and/or a suffix. Fill in the blanks.* **LO 3.1, 3.3**

1. The female egg cell is known as an _____/_____
2. This term does not start with a prefix; it starts with a combining form and ends with a suffix.
   Study of the cell: _____/_____
3. This term also begins with a combining form, which is a root plus a combining vowel. The term ends with a suffix. Pertaining to the cell: _____/_____

B. Continue building your knowledge of elements. *Add the elements that will complete this medical term. Fill in the blanks.* **LO 3.1, 3.3**

1. Within the cell _____/cellul/ _____
2. Substance of a cell except for the nucleus _____/plasm
3. Chemical substance found in drugs _____/oid

C. Seek and find the medical terms that are defined as follows. *Fill in the blank with the correct term.* LO 3.3, 3.9

1. small organ _____
2. thin layer of tissue covering a structure or cavity _____
3. electrically charged particles _____
4. functional center of a cell or structure _____

D. Continue analyzing the logic of medical language. *Fill in the blanks.* LO 3.1, 3.3

1. Which term refers to an enzyme? _____
2. Find a term that contains an element that means *water* _____
3. Which term refers to breaking substances down? _____

E. Define word elements. *Given the word element, identify its meaning.* LO 3.1

1. The meaning of the word element *-logy:*
   a. pertaining to **b.** composed of **c.** one who studies **d.** study of
2. The meaning of the word element *-al:*
   a. pertaining to **b.** composed of **c.** structure **d.** study of
3. The meaning of the word element *-logist:*
   a. one who studies **b.** tissue **c.** upon **d.** structure

F. Understanding elements is the key to a large medical vocabulary. *Work with the following exercise to increase your knowledge of medical language. Fill in the blanks.* LO 3.4

osteoblast osteoclast osteocyte

1. The three terms list above all refer to (select one) a. cartilage b. bone c. collagen The element they have in common is: _____
2. The element that changes in every term is the (select one): P R CF S
3. The suffix that means germ cell is: _____
4. The suffix that means break is: _____
5. The suffix that means cell is: _____

G. Match the appropriate medical term in the first column to the descriptions given in the *second column.* LO 3.4

_____	**1.** synovial	**a.** bone forming cell
_____	**2.** meniscus	**b.** connects muscle to bone
_____	**3.** tendon	**c.** slippery lubricant
_____	**4.** osteoblast	**d.** shock absorber

H. Use your knowledge of the building blocks of terms, and deconstruct the following terms into their basic elements. *This will give you a better picture of how the words were formed. Fill in the blanks. The first one is done for you.* LO 3.1

1. homeostasis home/o/stasis
2. urinary _____/_____
3. cardiovascular _____/_____/_____
4. respiratory _____/_____/_____