english *for* Chemistry

Daud K. Walanda
Ryka M. Walanda

PT Inovasi Pratama Internasional
Sumatera Utara, Indonesia

English for Chemistry

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PT INOVASI PRATAMA INTERNASIONAL

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Daud K. Walanda
Ryka M. Walanda

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FOREWORD

The English for Chemistry book is intended to fulfill the need for teaching learning materials especially for students who learn science, due to the lack of textbooks and other educational materials.

This book is expected to assist science students mastering the basic English especially reading and writing to support them understanding of types of word or part of speech, sentence structure, textbooks, dictionary, chemical terminologies and literature as well as scientific information in English.

The preparation of this book basically takes from collection of lecture materials with additional material from several textbooks that are closely related with teaching materials. However, there will be very many deficiencies in the first published book, specifically a typographical error. For that the authors are happy to accept all improvements, criticisms and suggestions for the improvement of the next edition.

Several parties have helped the author in the process of completing this book, it is very appropriate to say thank you especially to Prof. Mery Napitupulu, MSc., PhD, who has done a lot contributions to the preparation of this book as well as several colleagues who make an invaluable contribution.

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Penulis

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Chapter 1

Root Word, Prefix and Suffix

Learning outcomes

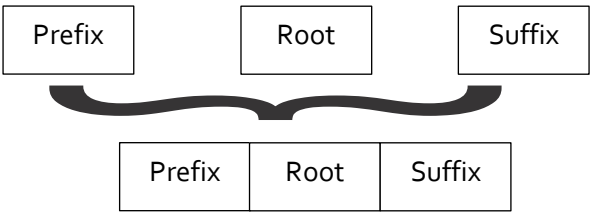
Upon the successful conclusion of **Chapter 1**, you will have to:

1. Define the terms root word, suffix, and prefix.
2. Understand parts of a word to determine meaning of words and unfamiliar words.
3. Give examples of how prefixes and suffixes are used.

One essential way science students build vocabulary is to learn the meaning of word parts that make up many scientific English words. These word parts consist of prefixes, suffixes, and roots, or bases. A useful strategy for determining the meaning of an unknown word is to "take apart" the word and think about the parts. Using context clues is only one method of enlarging your vocabulary. Using structural clues is a second. This simply means students need to understand the various parts/units of a word and how they are put together.

These parts consist of the ROOT WORD, the PREFIX, and the SUFFIX. Not every word, however, has all three parts. The fundamental unit of scientific words is **the root**. This establishes the basic meaning of the word and is the part to which modifying prefixes and suffixes are added.

A prefix is a short word part added before a root to modify its meaning. A suffix is a short word part or series of parts added at the end of a root to modify its meaning. The very words of prefixes and suffixes are good examples, too. *Pre-* means before and *fix* means attach, so quite literally, a prefix is something attached to the beginning of something else. *Suf-* is a variant of a sub, below or under, so a suffix is something fastened underneath something else (in this case, at the end of the root). A suffix may indicate that the word is a noun or an adjective and often determines how the definition of the word will begin.



A ROOT WORD is the main part of the word.

A PREFIX is a letter or group of letters placed at the beginning of a word to change its meaning.

A SUFFIX is a letter or group of letters placed at the end of a word. Sometimes it changes how the word is used in a sentence.

Example: In the word EXCHANGEABLE:

Change is the ROOT WORD

Ex - is the PREFIX, and

-able is the SUFFIX

For example, the suffix ABLE changes the meaning of a root word. ABLE means having the power or skill to do something. Therefore,

while CHANGE means to MAKE different, CHANGEABLE means ABLE to make (something) different.

On the other hand, the suffix -ING changes the way a word can be used in a sentence.

Consider the word CHANGING. In which of the following sentences would you use the word change? In which would you use CHANGING?

I will have to……the flat tire.

I am……the flat tire.

The meaning of both words is almost the same. Notice, however, there

is slight difference in me.

Exercise 1.1

Write the root word on the line provided.

	Word Pairs	Root word
1.	actor-react	act
2.	unfair-fairness	----------
3.	meatball-meaty	----------
4.	repack-package	----------
5.	directly-indirect	----------
6.	failure-unfailing	----------
7.	dislike-likeness	----------
8.	guilty-guiltless	----------
9.	uncertain-certainly	----------
10.	careful-careless	----------
11.	shipment-reship	----------

12. remove-movement ----------
13. frequently-infrequent ----------
14. comfortable-discomfort ----------
15. location-relocate ----------

What does UNAPPROACHABLE mean in the following sentence?

> Your employer is UNAPPROACHABLE. You cannot talk to him about a raise.

UNAPPROACHABLE means not able to approach someone, not able or possible to go to someone, or not able to talk to someone.

That's the way STRUCTURAL help to unlock the meanings of the words. Now you have two kinds of clues to help you increase your vocabulary and unlock word meaning: CONTEXT CLUES which are hints found within a sentence, paragraph, or passage that a reader can use to understand the meanings of new or unfamiliar words and STRUCTURAL CLUES the process of breaking words down into their basic parts to determine word meaning. Knowledge of prefixes, roots, and suffixes can assist a student in using this type of context clue.

Learning the meanings of common prefixes can help student understand unknown English words that come across or find in the textbooks or scientific articles. It can also help you become better at spelling words.

1.1. Prefixes

Adding a prefix to a word usually does not change the part of speech of the root word, so, for example, adding a prefix to verb results in a new verb, while adding a prefix to an adjective results in a new

adjective. Prefixes are not words in their own right and cannot stand on their own in a sentence. Sometimes it can just be a simple letter that acts as a prefix – but sometimes it is a lengthier word.

As you develop your vocabulary, you will probably start to pick up words naturally that use prefixes – without even realizing you're using them. Here are some of the most common prefixes used – and how they can change the root word.

a. Prefix UN-

Read the following sentences. Notice the CONTEXT CLUES. Underline the ROOT WORD in each CAPITALIZED word.

1. I am UNACCUSTOMED to job hunting. I have never done it before.
2. I am UNCONCERNED about the interview. I think I will do well.
3. The interviewer said I did not have enough experience. I was told I was UNQUALIFIED for the job.
4. Nobody helped me. I did the work UNASSISTED.
5. Who can do that much work in one day? I feel the request is UNREASONABLE.

Exercise 1.2

Write the CAPITALIZED word mentioned in the sentences above.

	Definition	Words
1.	not accustomed to or used to	unaccustomed
2.	without help or assistance	----------
3.	not worried or concerned	----------
4.	lacking the necessary ability or requirements	----------
5.	demanding more than can be expected	----------

b. Prefix MIS-

Read the following sentences. Notice the CONTEXT CLUES. Underline the ROOT WORD in each CAPITALIZED word.

1. The owner said the coach has MISMANAGED the team. He claims the team was trained badly.
2. The owner also believes that the coach MISTREATED some of the players. He states that some of them did not get a fair chance to play.
3. Personally, I think that these statements will MISLEAD people. They give the wrong idea.
4. I am convinced the coach was MISJUDGED. He is a very talented person.
5. Such statements MISINFORM the public because they do not tell the whole story.

Exercise 1.3

Write the CAPITALIZED word mentioned above.

Definition Words			New word
1. Change	+	- able	Changeable
2. Change		- ability	----------
3. Change		- able, ness	----------
4. Change		- ably	----------
5. Change		- full	----------
6. Change		- less	----------
7. Change		- ling	----------

c. Prefix DIS-

The prefix 'dis-'comes from Latin, where it has the literal meaning 'apart' and is now commonly used to mean 'opposite of', 'not', 'remove' and 'reverse'.

Exercise 1.4

Add the prefix DIS- to the following root words.

	Root Words	New Words
1.	Appear	----------
2.	Advantage	----------
3.	Connect	----------
4.	Content	----------
5.	Obey	----------

d. Prefixes IL-, IM-, IN-, IR-

Read the following sentences. Notice the CONTEXT CLUES. Underline the ROOT WORD in each CAPITALIZED word. The first one has been done as an example.

1. His behavior is IMMATURE.
2. This handwriting is ILLEGIBLE. I cannot read the writing.
3. The length of this skirt is IRREGULAR. Measure it to make it even.
4. That glass is IMPERFECT. It has a crack in it.
5. These people are INELIGIBLE for the job. They do not meet the requirement.

Exercise 1.5

Write the CAPITALIZED word that matches each definition.

	Definitions	
1.	not possible to read	----------
2.	not meeting the requirement	----------
3.	childish	----------
4.	faulty	----------
5.	uneven	----------

e. Prefix CO-

Read the following. Notice the CONTEXT CLUES. Underline the ROOT WORD in each CAPITALIZED word. The first one has been done as an example.

If we wish to COEXIST and live together peacefully in this world, we must COOPERATE with each other.

Working together is the secret of success in many fields. In athletics, two people may be selected as CO CAPTAINS of a team. Each has a special skill that will help the team play better and hopefully win more games.

In book publishing, two people often CO-AUTHOR a book. One has had an exciting experience that everyone wants to read about. The other has the skills needed to write the story.

Exercise 1.6

Write the CAPITALIZED word that matches each definition.

	Definitions	Word
1.	a person who works with another person on a book	----------
2.	two people who share leadership of an athletic team	----------
3.	a person charged with the same crime as another person	----------
4.	to live or exist together at the same place or time	----------
5.	to work together for a common purpose	----------

f. Prefix INTER-

Read the following. Notice the CONTEXT CLUES. Underline the ROOT WORD in each CAPITALIZED word.

1. The parts of this puzzle INTERLOCK so that it will not fall apart.
2. This is an INTERRACIAL community. People of many different races live in the area.
3. One medicine may INTERACT with another medicine and make the patient feel worse.
4. All of the problems are INTERRELATED. Living conditions, employment, education, and crime affect each other.
5. If you plan to visit Europe, you can take an INTERNATIONAL flight from Kennedy Airport.

g. Prefix PRE-

Read the following. Notice the CONTEXT CLUES. Underline the ROOT WORD in each CAPITALIZED word.

1. We must make all of our plans before the day of the party. If we do not PREPLAN, we may forget to buy some of the food.
2. Do not decide before you know all the facts. If you PREJUDGE a person, you may make the wrong decision.
3. We must PREARRANGE the concert. If we do not make our arrangements in advance, the musicians may not be able to come.
4. A dangerous machine should have a protection guard. This PRECAUTION will prevent workers from being injured.
5. The baby was PREMATURE. The birth was not expected for two more weeks.

h. Prefix RE-

Read the following. Notice the CONTEXT CLUES. Underline the root word in each capitalized word.

1. They will have to REROUTE the airplane to Washington, D.C.
2. Kennedy Airport in New York is closed because of the storm.
3. Save your newspapers. The town will RECYCLE the paper so that it can be used again.
4. Nobody answered the advertisement I put in the newspaper. I will have to REINSERT it for another three days.
5. Can I RESHAPE this clay? I do not like this form for vase. The mark seems to disappear and then REAPPEAR.

i. Prefix SEMI-

Read the following. Notice the CONTEXT CLUES. Underline the root word in each CAPITALIZED word.

1. The person is a SEMI-INVALID. He was injured in an automobile accident and can no longer walk very far.
2. This apartment is only a SEMIPERMANENT arrangement. I will be moving to a new apartment next month.
3. In order to play in the final rounds of the game, you must be one of the winners in the SEMIFINAL contest.
4. The patient is not unconscious, nor is he fully awake. He is SEMICONSCIOUS.
5. Does this company pay its employees once a month or SEMIMONTHLY?

j. Prefix SUB-

Read the following. Notice the CONTEXT CLUES. Underline the ROOT WORD in each CAPITALIZED word.

1. This apartment is very cold. As a result, the old man's temperature is SUBNORMAL.
2. We can SUBDIVIDE this apartment into two smaller apartments.
3. We can take the SUBWAY to Times Square.
4. The SUBCOMMITTEE will report to the main committee within two weeks.
5. An apartment without heat or running water is SUBSTANDARD.

k. Prefix SUPER-

Read the following. Notice the CONTEXT CLUES. Underline the ROOT WORD in each CAPITALIZED word.

1. America, Russia, China, and other nations are SUPERPOWERS. They influence world affairs.
2. Superman is SUPERHUMAN. He does things that a normal person cannot do.
3. The weeds are SUPERABUNDANT. There are so many they are killing the rose bushes.
4. Ghosts are SUPERNATURAL.
5. Some people are SUPERSENSITIVE. They are hurt if everyone doesn't agree with their ideas.

l. Prefix TRANS-

m. Read the following. Notice the CONTEXT CLUES. Underline the root word in each CAPITALIZED word.

1. We took a TRANSATLANTIC flight from New York to London.
2. The liquid that man is drinking will TRANSFORM him into a wolf.
3. A business TRANSACTION such as selling a house can bring a profit to the seller.
4. A kidney TRANSPLANT means moving a kidney from one person to another.

n. We plan to take a TRANSCONTINENTAL flight from New York City to California.

1.2. Adding Suffixes

Try your hand at making new words. To each root word add the new word on the line provided.

	Root word	Suffix	New word
1.	Comfort	-able	----------
2.	accident	-all	----------
3.	accept-	-ance	----------
4.	deport-	-ation	----------
5.	sorrow	-ful	----------
6.	hero	-ism	----------
7.	humor	-ist	----------
8.	collect	-ive	----------
9.	central	-ize	----------
10.	start	-er	----------
11.	fear	-less	----------
12.	exact	-ly	----------
13.	lone	-ly	----------
14.	achieve	-ment	----------
15.	deaf	-nests	----------
16.	prosper	-ous	----------
17.	trouble	-some	----------
18.	storm	-y	----------

Exercise 1.7

Change or add a suffix so that each CAPITALIZED word fits the context. Then write the new word in the space provided.

1. Ambition He is a very----------person
2. Assist I need your----------

3. Communicate The common cold is a----------disease.
4. Confide I have----------in your ability.
5. Demonstrate This---will teach you how to Operate the New equipment.
6. Endure His----------is low because he is not in good physical condition.
7. Recur----------The----------of the problem made me seek professional help.
8. Resist There is great----------to higher taxes.
9. Skill He handled the problem---
10. Style Do you like----------clothing?

Exercise 1.8

Each pair of words below shares a common SUFFIX. This is a group of letters added to the end of both words. Write these suffixes on the lines provided.

	Word pair	Suffixes
1.	agreeable-acceptable	----------
2.	personal-regional	----------
3.	considerate-liquidate	----------
4.	crooked-featured	----------
5.	adviser-boiler	----------
6.	careful-wishful	----------
7.	childhood-falsehood	----------
8.	terrify-magnify	----------
9.	atomic-democratic	----------
10.	selfish-childish	----------

Exercise 1.9

Read the passage below and underline any root word and its prefix and/or suffix.

Chemical Reactions

A chemical change must occur. You start with one compound and turn it into another. That's an example of a chemical change. A steel garbage can rusting is a chemical reaction. That rusting happens because the iron (Fe) in the metal combines with oxygen (O_2) in the atmosphere. When a refrigerator or air conditioner cools the air, there is no reaction. That change in temperature is a physical change. Nevertheless, a chemical reaction can happen inside the air conditioner.

A reaction could include ions molecules or pure atoms. We said molecules in the previous paragraph, but a reaction can happen with anything, just as long as a chemical change occurs (not a physical one). If you put pure hydrogen gas (H_2) and pure oxygen gas in a room, they can be involved in a reaction. The slow rate of reaction will have the atoms bonding to form water very slowly. If you were to add a spark, those gases would create a reaction that would result in a huge explosion. Chemists would call that spark a catalyst.

Single reactions often happen as part of a larger series of reactions. Take something as simple as moving your arm. The contraction of that muscle requires sugar for energy. Those sugars need to be metabolized. You'll find that proteins need to move in a certain way to make the muscle contract. A whole series (hundreds actually) of different reactions are needed to make that simple movement happen.

Vocabulary

	Prefix/ Suffix	Meaning	Example
1.	acet-	acid, vinegar	acetic acid,
2.	bi-	two	bidentate, bicyclic ligands
3.	calci-	lime, chalk	calcium, calcite, calcification
4.	calor	heat	calorie, calorimeter,
5.	de-	not, away from	dehydrate, denature
6.	dia-	through	diaphragm, diagonal
7.	dis-	apart, away, not	disintegrate,
8.	-ate	chemical, compound	acetate, aluminate
9.	acet-	acid, vinegar	acetic acid,
10.	bi-	two	bidentate, bicyclic ligands
11.	calci-	lime, chalk	calcium, calcite,
12.	calor	heat	calorie, calorimeter,
13.	de-	not, away from	dehydrate, denature
14.	dia-	through	diaphragm, diagonal
15.	dis-	apart, away, not	disintegrate,

Terms	
acid	a substance that produces $H^+(aq)$ ions in aqueous solution. Strong acid ionize completely or almost completely in dilute aqueous solution. Weak acids ionize slightly
allotropes	different forms of the same element in the same physical state.
anion	a negative ion; an atom or group of atoms that has gained one or more electrons.
base	a substance that produces $OH^-(aq)$ ions in an aqueous solution. Strong soluble bases are soluble in water and are completely dissociated. Weak bases ionize only slightly.
binary compound	A compound consisting of two elements; may be ionic or covalent.
boiling point	the temperature at which the vapor pressure of a liquid is equal to the applied pressure; also the condensation point
bonding orbital	a molecular orbit lower in energy than any of the atomic orbitals from which it is derived; lends stability to a molecule or ion when populated with electron
central atom	an atom in a molecule or polyatomic ion that is bonded to more than one other atom
coke	an impure form of carbon obtained by destructive distillation of coal or petroleum
colloid	a heterogeneous mixture in which solute-like

	particles do not settle out.
compound	a substance of two or more elements in fixed proportions. Compounds can be decomposed into their constituent elements
concentration	amount of solute per unit volume or mass of solvent or of solution
degenerate	of the same energy
dilution	process of reducing the concentration of a solute in solution, usually simply by mixing with more solvent
dipole	refers to the separation of charge between two covalently bonded atoms

Chapter 2

The Dictionary

Learning outcomes:

Upon the successful conclusion of **Chapter 2**, you will have to:

4. Use the dictionary for looking up an English word.
5. Differentiate the type of dictionaries.
6. Name the element of the Dictionary

When you cannot guess the meaning of new words, look them up in the dictionary. The dictionary starts off with a 'preface' and notes on the use of the dictionary. Read as many of these as you can, but do not bother with the section on verb patterns. The dictionary is defined as a book reference source of words in a language or discipline, arranged alphabetically and describes their meaning. In addition to defining the words, larger dictionaries also provide information on the spellings, pronunciation, word origins (etymology), functions, and different forms of the word.

A dictionary is a very important tool for anyone who is learning a new language. With a good dictionary, you can do the following:

- check the meaning of an English word you see or hear.
- find the English translation of a word in your language.
- check the spelling of a word.

- check the parts of speech of a word.
- check the plural of a noun or past tense of a verb.
- find out other grammatical information about a word.
- find the synonym or antonym of a word.
- look up the collocations of a word.
- find out how to say a word.
- find out about the history of a word.
- find examples of the use of a word in natural language.

2.1. Types of Dictionary

Most learners will make use of a dictionary. Dictionaries can be classified according to the number of languages, the age of the user, the size, and the scope covered by the subject.

a. Number of Languages

Monolingual dictionaries: they are written in one language. They are chiefly intended for native speakers. They provide many kinds of information about their entry word. Each entry word is rephrased in words in the same language as the entry word.

Bilingual dictionaries: they contain an alphabetical list of words and expressions in one language for which exact equivalents are given in another language. The purpose of bilingual dictionaries is to provide help for someone who understands one language but not another.
Bilingual dictionaries may be unidirectional or bidirectional. They may go in one direction from English to Indonesian or may be

combined with another dictionary that goes from Indonesian to English.

Trilingual dictionaries: They consist of 2 widely understood languages as English and Dutch plus one language having much more local use such as a little-known Indonesian language.

b. The Age of User

School dictionaries: they have simplified and graded vocabularies, large type, attractive graphics, attractive format, and illustrations, sometimes in color. They are usually divided into elementary school (ages 3-8), middle school (ages 6-10), and secondary school (ages 9-12). Children's dictionaries should have controlled vocabulary and limited definitions. Some have graded vocabularies. They assign a grade level to each vocabulary entry. High school dictionaries contain 75,000-100,000 entries. Most high school dictionaries resemble adult desk dictionaries but are set in larger types with more illustrations and have sturdier bindings. School dictionaries' definitions are somewhat simpler than those of most adult dictionaries but their vocabulary is varied enough for the student to find his own level.

c. The Size of Dictionaries

Some dictionaries are designed for college students and include words that the editors believe are most relevant to that market segment (and we must never forget that dictionaries are commercial products and that there is no such thing as The Dictionary).

English lexicon has about 4 million. It includes 700,000 in the Merriam-Webster files, 1 million words in the scientific vocabulary,

dialectical words, slang, neologisms, exotic words (from other languages), trade names, words derived from place names, obsolete words and spellings of them; 6 million chemical compounds; 200,000 medical terms. Those include Latin anatomical words and expressions.

College dictionaries: contain 130,000-160,000 entries. They are used in colleges and schools.

e.g.: Collins Dictionary of The English Language, Longman New Universal Dictionary

Desk dictionaries: They contain from 60,000-100,000 words. They can be picked up easily at a desk. They do not have fewer entries than a college dictionary, but their definitions are briefer and fewer senses are given for each word.

e.g.: Thorndike-Barnhart Comprehensive Desk Dictionary.

Pocket dictionaries: They have 40,000-60,000 entries. They are cheap dictionaries of small size (usually 4" x 6") with paper covers. They are good to use for spelling. Their definitions are close to synonyms. They often include small maps and population statistics.

Unabridged dictionaries: They contain between 400,000-600,000 entries. They give full coverage to the lexicon in general use (in common use in the public press and in ordinary speech in both informal and reserved styles) and substantial coverage to the specialized lexicon.

e.g.: Webster's Third New International Dictionary

Semi-abridged = semi-unabridged: They contain 260,000 words

d. Scope of Coverage by Subject

General dictionaries: in the general dictionary, each word may have multiple meanings. Some dictionaries include each separate meaning in the order of most common usage while others list definitions in historical order, with the oldest usage first. By general dictionary, it should not be understood that it contains the entire lexical stock of the language.

Special subject dictionaries: there are subject field dictionaries in chemistry, medicine, biology, electronics, architecture, geography, education, and engineering. Some are limited to one aspect of languages such as dictionaries of pronunciation, spelling, abbreviations, acronyms, synonyms, etymological, proverbs, quotations, and idioms. Specialized dictionaries tend to be more encyclopedic in content depending on concept rather than terms for classifying information. e.g.: Matthews' Concise Oxford Dictionary of Linguistics, and Oxford Dictionary of Chemistry.

e. The Language of the User

ESL dictionaries: they are designed for those who are learning English as a second language. They provide detailed information on pronunciation, verb patterns, and collocations. Definitions are expressed in simplified language and sometimes in a controlled vocabulary. They are designed to enable L2 learners to produce utterances in English not just comprehend them. There ESL dictionaries for beginning, intermediate and advanced students. The

vocabulary of ESL dictionaries contains many idiomatic expressions and culture specific terms. They contain information that ordinary monolingual dictionaries do not. They tell the user which nouns are countable and which are not, whether verbs are transitive or intransitive and what sort of objects they take if they are transitive. They tell how to inflect verbs, and how to compare adjectives and adverbs, whether adjectives occur before a noun of following a verb; how words are pronounced in British English and in American English and how compounds are stressed.

e.g.: Harper Collins Beginners ESL Dictionary, Collins CoBuild New Student's Dictionary, Longman Dictionary of Contemporary English.

2.2. Elements of a Dictionary

a. Front Matter

Front matter (i.e., everything from the front cover to the beginning of the alphabetical listing of words) includes a guide to the use of the dictionary. The guide describes every part of the dictionary article: entry word, syllabication, pronunciation, inflected forms, various kinds of labels, cross-references, variants, etymology, synonyms, and usage notes. The purpose of the guide is to describe as clearly as possible all kinds of information included in the dictionary, show the reader how to interpret the data given, and provide clues for locating as quickly as possible particular items of information. A sample page from the A-Z section is often printed with various parts of the entries bracketed and linked to captions that identify each part and refer to sections of the guide where the items are discussed.

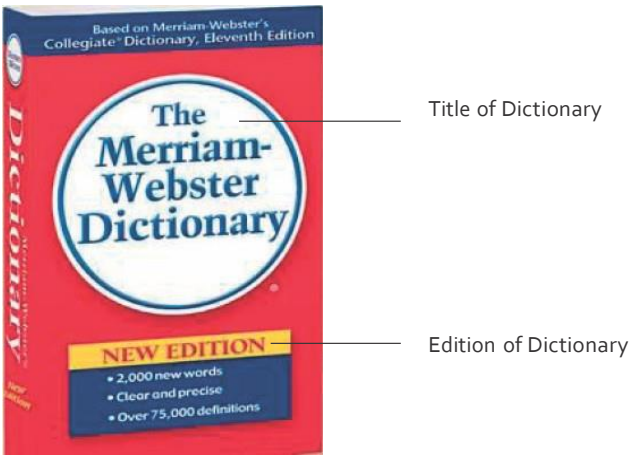


Figure 2.1. Front cover of The Merriam-Webster Dictionary.

Desk dictionaries include a history of the English language, pronunciation, usage, and regional varieties of English, etymology, the influence of linguistics on lexicography, computer analysis of language, pronunciation, Americanisms and Canadian English.

b. Back Matter

Back matter (i.e., everything from the end of the alphabetical listings to the inside back cover) contains various linguistic aids such as: lists of irregular verbs, spelling guides, tables of ordinal and cardinal numbers, tables of weights and measures and punctuation guides. Others include sections listing biographical and geographical names, different practical guides to writing, (pronunciation, grammar, style), forms of address, signs and symbols, lists of abbreviations, foreign

jeal·ous (jĕl′əs) *adj.* **1.** Fearful or wary of being supplanted; apprehensive of losing affection or position. **2a.** Resentful or bitter in rivalry; envious: *jealous of the success of others*. **b.** Inclined to suspect rivalry. **3.** Having to do with or arising from feelings of envy, apprehension, or bitterness: *jealous thoughts*. **4.** Vigilant in guarding something: *We are jealous of our good name*. **5.** Intolerant of disloyalty or infidelity; autocratic: *a jealous God*. [Middle English *jelous*, from Old French *gelos*, jealous, zealous, from Vulgar Latin **zēlōsus*, from Late Latin *zēlus*, zeal. See ZEAL]—**jeal′ous·ly** *adv.*—**jeal′ous·ness** *n.*

c. Entry and entry-word

The entire paragraph quoted above is called an entry; the first (bolded) word of the entry is its head- or entry-word. There are 2 kinds of entries: main entry and sub entry. Alphabetization of entries: Dictionaries alphabetize letter by letter rather than word by word: e.g.: power powerful power of attorney

ENTRY = HEADWORD + INFORMATION

- Each word listed in the dictionary is called an entry word. The entry word is given in darker and larger print called boldface print. It gives the spelling and the syllable if there are more than one.
- The pronunciation is given after the entry word. Special diacritical marks are used in order to find out what sounds the marks stand for, you should look at the pronunciation key.
- The part of speech is given
- Related forms of the word, such as plurals for nouns or principal parts for verbs may be given. These related forms are called inflections.
- The definitions are numbered.
- Sometimes a sentence using the word is given
- The original of a word may be shown.

- Picture are sometimes printed to help define the word.

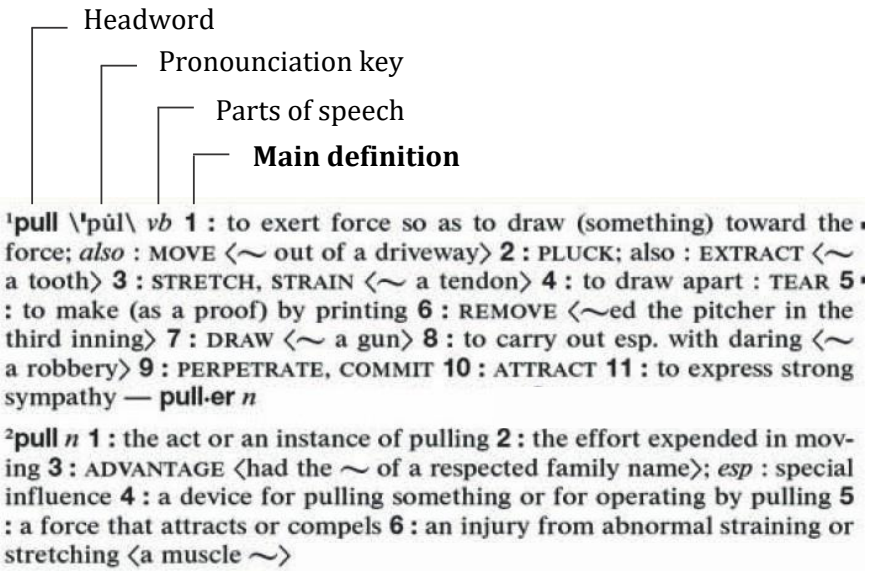
Idioms are listed in several places. They are usually run in at the end of the entry for one of the key words of the phrase. Most dictionaries list words under the first word, but exceptions are common.

The entry/subentry system is used in scientific and technical dictionaries in which 50% of the total entries are phrasal entries. Phrasal entries are alphabetized under the governing noun and then alphabetizing (usually letter by letter) within the subentry field.

e.g.: blood blood fluke
blood bank blood poisoning
blood clot blood pressure
blood count blood test

Some prepositions, connectives, or articlesare ignored in letter-byletter alphabetization.

Chemical terms use the entry/subentry method of alphabetization. They are alphabetized letter-by-letter but appear as subentries if listed as 2 words. Methyl cellulose would appear as a subentry under



methyl not under cellulose, but methylcellulose would appear in its own alphabetic place as a main entry

d. Content of Entry

Headword: ordinary dictionaries facilitate finding information about the headwords by arranging them alphabetically. Headword is the word you look up in the dictionary. Headwords are the words listed alphabetically throughout the dictionary.

Pronunciation: The second part of the dictionary entry is the pronunciation transcription. Often, the transcription will be included within a pair of forward slashes (//) or within parenthesis. This is the part that seems to be from a different language. Dictionaries use the phonetic or phonemic system to show the pronunciation of a word. In the phonemic system, the word is respelled in alphabetic characters with diacritical marks over certain vowels and with

primary and secondary stress marks. The pronunciation key is usually printed on every 2 page spread. In the phonetic system, the International Phonetic Alphabet (IPA) is used. The pronunciation key is usually included in the front matter. Sometimes, dictionaries show 2 pronunciations: Am and Br pronunciations. For ESL dictionary users, pronunciation is of great importance. Bilingual dictionaries generally show one pronunciation only. Pronunciation is regarded of secondary importance in BD. Some scientific and technical dictionaries show pronunciation and some do not. The pronunciation will either be

Spellings	**AHD**
pat	ă
Deed, milled	d
Secondary	ˊ
About, item, edible, gallop, circus	ə
tight, stopped	t
pit	ĭ
valve	v

in the American Heritage Dictionary (ADH) form or International Phonetic Alphabet (IPA) form. The following is the pronunciation of additive from The Concise American Heritage Dictionary (1997, p.8)

IPA	**spellings**
Primary stressed syllable	'
Apple, can, hat	æ
Do, ladder, bed	d
It, big, finishes	ˊ
About, item, edible, gallop, circus	|
Top, better, cat	t
Very, seven, love	v

in the ADH form:

(ăd′Ə-t ĭv)

The following excerpt is from its pronunciation key:

The same word in IPA would appear rather different /'ædltlv/ . This pronunciation and pronunciation key excerpt is from Dictionary.com (2008):

Syllabication (or syllabification) in the pronunciation section separates the word into its component spoken syllables and typically also indicates stress.

Stress; English has the following stress rules:

1. The great majority of two-syllable words are stressed on the first syllable , e.g.: 'ne-ver , 'break-fast , 'Mon-day .
2. A number of words have two different stress patterns according to whether they are verbs or nouns, e.g.: absent, accent, conduct, convict, digest, separate, perfect, permit, present, suspect, transport.

AHD inserts a hyphen or stress mark between each syllable in the pronunciation and marks the syllable with the main stress by a following. For example, the most usual pronunciation of Mongolia is given as (mŏnggō -lē-@, . . .).

e. Parts of speech

The third item in a dictionary entry is the part of speech. AHD uses the nine traditional parts of speech: adjective, adverb, article, conjunction, interjection, noun, preposition, pronoun, and verb. It distinguishes definite and indefinite articles and transitive, intransitive, and auxiliary verbs. It also marks some singular and plural nouns and lists prefixes and suffixes. Some dictionaries may

use terms that are unfamiliar to you, such as the Oxford English Dictionary's (OED) substantive (abbreviated sb.). OED is also unusually fine-grained as it designates nouns as either of action or of agent (n. of action/agent).

adjective	*adj.*
adverb	*adv.*
conjunction	*conj.*
interjunction	*injer.*
noun	*n.*
preposition	*prep.*
pronoun	*pron.*
verb	*v.*

If the word is the plural form of a singular word, the abbreviation pl. will be included before the part of speech abbreviation (i.e. pl.n.).

Definition

The fifth item included in a dictionary entry is the definition. A definition is the part of an entry which describes a particular meaning and usage of the headword which drew us to the dictionary in the first place. There may be one or more definitions in an entry. If there is more than one definition, then each one is numbered. The first part of definition is called main definition follows by alternate definitions. The format varies but generally the language is first indicated, then the original word and its English translation. To demonstrate a definition, some dictionaries include phrases or sentences with the word after a specific definition.

Etymology/word history

After the definitions of the word, some dictionaries provides a brief sketch of the history or etymology (not entomology) of the word. The format varies but generally the language is first indicated, then the original word and its English translation. In this case, modern English jealousy is descended from Middle English jelous, which was borrowed from the Old French word gelos, which in turn came from Vulgar (i.e., ordinary spoken) Latin *zēlōsus (* indicates that the form does not occur in any manuscript but has been reconstructed according to generally accepted linguistic principles of language change), which descended from Late Latin zēlus. (Many dictionaries abbreviate the names of languages and historical stages of languages; check your dictionary's list of abbreviations for expressions like ML and ME.) AHD is unusually helpful in providing for many words a paragraph-length Word History separate from the etymological sketch within the entry. Typically, learners' dictionaries do not include etymological information, though some language teachers believe that such information can be useful.

Compound

A compound is a combination of the headword and another word.
COMPOUND = HEADWORD + ANOTHER WORD

For Example:	Post office	= Post + Office
	Post-free	= post + free
	Postman	= post + man

Compound are given at the end of an entry.

Derivative

A derivative is a combination of the headword an a suffix (eg;–tion, -able, -ary, -ly).

DERIVATIVE = HEADWORD + SUFFIX

For example:	loving	= love + ing
	Hateful	= hate + ful

Derivatives of headwords are given at the end of an entry.

Examples:

Headword	- photograph	: invent
Derivative	- photographer	: inventor
	- photography	: inventive

Exercise 1.1

Find the following word in your dictionary and write down in your exercise book the number of the page on which each word is found. Also record the time at which you start and finish this exercise, and work out the total time you took to complete it

1.	psaltery	----------
2.	bovillon	----------
3.	glaucous	----------
4.	naiad	----------
5.	efface	----------
6.	yeoman	----------
7.	quondam	----------
8.	myxomatosis	----------
9.	salvia	----------
10.	wrung	----------
11.	squaw	----------
12.	urchin	----------
13.	rhythm	----------
14.	immure	----------
15.	atavism	----------
16.	misconceive	----------
17.	dearth	----------
18.	wont	----------
19.	caulk	----------
20.	seine	----------

Exercise 2.2

Write the following words in the alphabetical order in your exercise book. Number them as 1-20.

Gotten; gizzard; grandeur; goulash; grapefruit; government; granddad; glacier; graphically; ghoul; grapnel; governor; guile; graph; guide; graphite; gourmand; grandee; gallery.

Exercise 2.3

With the aid of your dictionary and the examples above, write down the derivatives for the following headwords:

Headword:

Geography: _____: _____: _____: _____

Geometry: _____: _____: _____: _____

Germinate: _____: _____: _____: _____

Giddy: _____: _____:_____: _____

Giddy: _____: _____: _____:_____

Learning Activity 4

The dictionary helps you spell correctly. Look up these words in your dictionary. Circle those which are spelled correctly. Goblet pivit knowledge seple meteorite fundamental

Most of words have only one correct spelling. A few have more than one. The dictionary will give the preferred spelling first; however, all the spellings given are correct. Look up these words in your dictionary and write the second spelling for each.

Ax _____ catsup _____ adviser _____ fulfil _____

Sometimes you know what a word sounds like but you don't know what letter it starts with so you can't find it in the dictionary. If that is the case, use this key.

If it sound like this	try this	If it sound like this	try this
ch	ch, c	i	s
f	f, ph	k	c, k, ch,
g	g, gu, gh	n	n, kn, gn, pn
h	h, wh	r	r, wr, rh
s	s, c, ps, sc	sh	sh, ch, su
w	w, wh	z	z, x

Exercise 2.4

Check your dictionary as you do the following exercise:

1. These word begin with an f sound. Add f or ph to spell each word correctly. ___ one ___anatic ___ysical ___antom ___ial ___orum ___rom ___ist
2. These word begin with a k sound. Add c, k, or, ch to spell each word correctly. ___itten ___aracter ___arrot ___emical ___orus ___ilt ___ing ___are
3. These words begin with an n sound. Add n, kn, gn, or ph to spell each word correctly. ___oll ___at ___ave ___eumonia ___ame ___eiss ___ock ___ature
4. These words begin with an s sound. Add s, c, ps, or sc to spell each word correctly. ___ing ___ircle ___eudo ___ychic ___ene ___itizen ___ire ___ imple
5. These words begin with an sh sound. Add sh, ch, su to spell each word correctly. ___oulder ___ ef ___gar ___icago ___iffon ___art ___out ___ed
6. These words begin with an r sound. Add r, wr, or rh to spell each word correctly. ___ight ___ong ___yme ___inoceros ___ite ___ubarb ___eward ___oad

7. These words begin with a j sound. Add j or g to spell each word correctly. ___olt ___anitor ___em ___ibe ___inger ___iraffe ___ail ___ypsy
8. These word begin with a g sound. Add g, gu, or gh to spell each word correctly. ___aze ___ess ___etto ___oul ___ide ___lamor ___argoyle ___ard
9. These word begin with a z sound. Add z or x to spell each word correctly. ___ebec ___one ___eal ___ylophone ___ylem___ innia ___ither ___ero

Exercise 2.5

Dictionary Exercise. Use you dictionary and find the meaning of the word underlined on the passage

Introduction to Dielectric Heating

The growth of chemistry has been closely associated with the discovery of new reagents and new modes of introducing energy into chemical reactions. In the days of alchemy, energy could only be generated thermally by means of fire, but the discovery of the lens, which could focus sunlight onto a chemical reaction vessel, showed that the energy necessary to drive a chemical reaction to completion could be derived from other sources. Humphrey Davy's isolation of sodium, potassium, calcium, strontium and barium as pure metals, using electrolytic methods in the early nineteenth century, provided an excellent illustration of how an alternative energy source could open up whole new areas of chemistry. Since those days chemists have maintained a watching brief on new energy sources in the hope that these might similarly lead to innovative synthetic possibilities.

The first reliable device for generating fixed frequency microwave radiation was designed by Randall and Booth at the University of Birmingham during World War II. The magnetron was produced in large numbers during the war because it formed the basis of radar transmitters, particularly in aircraft and anti-aircraft batteries. At that time it was widely recognised that infrared

radiation and visible light were capable of stimulating chemical reactions and therefore it did not come as a major surprise when it was first observed that microwave radiation was able to heat foodstuffs. Indeed there are several apocryphal tales recounting how bars of chocolate, eggs or popcorn reacted dramatically when exposed accidentally to microwave sources.

The first patent for microwave dielectric heating was filed by the Raytheon Company in 1946 and a prototype oven was installed in a Boston restaurant. Commercial microwave ovens became available in 1947, at a cost of $5000; however, they were nearly 2 m high and weighed more than 350 kg. Notwithstanding these clumsy origins, by 1976 60% of US households had microwave ovens. This widespread use of microwave ovens in the homes can be attributed to the effective technology transfer, which was achieved by Japanese electronics companies and their professional marketing of the products all over the world. It owed much to the Japanese genius for producing electronic goods that were cheap, reliable and consumer friendly. From these early days, it was recognised that the rapid heating of foodstuffs in a microwave cavity arose because of their high water content and the consequent efficient conversion of microwave energy into thermal energy by water molecules at microwave frequencies. Therefore, in addition to the development of large-scale applicators for the food processing industry, the advantages of microwave dielectric heating for drying was recognised in the 1950s and 1960s; for example, DuPont built large-scale facilities for drying nylon based on microwave technology. Since the microwave radiation interacted solely with the water molecules and not the nylon, thistechnique had the advantage that the drying process would halt once all the water molecules had evaporated and the substrate was not scorched.

The advantages of microwave dielectric heating for analytical processes were also recognised and specially designed microwave applicators for chemical analyses were soon available in the marketplace. These applications utilised the interactions between microwave energy with a frequency of 2.45 GHz and water either on

the surface of the analytical samples or in the acidic solutions and therefore techniques were developed initially for drying of wet analytical samples and eventually for the acid digestion of samples. The rate-determining step in a complete analytical procedure is often the dissolution of the sample and therefore microwave accelerated acid digestion made an important contribution to improving the overall efficiency of the analytical process.

There were also reports in the materials literature during the 1970s of microwave dielectric heating being used for ceramic processing and calcining. Examples of encapsulating radioactive samples in inorganic glasses by using microwave dielectric heating were also patented. During this time, the application of microwave dielectric heating in chemical laboratories remained very limited. The perception that the microwave dielectric heating phenomenon arose exclusively from specific interactions between microwave radiation and water molecules contributed to this lack of interest. Early measurements by von Hippel and his co-workers at MIT established that this property was not limited to water and there were other materials capable of coupling effectively with microwaves, but these results did not percolate into the chemical consciousness. The realisation that it was possible to use microwave energy to accelerate reactions in organic solvents resulted from empirical observations rather than theoretical considerations, but nonetheless represented an important development for synthetic chemistry. Following on from the important observations by Gedye, Majetich and their coworkers in 1986 that a range of organic reactions could be accelerated under microwave conditions, the use of microwave dielectric heating in organic, inorganic and organometallic chemistry has expanded very rapidly and now there are more than 2000 papers describing the application of this technique for the synthesis of new compounds.

The early papers in this field used either domestic microwave ovens, adapted versions of them or cavities initially designed for analytical science, and their use raised many questions and speculations concerning the mechanism by which chemical

reactions were accelerated. In particular, it was necessary to solve a range of technical problems associated with the safe containment of flammable organic liquids, sometimes under pressurized conditions, and required the development of accurate and reliable temperature measurement before the scientific fundamentals of microwave-accelerated chemical reactions were defined fully. It also proved necessary to return to the basics and define more clearly the basis of microwave dielectric heating and the measurement of the appropriate dielectric parameters responsible for this phenomenon. The purpose of this chapter is to provide a chemically intelligible account of microwave dielectric heating and to clearly distinguish the similarities and differences between conventional and microwave heating of reactions.

Pronunciation

Chemicals	Pronunciation	Names	Pronunciation
acetal	ăs-ê-tăl	Ampere, A.M.	ä pâr
acetic	-sē´ t k	Arrhenius, S.A.	a r · rā n · ŭs
acetone	ăs ê · tōn	de Broglie, M.D.	dĕbrô glē´
acetyl	ăs ê · tēl	Debye, P.J.	dĕ · bi
aqueous	ā kwê · ŭs	Dewar, J.	dū ĕr
bromine	brō´mēn	Fourier, J.B.J.	frōō´ rya
chloride	klō´ r d	Grignard, V.	grē · nyár
cyclic	s kl k	Joule, J.P.	jowl
distillate	d s ti · lāt	de Laplace, P.S.	dĕlà · plàs
enzyme	ĕn z m	Lavoisier, A.L.	là vwà zya
fluorine	flōō´ ô · r n	Le Chatelier, H.L.	lĕ shä tĕ · lya
gaseous	găs ê-ŭs	Michaelis, L.	m k · ā l s
glucoside	glōō´ kô · s d	Nernst, W.H.	nĕrnst
lysine	l sēn	Ostwald, W.	ost vält

malachite	măl ·k t	Pasteur, L.	păs · tûr
nicotine	n k ô · tēn	Pauli, W	pou lê
phthalein	thăl ê · n	Planck, M.	plängk
pseudomonas	sū dô·mō´năs	Proust, J.L.	prōōst
research	rê · sûrch	Raman, C.V.	rä màn
terpenoid	tûr pê · noid	Schrodinger, E.	shrā d ng · ẽr
titrate	t trāt	Soxhlet, F.	zŏks´ lĕt
xanthine	zăn thēn	Van del Waals, J.d	vän dẽr vàls

Terms

Carbanion	Anorganicioncarryinganegativechargeonacarbon atom.
Carcinogen	Asubstancecapableofcausingorproducingcancerin mammals.
Catenation	Bonding of atoms of the same element into chains or rings.
Detergent	A soap-like emulsifer that contains a sulfate, SO3 or a phosphate group instead of a carboxylate group.
Dissociation	In aqueous solution, the process in which a solid ionic compound separates into its ions.
Electronega-tivity	A measure of the relative tendency of an atom to attract electrons to itself when chemically combined with another atom.
Eluate	Solvent (or mobile phase) which passes through a chromatographic column and removes the sample components from the stationary phase.
Emulsion	Colloidal suspension of a liquid in a liquid.

Endothermic	Describes processes that absorb heat energy.
Equivalence Point	The point at which chemically equivalent amounts of reactants have reacted.
Excited State	Any state other than the ground state of an atom or molecule.
Exothermic	Describes processes that release heat energy.
Extrapolate	To estimate the value of a result outside the range of a series of known values. Technique used in standard additions calibration procedure.
Flotation	Method by which hydrophobic (water-repelling) particlesofanorearesеparatedfromhydrophilic(water-attracting) particles of a metallurgical pretreatment process.

Chapter 3

Word Formation

Learning outcomes:

Upon the successful conclusion of **Chapter 3**, you will have to:

7. Defined the terms of word
8. Differentiated the types of word formation.
9. Gave examples of the word formation.

In the previous module you have learned a number of the most common suffixes in English. Notice that a suffix usually changes a word from one part of speech to another. You can frequently tell the part of speech by its form, in contrast to another form of the same word. For example, imagine (verb), imagination (noun), imaginative (adjective), and imaginatively (adverb). We do not have to know the meaning of this word in order to recognize these parts of speech. In the nonsense sentence Tashism vipped prodoption bortly, we can be fairly sure what part of speech each word is. We do not know this because the nouns are names of persons, places, or things, or because the verb describes an action or state of being. We have no idea of the meaning of these words. But we do recognize characteristic form: -ism and –tion as noun endings, -ed as a verb ending, -ly as an adverb ending. You can improve your vocabulary by learning some of these common suffixes and how they change words from one part of speech to another

What is a word

This section introduces basic concepts needed for the study and description of morphologically complex words. Since this section is about the particular of morphology called word-formation, we will first take a look at the notion of ‘word'. We will then turn to a first analysis of the kinds of phenomena that fall into the domain of word-formation, before we finally discuss how word-formation can be distinguished from the other sub-branch of morphology, inflection:

If you had to define what a word is, you might first think of the word as a unit in the writing system, the so-called orthographic word. You could say, for example, that a word is an uninterrupted string of letters which is preceded by a blank space and followed either by a blank space or a punctuation mark. At first sight, this looks like a good definition that can be easily applied, as we can see in the sentence in example:

Oxygen is a collorless gas.

We count five orthographic words: there are five uninterrupted strings of letters, all of which are preceded by a blank space, four of which are also followed by a blank space, one of which is followed by a period. This count is also in accordance with our intuitive feeling of what a word is. Even without this somewhat formal and technical definition, you might want to argue, you could have told that the sentence in example above contains five words.

Words are usually considered to be syntactic atoms, i.e. the smallest elements in a sentence. Words belong to certain syntactic classes (nouns, verbs, adjectives, prepositions, etc.), which are called

parts of speech, word classes, or syntactic categories. The position in which a given word may occur in a sentence is determined by the syntactic rules of a language. These rules make reference to words and the class they belong to. For example, the is said to belong to the class called articles, and there are rules which determine where in a sentence such words, i.e. articles, may occur (usually before nouns and their modifiers, as in the big house). We can therefore test whether something is a word by checking whether it belongs to such a word class. If the item in question, for example, follows the rules for nouns, it should be a noun, hence aword. Or consider the fact that onlywords (and groups of words), but no smaller units, can be moved to a different position in the sentence.

For example, in 'yes/no' questions, the auxiliary verb does not occur in its usual position but is moved to the beginning of the sentence (You can read my textbook vs. Can you read my textbook?). Thus syntactic criteria can help to determine the wordhood of a given entity. To summarize our discussion of the possible definition of 'word' we can say that, in spite of the intuitive appeal of the notion of 'word,' it is sometimes not easy to decide whether a given string of sounds (or letters) should be regarded as a word or not. In the treatment above, we have concentrated on the discussion of such problematic cases. In most cases, however, the stress criterion, the integrity criterion and the syntactic criteria lead to sufficiently clear results.

The properties of words are summarized as follows: (i) words are entities having a part of speech specification; (ii) words are syntactic atoms; (iii) words (usually) have one main stress; and

(iv) words (usually) are indivisible units (no intervening material possible).

3.1. Type of Word Formation

Before we turn to the application of the terms introduced in this section, we should perhaps clarify the distinction between 'root,' 'stem,' and 'base,' because these terms are not always clearly defined in the morphological literature and are therefore a potential source of confusion. One reason for this lamentable lack of clarity is that languages differ remarkably in their morphological make-up, so that different terminologies reflect different organizational principles in the different languages. The part of a word which an affix is attached to is called base. We will use the term root to refer to bases that cannot be analyzed further into morphemes.

Roots (or bases) are the morphemes (free or bound) that carry the principal or basic concept, idea or meaning in a word. They generally constitute the nuclei or cores of words. When roots are free morphemes, they constitute content (and function) words by themselves, such as book, dog, house, carry, quick, early, etc. When roots are bound morphemes, they form parts of words, such as -ceive in perceive, -tain in attain, -sume in presume, etc. The term 'root' is used when we want to explicitly refer to the indivisible central part of a complex word. In all other cases, where the status of a form as indivisible or not is not at issue, we can just speak of bases (or, if the base is a word, of base words). The derived word is often referred to as a derivative. The base of the suffix -al in the derivative colonial is colony, the base of the suffix -ize in the derivative colonialize is

colonial, the base of -ation in the derivative colonialization is colonialize. In the case of colonial the base is a root, in the other cases it is not

The term ‘stem’ is usually used for bases of inflections, and occasionally also for bases of derivational affixes. To avoid terminological confusion, we will avoid the use of the term ‘stem’ altogether and speak of ‘roots’ and ‘bases’ only. For their part, stems are free roots to which derivational affixes have been added or are likely to be added. In this sense, a stem = a root, as in fish, place; a stem = a root + one or more derivations, as in comfortable, uncomfortable, uncountableness. Notice that stems are words without inflectional morphemes. For example, in the word disestablishment, disestablish, establishment, and establish (which is a root at the same time) are stems.

The chief process of English word-formation by which the base may be modified are:

1. Affixation:
    a. adding a prefix to the base, with or without a change of wordclass (eg: catalyst → autocatalyst).
    b. adding a suffix to the base, with or without a change of word-class (eg: drive → driver). This section has been broadly disscused in the Unit 2, Prefix and Sufix.
2. Conversion, ie. assigning the base to a different word-class without changing its form ('zero affixation', eg: drive v → drive n). Conversion is the word formation process in which a word of one grammatical form becomes a word of another grammatical form without any change to spelling or pronunciation.

Conversion is also referred to as zero derivation or null derivation with the assumption that the formal change words results in the addition of an invisible morpheme.

3. Compounding, ie adding one base to another (eg: palm + oil → palmoil). A compound word is a union of two or more words, either with or without a hyphen. It conveys a unit idea that is not as clearly or quickly conveyed by the component words in unconnected succession. The hyphen is a mark of punctuation that not only unites but also separates the component words; it facilitates understanding, aids readability, and ensures correct pronunciation. When compound words must be divided at the end of a line, such division should be made leaving prefi xes and combining forms of more than one syllable intact.

Once a base has undergone a rule of word-formation, the derived word itself may become the base for another derivation; and so, by reapplication, it is possible to derive word of considerable morphological and sematic complexity.

Exercise 3.1

Making verbs into nouns. Here are some common suffixes that change verbs into nouns. Fill in the blanks. Check your dictionary if you are not sure of the spelling.

-al	to arrive	the arrival	to refuse	----------
	to deny	the denial	to dismiss	----------
	to propose	----------	to approve	----------
-ure	to depart	the departure	to erase	----------
	to fail	the failure	to enclose	----------

	to press	----------	to legislate	----------
-y	to deliver	the delivery	to inquire to	----------
	to arm	the army	discover to	----------
	to flatter	----------	recover	----------
-ment	to agree	the agreement	to punish	----------
	to pay	the payment	to employ	----------
	to govern	----------	to argue	----------
-ance	to annoy	the	to exist	----------
-ence	to refer	annoyance	to perform	----------
	to attend	the reference	to prefer	----------
	to accept	----------	to disturb	----------

-ation	to consider	the consideratio	to admire	----------
	to inform	the information	to declare	----------
	to combine	the combination	to examine	----------
	to resign	----------	to prepare	----------
-sion	to confuse	the confusion	to impress	----------
	to decide	the decision	to revise	----------
	to divide	----------	to profess	----------
-er	to teach	the teacher	to paint	----------
-or	to direct	the director	to govern	----------
	to manage	----------	to employ	----------

Exercise 3.2

Making adjectives into nouns. Here are some common suffixes that change adjectives into nouns. Fill in the blanks. Check your dictionary if you are not sure of the spelling.

-	kind	the kindness	pleasant	----------
ness	quit	the quietness	useful	----------
	happy	----------	sleepy	----------
-ity	active	the activity	real	----------
	curious	the curiosity	mobile	----------

	stupid	----------	tranquil	----------
-ism	ideal	the idealism	imperial	----------
	colonial	the colonialism	conservative	----------
	human	----------	favorite	----------

Exercise 3.3

Making nouns into adjectives. Here are some common suffixes that change nouns into adjectives. Fill in the blanks. Check your dictionary if you are not sure of the spelling.

-ary	the moment	momentary	the compliment	----------
	the custom	customary	the revolution	----------
	the fragment	----------	the honor	----------
-like	the life	Lifelike	the lady	----------
	the child	----------	the war	----------
-ic	the history	historic	thephotograph	----------
	the artist	artistic	the rhythm	----------
	the athlete	----------	the base	----------
-less	the power	powerless	the use	----------
	the home	homeless	the fault	----------
	the age	----------	the worth	----------
-ful	the power	powerful	the delight	----------
	the skill	skillful	the success	----------
	the faith	faithful	the beauty	----------

Exercise 3.4

Making nouns into adjectives. Here are some common suffixes that change nouns into adjectives. Fill in the blanks. Check your dictionary if you are not sure of the spelling.

-ish	the fool	foolish	the self	----------
	the child	----------	the sheep	----------
-y	the cloud	cloudy	the dirt	----------

	the wealth	wealthy	the guilt	----------
	the fun	----------	the mess	----------
-ly	the friend	friendly	the order	----------
	the cost	costly	the man	----------
	the month	----------	the time	----------
-al	the person	personal	the accident	----------
	the universe	universal	the region	----------
	the cause	----------	the brute	----------
-ous	the danger	dangerous	the nerve	----------
	the mystery	mysterious	the poison	----------
	the fame	----------	the victory	----------

Exercise 3.5

Making verb into adjectives. Here are some common suffixes that change verbs into adjectives. Fill in the blanks. Check your dictionary if you are not sure of the spelling.

-ive	to create	creative	to possess	----------
	to attract	attractive	to instruct	----------
	to select	----------	to prevent	
-ent	to excel	excellent	to please	----------
-unt	to confide	confident	to depend	----------
	to urge	----------		
-able	to pay	payable	to perish	----------
-ible	to agree	agreeable	to force	----------
	to remark	----------	to sense	

Exercise 3.6

Making adjectives into adverbs. Here is the most common suffix that changes adjectives into adverbs. Fill in the blanks. Check your dictionary if you are not sure of the spelling.

-ly	Noisy	noisily	social	----------
	Private	privately	confident	----------
	Recent	----------	final	----------
	Easy	----------		

Exercise 3.7

Making nouns and adjectives into verbs. Here is a common way of changing nouns and adjectives into verbs. Fill in the blanks. Check your dictionary if you are not sure of the spelling.

-ive	real	to realize	civil	----------
	author	to authorize	immortal	----------
	familiar	to familiarize	organ	----------
	legal	----------	critic	----------
	final	----------	computer	----------
-ify	simple	to simplify	solid	----------
-en	soft	to soften	broad	----------

Exercise 3.8

Summary of word forms. In the table below, fill in the blanks with the correct form of the word. The first is done as an example. If you are not sure of the correct form, check your dictionary.

NOUN	VERB	ADJECTIVE	ADVERB
imagination	imagine	imaginative	imaginatively
----------	complete	----------	----------
----------	----------	convincing	----------
excellence	----------	----------	----------
----------	----------	----------	satisfactorily
----------	exceed	----------	----------
----------	----------	repeated	----------
consideration	----------	----------	----------
----------	succeed	----------	----------
----------	----------	----------	comparatively
----------	----------	separate	----------
----------	persuade	----------	----------
----------	----------	----------	decisively

3.2. Conversion

1. Conversion from Verb to Noun

Firstly, we shall study the shift from verb to noun. The same pair of converted words can be placed into two different categories depending on the subjectivity of their meaning. Nouns coming from verbs can expressed state of mind or state of sensation, like in the nouns experience, fear, feel or hope. Nouns can also name events or activities, such in the case of attack, alert and laugh. The object of the verb from which the noun is derived can be observed in visit, increase, call and command. In the fourth division the noun refers to

the subject of the original verb. Examples of this kind are clone, contacts or judge. Other nouns show the instrument of the primitive verb, like cover and start. Finally, a place of verb can also be norminalised, like in turn or rise.

2. Conversion from Noun to Verb

Verbs converted from nouns have also many subclassifications. They can express the action of putting in or on the noun, such as in pocket(ed), to put in the pocket, flim and practice. These verbs can also have the meaning of to provide with (the noun) or to give (the noun). like name (to give a name to somebody), shape or fuel. These verbs belonging to the third division will express the action done with the noun as instrument. It can be exemplified with hammer or brake. Another group of verbs has the meaning of to act as the noun with respect to something, as exemplified in hosted. Other subclassification has the sense of making something into the original noun, like in schedule and rule. The last group means to send by means of the noun, that is the case of ship(ed) or telephone(d).

3. Conversion from Adjective to Verb

Adjectives can also go through the process of conversion, especially to verbs. De-adjectival verbs get the meaning of to make (adjective). It can be easily seen by means of examples like black(ed), open, slow(ing). In some cases, when verbs are used intransitively.

Learning Activity 6

A. Compounding

A compund word is a union of two or more words, either with or without a hyphen. There is no one formal criterion that can be

used for general definition of compouns in English. The hyphen is a mark of punctuation that not only unites but also separates the component words; it facilitates understanding, aids readibility, and ensures correct pronunciation. When compound words must be divided at the end of a line, such division should be made leaving prefixes and combining forms of more than one syllable intact.

In English, for instance, compound words have the following characteristics:

1. Compounds words behave grammatically and semantically as single words.
2. Since compound words behave as units, between their component elements no affixes (whether inflections or derivations) can usually occur; inflectional suffixes can appear only after compound words. For example, bathrooms, school, buses, water resistant. Exceptions: passersby, brothers-in-law, courts-martial.
3. Compound words can be written in three different ways:
    a. Open, i.e., with a space between the parts of the compound; e.g., toy store, diving board, flower pot.
    b. Hyphenated i.e., with a hyphen (-) separating the elements of the compound. e.g., flower-pot, air-brake, she-pony.
    c. Solid, e.g., without a space or hyphen between the component elements of the compound; e.g., flowerpot, washrooms, pickpocket.
4. The global meaning of the compound word can often be guessed from the individual meaning of each element of the compound. For example, a boathouse is ‘a shed in which boats

are stored'; a bookstore is 'a store which sells books'; and so on. But there are a few compound words whose global meanings have to be learned as if they were single words because such meanings cannot be guessed from the individual meanings of the component elements of the compounds. For instance, a Redcoat is 'a British soldier', not 'a coat that is red'. Similarly, a flatfoot is 'a detective or policeman', a turncoat is 'a traitor', a hot dog is 'a kind of fast food', etc.

5. Compound words usually have the primary stress on the first element of the compound; e.g., "air-Ækrafts, "chewing-Ægum. This fact differentiates compounds from phrases that have the same elements and order as compounds. Phrases usually have their primary accent on the second (or nominal) element; e.g., a "red Ã coat vs. a "Red Ækoat; a "flat Ã foot vs. a "flatÆfoot; the "white Ã house vs. the "White ÆHouse. Of course, there are a few compounds which have their primary stress on the second element as phrases; e.g., Æworking "man, Æflying "saucer, woman "writer, Æ fancy "dress.
6. The second element (or head word) of the compound usually determines the grammatical category to which the whole compound belongs. Following are a few possible combinations:
   n + n = n; e.g., sunrise, dancing girl, hand-shake, air-conditioning, cigar smoker, windmill.
   v + n = n; e.g., rattlesnake, call-girl, dance-hall.
   adj. + n = n, e.g., darkroom, highbrow.
   n + adj. = adj.; e.g., airsick, bottle-green.
   pron. + n = n; e.g., she-pony, he-goat.

prep. + v = v; e.g., overtake, undergo.

prep. + n = n; e.g., onlooker, off-day.

adj. + adj. = adj.; e.g., gray-green, Swedish-American.

The most common type of word formation is the combination of two (or more) nouns in order to form a resulting noun:

Noun + Noun = Noun
Examples: landmine, wallpaper, toothbrush

The first of the two compounds may be descriptive (i.e. tablecloth, a cloth with which to clean [or cloth] tables), or both compounds may create a whole new meaning altogether (i.e railroad, which is not a "road" in the typical sense of the word.) It is also possible to form words whose components are equally important to or descriptive of its meaning, for example, a washer-dryer refers to an object combining two functions.

There are, of course, many more different ways how compound nouns can be related to each other and how their new meanings can best be explained grammatically. In most cases, however, the nature of these compounds is self-explanantory, and their meanings are quite comprehensible even for those who encounter them for the first time.

Note that compound nouns usually appear as two separate words, only those more commonly used, those found in every-day language, and usually compounds with no more than three syllables are found as one word. Hyphens (-) between the segments of a compound noun are absolutely exceptional. Examples: windowsill

(the sill attached under a window), shopwindow (a shop's window), doorkey (a key for the door), bookpage (a page in a book), silverspoon (a spoon made of silver), waterpipe (a pipe that carries water), dockyard (a yard for docks), fireman (somebody who fights fire), wallpaper ("paper" one glues to walls), Independence Day (anniversary of the Declaration of Independence), office supply (goods for office use), water shortage (shortage of water), labour riot (employees rioting), television set (a set for watching television), headache (an aching head), snowfall (snow falling), answerphone (a phone that answers), air-conditioner (a machine conditioning air), gunfight (a fight carried out with guns).

Verb+Noun

Here verbs describe what is done with an object or what a subject "does", in short, a new noun is formed, usually referring to something concrete, and the verb defines the action related to it:

Verb + Noun = Noun: draw + bridge = drawbridge.

A drawbridge is a bridge that can be inclined in order to allow ships to pass, or "drawn". Here, the noun is the direct object.

hitman = a man who carries out "dirty jobs", or, who "hits". Here, the word as part of speech is the subject.

Besides that, both segments can be related in other ways, i.e. the noun may stand for a adverb of place: walkway = people walk on the walkway.

The usual rules apply to spelling. More examples:

walkway (a way to walk on), divecenter (a place where one goes diving), runway (a strip of flat land where aircraft start or land ["run"]), filter-paper (paper used for filtering liquids or gases), driveway (a road leading to a garage or a building), payday (the day one receives his or her salary), paycheck (a check used for the payment of wages or salaries),

Noun+Adjective

Nouns and adjectives can also be compounded in the opposite order:

Noun + Adjective = Adjective

Camera + shy = camera-shy (Shy in respect of appearing or speaking before cameras).

In this case, the resultant is an adjective, while the noun explaines the objective. Another possibility is that the noun supports the adjective, i.e. as an intensifier:

dirt-cheap = cheap as dirt; paper-thin = thin as paper

Those rules do also apply to the linking of nouns and participial adjectives: English-speaking; soul-destroying; frost-bitten.

More common and shorter compounds appear as one word whereas those longer and less common are linked by a hyphen. More examples of all subtypes: waterproof (proof or resistant against water), seaworthy (a ship withstanding the dangers of the sea), airworthy (an aircraft safely flyable), blameworthy (a person deserving blame), bookworthy (something worth being published), trustworthy (somebody who can be trusted), jet black (deep black), footsore (having a sore foot), heart-sick (a person suffering from

heart disease), seasick (being sick from the effects of a stormy sea), homemade (made privately at home), power-mad (mad about or craving power), colour-blind (unable to discriminate colours other than black and white and grey),

Adjective+Noun

Another major type of word formation is the compounding of Adjectives and nouns:

Adjective + Noun = Noun:

brown + bear = brownbear

In this case, the adjective defines or describes the character of the noun (a brownbear is a bear that is brown). It is also possible, however, to link the two segments and end up with a totally new word, for example, yellowpress refers to newspapers specializing in sensational news items. If the meaning of the compound does not immediately register through analysis of the segments, the latter is the case. Then, only a look in the dictionary will help.

These compounds usually appear as one word. Examples: blackboard (a board to write on vertically attached to a wall), redneck (a Southerner of poor social background), yellowpress (see above), blueprint (prints of building plans, or detailes plans in general), lazybone (a lazy person), brownbear (see above), braveheart (somebody who's brave), wiseguy (a pretentious person who behaves as if he knows more than others), hardcopy (something in print), software (computer programmes), coldblood (a person devoid of feelings of pity),

Other Compounds

There are various other types of compounds. A selection of which is shown below.

Adjective+Adjective

bitter-sweet, deaf-mute, aural-oral, Anglo-Saxon

Adjective + Participle

far-reaching, far fetched, narrow-minded, single-minded, highclimbing, low-yielding, red-painted, bare-handed

Note: It is as well possible to combine adjectives with participles not originating from verbs.

Adjective+Verb

to blackmail, to dryclean, to blackpaint, to whitewash

Noun+Verb

to proofread, to babysit, to brainstorm, to sightsee, to tape-record

Exercise 3.9

Read the passage below. Underline words that indicated noun, verb, adjectives, or adverb.

Microwave Assisted

During the summer of 2001, two groups reported the development of three-component syntheses of _-amino phosphonates. _-Amino phosphonates are of biological relevance since they act as peptide mimetic. Compounds containing this structural element have been used as enzyme inhibitors, antibiotics, herbicides and pharmacological agents, because of their close structural analogy to _-amino acids. A number of synthetic methods

for the synthesis of aminoalkyl phosphonates have been developed during the past two decades. Generally, they are prepared from the addition of phosphorous nucleophiles to imines in the presence of either base or acid. Standard Lewis acids such as $SnCl_4$, BF_3OEt_2, $ZnCl_3$ and $MgBr_2$ have been used for this transformation. Since the amines and the water that forms during imine formation can decompose or deactivate the Lewis acids, these reactions cannot be carried out in a 'one-pot' operation. However, the use of lanthanide triflates or indium trichloride as catalysts circumvents these problems. These procedures do not require the pre-synthesis of unstable imines, although longer reaction times (10–20 h) are required to obtain the desired products in good yields. Interestingly, metal triflates are found to be effective for the chemoselective reaction with aldehydes without touching the ketones

The application of microwave technology to speed up chemical reactions is now an accepted and acknowledged tool among chemists. However, combining it with other methodologies such as multicomponent reactions can further enhance the benefits offered by the microwaves alone. This passage is a non-comprehensive summary of the available papers where microwave dielectric heating has been used in combination with multi-component reactions. The examples highlight the fabulous possibilities that can be found in the crosssection of these technologies. The numbers of papers describing the combination are still limited, but nevertheless microwave heating will have an impact in the area and most certainly, we will see an increased number of publications and increased interest in the near future.

Terms

Bonding Pair	Pair of electrons involved in a covalent bond.
Condensation	Liquefaction of vapor.
Coordination	In describing crystals, the number of nearest neighbours of an atom or ion. The number of donor atoms coordinated to a metal.

Denaturation	A process pertaining to a change in structure of a protein form regular to irregular arrangement of the polypeptide chains.
Deposition	The direct solidification of a vapor by cooling; the reverse of sublimation.
Diamagnetism	Weak repulsion by a magnetic field
Formal Charge	A method of counting electrons in a covalently bonded molecule or ion; counts bonding electrons as though they were equally shared between the two atoms.
Formula	Sand, rock, and other impurities surrounding the mineral of interest in an ore.
Gangue	Describes processes that absorb heat energy.
Ground State	The lowest energy state or most stable state of an atom, molecule or ion.
Hybridization	Mixing a set of atomic orbitals to form a new set of atomic orbitals with the same total electron capacity and with properties and energies intermediate between those of the original unhybridized orbitals.
Hydration	Reaction of a substance with water
Isomers	Different substances that have the same formula
Isomorphous	Refers to crystals having the same atomic arrangement. For more information see Crystallography
Ligand	A Lewis base in a coordination compound.
Melting Point	The temperature at which liquid and solid coexist in equilibrium; also the freezing point.
Metalloids	Elements with properties intermediate between metals and nonmetals: B, Al, Si, Ge, As, Sb, Te, Po, and At.
Nucleons	Particles comprising the nucleus; protons and neutrons.
Nucleus	The very small, very dense, positively charged

center of an atom containing protons and neutrons, as well as other subatomic particles.

Chapter 4

Active Sentence and Passive Sentence

Learning objectives:

Upon the successful conclusion of **Chapter 4**, you will have to:

1. Differentiate the active and passive sentences.
2. Gave examples of the active and passive sentences.
3. Explained the use of present simple, past simple and present perfect tenses in passive forms.

In scientific English, in particular in any scientific textbooks at least one-third of all the finite verbs will be in the passive. Most of these passive verbs will be either of the two main past tenses–the Present Simple (or be used with modals such as can, may, should and will) and the Present Perfect. Therefore, it is obvious that scientists use the passive much more frequently than most other kinds of writers.

The first reason for this is that the passive sentences do not mention people. For a scientist many references to people are unneccessary and confusing. A second reason for using passive is that the subject is a very important part of the sentence. A third reason for using the passive is that passive sentences may be a little shorter

Language Basics

1. All finite passives are formed by some part of the verb be (e.g. am, is, are, was, were, has, been, will be, to be, is going to be) plus the past participle (e.g. mailed, corrected, taught, surprised).
2. The object of an active sentence becomes the subject of a passive sentence.
3. The subject of an active sentences becomes part of the "by phrase" in a passive sentence.

Examples:

a. Acids should be handled with great care.
b. The gas is heated.
c. The bridges are made of concrete.
d. Impurities are eliminated by a filter.

In many situations, the passive can be used to give the necessary information in the best possible way; impersonally, concisely, objectively and giving importance to the most important facts.

He places the red litmus paper in the solution (active)
The red litmus paper is placed in the solution (passive)

Forming Passive Verbs

Non Continuous Form Active :

S	V	O

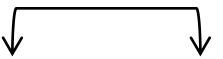
(V= transitive verb)

Passive :

S	Be V(III)	O

(V(III)= transitive verb)

Examples:



a. Active : The storm damaged the harbour last week.

S V O

Passive : The harbour was damaged by the storm.

S (be)……..V "by phrase"

b. Active : They tested the new batteries yesterday.

S V O

Passive : The new batteries were tested yesterday.

S (be) V

c. Active : They did not complete the work on time.

S V O

Passive : The work was not completed on time.

S (be) V

Modal

Active :

S	V	O

(V= transitive verb)

Passive:

S	modal be V(III)	O

(V(III)= transitive verb)

Examples:

The survey will be completed next year.

The survey may be completed next year.

Acids should be handled with great care.

Heat can be generated in several ways.

The modal passives commonly used to describe things which should or should not be done. The passive modals are particularly common in written instructions, warning and notices.

Negative statements and questions in the passive

Examples:

Litmus paper	is not	used	in this experiment.
His research	will not be	completed	this year.
Agriculture	cannot be	developed	without sufficient water.

Change the active verbs to passive verbs. Write the subject of the passive sentence.

Simple Present Tense

The Simple Present is the tense used to describe scientific facts and scientifics events and is usually used when describing experiments. This is particularly true if standard or classical methods are employed. Consider this description:

An experiment to measure atmospheric pressure

First, a long glass tube is taken. The tube is closed at the top and is then completely filled with water. Next it is placed vertically in a large barrel half full of water. When the bottom of the tube is opened, the water level in the tube only falls to a height of approximately 10 meters above the water level in the barrel. As a result, a vacuum is left in the upper part of the tube. The water in the tube is supported

by the atmospheric pressure. The height of the column of water can therefore be used to measure atmospheric pressure.

This is written in the Present Simple passive. However, there are few occasions when it is either better or necessary to use the Present Perfect.

Consider this short passage:
A distillation flask is filled with a mixture of water and methylated spirit in a ratio of 2 to 1. The flask is then heated over a low flame. Distilling is continued until about 3 cm of the distillate has collected in the boiling-tube.

Present Perfect Tense
Active : Bob has mailed the letter
Bob has mailed the letters
Passive : The letter has been mailed by Bob
The letters have been mailed by Bob

Use of Past Simple
The past simple is normally used to describe actions which happened in the past and are now finished. Consider this statement:

The first satellite, Sputnik I, circled the earth 200 times.

Because the Past Simple is used we know that the action is finished. We know that Sputnik I is no longer going round the earth.

Simple Past Tense

Active : The news surprised me.
The news surprised us.

Passive : I was surprised by the news
We were surprised by the news.

Often, however, the Past Simple is used together with a time-phrase that refers to the completed past.

Originally, generators produced only direct current.
Initially, generators produced only direct current.

More examples of the use of the Present Perfect:

- When sufficient liquid has collected in the beaker it should be removed.
- It will be observed that some of the chalk has not dissolved.
- Examine the contents of the tube in which the liquids have collected.

Notices that the Present perfect occurs in the subordinate clauses (the clauses beginning when, that, in which). However, the Present perfect is only used in such clauses under certain circumstances.

a. Heat the water until it boils. (It boils at a moment in time)
   Heat the water until it has boiled away. (It boils away over a period of time).
b. Turn off the burner when the substances is reduced to ash.

Turn off the burner when the substances has been reduced to ash.

Although it is possible to write Turn off the burner when the substances is reduced to ash, the Present Prefect gives a more accurate description. This because it shows that the substance is not immediately reduced to ash.

The present perfect is used in certain historical and 'news' statements, but again it is not always easy to use this tense correctly. In fact, as its name suggests, the Present perfect is only 'half time a past tense'. It has been called the Pre-Present', and perhaps this is a better name because it is used to describe:

(a) activities carried out a little while before now or just before now.

- A description of the new alloys has recently been published.
- The research team has just published a description of the new alloy.
- The properties of semi-conductors have only recently been fully understood.

Therefore, the Present Perfect is usually used with just and recently. But remember that the Past Simple is used id the statement describes when the activity took place:

- A description of the new alloy was published last month.

(b) activities carried out at some unstated or unspecified time before now.

- Man has been to the moon.
- A network of communication satellites has been established.

- The minister has approved the new plan.

(c) activities starting sometime in the past, continuing until now, and possibly continuing for some time in the future:

- Medicine has made great progress in the last twenty years.
- This has been known for forty years. • This has been known since 1930.

Compare the last two example sentences with:

- This was first known forty years ago.
- This was first known in 1930.

Other uses of the Present Perfect

It + Passive verb + that.....

Look at these changes:

x = y

x = has been shown

it has been shown that x = y.

The last sentence is an example of the it-that structure. In this structure the it is 'empty'. It does not refer to anything. This can be seen from the example above. The most useful expression using this structure are as follows:

(a) It has been $\begin{bmatrix} shown \\ demonstrated \\ proved \end{bmatrix}$ that

It has been shown that angles ABC and DEF are equal
It can therefore be concluded that angles ABC and DEF are equal.

(b) It wiil be [*seen* / *noted* / *observed*] that……..

It will be noted that this result is similar to that obtained by Fisher and Jones

(c) It used be thought that.....
It was once thought that.....

It used to be thought that lead could be changed into gold.
(This a common way of stating that something is no longer believed to be true or possible).

(d) Although it is often said that....., this is not true.

It is [*often* / *commonly* / *generally*] said / believed that....., but.....

It is commonly believed that acid solutions do not affect gold, but this is not true.

(this a way of saying that certain general beliefs are wrong)

Exercise 4.1

Read this passage. Underline the passives and then answer the questions.

As oil usually found deep in the ground its present cannot be determined by a study of the surface. Consequently, a geological survey of the underground rock structure must be carried out. If it is thought that the rocks in a certain area contain oil, 'a drilling rig' is assembled. The most obvious part of a drilling rig is a tall tower which is called 'a derrick'. The derrick is used to lift section of pipe, which are lowered into the hole made by the drill. As the hole is being drilled, a steel pipe is pushed down to prevent the sides from falling in, and to stop water filling the hole. If oil is truck a cover is firmly fixed to the top of the pipe and the oil is allowed to escape through a series of valves.

1. Write down the two passives which include adverbs.
2. Write down the two modal passives.
3. Write down the one present continous passive.

Many passives are followed by prepositional phrases. Here are some common types.

To

The temperature is then reduced to –240 oC.

The results are given to three decimal places.

In these sentences to means as far as. Notice the difference between:

The liquid is cooled to 5 °C.

The liquid is cooled 5 °C.

From

This often used after verbs that have the general meaning of get or obtain. Here are three examples:

Fresh water can be distilled from sea-water.

Domestic electricity is taken from power lines.

paper is made from wood.

As

This preposition frequently follows a passive verb containing the modal can. This is shown in these examples:

The speed of sound can be taken as 333 m/sec.

This can be expressed as a curve.

A small mirror can be used as a reflector.

This is usually known as the Law of inertia.

Exercise 4.2

Rewrite, putting the verbs in brackets into the correct form (either active or passive). Here is an example:

The crucible ..... with a clamp. (hold)

The crucible was held with a clamp.

1. The sun ..... at 5.34 this morning. (rise)
2. Ealy pumps ..... by the wind. (drive)
3. The eclipse ..... at 8.20 pm on July 1st, 1963. (see)

4. The first planes ..... at less than 100 km per hour. (fly)
5. The lesson ..... by most of the claa. (not understand)
6. The lenses for many eighteenth century opical instruments ..... in Holland. (grind)

Exercise 4.3

Read the passage below and underline any passive sentences.

CHEMICAL vs. PHYSICAL CHANGES

It is important to understand the difference between chemical and physical changes. The two types are based on studying chemical reactions and states of matter. We admit that some changes are obvious, but there are some basic ideas you can use. Physical changes are about energy and states of matter. Chemical changes happen on a molecular level

When you step on a can and crush it, you have forced a physical change. The shape of the object has changed. It wasn't a change in the state of matter, but something changed. When you melt an ice cube you have also forced a physical change (adding energy). That example caused a change in the state of matter. You can cause physical changes with forces like motion, temperature, and pressure.

Chemical changes happen on a much smaller scale. While some experiments show obvious chemical changes such as a color change, most chemical changes happen between molecules and are unseen. When iron (Fe) rusts you can see it happen over a long period of time. The actual molecules have changed their structure (the iron oxidized). Melting a sugar cube is a physical change because the substance is still sugar. Burning a sugar cube is a chemical change. The energy of the fire has broken down the chemical bonds.

Some changes are extremely small. Chemical changes can happen over a series of steps, and the result might have the same number of atoms but have a different structure. The sugars glucose, galactose, and fructose all have six carbon atoms, twelve hydrogen atoms, and six oxygen atoms. Even though they are made of the same atoms, they have very different shapes and are called structural isomers. They each have different chemical reactions because of their molecular structure.

Sometimes a liquid can be sitting in one place (maybe a puddle) and its molecules will become a gas. That's the process called evaporation. It can happen when liquids are cold or when they are warm. It happens more often with warmer liquids. Evaporation is all about the energy in individual molecules, not about the average energy of a system. The average energy can be low and the evaporation still continues.

You might be wondering how that can happen when the temperature is low. It turns out that all liquids can evaporate at room temperature and normal air pressure. Evaporation happens when atoms or molecules escape from the liquid and turn into a vapor. Not all of the molecules in a liquid actually have the same energy.

The energy you can measure with a thermometer is really an average of all the molecules in the system. There are always a few molecules with a lot of energy and some with barely any energy at all. The molecules with a lot of energy are able to build up enough power to

Exercise 4.4

Identify and underline the passive voices in the following sentences.

1. Some ice was crushed and mixed with salt to form a freezing mixture.
2. This mixture was placed in a large container.
3. A small amount of hot water was poured into a calorimeter.
4. The calorimeter was then inserted into the freezing mixture.
5. The water was then allowed to cool, and readings of the temperature were taken every minute.
6. The water was stirred continually throughout the experiment.
7. The value of the temperature was noted at every reading.
8. The experiment was continued until the temperature of the water was well below 0 ^{o}C.
9. The water was observed carefully as the temperature approached 0 ^{o}C.
10. The stirring was continued and the temperature was noted for several minutes after ice formed in the calorimeter.
11. A graph of temperature against time was plotted from the tabulation of the results.

Exercise 4.5

Write passive sentences based on the above list of verb using either non continuous form and modal formulas.

Vocabulary

Heat	weaken	weight
Melt	toughen	rinse
Freeze	soften	wash
boil	harden	extract

liquefy	roughen	repeat
solidify	strengthen	remove
cool	widen	fill
mix	lenghten	crush
pour	shorten	immerse
stir	deepen	insert

Terms

atom	the smallest unit of an element. An atom contains electrons and a nucleus. The nucleus is made up of protons and neutrons.
boiling	the act of changing from a liquid to a gas by heating
chemical change	when a substance undergoes a chemical change, it becomes a different substance. Because it is no longer the same substance, it no longer has the same properties
corrosion	any destructive chemical change occurring in a metal. When some metals corrode, they become rusty.
Covalent bond	a type of bond between atoms. In a covalent bond, atoms share electrons.
distillation	a process by which the parts of a mixture are physically separated. Distillation involves evaporation and condensation
electricity	the movement of electrons
electrolysis	breaking a compound into simpler substances by putting a current of electricity through the compound
electron	A particle that has a negative charge and goes around an atom's nucleus
energy	the ability to do work, to keep up a force through a distance

Terms

Chapter 5

Textbook

Learning objectives:

Upon the successful conclusion of **Chapter 5**, you will have to:

1. Describe definition of the textbook.
2. Recognise the important part of the textbook.
3. Understand the use of textbook in studying a course.

Most of your reading will be the purposeful, study-type reading of textbooks. Though you may often use a skimming technique, usually you will use a careful, close reading technique in order to understand specific information. This includes facts, formulas, dates, causes, effects, attitudes, ideas, experiments, results the whole range of information that is contained in the textbooks of your various courses. Though the subject matter is different, its organization and presentation are similar. Because this kind of reading is so important to you, it will be useful to look closely at what a textbook contains and at how you can make the most efficient use of its contents.

5.1. Definition of Textbook

Textbook is a teaching tool (material) which presents the subject matter defined by the curriculum. A university textbook is required

to contain the complete overview of the subject, including the theories, as well as to be of a more permanent character.

A textbook is a collection of the knowledge, concepts, and principles of a selected topic or course. It's usually written by one or more teachers, college professors, or education experts who are authorities in a specific field. Most textbooks are accompanied by teacher guides, which provide you with supplemental teaching materials, ideas, and activities to use throughout the academic year. Textbooks provide you with several advantages in the classroom:

- Textbooks are especially helpful for beginning teachers. The material to be covered and the design of each lesson are carefully spelled out in detail.
- Textbooks provide organised units of work. A textbook gives you all the plans and lessons you need to cover a topic in some detail.
- A textbook series provides you with a balanced, chronological presentation of information.
- Textbooks are a detailed sequence of teaching procedures that tell you what to do and when to do it. There are no surprises—everything is carefully spelled out.
- Textbooks provide lecturers and teachers with a complete program. The series is typically based on the latest research and teaching strategies.
- Good textbooks are excellent teaching aids. They're a resource for both teachers and students

5.2. Surveying the Textbook

Your textbook is going to be your companion for quite a long time. As with a friend, it is helpful to get acquainted. When you first get the book, skim through it to see what is included and how it is organized. Most textbooks are designed in a similar format. Look especially at the following parts.

a. The Cover Page (Title Page)

Title Page of textbooks is never simple. It is generally a short catchy title followed by a colon and a longer explanation of the subject matter. It also contains the publication, authorial, and copyright information. It is surprising how many students do not know the titles of their textbook or the authors' names. It may not seem important, but since you are going to put confidence in the authors and their books, it may be worthwhile to know their names, who they are, where they come from, and what they have done in the field. This is essential, of course, if you must prepare footnotes or a bibliography.

b. Fly Leaf (Fly Page)

This page faces the endsheet (which is glued to the book cover). This page is thicker and far more durable than the other pages in your book. Usually blank, this page is excellent for writing down basic formulas or fundamental notes which you will need again and again as you study from the book.

c. Title/Author page

The information on this page is fairly consistent. It contains the full title of the book, the edition, the name of the author, the author's academic affiliation (where the author was teacher when the book was written), and the book's publisher. If there is more than one author, all their names will appear on this page.

d. Copyright page

The book's copyright information is located prominently on this page. Copyright indicates the intellectual ownership of the book's content. There is often a paragraph explain who has the legal right to copy pages from the book. You will also find the Library of Congress call number, the International Standard Book Number (ISBN).

e. Preface or Foreword

The preface is an introductory statement written by the author or authors specifically to the reader. The preface gives the author's reason and purpose for writing, organization, method of presentations, and whatever particular features of the book you should especially notice, and may include a summary of problems encountered while writing the book. The preface also attempts to describe the reader; for whom the book is meant. This should not be confused with the foreword. The foreword (sometimes spelled forward) contains remarks about the book, usually written by someone other than the author. Frequently in textbooks there is a section at the beginning entitled "To the student." Read it carefully. The author is explaining how to get the most out of textbook are very

expensive; you should try get your money worth. If this is a second or subsequent edition, this where the author explains the changes and improvements.

f. Table of Content

Skim through the table of contents to get an overall view of the material in the book. Some tables of contents are actually outlines, with subtopics of each chapter. This section of the text is the fastest, easiest way to survey the territory over which you will travel.

g. Text

The chapters of most textbooks include a variety of study guides. Section headings, in boldface type, announce the general subject of the material that follows. Frequently you will find summaries at the end of each chapter, often with though questions and exercises. Many texts contain maps, charts, diagrams, and tables. Do not ignore them. They have been included to help you visualize the information. They are valuable aids to understanding. Know how to read them, and read them.

h. Glossary

Many textbooks include a glossary, either at the end of each chapter or at the end of the book. This is a kind of dictionary which defines or explains some of the technical terms in the book and often provides examples and page references.

i. Bibliography

An alphabetical list or relevant books and articles is frequently included either at the end of each chapter or at the end of the book. If you want further information on the subject, or if you want to know the author's sources, the bibliography will list them by the author, title, publisher, and date.

j. Index

One of the most important sections of any textbook is the index at the end. This is usually a thorough, fairly detailed alphabetical listing of all the major persons, places, ideas, facts, or topics that the book contains, with page references. For review, or for quickly locating some points you wish to check, the index is valuable guide.

Exercise 5.1

Choose a textbook which you are currently studying. Identify this book by writing brief comments about each of the following parts.

1. **Bibliographical information**. Write the name of the author(s), title of the book, place and date of publication, and the publishers.
2. **Front matter**. Does the book have a preface, foreword, introduction, to the teacher, or to the Student? What information here might be useful for a better understanding of the purpose, content, and arrangement of the text?
3. **Table of contents**. Does the table of contents give you a general idea of the material and organization of the book? It is only a list of chapter titles? Is it a kind of outline with topics and subtopics? How does it table of contents? Is it useful? Why?

4. **Text**. Are there different typographical devices to mark off sections and to emphasize important materials? Is there summary, notes, or additional reading at the end of the chapter? Are there maps, diagrams, charts, graphs, or tables to clarify significant points? Are the type clear, the margin wide, and the overall effect of the page pleasing to the eye? Without considering their content, which of the books is more appealing because of its organization, layout, and various reading aids?
5. **Back matter**. Does the book have a glossary? Is technical terms defined clearly as they occur in the text? Are they defined in a separate section, either in the chapter or at the end of the book? Does the book have a bibliography? If so, does it have brief comments about the content and relative value of the book that are listed? Is the bibliography at the end of each chapter, or is it placed at the end of the text?
6. **Index**. Is the index complete? Is there special information at the beginning of the index that you should know about in order to make best use of it? Think of a specific topic in each course and try to find page references quickly.

Title page

Microwave Assisted Organic Synthesis

Edited by

Jason P. Tierney
GlaxoSmithKline
Harlow, UK

Pelle Lidstr¨om
Biotage AB
Uppsala

Preface

Microwave-assisted organic chemistry has during the last years moved from being an obscurity in the laboratory environment to be an invaluable tool within chemistry research. Although the first reports on microwave-assisted organic synthesis dates back as far as 1986, the breakthrough of the technique as a routine tool in synthesis has been slow. The main reason has been difficulties in conquering the forces of the flame, i.e. there has been a lack of dedicated equipment available to perform chemistry using microwave irradiation. This lack of dedicated equipment led to the use of domestic appliances, leading to very unpredictable and sometimes devastating results. It also gave the technique an aura of black art. However, with the introduction of dedicated equipment, novel, interesting, reproducible chemistry has been and is continuously performed. In this book we have tried to assemble a selection of authors to shine light on the underlying principles of microwave dielectric heating, how this

dielectric heating has been used in chemistry to give us microwave-assisted organic synthesis applied on a wide variety of reaction types as well as on how microwave-assisted organic synthesis has impacted the chemistry research within industry. These chapters have been written by some of the most prominent researchers of modern microwave-assisted organic synthesis and we hope that you will find it both interesting and enlightening.

Jason P. Tierney

Pelle Lidstr¨om

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D. MICHAEL P. MINGOS

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Glossary Cuneiform (kū nē a fŏrm): a word meaning "wedgeshaped," applied especially to the wedge-shaped characters of the writing of the Sumerians, ancient babylonians and Assyrians.

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Exercise 5.2

Using a dictionary, described the following unfamiliar book-related terms.

addendum _____

afterword _____

binding _____

chapter _____

corrigenda _____

dedication _____

E-book _____

edition (ed) _____

endpaper _____

epigraph _____

epilogue _____

errata _____

folio _____

fore-edge _____

foreword _____

frontispiece _____

Galleys _____

gutter _____

half-title _____

illustration _____

interleaf _____

issue _____

leaf _____

manuscript _____

margin _____

paperback _____

plate _____

postscript _____

prelims _____

proem _____

prolegomenon _____

prologue _____

proofs _____

publication date _____

recto _____

reprint _____

rubric _____

running head _____

slipcase _____

spine _____

title page _____

unpaginated _____

verso _____

watermark _____

Chapter 6

Noun Group

Learning outcomes

Upon the successful conclusion of **Chapter 6**, you will have to:

10. Describe the position and function of the noun group in a sentence.
11. Identify the constituent parts of the noun group either compulsory (head noun), and optional (adjective, adverb, numbers, determiner, noun and adjunct).
12. Explain the meaning of a noun group in a sentence.

In English, the order of the parts of a sentence is very important. In Spoken English, the NOUN parts of a sentence are often simple and the VERB parts are complicated.

In Written English, especially in scientific/technical English, the VERB parts are often simple and the NOUN parts complicated. All sentences in English MUST contain at least one VERB.

The simplest sentence in English has a SUBJECT and VERB. The SUBJECT normally comes before VERB.

Example: (i) The boy cried

(ii) The ship sank

In (i),"the boy" is the SUBJECT

In (ii) "the ship" is the SUBJECT

While “cried” and “sank” are the VERBS.

This SUBJECT + VERBS (S + V) combination is the minimum requirement for a sentence in English.

A piece of language with a SUBJECT and a VERB is called a CLAUSE.

In the example above, the sentence have only one CLAUSE.

Other sentences may have two or more CLAUSES.

6.1. The Subject (Noun Group)

The subject in English sentence can be very simple or very complicated.

The SUBJECT of a sentence is the “doer” of an action and so must be a person or thing. The “doer” is therefore a PRONOUN, a NOUN or a group of words based on a NOUN.

We will refer to all of these possibilities as a NOUN GROUP. We will look at each of these types of NOUN GROUP as SUBJECT. That is, we will look at the NOUN GROUP as:

(i) a PRONOUN

(ii) a single NOUN

(iii) a group of words based on a NOUN

TYPE 1. PRONOUN as NOUN GROUP/SUBJECT

As mentioned above, the SUBJECT in an English sentence can be very complicated or very simple.

Perhaps the simplest kind of SUBJECT is the one where the NOUN GROUP consists of a PRONOUN such as:

I, you, we, they, etc.

Example: I waited

She went home

He conducted the experiment.

Sentences like these, with PRONOUN as SUBJECT are rare in Scientific English. This is because Scientific writing is not concerned with people but rather it is concerned with things, facts, events, etc.

It is more usual in Scientific English to use the two types of SUBJECT which will be explain below.

TYPE 2. SINGLE NOUN AS SUBJECT/NOUN GROUP

In this type of SUBJECT/NOUN GROUP, the only compulsory element is a NOUN.

Therefore, the NOUN GROUP may consist of a single NOUN.

Note: Where there is a single NOUN or a group of words based on a NOUN, there is always a MAIN or HEAD NOUN.

In the following examples, the SUBJECT is underlined and the HEAD NOUN is indicated. Note that the HEAD NOUN is the only element in the NOUN GROUP.

Example: Sound travel at 333 m/sec

"sound" is the HEAD NOUN in the above NOUN GROUP

Water solidified at zero degrees Celcius.

"water" is the HEAD NOUN

In the above example, the NOUN GROUP consists of only a HEAD NOUN. We can therefore create a formula for the NOUN GROUP, based on the above information.

The formula for the NOUN GROUP is: The HEAD NOUN (HN) is acompulsory.

TYPE 3. GROUP OF WORDS AS SUBJECT/NOUN GROUP

The NOUN GROUP may also consist of a group of words.

In such a group, there is always a MAIN or HEAD NOUN as well as other words, such as numbers, adjectives, adverbs, etc. The extra words in the NOUN GROUP give extra information about the NOUN.

In simple NOUN GROUPS, the extra information is placed before the HEAD NOUN.

In the following examples the SUBJECT is underlined.

Example: (i) The reactor exploded

"reactor" is the HEAD NOUN

(ii) The bridge collapsed

"bridge" is the HEAD NOUN

(iii) The heavy rain caused flood in Java

"rain" is the HEAD NOUN

From the above examples, it is clear that our formula for the NOUN GROUP, HN, is incomplete, because in example (i) and (ii) above there are two elements in each SUBJECT and in example (iii) there are three elements.

Therefore we will have to refine our formula to include the other optional elements which can occur in a NOUN GROUP.

In the rest of this section, we will look more closely at the optional elements of the NOUN GROUP.

a. Optional Element 1----------ADJECTIVE (A)

ADJECTIVE give us more information about the HEAD NOUN. They are always placed before the HEAD NOUN.

Example: Soft woods are cheaper than hard woods.

"soft" is an ADJECTIVE (A)

"woods" is thee HEAD NOUN (HN)

Black surfaces do not reflect light well

"black" is an ADJECTIVE (A)

"surfaces" is the HEAD NOUN (HN)

Our formula for the NOUN GROUP now become: { A } HN

Where the brackets { } indicate that the element is not compulsory, i.e. OPTIONAL. { A } is an optional element ADJECTIVE and HN is the compulsory element HEAD NOUN.

Often, however, we use more than one ADJEVTIVE in the NOUN GROUP.

Example: handsome young men

A A HN

Small antique sofas

A A HN

Big old red buses

A A A HN

Viscous green solution

A A HN

To account for using more than one ADJECTIVE, we must change our formula to: { A }*HN where { A } is the optional element (ADJECTIVES)

And * indicates that the element ADJECTIVE may occur more than once.

Exercise 6.1

In the following NOUN GROUPS, identify the ADJECTIVES and the HEAD NOUN, as in the above examples.

1. small furry animals
2. thick grey snake
3. dangerous volcanic activity
4. precise mathematical calculation
5. transparent flammable liquids.

When we group adjectives together there is a general rule for the position of each type adjective, these are:-

Position:

1st*	2nd*	3rd	4th	5th	6th	7th	8th
Opinion	Size	Age	Shape	Colour	Material	Origin	Purpose
	Nice	Small	Old	Square	Black	Plastic	British	Racing
	Ugly	Big	New	Circular		Blue	Cotton	
	American		Running					

This is just a guide as you wouldn't normally see so many adjectives in one description.

For example:

- "She had a big, ugly, old, baggy, blue, cotton, British, knitting bag." Is grammatically correct but a bit too long-winded.

* You might swap opinion and fact adjectives depending on what you wish to emphasise.

For example:

- "She had a long, ugly nose." emphasising the length of her nose.

- "He was a silly, little man." emphasising that the man was silly.

b. Optional Element 2---------ADVERB (adv.)

ADJECTIVES in the NOUN GROUP can be modified by ADVERB (adv). ADVERBS give us more information about ADJECTIVES.

Example:

an extremely beautiful young woman

Adv A A HN

A very old black car

Adv A A HN

An ADVERB modifies ONLY the ADJECTIVE immediately after it. Each ADJECTIVE in the NOUN GROUP can have one ADVERB, or stand alone.

Example: an extremely expensive very large O blue house

Adv A Adv A A HN

An extremely expensive very large light blue house

Adv A Adv A Adv A HN

Note: An ADVERB in the NOUN GROUP cannot stand alone – it must be attached to an ADJECTIVE.

To account for these ADVERB and ADJECTIVE combination, wee must once again alter our formula for the NOUN GROUP to:

{{ Adv}A}* HN, where Adv is an optional element within the optional element Adv/A

Exercise 6.2

In the following NOUN GROUPS, identify the ADVERBS, ADJECTIVES

and the HEAD NOUNS, as in the above examples.

1. extremely high temperatures
2. relatively simple equations
3. really large dinosaurs
4. highly graphic descriptions
5. very intense gravitational field

c. Optional element 3---------NUMBERS (Num)

NUMBERS and other expression of quantity, such as many, much, a lot of, etc., are placed before the ADVERB/ADJECTIVE element in the NOUN GROUP.

Example: two very fast electric trains
Num Adv A A HN

Nine extremely difficult mathematical problem
Num Adv A A HN

Many highly dangerous chemical solution
Num Adv A A HN

Since the NUMBER element is also optional, the formula for the NOUN GROUP becomes: { Num } {{Adv} A }* HN

Exercise 6.3

Write some of you own {Num} {{Adv}A}*HN combination in the following spaces. Again, you can easily find these in magazines, textbooks, etc.

1. _____
2. _____
3. _____
4. _____

5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

d. Optional element 4--------DETERMINER (Det)

Determiners consist of two types:

1. The Demonstrative Pronouns, this and that, and their plurals, these and those.
2. The Definite Article, the, and its plural, the.

Example:	those	two	very	intelligent	students
	Det	Num	Adv	A	HN
	The	highly	dangerous	volatile	solutions
	Det	adv	A	A	HN

Our formula thus become: {Det} {Num} {{Adv}A}* HN

Note: A and its plural some can also be regarded as Det but CANNOT be used with Num.

1. _____
2. _____

Exercise 6.4

Write some of your own {Det} {Num} {{Adv}A}* HN combinations in the following spaces.

_____

3. _____
4. _____
5. _____

6. _____
7. _____
8. _____
9. _____
10. _____

e. Optional element 5-------- NOUN (N)

Another way of including more information in the NOUN GROUP is by using a NOUN + NOUN (N + N) combination.

In these cases, there is still only one HEAD NOUN.

These combinations occur very frequently in Scientific English.

Example: river water = the water in rivers

N HN

Sea water = the water in the sea

N HN

A petrol engine= an engine which uses petrol

N HN

An oil well, a water tower, a Physics experiment. Etc.

The formula for the NOUN GROUP thus becomes:

{Det} {Num} {{Adv}A}* {N} HN

Exercise 6.5

Write some of your own {Det} {Num} {{Adv}A}* {N} HN combination in the following spaces.

1. _____
2. _____
3. _____
4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

f. Optional element 6----------ADJUNCT (Adj)

Adding information after the HEAD NOUNS is yet another way of packing more information into the NOUN GROUP.

We often use "of" or some other PRPOSITION in these cases. (The SUBJECTS are underlined).

Example: (i) The volume of a gas varies with its pressure.

HN --Adj—

In this example, "volume" is the HEAD NOUN and " of a gas" is extra information placed after the HEAD NOUN.

(ii) A mixture of concentrated Nitric Acid and Hydrochloric Acid dissolve gold.

(iii) The greenish-brown solution in that bottle is very toxic.

The element Adj, as mentioned above, is optional but can occur more than once in the NOUN GROUP.

Example: The book in the cupboard on the top shelf……

Det HN -------Adj 1------ ----Adj 2-------

In our formula, we will represent this as: { Adj }*

The formula thus becomes:

{Det} {Num} {{Adv}A}* {N} HN {Adj}*

Final Word on NOUN GROUP

Using the formula we have developed above, we can generate both very simple and very complex NOUN GROUPS. Look at the table below:

{Det}	{Num}	{{Adv} A}*	{N}	HN	{Adj}*	V
Those	2	extremely	dangerous	water	samples	in those bottles
		Highly	corrosive			on the shelf
Viscous		Green			on the left	at the top ARE

The MINIMAL NOUN GROUP that can be generated from the above table is:

Sample ARE ……..

Since HN is the only compulsory elemen.

On the other hand, the MAXIMAL NOUN GROUP that can be generated is:

Those 2 extremely dangerous, highly corrosive, viscous, green water sample in those bottles on the shelf on the left at the top ARE……..

Fortunately, extremely long NOUN GROUPS are rare. However, they do occur.

The ability to recognize the HEAD NOUN in the NOUN GROUP is very important.

This is because, if the HEAD NOUN is Singular, then the VERB must be Singular.

And if the HEAD NOUN is plural, then the VERB must be Plural.

The VERB must agree with the HEAD NOUN.

Look carefully at the following examples:

The teacher of the student is……..

The teacher of the students is…….

The teachers of the student ARE…….

The teachers of the students ARE…….

Whether we use "IS" or "ARE" is determined by the HEAD NOUN. It is NOT determined by the NOUN closest to the VERB, i.e. student/s in the example above.

Exercise 6.6

Underline the SUBJECT in the following sentences. Then name each element in the NOUN GROUP as in the examples that you have already done in this section.

1. Steel melts at 600 degrees Centigrade.
2. The opposite angles of a parallelogram equal 180 degrees.
3. Parallel straight lines never meet.
4. An electric shock of 1000 volts usually causes death.
5. The magnetic needle of a compass points toward the North.
6. The mass of a metal varies with its temperature.
7. Sound has a speed of 333 m/sec.
8. The two cylinders of oxygen are 38kg, and 41kg in weight.
9. A triangle is a figure which has three straight sides.
10. The freezing point of water is zero degrees centrigrade.

Chapter 7

Verb Group

Learning outcomes

Upon the successful conclusion of **Chapter 7**, you will have to:

13. Distinguish transitive and intransitive verbs
14. Describe the position and function of the verb group in a sentence
15. Identify the constituent parts of the verb group (main verb, auxiliary, modals, negatives, and adverbs: frequency and manner).
16. Explain the meaning of a verb group in a sentence.

As mentioned at chapter 6, the SUBJECT or NOUN GROUP (NG) is one of the compulsory elements in a clause-----the other one is the VERB or VERB GROUP (VG).

The VERB GROUP in English is often very complicated. This is because it contains a lot of information, i.e. information about tense, etc.

For this reason, a large part of many English courses is concerned verbs.

Similarly, in our course, we will spend a lot of time looking at the VERB GROUP.

The VERB “BE” and “HAVE”

The verb “be” and “have” are so important in Scientific and Technical English and will explain later on.

TRANSITIVE and INTRANSITIVE VERBS

Transitive Verbs are those verbs which can take an OBJECT.

Intransitive Verbs are those verbs which cannot take an OBJECT.

Sometimes the difference between TRANSITIVE and INTRANSITIVE verb is very clear.

Some verbs, for example, can used only TRANSITIVELY and other verbs can be used only INTRANSITIVELY.

Example: raise The scientist raised the temperature of the solution.

Rise The temperature of the solution rose.

The verb “raise” MUST take an OBJECT (i.e. it is always TRANSITIVE), whereas the Verb “rise” cannot take an OBJECT (i.e.it is always INTRANSITIVE).

Many verbs can be either TRANSITIVE or INTRANSITIVE.

They may be TRANSITIVE in one sentence and INTRANSITIVE in another.

Example: (i) He studies hard INTRANS.

(ii) He studies every night INTRANS.

(iii) He studies his lecture notes carefully TRANS.

This distinction between TRANSITIVE and INTRANSITIVE verb is very important because only TRANSITIVE verb can become PASSIVE.

Note: we ONLY want you to be able to recognize and name the parts of the VERB GROUP.

7.1. The Structure

A VERB GROUP consists of at least a MAIN VERB (MV) ----this is the only compulsory element.

A part from the MAIN VERB, there may be a number of optional elements---which is by adding these optional elements, we can include more information in the VERBS GROUP.

In the following sentences, the VERB GROUP consists of only a MAIN VERB. (In the examples, the MAIN VERBS is underlined.)

This bottle contains Nitric acid.

"contains" is the MAIN VERB

Sea water corrode iron.

MV

The sun rises in the East.

MV

In Scientific and Technical English, it is very common that the VERB GROUP consist only of a MAIN VERB. However, the VERB GROUP also frequently contains a number of optional elements.

Optional elements in the Verb Group

a. AUXILIARIES (Aux)

Auxiliaries are parts of the following verbs:

"to be" am, is, are, was, were, be, been, being

"to have" has, have, had

"to do" does, do, did

The function of AUXILIARIES is to indicate both TENSE (present, past, future, etc.) and VOICE (active, passive).

To indicate TENSE and VOICE, the auxiliaries are used in various combinations before the MAIN VERB.

Note: The verbs 'to be', 'to have' and 'to do' can also be the MAIN VERB in a clause. They have other roles besides being auxiliaries.

For example:

In the following sentences, the verb 'to have' is used both as:

A MAIN VERB (example (i)) and an auxiliary (example (ii) and (iii)).

e.g. (i) The moon has a radius of 1736 km

"has" is the MAIN VERB

The student has completed the experiment.

"has" is an AUXIALIARY verb

His thesis has been published.

"has" and "been" are AUXILIARY verbs.

Similarly, the verbs 'to be' and 'to do' can be either the MAIN VERB or an AUXILIARY verb.

Exercise 7.1

Underline the VERB GROUP in the following sentences and name the parts as in the above examples, i.e. the MAIN VERB and the AUXILIARY verbs. The first example has been done for you.

The tunnel was closed 80 years ago.

Aux MV

1. Paper is made from wood.
2. In many countries, the environment is threatened by pollution.
3. Sunlight is reflected by white surfaces.
4. Many car engines are cooled by water.

5. The size of the hole in the ozone layer has been increasing over the last 10 years.
6. The oxygen balance in the atmosphere is maintained by photosynthesis.

b. MODALS (Mod)

MODALS are added to the VERB GROUP to add extra information to the VERB GROUP. At this stage, we will identify MODALS, the meaning of these MODALS at a later time.

There are three groups of MODALS in scientific English:

GROUP 1----------can, may, might, could.

These MODALS are used to express ability and probability.

Example: (i) Heat can be generated in several ways.
Mod Aux MV

"can" is a MODAL, "be" is an AUXULIARY, "generated" is the MAIN VERB.

(ii) His research may be completed next year.
Mod Aux MV

(iii) A solid can be purified by crystallization.
Mod Aux MV

GROUP 2--------will.

"will" is used for making predictions about the future.

These predictions are made when we are not fully certain but are fairly certain that some thing will happen, e.q. when we predict the result of an experiment.

Example:

(i) Scientist will find a cure for aids before 2000.

Mod MV

(ii) His research results will shock theoretical physicist.

Mod MV

(iii) The world oil supply will be exhausted by 2020

Mod Aux MV

GROUP 3-------should, must, have to.

These MODALS are used to give warning, instruction or advice.

Example:

(i) The students have to return their work on time.

Mod MV

(ii) Acids should be handled very carefully.

Mod Aux MV

(iii) The equipment must be returned to its place.

Mod Aux MV

Exercise 7.2

Underline the VERB GROUPS in the following examples and name the parts in the same way as the above examples.

1. The area of a circle can be calculated using geometry.
2. Concrete should contain at least 12% cement.
3. The impurities in the water are eliminated by a filter.
4. Fresh water can be distilled from sea water.
5. Modern aeroplanes are powered by jet engines.
6. All books should be returned to the library by Friday,
7. Distilled water does not corrode iron.
8. Object of different weights can be separated by a centrifuge.

c. NEGATIVES (Neg)

In NEGATIVE sentences, the word "not" is added to the first MODALS or the first AUXILIARY.

Examples:

(i) Distilled water does not contain impurities.
Aux + neg MV

(ii) Sea water will not affect this new alloy.
Mod+neg MV

(iii) The experiment was not conducted very carefully.
Aux + neg MV

(iv) The experiment should not have been conducted.
Mod + neg Aux Aux MV

(v) The experiment should not have to be repeated.
Mod + neg + Mod Aux MV

Exercise 7.3

Using the sentence above as an examples, underline and identify the parts of the VERB GROUPS in the following sentences.

1. Boiler pressure should not exceed 300 psi.
2. The fume of nitric acid should not be breathed.
3. Agriculture cannot be developed without sufficient water.
4. The explosion could not have been caused by a leak.
5. The ship has not been raised from the sea floor.
6. Expensive spraying programs are not required.
7. Malaria cannot be eradicated in rural areas.
8. An asteroid could not have killed the dinosaurs.

d. ADVERBS (adv)

Adverbs can be added to ADJECTIVES in the NOUN GROUP to give us more information about the ADJECTIVE.

Similarly, ADVERBS can be added to the VERB GROUP to provide extra information about the MAIN VERB.

There are many kinds of ADVERB which we can use in the VERB GROUP. Two of them are:

ADVERBS of FREQUENCY

ADVERBS of MANNER

ADVERBS of FREQUENCY

Adverb of frequency tell us how often something occurs (Active) or how often something is carried out (Passive).

The frequency can range from zero frequency to total frequency,

i.e., 0% to 100% of time.

Zero frequency is indicated by the word "NEVER" while its opposite or 100% frequency, is indicated by "ALWAYS".

Between 0% and 100% frequency, there exists a continuum of frequencies. This can be illustrated as:

0% never

Almost never

Hardly ever

Rarely

Seldom

Occasionally

Sometimes

Often

Frequently

Usually

Almost always

100% always

We can also add the word 'very' to some of the above ADVERB to get more possibilities, e.g. very rarely, very often, very frequently, etc.

In simple Tenses, ADVERBS OF FREQUENCY are placed immediately before the MAIN VERB in the VERB GROUP.

Example:

(i) Bridges are usually made of concrete.

Aux Adv MV

(ii) The needle of a compass always points North.

Adv MN

(iii) Oil is often found in limestone formations.

Aux Adv MV

If there is more than one auxiliary or modals, then the adverb of frequency is placed after the first auxiliary or modals.

(iv) The classes would usually have been completed by now

Mod Adv Aux Aux MV

In sentences (v) which are negative, the adverb is placed after "NOT".

(v) The problem would not usually have been solved so quickly.

Mod neg Adv Aux Aux MV

Exercise 7.4

Underline the VERB GROUPS in the following sentences. Then identify and name the parts of the VERB GROUP, as in the above examples.

1. Wood is usually cut with a saw.
2. Oven temperatures are usually controlled by a thermostat.
3. Dangerous experiments should always be conducted under strict supervision.
4. Difficult mathematical problems can almost always be solved using computers.
5. The hole in ozone layer will always have to have to be monitored.
6. A long thesis would not usually have been completed in such a short time.

ADVERBS of MANNER

ADVERB of MANNER tell us how/is what manner something occurs (active) or is carried out (Passive), e.g. how well, how badly, how quickly, how carefully, etc.

Unlike ADVERB OF FREQUENCY, which are placed BEFORE the main verb, adverb of manner are normally placed after the MAIN VERB.

e.q (i) The work was completed quickly.
Aux MV Adv

(ii) The research was conducted carelessly.
Aux MV Adv

If the main verb is followed by an OBJECT, then the ADVERB OF MANNER can be placed.

before the MAIN VERB (as above)

Example: (i) He quickly completed the work.
Adv MV obj

(ii) They carelessly conducted….the research.

Adv MV obj

after the OBJECT.

Example: (i) He completed the work quickly.

MV obj Adv

(ii) They conducted the research carelessly.

MV Obj Adv

Placing the adverb of manner before the MAIN VERB is preferred if the OBJECT is long (i.e. contains a lot of words).

Example:

She carefully conducted the dangerous, complex, time consuming

Adv MV

Is preferred to / better than

She conducted the dangerous, complex, time-consuming experiment carefully.

MV Adv

Adverb of Manner can also have "very" in front of them to give extra information, e.g. very quickly, very carefully, etc. (The word 'very" is also an ADVERB)

Example: She conducted the experiment very carefully.

MV Adv Adv

Exercise 7.5

Underline the verb groups in the following sentences. Then identify and name the parts of the verb group.

1. 34% of solar radiation is directly reflected back into space.
2. Long infrared waves are readily adsorbed by atmospheric carbon dioxide and water vapour.

3. The atmospheric temperatures of some regions are profoundly influenced by winds and ocean currents.
4. The difference between analog and digital data is not always clearly understood.
5. A nuclear chain reaction takes place very rapidly.
6. Molecules in a fluid do not conduct heat very well.

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