LIFEPAC®

SCIENCE

STUDENT BOOK

10th Grade | Unit 5

Alpha Omega
PUBLICATIONS

SCIENCE 1005
Plants: Green Factories

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Alpha Omega PUBLICATIONS

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Plants: Green Factories

Introduction

Plant cells are made up of incredibly complex chemical factories with thousands of compounds being manufactured to meet the needs not only of the green plants themselves but also of all other forms of life on earth.

In this LIFEPAC® you will explore more of the amazing structures and capacities of these unique organisms, which people often take for granted. Green plants are the first step in the living life support system God designed for us and our planet Earth.

In Science LIFEPAC 1001 (Taxonomy: Key to Organization) some of the general plant characteristics were introduced. You may recall some of the characteristics of plants which taxonomists use to decide if an organism is a member of the plant kingdom. You may wish to review that LIFEPAC before going into a deeper study of plants in this LIFEPAC.

A better understanding of the plant world will give us greater appreciation for God's masterpieces of greenery and a keener sensitivity to the delicate and marvelous balance of life on earth.

Our tour of the green factories will begin by asking some very basic *how* questions. Do not be surprised if you find the answers unexpectedly fascinating! How is a plant made? How do plants grow? How do plants work? How do plants make food? How do plants use energy? How are plants important to us?

Objectives

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAC. Each section will list according to the numbers below what objectives will be met in that section. When you have finished this LIFEPAC, you should be able to:

1. Describe a plant cell.
2. Name different types of plant cells and give their functions.
3. List examples of root types and functions.
4. List examples of stem types and functions.
5. List leaf types and functions.
6. List flower types.
7. List fruit types.
8. Discuss growth.
9. Distinguish between monocots and dicots.
10. Describe the process of photosynthesis.
11. Discuss protein synthesis.
12. Describe the phases of respiration.
13. Discuss the importance of plants to people.
14. List ways world food needs are being met.
15. Express an appreciation for God's purpose and design in plants.

Survey the LIFEPAC. Ask yourself some questions about this study and write your questions here.

1. HOW IS A PLANT MADE?

Too often we fail to appreciate the complexity of plants or only think of them as environmental decorations, merely ornaments. Plants do bring beauty to our everyday lives and travel adventures. However, plants do much more than merely lead the lives of plastic or silk flowers.

Obviously, all plants are not alike. A nature scene would be strange indeed if all the trees were oaks and if all the oaks had only so many leaves on so many limbs. The great diversity we see in life is a result of the greater diversity in the basic building unit, the living cell. Someone has said God's fingerprints are seen everywhere in the handiwork He has created. Nowhere is design so evident as in the microscopic world of the cell. Plant cells are among the most fascinating cells in all of life in appearance, in complexity, in function, in design—showing God's great care and wisdom in even the lowly plant. Solomon in all of his human glory was not adorned as beautifully as the lilies of the field. The Bible tells us how much more He cares for us as people, the crown of His creation. (Matthew 6:28–29; Luke 12:27)

Section Objectives

Review these objectives. When you have completed this section, you should be able to:

1. Describe a plant cell.
2. Name different types of plant cells and give their functions.
3. List examples of root types and functions.
4. List examples of stem types and functions.
5. List leaf types and functions.
6. List flower types.
7. List fruit types.

15. Express an appreciation for God's purpose and design in plants.

Vocbulary

Study these words to enhance your learning success in this section.

carpel	**cell**	**cellulose**
cell wall	**chloroplast**	**chromosome**
collenchyma	**cytoplasm**	**DNA**
energy	**epidermis**	**inflorescence**
membrane	**mitochondria**	**nucleolus**
nucleus	**parenchyma**	**petal**
phloem	**protoplasm**	**protoplast**
ribosome	**RNA**	**sclerenchyma**
sepal	**stamen**	**tissue**
vacuole	**xylem**	

Note: *All vocabulary words in this LIFEPAC appear in* **boldface** *print the first time they are used. If you are unsure of the meaning when you are reading, study the definitions given.*

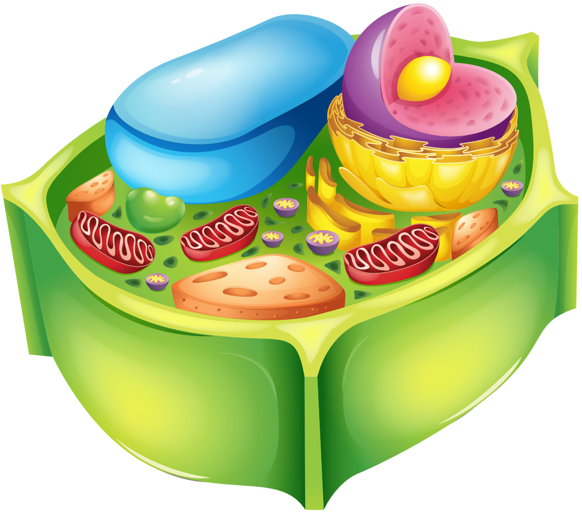
THE PLANT CELL

Plants come in many forms ranging from apparently simple one-celled algae (al' jee) to highly specialized flowering plants made up of many-celled organs. The one basic difference appears to be the number of **cells** required to enable the plant to function normally. How is it that a single-celled alga (al' gah) can carry out the activities of a flowering plant which contains millions of cells? The capacity of this microscopic unit of life known as the cell is truly tremendous.

History. Robert Hooke, an English experimental physicist, published his work on microscope improvements, *Micrographia*, in 1665. In this work Hooke coined the word "cells" to describe the tiny chambers he observed in thinly sliced sections of cork. He estimated that one cubic inch of cork contained more than 1.25 billion cells. Two German biologists. M. J. Schleiden, a botanist, and Theodore Schwann, a zoologist, proposed in 1839 that all plant and animal tissue is made up of these tiny individual cell units. This idea became known as the *cell theory of life*.

How we interpret the cell influences our view of life. The processes of inheritance, growth, development, aging, death, and disease are varied aspects of cell behavior. In a sense life could be described as an *uninterrupted succession of cells*.

Cells are similar. A remarkable fact about cells is that they are very different, yet very similar. Your own body (30 trillion or more cells) has more than one hundred different types of



| Plant Cell

cells. Whatever the organism, cells have similar characteristics.

Cells are similar in structure. All cells have an outer **membrane** or plasma membrane that controls the passage of materials into and out of the cell. Inside the membrane is a living substance called **cytoplasm** which contains a variety of tiny bodies and chemical substances. Another type of living substance inside the cell membrane is the genetic material found in the **nucleus** or **chromosomes**. The living unit of the cell is known as the **protoplast**. The living substance of the cell is referred to as the **protoplasm**. The cytoplasm and the nucleus make up the protoplasm.

Cells are similar in function. The structures found in the cell have the ability to take in **energy** and convert it into other forms. Cells have the ability to use energy to build and maintain themselves and to exchange substances between their internal environment and the outside environment. The internal environment of the cell may be quite different from the outside. Living cells may be very selective in the materials taken in or released. Cells have the ability to reproduce new cells that have the same abilities as the originals.

Cells are different. Plant cells differ from other living cells by structures, such as the **cell wall** outside the cell membrane, **vacuoles** containing cell sap and surrounded by a vacuolar membrane, and **chloroplasts** scattered in the cytoplasm.

Cell design. The cell wall is a rigid layer of **cellulose** and other substances produced by and surrounding plant cells. Whether a plant structure is flexible or rigid depends upon the nature and age of the cell walls making up that structure.

Vacuoles appear to be large empty spaces within plant cells. However, these compartments within the cytoplasm, usually larger in older plant cells, contain the watery fluid and substances known as the cell sap. Some of these substances are minerals, sugars, and dissolved protein. The cell sap of the vacuole may contain substances that are metabolic waste material and are poisonous to the cell protoplasm. Calcium oxalate and plant coloring substances, such as the anthocyanins which give the blue and red hues to plants, may be found in the vacuoles. Vacuoles serve also as reservoirs and are important in maintaining the water balance of the cell. These functions differ from the food vacuole functions of animal cells.

Bodies known as plastids are found in the cytoplasm of plants. Plastids are named for the types of pigments, or colors, they contain. Chloroplasts are green, football-shaped plastids. These tiny bodies carry out the life support system of photosynthesis. Without the energy-trapping ability of the chlorophyll pigments within the chloroplast, no life as we know it would exist on earth. The green plants are the food suppliers of all life on earth. Other plastids include the colorless leucoplasts such as those that assist in starch storage in potatoes and the orange chromoplasts that give carrots and marigolds their colors.

Complete these sentences.

1.1 The basic structural units of plants and animals are ______________________________ .

1.2 This basic structural unit was first identified and named about ______________________ years ago.

1.3 One definition of life given in this LIFEPAC is ______________________________ .

1.4 A remarkable fact about cells is ______________________________ .

Complete these lists.

1.5 List three ways plant and animal cells are similar in structure.

a. ______________________________

b. ______________________________

c. ______________________________

1.6 List three ways plant and animal cells are different in structure.

a. ____________________

b. ____________________

c. ____________________

1.7 List three ways plant and animal cells are similar in function.

a. ____________________

b. ____________________

c. ____________________

1.8 List three ways plant and animal cells are different in function.

a. ____________________

b. ____________________

c. ____________________

Explain these concepts.

1.9 Explain what is meant by the statement, "The basic difference among plant groups appears to be the number of cells required to enable the plant to function normally."

____

____

1.10 Explain what is meant by the statement, "Cells are very different, yet very similar."

____

____

____

PARTS OF THE PLANT CELL

The design, sophistication, precision, and complexity of the cell might be likened to the functioning of the most expensive, finely engineered watch. Even though each part has its own purpose, the entire works of the watch function as a single unit.

Some parts are easily seen; others may be partly or totally hidden. Studies of the cell have made it possible to prepare and to stain plant tissues so that hidden parts may be seen. Improvements in microscope engineering, including the electron microscope and the scanning electron microscope, have opened fascinating new worlds that lie within the cell.

Taking a closer look at the cell, we find evidence of an orderly creation planned by a Master Designer.

Nucleus. A very prominent body within the cell is the nucleus. The nucleus may take on different shapes and positions in the cell, but its purpose is the same. The cell headquarters and inheritance are centered in the nucleus. Cell activities are ordered and controlled by chemical messages which come from the nucleus. The inheritance units, or genes, are responsible for determining the way the cell and the entire organism will grow and develop. God selected the genes within the **DNA** (deoxyribonucleic acid) molecular structure to provide the blueprint for inheritance of cells and organisms. The genes are carried as part of the DNA molecules making up chromosomes. Chromosomes are observable as thread-like objects in the nucleus and change in size and shape at different stages of cell development. A constant number of chromosomes is always in each cell of a particular species of plant or animal. Each body cell of a corn plant has twenty chromosomes, a potato plant has forty-eight, a sugar cane plant has eighty, and a human body cell has forty-six chromosomes.

Within the nucleus another smaller, darker body called a **nucleolus** is sometimes visible. One or more of these nucleoli (singular, nucleolus) may be observed in a nucleus. The nucleolus is a concentration of nucleic acid, **RNA** (ribonucleic acid), which is important in carrying chemical messages from the DNA of the nucleus to other bodies in the cytoplasm where proteins are made. The amount and types of protein made in the cytoplasm help to decide what kind of cell a cell will be. The nucleolus occurs in plants and animals. Other names and functions are given to different types of nuclear bodies found in animals and humans.

Cytoplasm. The cytoplasm is a mixture of suspended bodies carried in a liquid phase. Many chemical reactions necessary for life take place in the cytoplasm. The cytoplasm is the most important part of the cell for carrying out *life activities*. The cytoplasm is protoplasm that surrounds the nucleus.

Some of the tiny bodies found in the cytoplasm are quite interesting. Many of the discoveries concerning these tiny bodies or organelles are as new as the electron microscope. New bodies, new discoveries, and new understandings continue to come from today's cell research. Some of the cytoplasmic bodies are the

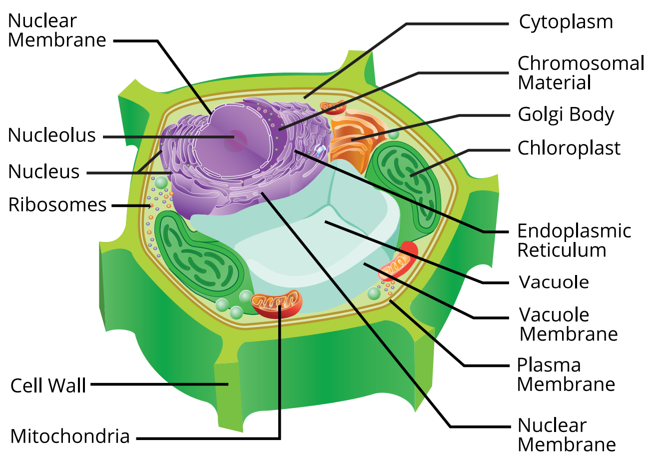


Figure 1 | Parts of a Plant Cell

chloroplasts, **mitochondria**, endoplasmic reticulum, **ribosomes**, and *Golgi bodies*. The phrase "simple cell" becomes less meaningful and even incorrect as we learn more and more of the complexities of life within the cell.

Chloroplasts are distinctive cytoplasmic bodies found only in green plants, and are responsible for photosynthesis. The tiny disk-shaped bodies may number more than fifty in a single leaf cell. Scientists estimate that half a million chloroplasts may be found in a square millimeter of a leaf cell. The electron microscope has photographed even smaller structures within the chloroplast. Stacks of coin-like membrane structures called grana (singular, granum) are connected in the photosynthetic system. The chlorophyll is found in the grana. The substance found around the grana is referred to as stroma. Each chloroplast is surrounded by an outer membrane. Additional smaller structures have been reported, but their functions in photosynthesis are not yet known.

Minute rod-shaped bodies found in the cytoplasm were reported around 1900. The design and function of these bodies known as mitochondria (singular, mitochondrion) was not discovered until use of the electron microscope was possible. Cellular energy for use by, and within, the cell is made available by the mitochondria. All cell activities and life functions are dependent on the working of mitochondria. Food molecules are broken down to form molecules of ATP (adenosine triphosphate), a chemical form of energy which can be directly used for life activities. Mitochondria vary in shape, are smaller than chloroplasts, and are just visible with the light microscope. The inner membranes of the mitochondria are folded inward forming cristae. The many shelf-like cristae increase the surface area of each mitochondrion allowing for greater energy production. An outer membrane encloses the mitochondrion body. More mitochondria are found in cells with higher energy requirements or in parts of cells where many energy-requiring activities are occurring.

The endoplasmic reticulum is a system of membranes that both provides channels for transport and divides the cytoplasm into compartments. The endoplasmic reticulum appears to be a cell communication system for chemical messages and to be a factory in association with ribosomes for life processes.

Ribosomes are tiny, round bodies that may be attached to the endoplasmic reticulum or scattered in the cytoplasm. Ribosomes have the important function of assembling proteins from amino acids.

Golgi bodies (collectively known as the Golgi apparatus of the cell) are groups of flattened membrane sacs and tubes. Golgi bodies are thought to be centers for collecting and packaging cell-building materials and enzymes. Construction of the cell wall may be a function of Golgi bodies, and the secretion and storage of high-energy compounds may be another function.

A feature distinguishing plant cells from animals cells is the cell wall. In older tissues the cell wall becomes rigid and durable and provides support for the plant body. Both plants and animals have cellular membranes surrounding the cells, but animals have skeletons for body support, and plants have cell walls. The cell wall gives shape and texture to plant cells and **tissues**. Thus, the cell wall is the plant feature that makes a plant a plant. In addition to providing support, the cell wall must allow for movement of water from cell to cell. The wall varies in construction from plant to plant and often within the same plant at different locations. The cotton fiber, for example, is a single cell with a many-layered cell wall arranged in an overlapping fashion. The resulting construction is somewhat like plywood and is amazingly strong. Some of the highest quality cotton fibers withstand breaking pressures of more than one hundred thousand pounds per square inch.

The cell contents described give a better picture of how God gives attention to even the finest detail and balance in the tiniest life structures. In the Psalms, David's exclamation of praise for God's overwhelming knowledge and wisdom is recorded again and again. Truly we are "fearfully and wonderfully made" as the Scriptures say. The design is amazing, but the working associations of all these cellular and molecular structures are even more incredible. Scientists are only beginning to understand this remarkable unit of life we call the cell.

Complete these activities.

1.11 Describe the structure and function of each of the following cell parts.

a. nucleus: ______________________________

____

b. nucleolus: ______________________________

____

c. chromosome: ______________________________

____

d. cytoplasm: ______________________________

____

e. mitochondria: ______________________________

____

f. chloroplast: ______________________________

____

g. endoplasmic reticulum: ______________________________

____

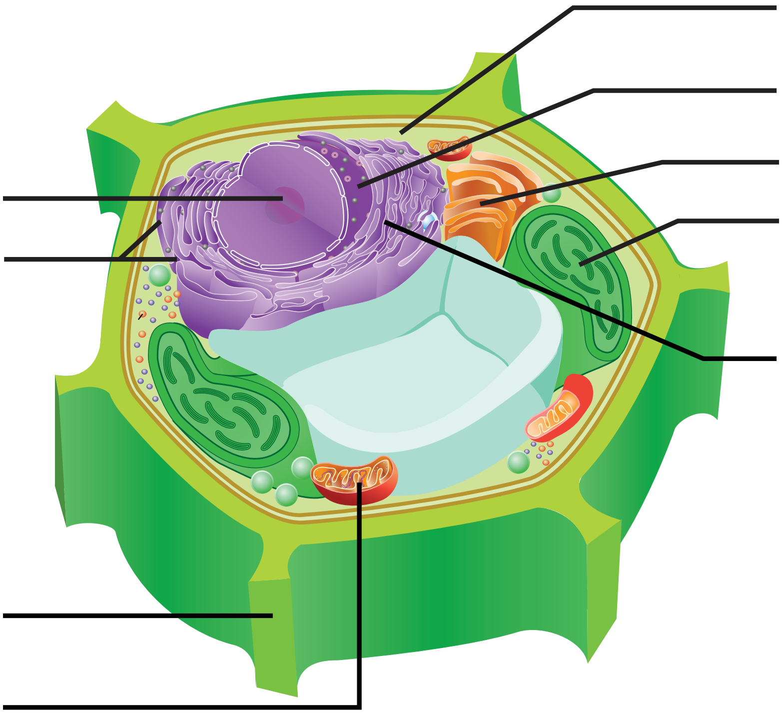
h. Golgi bodies: ______________________________

____

i. cell wall: ______________________________

____

1.12 Label the following diagram with these cell parts described in 1.11.



1.13 Obtain or make a box at least a foot square or larger with one open side. Using thread or wire, suspend cytoplasmic and nuclear structures mentioned in the LIFEPAC. Make these cell parts from construction paper, styrofoam, or other materials. Use the cell diagram for guidelines. Label each part in a scale drawing accompanying your project.

TEACHER CHECK ______ initials ______ date

ANATOMY AND MORPHOLOGY OF THE PLANT

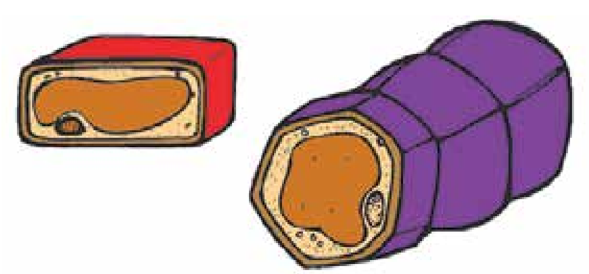
In this section you will study cells, tissues, and the internal design of plants—anatomy—and the outward appearance and characteristics of plants—morphology.

Cells and tissues. In the plant science of horticulture, cuttings are commonly used to propagate many house plants and a number of garden and orchard plants. Research has shown that one individual cell has the potential to develop into the entire plant. The cell propagation method known as *tissue culture* has been extremely valuable in plant research. A "mass" of cells from practically any part of a plant can, under the proper conditions, develop into a new plant with the same genetic inheritance as the parent plant. The cells taken from a plant are grown by using a special nutrient medium in a similar way to growing bacteria. The cells will first begin to increase in number by simple cell division. Gradually cells of different kinds will begin to form and a tiny leaf will take shape and begin to turn green if provided with light. More leaves, a stem, roots, and eventually a complete plant will form, ready to grow under normal conditions. Each of these tissue cultures of plants is a carbon copy of the parent plant just as a cutting would be. However, in the case of tissue cultures only a single cell or small portion of cells is necessary for growth of the new plants.

Scientists have discovered that only a portion of a plant is not sufficient to function as a whole plant. More cells and parts are needed. Miraculously the Creator has coded within the nucleus the messages needed to produce the different types of cells and tissues necessary to make a growing living plant of each specific kind. More than one type of cell is essential. These different types of cells make up tissues, tissues make up organs, and organs make up systems within living things.

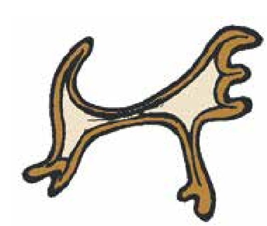
Simple tissues. Cell tissue is simply the grouping together of a mass of cells to form some characteristic part of the plant body. Different tissues can be identified by the types of cells making up the tissue and the function of the cells in that specific tissue. The major portion of most fruit and flowers is a simple tissue called **parenchyma** (pah reng' ki mah). This tissue is characterized by cells with thin primary cell walls, a thin layer of cytoplasm, and a large vacuole. Parenchyma cells make up parenchyma tissue. Parenchyma cells vary in shape but are generally isodiametric (i.e., having the same diameter in each direction). Parenchyma tissue primarily serves the purpose of food and water storage. The potato tuber, an enlarged underground stem, is composed mainly of starch-storing parenchyma tissue. Parenchyma is the most common type of cell encountered in the plant body.

Complex tissues. Parenchyma cells may occur only with other parenchyma cells to form a *simple tissue*. However, if more than



| Parenchyma

| Collenchyma



| Sclereid

one cell type is found, the tissue is described as a *complex tissue*. **Collenchyma** and **sclerenchyma** are examples of simple tissues. The **epidermis**, **phloem**, and **xylem** are complex tissues.

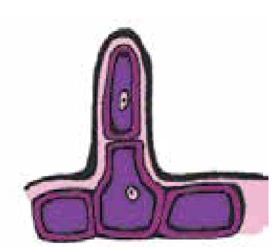
Collenchyma (kah leng' kah mah) tissue commonly occurs underneath the epidermis. Collenchyma tissue cells have thick, flexible walls and glisten when viewed under the microscope. This tissue is important to the support of young, growing plants. A good place to observe collenchyma is in the ribs of celery stalks.

Sclerenchyma (sklah reng' kah mah) tissue may occur in many parts of the plant body. Sclerenchyma cells, such as sclereids, have thick cell walls and are important for support and strength of older plants. The hard, thickened cell walls are left after the protoplasts of these cells have dried up. Another type of sclerenchyma is the fiber, a long tapered cell.

The outermost layer of cells of the young plant body is the epidermis. This complex tissue may be composed of epidermal cells, guard cells, and epidermal hairs. The epidermis may be one or more layers thick. Multiple layers are usually found in plants with water storage characteristics, such as desert plants like oleanders. Outside of the epidermis is found a waxy layer of cuticle.

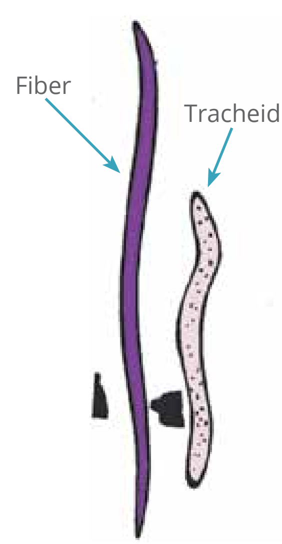
Another complex tissue is the phloem (floa' um). The phloem is the conducting tissue for food in plants. Distinctive cells of the phloem are the sieve-tube members and companion cells. Other cells which may be part of the phloem tissue are parenchyma and sclerenchyma. Sieve-tube members are the cells which make up the sieve tubes, or food-conducting tubes. The companion cells are closely associated with the sieve-tube members and assist with secretion and removal of materials from the sieve-tube members. Phloem forms part of the conductive or vascular system throughout the plant body. The phloem in the leaves conducts food materials for nutrition and storage through sieve-tube members to the stem and root. When materials are recalled from storage, the sieve-tube members serve as the conducting tissue for this process.

The xylem is another complex tissue important in water and mineral transport in plants. Distinctive cells of the xylem are the tracheids and vessel members. Other cells that may be a part of the xylem tissue are parenchyma and sclerenchyma. Tracheids and vessel members make up the long water conducting tubes or vessels in the plant. The water moves through pits in the overlapping ends of these elongated cells. Xylem tissues conduct water absorbed by the roots and transport it to the stem, leaves, and all body parts where life activities are occurring.

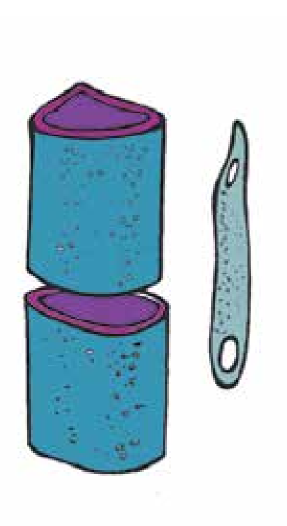


| Epidermal Cells

| Sieve-Tube Members with Companion Cells



| Tracheid



| Vessel Members

Complete these sentences.

1.14 A mass of like cells makes up a ______________________________ .

1.15 A mass of cells with more than one cell type make up a __________________________ .

1.16 A research method known as ______________________________ has shown that one individual cell has the potential to develop into a whole plant.

1.17 Probably the most common cell making up the bulk of the plant body is _____________________ .

1.18 The water-conducting tissue is called the __________________________ .

1.19 The food-conducting tissue is called __________________________ .

1.20 The outermost layer of cells of a plant body is __________________________ .

1.21 The oblong support cells in young green stems or leaf stalks are _____________________________ .

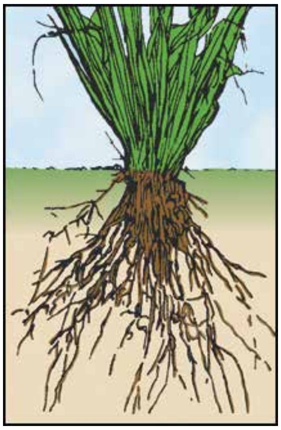
1.22 The thick-walled cells important for support in older plant tissues are ________________________ .

We have considered the plant cell as the unit of life for all plants. We have seen how cells make up tissues with specific structures and functions of plants. We shall begin to see how the cells not only are building blocks but also are puzzle pieces that join to make the plant organs and entire plant in a way for each plant to become a distinctive living organism.

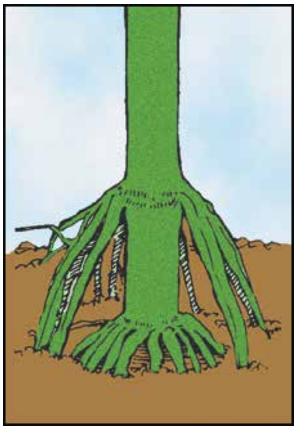
Five plant organs are important to study in relationship to green plants. These plant organs are roots, stems, leaves, flowers, and fruit. A very practical way to think about roots, stems, and leaves is in terms of eating. One of the five food groups for a healthful diet is the vegetable group. Some of the most commonly eaten fruits and vegetables are called one thing, but are biologically something else. You will see what is meant by this statement as you study this section of your LIFEPAC. What makes a root a root, a stem a stem, and so on? You may be quite surprised with the answer.

Roots. Usually we think of roots as being the underground portion of the plant which serves to anchor the plant body and to absorb water and minerals. Two other functions of the roots are storage of food and conduction of

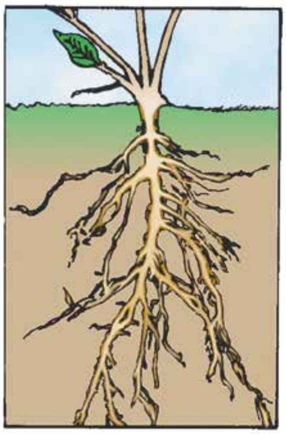
| Plant root



| Fibrous Root (Grass)



| Adventitious Prop Roots (Corn)



| Taproot (Dandelion)

the water and minerals to other plant parts. Absorbed substances move and are moved into the xylem for transport to the stems and leaves.

Two types of root systems are the taproot and fibrous root. The taproot is generally a deeper root system with a long root growing downward and branch roots growing outward from various parts of the taproot. Roots may grow quite deep under unusual circumstances. A wild fig tree in Africa has a reported root depth of 120 meters. Alfalfa and creosote taproots grow deeply into the soil, but most of the feeding roots lie within the first 15 centimeters of soil. The spread of roots around a plant is usually greater than the depth roots grow.

In grass or lily-type plants the primary root lives only a short while. As a result a fibrous root system arises from the stem above the old withered root. Roots that develop from stems instead of root tissues are termed *adventitious* roots. Each root of an adventitious, fibrous system is similar in appearance with none conspicuously larger than any others. Such roots make good ground cover to help prevent soil erosion. Fibrous root systems tend to be shallow but cling tightly to soil particles. Corn roots may be spread as much as a meter around the plant but only grow about one and one-half meters deep.

Stems. The main functions of stems are to support the plant body and leaves and to conduct food, water, and minerals to other plant parts. Stems come in many forms, from the delicate transparent stem of jewelweed (*Impatiens*) to the thorny stems of the rose (*Rosa*) to the mighty trunks of the oak (*Quercus*). There are other interesting variations of stem appearance and functions. Grape (*Vitis*) stems have modified stems called *tendrils* that coil around objects to help support this vine-like climbing plant. The green stems of cactus plants (*Opuntia*) are really photosynthetic stems. Cactus spines are modified leaves. Stems of some succulent plants are thick, fleshy, water-storing organs that aid survival in dry, hot, desert conditions. Potato (*Solanum*) tubers are underground stems that are enlarged, fleshy food storage stems.

Leaves. Leaves are the primary site for photosynthesis in green plants. Along with photosynthesis, oxygen, and carbon dioxide, exchange occurs between the internal and external environment of a plant. Leaves come in many forms—the broad, flat, thin, green leaves of a cottonwood tree; the long, narrow, keel-shaped bluegrass leaves; or the somewhat thickened, narrow, triangular leaves (needles) of the pine tree. Leaf characteristics help us to determine something about the ecological type of the plant. The three basic ecological types are hydrophytes (hie' dro fites), plants that grow

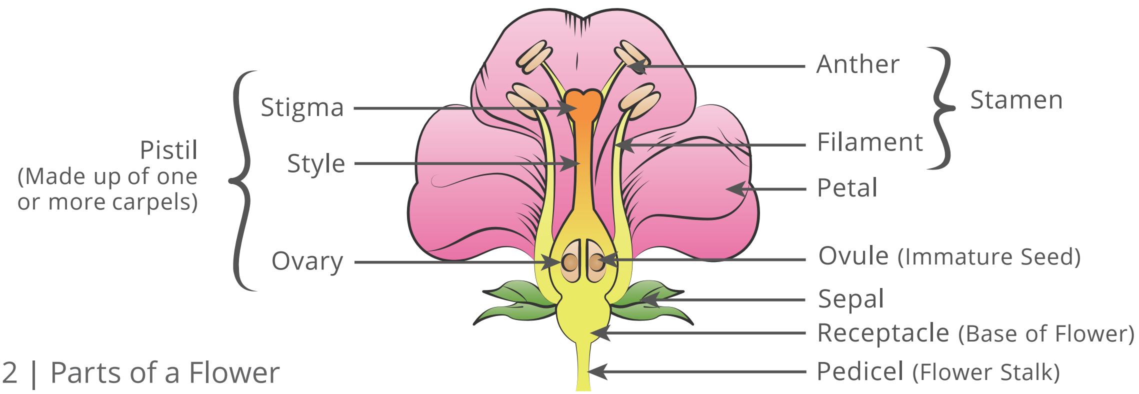


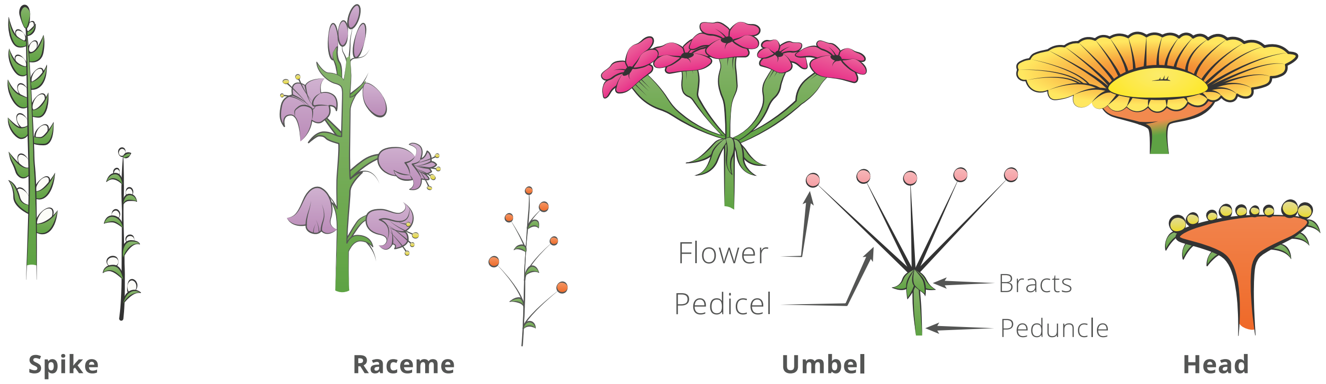
Figure 2 | Parts of a Flower

in a water habitat; mesophytes (mes' o fites), plants that grow in habitats that are neither too wet nor too dry; and xerophytes (zir' o fites), plants that grow in dry habitats.

Flowers. Flowers are reproductive organs of plants, and the center of seed production. Many interesting ecological relationships exist between the flowers of certain plants and specific pollinating insects, birds, or bats. Some of the most delicate beauty of all creation is given to the flowers. Flower parts consist of (1) the **sepals** (collectively, the *calyx*), which are the outermost whorl of appendages; (2) the **petals** (collectively, the *corolla*), which are interior to the sepals; (3) the **stamens** (collectively, the *androecium*), which are interior to the petals; and (4) the **carpels** (collectively, the *gynoecium*), which are interior to the stamens. The way flower parts are attached or arranged helps a taxonomist decide to which family a plant may belong. Common flowers may be divided into three basic types: hypogynous, perigynous, and epigynous.

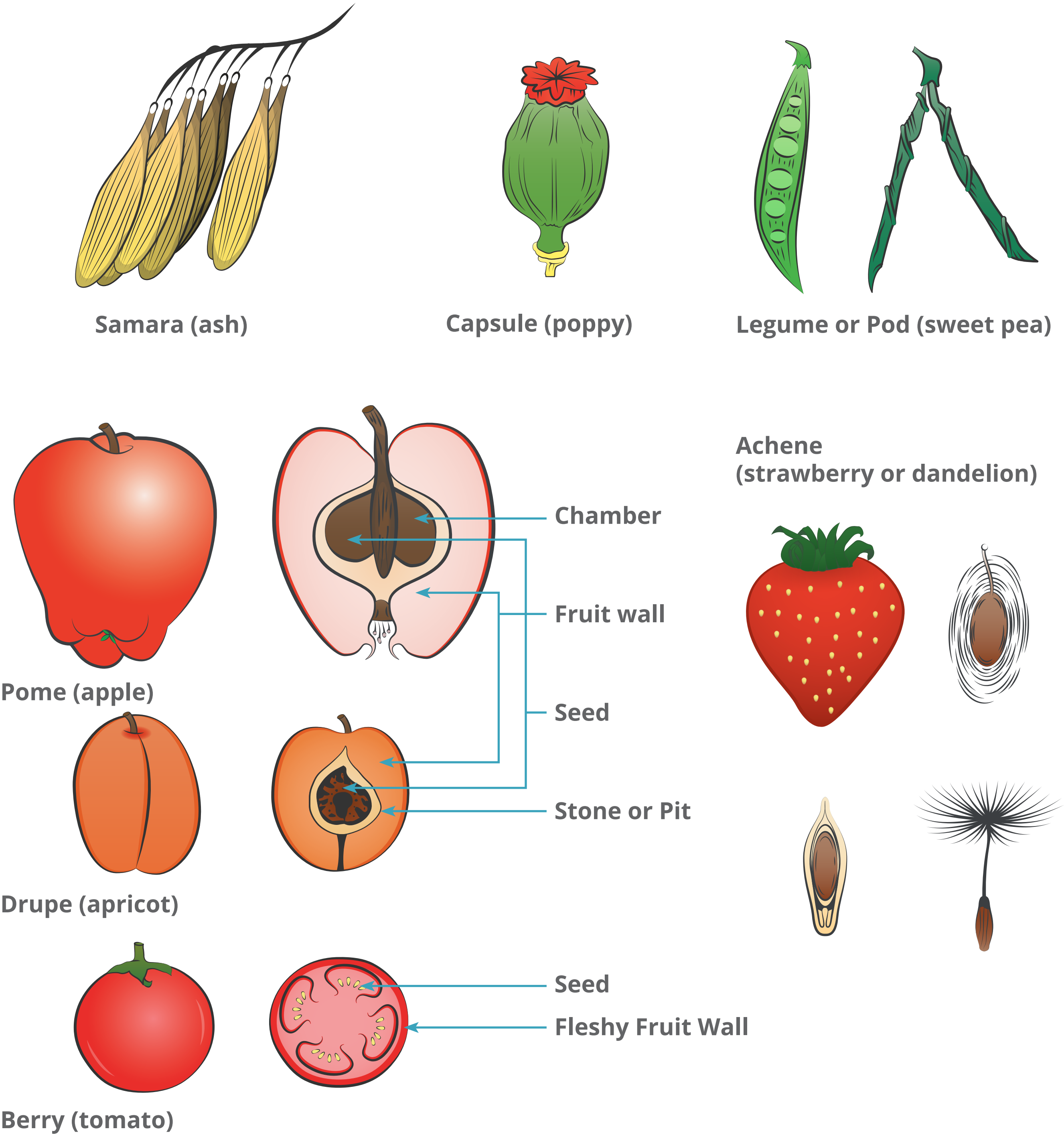
Flowers may occur singly or in groups. Flower clusters are termed inflorescences. Common inflorescences are the spike, raceme, umbel, and head. Note the pattern for attachment in each type of inflorescences.

| Types of Flowers



| Common Types of Inflorescences

Fruit. The definition of fruit is a matured flower ovary. Fruit usually contains seeds. Other flower parts are considered part of the fruit if, at maturity, they are fused to the ripened ovary. Just as flowers often have interesting and unusual pollinator relationships, fruits have unusual agents of dispersal. Fruits are classified by such characteristics as dry or fleshy; dehiscent or indehiscent; and simple, multiple, or aggregate.



| Types of Fruit

Complete these sentences.

1.23 Two main functions of roots are a. ______________________ and b. ______________________ .

1.24 Two main functions of stems are a. ______________________ and b. ______________________ .

1.25 Two main functions of leaves are a. ______________________ and b. ______________________ .

List in proper order.

1.26 These terms are units of organization of body structure.
List in order from smallest to largest:

organs cells systems tissues.

a. _______________ b. _______________ c. _______________ d. _______________

Make some diagrams. Use additional references as necessary.

1.27 Sketch and label five types of plant cells.

1.28 Sketch and label three types of inflorescences with plant name examples.

1.29 Sketch and label four types of fruit and give examples for each.

Review the material in this section in preparation for the Self Test. The Self Test will check your mastery of this particular section. The items missed on this Self Test will indicate specific areas where restudy is needed for mastery.

SELF TEST 1

Match these items (each answer, 2 points).

1.01	________	DNA	a.	body that releases energy from foods
1.02	________	mitochondria	b.	cell headquarters
1.03	________	chloroplast	c.	contains cell sap
1.04	________	nucleus	d.	genes are made of this substance
1.05	________	cell wall	e.	layers of cellulose outside the cell
			f.	food-making body

Answer true or false (each answer, 1 point).

1.06 ____________ Plant cells are miniature factories that make thousands of chemical compounds for themselves and the whole world.

1.07 ____________ God's great care for life on earth is shown in the intricate detail and beauty in even microscopic life.

1.08 ____________ The main difference among plants is size—trees, shrubs, herbs.

1.09 ____________ One definition of life is an uninterrupted succession of cells.

1.010 ____________ Between five and ten different types of cells are in the human body.

1.011 ____________ Cell activities are controlled by chemical messengers from the vacuole.

1.012 ____________ A simple cell is a good description since most cells are so small and influence so little in life.

1.013 ____________ The bodies that break down food molecules to form DNA are the ribosomes.

1.014 ____________ The cell communication system for chemical messages and materials is thought to be the membrane system known as endoplasmic reticulum.

1.015 ____________ One reason plants do not move is the rigid walls of the cells.

Complete these sentences (each answer, 3 points).

1.016 Tiny chambers were first observed and described from microscope observations by a man named ______________________ .

1.017 He (the man in 1.016) called the tiny cork chambers he observed _______________________ .

1.018 The statement, "All plant and animal tissue is made up of tiny units," is known as the _____________________________________ .

1.019 Cells are divided into two living parts, the a. ____ and the b. _____________________________________ .

1.020 A part of the plant cell that may contain crystals or poisons harmful to living protoplasm is the _________________________ .

1.021 Potato tuber cells have leucoplasts which help ______________________ .

1.022 The orange color of carrot roots and of marigold flowers comes from cell bodies known as ____________________________ .

1.023 The thread-like objects in the nucleus are the a. ______________________________ and carry the b. _______________________________________ of inheritance.

1.024 Chloroplasts contain a green substance called ___________________________ .

1.025 The _________________________ is a dot or smaller dark body containing RNA in the nucleus.

1.026 The function of ribosomes is ____ .

Answer these questions (each answer, 5 points).

1.027 What are three ways plant cells differ from animal and human cells?

a. ____

b. ____

c. ____

1.028 What are two ways plant cells are like animal and human cells?

a. ____

b. ____

1.029 What is the problem of describing the unit of life as "a simple cell"?

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1.030 What are three cell activities associated with a cell body, or organelle? Describe the activity, and name the cell body associated with it.

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1.031 What is meant by the phrase "plants are green factories"?

____

____

____

Match these items (each answer, 2 points).

1.032 ________ root

1.033 ________ stem

1.034 ________ leaf

1.035 ________ flower

1.036 ________ fruit

a. support of leaves

b. absorption

c. seed dispersal

d. food-making

e. seed production

f. energy release from food

87/109	SCORE ____________	TEACHER ____________ initials	____________ date

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