

507



SCIENCE
507

Date: _____

Name: _____

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SCIENCE 507

OBJECTIVES

1. Learn the basic parts and purpose of vascular plants
2. Learn about the parts of a plant that are involved in photosynthesis
3. Know the elements needed in and the process of photosynthesis
4. Learn and compare the life cycles of plants, animals, and insects
5. Know the definition of the vocabulary words

Vocabulary Words to Know

On a separate sheet of paper write the vocabulary words and use them in a sentence.

Teacher Initials

-  **Amphibian** (ăm-fīb'ē-ən)- cold-blooded animal that has a backbone
-  **Angiosperm** (ăn'jē-ə-spûrm')- plant that produces seeds mostly in the ovaries of flowers
-  **Chlorophyll**- the substance in the chloroplasts that gives green plants their color and enables plants to carry out photosynthesis
-  **Chloroplast**- the part of a plant cell that contains chlorophyll
-  **Cortex**- fleshy part of a plant
-  **Cuticle**- the waxy coating on leaves that prevents dehydration
-  **Epidermis** (ěp'ī-dûr'mīs)- the outer layer of cells on a living thing; skin
-  **Geotropism** (jē-őt'rə-pīz'əm)- the response of a plant to gravity
-  **Ground tissues**- parts of a plant that do not help transport materials in a plant
-  **Gymnosperm** (jīm'nə-spûrm')- a plant that produces seeds that are exposed to air and are grown mostly in cones
-  **Hydrotropism** (hī-dröt'rə-pīz'əm)- the response of a plant to water
-  **Life cycle**- the different stages of life that an organism goes through
-  **Merciful**- showing kindness when dealing with others
-  **Phloem** (flō'ěm')- the vascular tissues that carry dissolved food from the leaves to the rest of the plant
-  **Phototropism** (fō'tō-trō'pīz'əm)- the response of a plant to light
-  **Stele** (stē'lē)- the central core of a vascular plant that holds the vascular tissues

📖 **Stoma**- a pore on a leaf or stem that allows gases and water vapor to enter and exit the leaf

📖 **Vascular tissues**- parts of a plant that help with the transport of minerals and water in the plant

📖 **Xylem** (zī'ləm)- the vascular tissues that carry water and minerals from the ground to the leaves

Experiment: Plants and Sunlight

Directions: You are going to pick out the things you need and write instructions for this experiment so that anyone can follow them. You will draw a hypothesis and work to prove or disprove that hypothesis. A hypothesis is a guess based on what you know. Fill in the areas that are provided. You will need to take measurements and create a line graph and bar graph on graph paper.

Here is the subject that you will be investigating:

Do plants grow more quickly with sunlight or without sunlight?

Read the question above. What do you think will happen? Write a hypothesis based on what you think will happen. _____

What things you will need to prove or disprove your hypothesis? Start from scratch. Do not use existing plants. _____

Write instructions that you will follow and that others can follow. _____

Start your experiment and follow your instructions. You will need to take measurements after chapter 1. Make sure that you have appropriate measuring instruments.

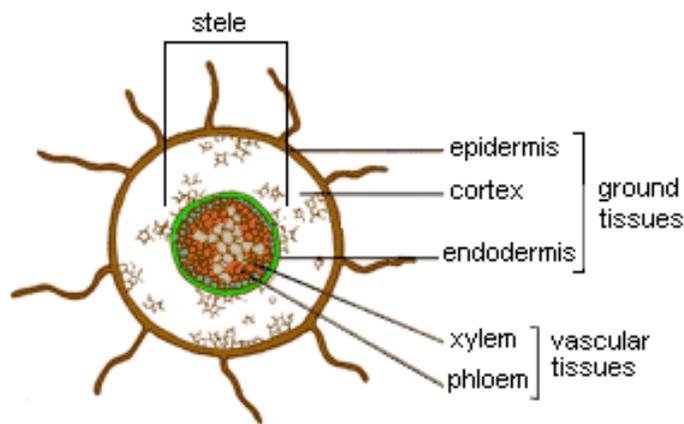
Chapter 1: Vascular Plants

In Unit 505 you learned about the circulatory system in humans. Well, plants also have a circulatory system. In this chapter you will learn about the circulatory system in plants.

Section 1: The Parts of a Vascular Plant

You know that you have arteries and veins that transport nutrients throughout your body, but did you know that most plants have something similar? Plants that live on land need a way to transport minerals and fluids throughout the plant. These plants are called vascular plants because of their special liquid carrying systems.

Most plants are vascular plants. Vascular plants have two main kinds of tissues called **vascular tissues** and **ground tissues**. The **vascular tissues** are found in the **stele**, which is the central core of a plant. The **vascular tissues** include all the different tubes and tissues that help transport materials throughout the plant. **Xylem** and **phloem** are **vascular tissues**. **Ground tissues** are all the other tissues that do not help with the transport of materials.



Lets start at the bottom of a plant. The roots have special hairs that absorb water and minerals into the root. If you were able to look inside a root, you would see groups of special tubes called vascular bundles. These vascular bundles carry liquids called sap through the plant.

There are two kinds of vascular bundles: the **xylem** and the **phloem**. The **xylem** carries water and minerals from the ground to the leaves of the plant. The **phloem** carries dissolved food from the leaves to the rest of the plant. These two systems work together to keep the plant fed and healthy.

Simple Experiment: Observing Vascular Tissues

You will need: one stalk of fresh of celery

- Food coloring
- Water
- Knife
- Glass jar
- Magnifying glass

Instructions: First, ask your parents or teacher for permission to do this experiment and use a knife.

Parent or Teacher Initials

Next, fill the jar with cold water. Cut three stems from the stalk of celery and place the cut ends in the water until they freshen-about an hour.

Then put some food coloring into the water that the celery stems are sitting in. Let the celery sit for several hours in the colored water.

After the celery has sat for several hours in the food coloring, take one stem out and cut it into short lengths. About how far did the food coloring travel up the celery stem? _____

Next take another stem out and remove several of the fibers. Examine them with the magnifying glass. Describe what they look like below.

Let the third stem sit in the food coloring. How long does it take for the food coloring to reach the leaves? _____

Teacher Initials

Answer the following questions without looking back.

1. Plants that have special systems to transport water and minerals throughout the plant are called _____.
2. Most plants are _____ plants.
3. What two main kinds of tissues do vascular plants have? _____

4. Where are vascular tissues found? _____
5. What is the stele? _____

6. _____ and _____ are vascular tissues.
7. _____ True or False? Ground tissues help with the transport of material in a vascular plant.
8. What do roots have that absorb water and minerals from the soil into the root? _____
9. If you look inside a root, you would see groups of tubes called _____
_____.
10. Vascular bundles carry liquids called _____ throughout the plant.
11. What kind of vascular bundles carry food away from the leaves? _____

12. What kind of vascular bundles carry water and minerals to the leaves? _____

Stop and Score Questions 1-12.

Score Correct Rescore



Merciful



Look up the definition of merciful in the dictionary. Write the definition below.

Now use a thesaurus and look up four synonyms of merciful. Write them below.

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

Teacher Initials

Section 2: Angiosperms and Gymnosperms

Now that you know the basic parts of vascular plants, let's learn more.

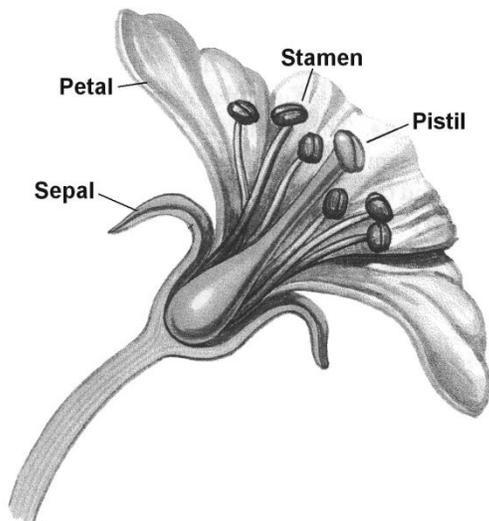
All vascular plants can be classified by how they produce seeds.

Angiosperms are plants that produce seeds mostly in the ovaries of flowers. **Angiosperms** include agricultural crops, garden flowers, broad leaf shrubs, trees, and most weeds.

Gymnosperms produce seeds that are exposed to air and are grown mostly in cones. All **gymnosperms** are pollinated by wind and include palms, conifers, and ginkgoes.

Let's review the parts of a flower and how they reproduce.

Angiosperm Reproduction



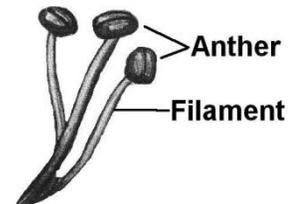
The purpose of a flower is to produce seeds for the plant.

To do this, most flowers have four main parts: the sepal, petal, stamen and pistil. The sepal is the part of the flower that encloses and protects the flower while it is still a bud. The petals are next. The petals help attract insects and birds.

This is important

because the insects and birds help to pollinate the flower. The third main part of a flower is the stamen. The stamen makes pollen. The pistil is the last and most important part. The pistil is the part of

the flower that has undeveloped seeds in the enlarged area at the base.



Now that you know which parts of the flower produce seeds and pollen, how does the pollen get to the seeds so that new plants will grow? This is where pollinators come in. As insects are searching for nectar, they brush against the stamens. The insect picks up the pollen on their bodies and when they visit the next flower, the pollen is brushed off onto

the stigma of the pistil. This process is called pollination. After the flower is pollinated, tiny sperm cells in the pollen fertilize, or unite with, the undeveloped seeds in the ovary. Now the seeds can grow into new plants. This whole process is how **angiosperms** reproduce.

Gymnosperm Reproduction



You learned that **gymnosperms** produce their seeds in cones. But how are the seeds pollinated? Well, most **gymnosperms** produce two kinds of cones: one with seeds and one with pollen. The wind blows the pollen from the pollen cone to the seeds of the seed cone. Because of this, **gymnosperms** are said to be wind pollinated. The pollen cones drop from the tree after all the pollen is blown away.

Answer the following questions without looking back.

13. What are angiosperms? _____

14. What are gymnosperms? _____

15. How are all gymnosperms pollinated? _____

16. What is the purpose of flowers? _____

17. Gymnosperms produce seeds in _____.

18. Where is pollen produced by gymnosperms? _____

19. What happens when all of the pollen that a gymnosperm has made is blown away? _____

20. List the four main parts of a flower.

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

21. Which part of a flower attracts insects? _____

22. Which part of a flower protects the flower while it is a bud? _____

23. Which part of a flower makes pollen? _____

24. Which part of a flower has undeveloped seeds? _____

25. List the four main parts of the pistil.

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

26. List the two main parts of the stamen.

1. _____
2. _____

Stop and Score Questions 13-26.

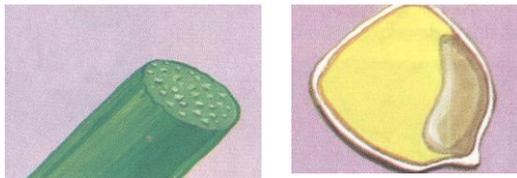
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Section 3: Monocots, Dicots, and Plant Movement

Monocots and Dicots

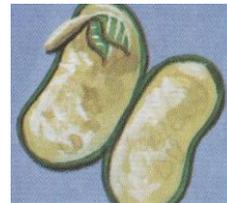
You know that vascular plants can be classified as **angiosperms** and **gymnosperms**, however there is another way of classifying vascular plants. Vascular plants can be classified by their seed and leaf structure. Dicotyledons or dicots are plants whose seeds have two parts. Monocotyledons or monocots are plants whose seeds have one part. You can see below the comparison of monocots and dicots. Monocots have one seed part while dicots have two. The leaves of monocots have parallel veins while the leaves of dicots have net-like veins. The flower petals of monocots come in multiples of three while the petals of dicots come in multiples of four or five. The vascular bundles of monocots are scattered through out the stem while in dicots the vascular bundles form a circle.

Monocots



Did you know?

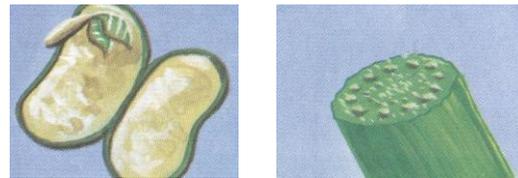
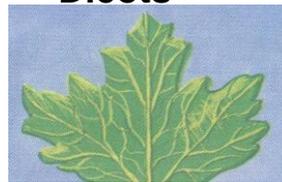
Di is a prefix that means two. Di-cotyledon means two cotyledons.



Mono is a prefix that means one. Mono-cotyledon means one cotyledon.



Dicots

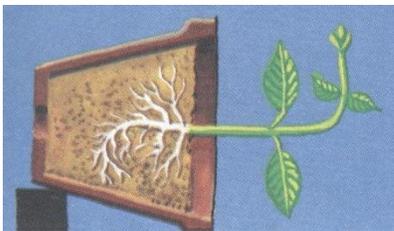


Plant Movement

You have learned so much about plants. You have learned the difference between monocots and dicots. You have also learned the difference between **angiosperms** and **gymnosperms** and the different parts of the vascular plant. Now let's learn about plant movement.

Plants can move. Not like you can by walking around. Plant movements are very slow but they can respond to their surroundings and change the direction they are facing and the direction their roots grow. This bending movement made by plants is called tropism.

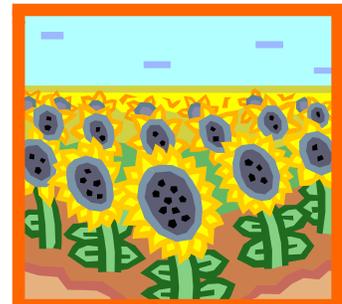
Plants move because of environmental conditions or stimuli affect their growth. Some stimuli attract plants and some repel them. Three major stimuli of tropism are water, gravity and light.



The response of a plant to gravity is called **geotropism**. You can see this if you take a houseplant, cover the pot with cardboard to hold the dirt in place, and turn it on its side. The roots will start to grow down and the plant will start to grow up. Have you ever seen a tree growing out of the side of a cliff? That is a perfect example of **geotropism**.

The response of a plant to water is called **hydrotropism**. The roots of a plant will grow in the direction of water. Sometimes, **hydrotropism** is a stronger stimulus to plants than **geotropism**.

The response of a plant to light is called **phototropism**. Sunflowers are good examples of **phototropism**. Sunflowers will always face the sun so as the sun moves across the sky, sunflowers will turn to face it. This means that the sunflowers will face east in the morning and west at night.



Answer the following questions without looking back.

27. Vascular plants can be classified by their _____ and _____ structure.
28. _____ or _____ are plants whose seeds have two parts.
29. _____ or _____ are plants whose seeds have one part.
30. What does the prefix mono mean? _____
31. What does the prefix di mean? _____
32. The bending movement of plants is called _____.
33. Plants move because _____
or _____ affect their growth.
34. What is geotropism? _____

35. What is hydrotropism? _____

36. What is phototropism? _____

Classify the following as dicots or monocots.

37. Leaves have parallel veins. _____
38. Flower petals come in multiples of four or five. _____

39. Seeds have two parts. _____
40. Vascular bundles are scattered. _____
41. Vascular bundles form a circle. _____
42. Flower petals come in multiples of three. _____
43. Seeds only have one part. _____

Stop and Score Questions 27-43.

Score Correct Rescore

Laughter: the best medicine!

Bill: One of my pigs was sick yesterday, so I gave him some sugar.

Bob: Sugar! Why?

Bill: Haven't you ever heard of sugar-cured ham?



Merciful

*If you sit down at set of sun
And count the acts that you have done,
And, counting, find
One self-denying deed, one word
That eased the heart of him who heard,
One glance most kind
That fell like sunshine where it went-
Then you may count that day well spent.*

*But if, through all the livelong day,
You've cheered no hear, by yea or nay-
If, through it all
You've nothing done that you can trace
That brought the sunshine to one face-
No act most small
That helped some soul and nothing cost-
Then count that day as worse than lost.*

~ Mary Anne Evans (Better known as George Elliot) ~

Study all that you have learned in this chapter. It is time for the Chapter Review.

Chapter 1 Review

Match the words with the correct definitions.

- | | |
|--------------------------|--|
| 1. _____Angiosperm | A. parts of a plant that help with the transport of minerals and water in the plant |
| 2. _____Geotropism | B. parts of a plant that do not help transport materials in a plant |
| 3. _____Ground tissues | C. the central core of a vascular plant that holds the vascular tissues |
| 4. _____Gymnosperm | D. the vascular tissues that carry water and minerals from the ground to the leaves |
| 5. _____Hydrotropism | E. the vascular tissues that carry dissolved food from the leaves to the rest of the plant |
| 6. _____Phloem | F. plant that produces seeds mostly in the ovaries of flowers |
| 7. _____Phototropism | G. a plant that produces seeds that are exposed to air and are grown mostly in cones |
| 8. _____Stele | H. the response of a plant to gravity |
| 9. _____Vascular tissues | I. the response of a plant to water |
| 10. _____Xylem | J. the response of a plant to light |

Answer the following questions.

11. Plants that have special systems to transport water and minerals throughout the plant are called_____.
12. What is the purpose of flowers?_____
13. Which part of a flower makes pollen?_____
14. The bending movement of plants is called_____.

Stop and Score Questions 1-14.

Score	<input type="text"/>	Correct	<input type="text"/>	Rescore	<input type="text"/>
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Merciful Word Find

Find the word from the list. Circle the synonyms of merciful.

U N F E E L I N G B T E R E V E S E L C
 W D O O P E N H E A R T E D O D F P W K
 I T D Y W J T N H A R D H E A R T E D G
 N O M V F N E W C H A R I T A B L E P F
 U R V N E F E G A V A S Z Q L L V E Z B
 F P R M I O A I S S E L H T U R W A Y U
 A B E C I N D E T R A E H D N I K W O P
 N L E Z A X U N S Y M P A T H E T I C I
 C N R C I Y D E R E N N A M D L I M G T
 T Z S O M E R C I L E S S W N T Y N L Y
 U N C O M P A S S I O N A T E W L L U I
 X G S S F C O N D E M N I N G T F Z F N
 S H N U S T P X H J P C D K A N X P I G
 I U L I O E H C N O E E C N A E M G C P
 N M O C V I L E E P R P A D H I H E R G
 A A U L F I C I A G R E L B O N S N E E
 B N Q M I D G A T R L E U R C E R T M Y
 I E B E N M X R R I T X H F I L A L C Q
 Q O R I G H P D O G P E I J Z H H E I S
 T S K H I B S S S F C D D L O Z R R F J

Beneficent

Charitable

Clement

Compassionate

Condemning

Cruel

Forgiving

Gentle

Gracious

Hard hearted

Harsh

Humane

Kind

Kind hearted

Lenient

Mean

Merciful

Merciless

Mild mannered

Noble

Openhearted

Pitiless

Pitying

Ruthless

Savage

Severe

Soft hearted

Sympathetic

Tender

Uncompassionate

Unfeeling

Unsympathetic

Stop and Score This Exercise.

Score

Correct

Rescore

Continuing the Experiment: Taking Measurements

Have your plants sprouted yet? If so, use appropriate measuring tools and measure how tall the plants with sunlight and without sunlight have grown. Record your measurements in the spaces below.

How long have your plants been growing? _____

Height of plants with sunlight _____

Height of plants without sunlight _____

So far, are your measurements supporting your hypothesis? _____

Every few days measure your plants again and record your measurements below.

How long have your plants been growing? _____

Height of plants with sunlight _____

Height of plants without sunlight _____

So far, are your measurements supporting your hypothesis? _____

How long have your plants been growing? _____

Height of plants with sunlight _____

Height of plants without sunlight _____

So far, are your measurements supporting your hypothesis? _____

How long have your plants been growing? _____

Height of plants with sunlight _____

Height of plants without sunlight _____

So far, are your measurements supporting your hypothesis? _____

Using graph paper, plot your measurements. Use this information to make a graph that compares the growth of the plants. Let your plants continue growing and record what happens on a separate sheet of paper.

Teacher Initials

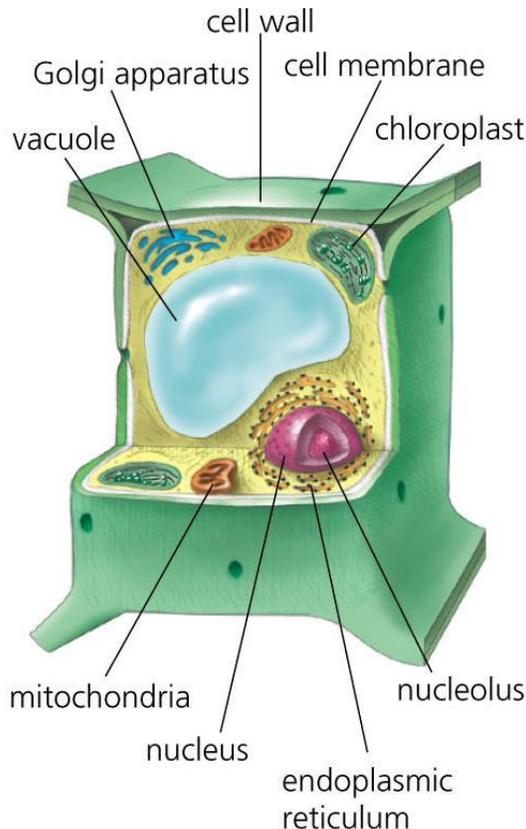
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Chapter 2: Plants and Photosynthesis

You know that plants are important and in the previous chapter you learned several different ways of classifying them. In this chapter you will learn how important they are and why.

Section 1: The Importance of Plants

Think about all the different kinds of ecosystems on earth. The desert, plains, oceans, mountains, arctic tundra, they all have plants. Some of them may not have very many plants, but there are at least a few plants in each ecosystem. This is very important because plants are the parts of an ecosystem that support life. In any ecosystem, there have to be plants for the animals to eat. If there were no plants, the animals would not survive.



Plant cells are different from any other kind of cell. Plant cells have a rigid cell wall as well as a cell membrane. Special organelles inside plant cells called the **chloroplasts** have **chlorophyll**. **Chlorophyll** is a green substance that carries out photosynthesis. The green in **chlorophyll** is actually what makes plants green.

Why do plants change color in the fall?

So what happens to the **chlorophyll** when the leaves turn brown in the fall? Well, during the spring and summer, trees store food for the winter when there is not enough water and light for plants to make food. As the days get shorter, and the nights cool off, the tree slows down the amount of photosynthesis they carry out until they quit all together. The bright green from the **chlorophyll** fades and you start to be able to see other colors like yellow, orange, and red. Those other colors were always there, but the green of the **chlorophyll** covered them up. Eventually,

the leaves will die and fall off the tree. You could say that the tree is in hibernation until spring.

When spring arrives, the days become longer and the temperatures heat up. This causes the trees to “wake up”. Sap starts to flow through the **vascular tissues** again and new leaves grow. As the leaves grow, the tree is able to make its own food again. The plant then produces seeds during the summer months. This cycle is repeated over and over throughout the life of the tree.

Answer the following questions without looking back.

1. Plants have a rigid _____ as well as a _____
_____.
2. What organelle has chlorophyll? _____
3. What color is chlorophyll? _____
4. Chlorophyll carries out _____.
5. What do tree do during spring and summer to prepare for winter?__

6. What happens to a deciduous tree when the days grow shorter and the nights cool off? _____

7. As the green of chlorophyll fades, what other colors do you see?__

8. _____ True or False? Green leaves also have other colors.
9. After the leaves fall off the tree, the tree is in _____ until spring.

10. Explain in your own word how a tree “wakes up” in the spring. ____

Stop and Score Questions 1-10.

Score	<input type="text"/>	Correct	<input type="text"/>	Rescore	<input type="text"/>
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Merciful

Showing kindness when dealing with others

Tell of a time when someone was merciful to you. Use four synonyms of merciful.

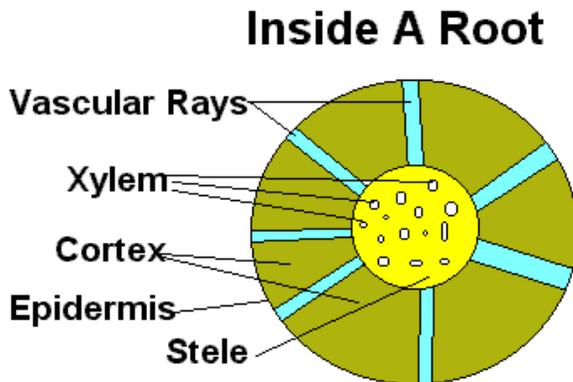
Teacher Initials

Section 2: Plant Parts

In Unit 505 you learned a little about photosynthesis. In this section you will review what you have learned.

Roots

Tree roots have tiny hair-like cells on them that absorb water and



nutrients from the soil, which is then carried to the roots. The roots have five different parts.

The **epidermis** is the outer layer of cells or the skin of the root. Each root has vascular rays that carry the water from the **epidermis** or skin to the center of the root. In the center of the root is the **stele**, which holds the vascular tissue. The **xylem**

carries water and food from the roots to the leaves and the **phloem** carries food from the leaves throughout the plant. The **cortex** is the fleshy part of the root between the vascular rays. Once the roots have done their job, the water and minerals are then sent through the **xylem** to the leaves.

Natures Food Factory

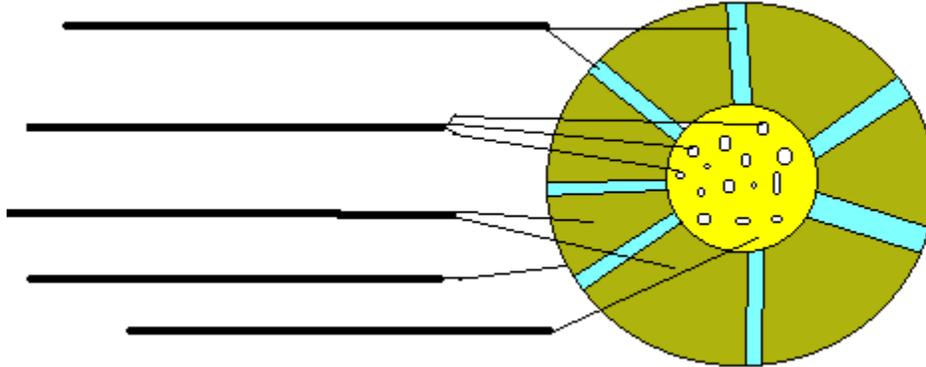
The leaves of plants are very important to the survival of the plant. This is because leaves are specially designed to produce food for the rest of the plant. The leaves have special cells that have **chlorophyll** to capture energy from sunlight. The leaves also have vascular bundles that bring water and minerals from the soil to the leaves and carry the food that the leaves make to the rest of the plant.



Leaves are designed to capture as much sunlight as they can on their flat surfaces. The more area that captures sunlight, the more food the plant can make. Some sea kelp has long stems that are attached to the sea floor and leaves that float on the surface. This helps the kelp to capture as much sunlight as possible during the day.

Answer the following questions without looking back.

11. Label the parts of a root.



12. What parts of a root absorb water and minerals from the soil? _____

13. Which part of a root holds vascular tissue? _____

14. What is the skin of the root called? _____

15. What is the fleshy part of a root? _____

16. Which part of a root carries water and minerals to the leaves? _____

17. Which part of a plant carries food from the leaves throughout the plant? _____

18. The _____ are specially designed to produce food for a plant.

19. The leaves have special cells with _____ to capture energy from _____.

20. How are leaves designed to capture as much sunlight as possible?

21. How are sea kelp designed to capture as much sunlight as possible during the day? _____

Stop and Score Questions 11-21.

Score	<input type="text"/>	Correct	<input type="text"/>	Rescore	<input type="text"/>
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One day a great lion lay asleep in the sunshine. A little mouse ran across his paw and wakened him. The great lion was just going to eat him up when the little mouse cried, "Oh, please, let me go, sir. Some day I may help you."

The lion laughed at the thought that the little mouse could be of any use to him. But he was a good-natured lion, and he set the mouse free.

Not long after, the lion was caught in a net. He tugged and pulled with all his might, but the ropes were too strong. The he roared loudly. The little mouse heard him, and ran to the spot.

"Be still, dear Lion, and I will set you free. I will gnaw the ropes."

With his sharp little teeth, the mouse cut the ropes, and the lion came out of the net.

"You laughed at me once," said the mouse. "You thought I was too little to do you a good turn. But see, you owe your life to a poor little mouse."

~ Aesop ~

Section 3: Photosynthesis

You know about the different parts of plants. Now let's learn about the special structures of leaves and what happens during photosynthesis.

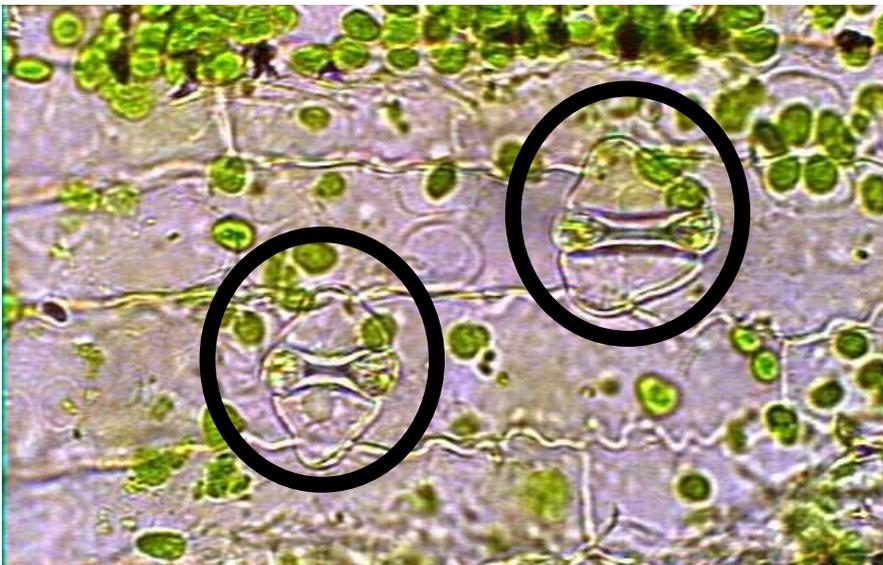
Leaves

Land plants have to be careful to not dry out. The leaves of land plants have a waxy coating called the **cuticle** on them to keep the needed water inside. There are special structures called **stomata** in the leaves that open to allow gases to enter and exit the leaf and close to prevent dehydration. These **stomata** are basically an opening that is guarded by two "guard cells". The guard cells open to allow carbon dioxide into the leaf and oxygen out of the leaf.

Hint

Stoma: Singular, one stoma

Stomata: Plural, two stomata



Corn epidermal peel viewed through a microscope.
Photographer: Michael Clayton Photograph used with permission.

In the picture on the left, you can see what actual **stomata** look like. This is a picture of the skin of a corn leaf. The **stomata** are circled. Can you see the guard cells and the opening where carbon dioxide enters the leaf and oxygen leaves the leaf?

The Mechanics of Photosynthesis

You know that green plants contain **chlorophyll**. When sunlight hits the **chlorophyll**, the molecules in the **chlorophyll** move faster. This

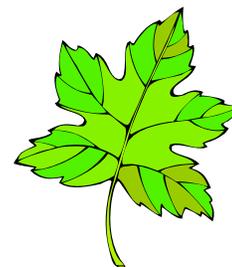
provides energy for the plant to change the water and carbon dioxide into sugar and oxygen.

But how much water and carbon dioxide does it take to make sugar? When a plant carries out photosynthesis, it takes six molecules of water ($6\text{H}_2\text{O}$) and six molecules of carbon dioxide (6CO_2) and recombines them. This makes one molecule of sugar ($\text{C}_6\text{H}_{12}\text{O}_6$) and six molecules of oxygen (6O_2). The six molecules of oxygen are useless to the plant and are considered waste. They are released back into the air through the **stomata**. The one molecule of sugar is absorbed into the sap and transported by the **phloem** where the plant needs it most. Because plants make one molecule of sugar at a time, there have to be many different cells carrying out photosynthesis at the same time or the plant would starve. That is why plant leaves are packed with millions of cells that have **chlorophyll**.

Even though land plants have a waxy coating on the leaves and **stomata** that open and close, land plants still lose a lot of moisture when oxygen is released. For example, cottonwood trees can lose up to 100 gallons of water every hour during hot, dry days! This is one of the ways that plants help return moisture to the air.

Did you know?

Plants sleep at night. When the sun goes down, there is no more sunlight energy for photosynthesis. So the plant closes all the stomata to prevent dehydration.



Answer the following questions without looking back.

22. What do land plants have that protects them from drying out? _____

23. Leaves have special structures called the _____.

24. Why do the stomata open? _____

25. Why do the stomata close? _____

26. A stoma is basically an opening that is guarded by two _____

_____.

27. What happens when sunlight hits chlorophyll? _____

28. During photosynthesis, water and carbon dioxide are changed into

_____.

29. How many molecules of water and carbon dioxide does a plant
need to make one molecule of sugar? _____

30. After one molecule of sugar is made, how many molecules of
oxygen are left over? _____

31. Oxygen is _____ to a plant.

32. After photosynthesis takes place, what happens to the “waste”
oxygen? _____

33. What happens to the sugar molecule? _____

34. What would happen to a tree that only had one cell with chlorophyll?

35. Up to how much water can a cottonwood tree loose during a hot, dry day? _____

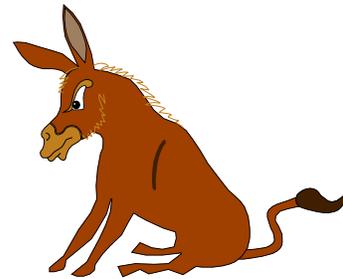
36. How does a plant sleep at night? _____

Stop and Score Questions 22-36.

Score	<input type="text"/>	Correct	<input type="text"/>	Rescore	<input type="text"/>
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Laughter: the best medicine!

A farmer passed away and left 17 mules to his three sons. The instructions left in the will said that the oldest boy was to get one-half, the second eldest one-third, and the youngest one-ninth. The three sons, recognizing the difficulty of dividing 17 mules into these fractions, began to argue.



The uncle heard about the argument, hitched up his mule, and drove out to settle the matter. He added his mule to the 17, making 18.

The eldest son therefore got one-half or nine; the second got one-third or six; and the youngest got one-ninth or two. Adding up 9, 6, and 2 equals 17. The uncle, having settled the argument, hitched up his mule and drove home.

Study all that you have learned in this chapter. It is time for the Chapter Review.

Chapter 2 Review

Match the words with the correct definitions.

- | | |
|----------------------|---|
| 1. _____ Chlorophyll | A. a pore on a leaf or stem that allows gases and water vapor to enter and exit the leaf |
| 2. _____ Chloroplast | B. fleshy part of a plant |
| 3. _____ Cortex | C. the outer layer of cells on a living thing; skin |
| 4. _____ Cuticle | D. the part of a plant cell that contains chlorophyll |
| 5. _____ Epidermis | E. the substance in the chloroplasts that gives green plants their color and enables plants to carry out photosynthesis |
| 6. _____ Stoma | F. the waxy coating on leaves that prevents dehydration |

Answer the following questions without looking back.

7. How are leaves designed to capture as much sunlight as possible?

8. What happens when sunlight hits chlorophyll? _____

9. During photosynthesis, water and carbon dioxide are changed into _____.

10. After one molecule of sugar is made, how many molecules of oxygen are left over? _____

Stop and Score Questions 1-10

Score Correct Rescore

Experiment: Making Conclusions

You have now conducted your experiment and made measurements. Now it is time to put all your information together into a report. First, review what you have learned.

Write your hypothesis. _____

Did your measurements support your hypothesis? _____

Towards the end, what happened to the plants without sunlight? _____

Towards the end, what happened to the plants with sunlight? _____

Draw a conclusion based on the results of this experiment. Your conclusion would either confirm or disprove your hypothesis. Finish this sentence.

Based on my experiment, I have found that _____

On a separate sheet of paper, write a report about your experiment. Start with the things that you used. Include your hypothesis, the instructions for the experiment, the measurements that you took, how well the plants had grown by the end of your experiment, and your conclusion. Your report should be at least four paragraphs long.

Teacher Initials

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Chapter 3: Life Cycles

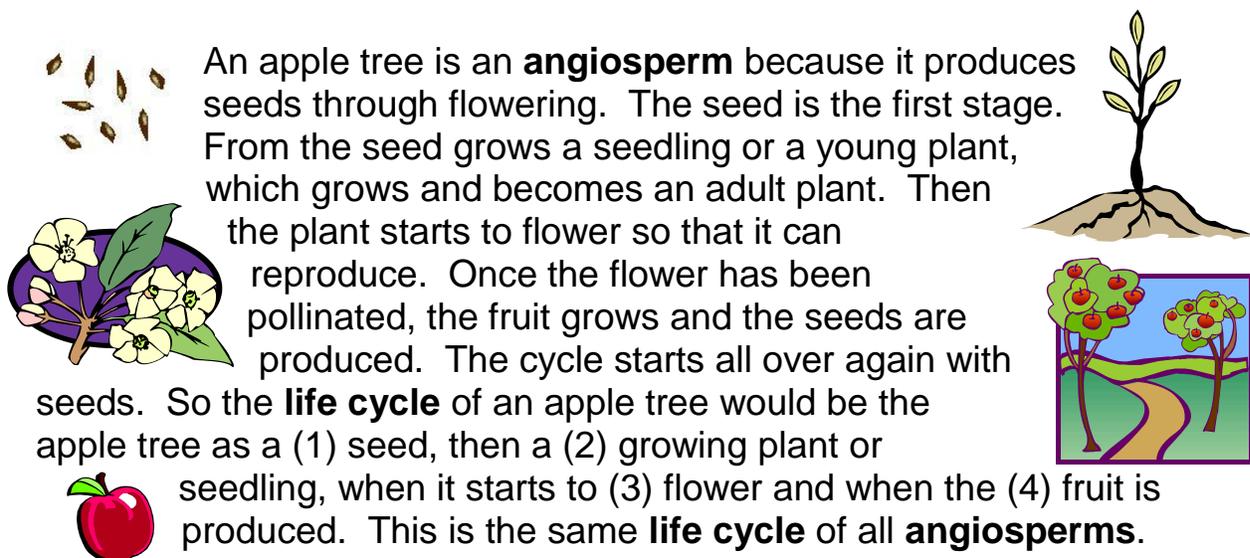
You have studied plants and you have studied how they work to make their own food. Just like you, plants change as they grow. In this chapter you will learn about the different stages in the lives of plants, animals and insects.

Section 1: Life Cycles of Plants

Every living thing has different stages of life. A **life cycle** is the different stages of life that an organism goes through.

In chapter one you learned about **angiosperms** and **gymnosperms**. You learned that **angiosperms** reproduce through flowers and **gymnosperms** reproduce through cones. Lets look at the **life cycles** of an **angiosperm** and a **gymnosperm**.

An apple tree is an **angiosperm** because it produces seeds through flowering. The seed is the first stage. From the seed grows a seedling or a young plant, which grows and becomes an adult plant. Then the plant starts to flower so that it can reproduce. Once the flower has been pollinated, the fruit grows and the seeds are produced. The cycle starts all over again with seeds. So the **life cycle** of an apple tree would be the apple tree as a (1) seed, then a (2) growing plant or seedling, when it starts to (3) flower and when the (4) fruit is produced. This is the same **life cycle** of all **angiosperms**.



The illustration shows the four stages of an apple tree's life cycle. At the top left, several brown seeds are shown. Below them is a small green seedling with two leaves growing out of a mound of soil. To the right of the seedling is a branch with several white flowers and green leaves. At the bottom left is a single red apple. To the right of the apple is a larger tree with green leaves and several red apples hanging from its branches. The background of the tree illustration is a simple landscape with a blue sky, green grass, and a yellow path.

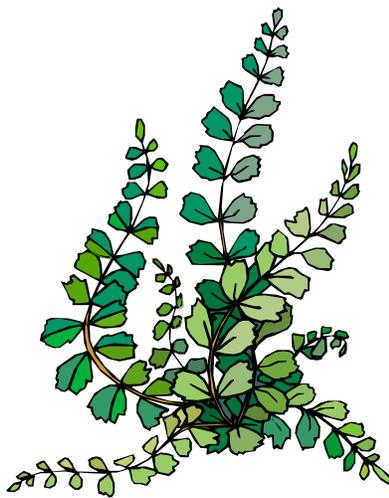
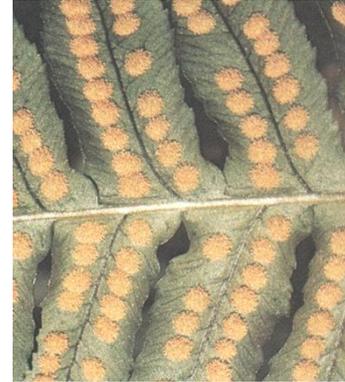
Gymnosperms are not very different. Instead of flowering, the gymnosperm produces cones. So the **gymnosperm life cycle** would be the plant as a (1) seed, then as a (2) growing plant or seedling, when it produces (3) cones and when the (4) fruit is produced. **Gymnosperms** generally produce tiny nuts as fruit.



Ferns

Ferns are rather different. They are vascular plants, but they are considered simple vascular plants because they lack the complex

structures of other vascular plants. Ferns don't grow from seeds like **gymnosperms** and **angiosperms**. Ferns grow from spores, which must have almost perfect growing conditions. The long leaves of ferns are called fronds and they unroll as they grow. On the bottom of each frond are spore cases where tiny spores are produced. When these spore cases open, the wind carries the millions of tiny spores away and



deposits them where some of them can grow. A spore will then grow into a gametophyte. A gametophyte is a heart-shaped leafy structure that contains male and female cells. The male cells are able to travel through a moist film and fertilize the female cells. Now a new fern can grow.

Now that you know the structure of a fern, the **life cycle** is something like this. The fronds of a fern have spore cases with spores in them. The spore cases open and release the spores. A spore grows into a gametophyte and fertilization takes place. The gametophyte grows a new fern, which grows spore cases and the **life cycle** of a fern is repeated.

Answer the following questions without looking back.

1. A life cycle is the _____
that an organism goes through.
2. Is an apple tree an angiosperm or a gymnosperm?

3. What is the first stage of an apple tree's life cycle? _____
4. What grows from an apple seed? _____

5. What is the third stage in the life cycle of an apple tree? _____

6. What is the last stage in the life cycle of an angiosperm? _____

7. List the four stages in the life of a gymnosperm
 1. _____
 2. _____

3. _____
4. _____
8. Gymnosperms produce tiny _____ as fruit.
9. Why are ferns considered simple vascular plants? _____

10. Ferns grow from _____.
11. Where are spore cases found? _____

12. How are fern spores scattered? _____
13. What is a gametophyte? _____

Stop and Score Questions 1-13.

Score	<input type="text"/>	Correct	<input type="text"/>	Rescore	<input type="text"/>
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Section 2: Life Cycles of Animals

Plants are not the only living things that have **life cycles**. Animals also have **life cycles**. In fact you are in the middle of the childhood part of your **life cycle**. In this section you will be learning more about the **life cycles** of a few animals.

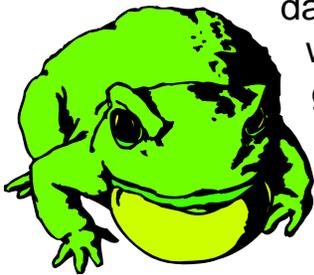
Frogs

Frogs are **amphibians**. **Amphibians** are cold-blooded animals that have a backbone. Generally **amphibians** live in water while they are young and breathe air when they are grown.



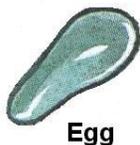
Frogs lay eggs in mass groups called spawns.

Once the eggs are fertilized, they grow for 6 to 21 days before they hatch. Once the eggs hatch, out come tadpoles. As tadpoles, these young frogs have gills that help them to breathe in water. For about 10 days after hatching, the tadpoles will hide in grasses or weeds because they are very fragile. Once they have grown a little, they will start swimming around and feeding off of algae. After four weeks, their gills are covered over with skin and the tadpoles grow tiny teeth that help them get oxygen from their food.



After about 6 to 9 week the tadpoles start to grow their back legs and the arms pop out elbow first. They look like a tiny frog with a tail. By 12 weeks the tail has shrunk to a stub. The frog will leave the water to live on land at about 16 weeks old.

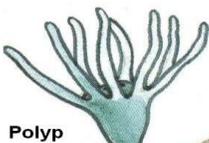
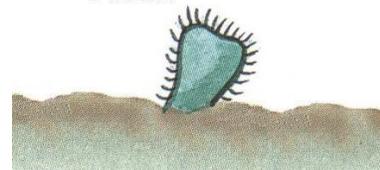
Jellyfish



Egg

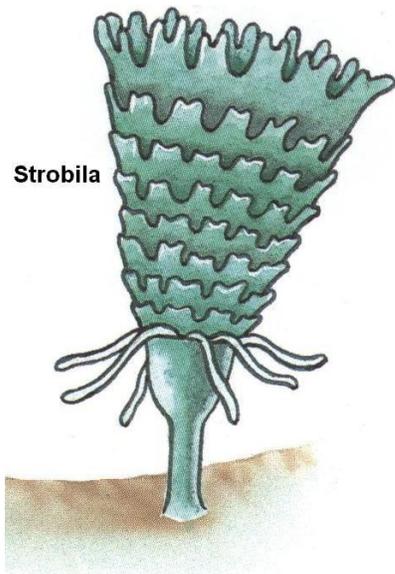
The **life cycle** of jellyfish is rather interesting. Jellyfish actually start as eggs. These eggs grow into planula, which have tiny hair like

Planula

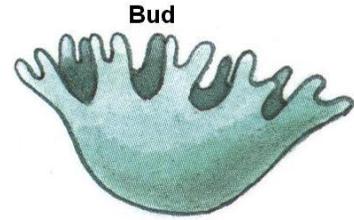


Polyp

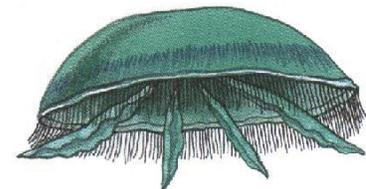
arms to swim with. The planulae anchor themselves to a hard surface on the ocean floor and grow into polyps. Polyps look so much like sea anemones that scientists first did not recognize that they were jellyfish. Polyps can make exact copies of themselves by growing



polyps like branches. So each egg can make many jelly fish. Polyps grow into strobila. Strobila form tiny jellyfish like a stack of pancakes and, when they are ready, pop off the little jellyfish. Again many jellyfish can come from one strobila. Once the tiny jellyfish are released from the strobila, they are called buds and they are



only 1/8th of an inch across. The buds are carried over great distances by the currents of the oceans. This is good because it is a great way for jellyfish to be distributed. As a bud, the jellyfish starts to develop feeding parts.



As it grows, the jellyfish becomes a juvenile and then an adult. As an adult, the jellyfish starts to produce eggs and the cycle starts all over again. Adult jellyfish only live an average of 2 to 6 months and are usually killed by rough waters.



Humans

You probably see people every day in the different stages of the human **life cycle**. Have you ever seen a tiny newborn baby? Well that is the first stage of human development. Next comes childhood, then the teen years when a child body changes into an adult body. Then comes being an adult. As an adult, people are able to marry and then have children of their own and the whole process starts over

again. In the picture you can see a newborn baby boy compared to an adult man.

Answer the following questions without looking back.

14. What are amphibians? _____

15. Generally amphibians live in water while they are _____
and breathe air when they are _____.
16. Frogs lay eggs in mass groups called _____.
17. How long do frog eggs grow before they hatch? _____
18. As tadpoles, young frogs have _____ that
help them breathe in water.
19. How long do tadpoles live after they hatch? _____
20. Tadpoles feed off _____.
21. When the gills of tadpoles are covered, where do they get their
oxygen? _____
22. Jellyfish start as _____.
23. The jellyfish eggs grow into _____.
24. How do planulae swim? _____
25. Planulae grow into _____.
26. How can planulae make exact copies of themselves? _____

27. Polyps grow into _____.

28. How big are buds when they are released from the strobila? _____

29. How long do adult jellyfish live? _____

30. What is the first stage of the human life cycle? _____

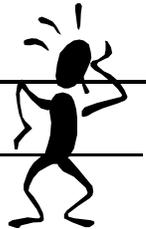
Stop and Score Questions 14-30.

Score Correct Rescore

Laughter: the best medicine!

Barry: Hey, guess what! A man just sold me the Nile River!

Harry: Egypt you.



Section 3: Life Cycles of Insects

Did you know?

A couple of the differences between moths and butterflies are:

1. Generally butterflies fly around during the day and moths at night.
2. Butterflies fold their wings together when they rest, but moths rest with their wings open

You have learned about a few of the **life cycles** of plant and animals. Jellyfish and frogs go through metamorphosis. That means that they completely change form and appearance while they are growing. In the insect world, there are lots of insects that go through metamorphosis. Let's learn a little about them.

Moths and Butterflies



Moths and butterflies are among the most commonly known insects. These insects go through four stages known as complete metamorphosis.

Stage one is the eggs that are laid by an adult insect. When the eggs hatch, the larvae emerge. Larva is the second stage. The larvae of moths and butterflies are caterpillars while the larvae of flies are maggots. Larvae are always eating because they are always hungry. During this stage the larvae molt or shed their exoskeleton several times. The

exoskeleton is rigid and can't stretch or grow with the larvae so it has to be discarded.



After molting several times, the larva is ready to rest for a while. The butterfly larvae grow a hard shell-like covering called a chrysalis. The moth larvae spin a silk cocoon for themselves. Once an insect has entered the chrysalis or cocoon, the insect is now a pupa, which is stage three. As a pupa, the insect changes into something completely different.

After the transformation is complete, the case splits open and the adult insect crawls out. As an adult, the insect has entered the fourth and final stage of its **life cycle**. Now the insect can lay eggs and the cycle starts all over again.



Several other insects go through the four stages of complete metamorphosis. Beetles, flies, mosquitoes, bees, and wasps are a few.

Answer the following questions without looking back.

31. List the four stages of complete metamorphosis.

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

32. What are the larvae of moths and butterflies? _____

33. What are the larvae of flies? _____

34. During the larva stage, the larvae molt or _____

_____ several times.

35. Why must larvae molt? _____

36. Butterfly larvae grow a hard shell-like covering called a _____
 _____.
37. Moth larvae spin a _____.
38. Once an insect has entered the case, it is a _____.
39. When the insect emerges from the case it is an _____ insect.
40. List five other insects, besides butterflies and moths, which go through the four stages of complete metamorphosis.
1. _____
 2. _____
 3. _____
 4. _____
 5. _____

Stop and Score Questions 31-40.

Score		Correct		Rescore	
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Laughter: the best medicine!

Did you hear about the man who heard music every time he put his hat on? The doctor fixed him right up by removing the hatband.



Keep up the good work! Now study all that you have learned in chapter 3. It is time for the Chapter Review.

Chapter 3 Review

Match the words with the correct definitions.

- | | |
|---------------------|--|
| 1. _____ Amphibian | plants that produce seeds in ovaries and grow mostly from flowers |
| 2. _____ Angiosperm | A. a plant that produces seeds that are exposed to air and are grown mostly in cones |
| 3. _____ Gymnosperm | B. showing kindness when dealing with others |
| 4. _____ Life cycle | C. the different stages of life that an organism goes through |
| 5. _____ Merciful | D. cold-blooded animals that have a backbone |

Answer the following questions.

6. List the four stages in the life of a gymnosperm

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

7. Generally amphibians live in water while they are _____ and breathe air when they are _____.

8. List the four stages of complete metamorphosis.

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

Stop and Score Questions 1-8.

Score Correct Rescore

Vocabulary Word Find

Find the vocabulary word from their definitions. Write the word in the blank provided.

N Z W G B Y M R E P S O N M Y G X Z L L
G A G P H V J M I P K Q U B R B Q U L A
M H J I X I E G A D Q A C T V J B Z Y E
V Y I L I O Y D K A O U O W A K M J H L
K K Z C L U C Q E B S C R S S W U G P C
V V C H L O R O P L A S T T C C J P O T
A V P A E B Y D I K T O N L U Z M M R E
M N D S R L Q K B P M U P X L N E S O K
H S G S E H C G J A S K B M A R R I L X
B X I I I U M I G D F I F S R O C P H O
X U E P O M S B T M L S B I T L I O C I
X W E T O S R S K U V Q B P I X F R X N
P E N P R R P E I W C G V O S K U T M A
M E L Y X O T E D T B B S R S Z L O T I
S W O E L U C O R I D T L T U S Q E Y B
S R Y G T E B A R M P N F O E A O G W I
R J C U M S V T H D W E U T S Q P X M H
Z A A P L Y F N N G Y U L O W J M R M P
T L I F E C Y C L E X H W H R E F C E M
I D R E U S L H K J O C C P Y G M W K A

_____ parts of a plant that help with the transport of minerals and water in the plant

_____ parts of a plant that do not help transport materials in a plant

_____ the central core of a vascular plant that holds the vascular tissues

_____ the vascular tissues that carry water and minerals from the ground to the leaves

_____ the vascular tissues that carry dissolved food from the leaves to the rest of the plant

- _____ plants that produce seeds in ovaries and grow mostly from flowers
- _____ a plant that produces seeds that are exposed to air and are grown mostly in cones
- _____ the response of a plant to gravity
- _____ the response of a plant to water
- _____ the response of a plant to light
- _____ the substance in the chloroplasts that gives green plants their color and enables plants to carry out photosynthesis
- _____ the part of a plant cell that contains chlorophyll
- _____ the outer layer of cells on a living thing; skin
- _____ fleshy part of a plant
- _____ the waxy coating on leaves that prevents dehydration
- _____ a pore on a leaf or stem that allows gases and water vapor to enter and exit the leaf
- _____ showing kindness when dealing with others
- _____ the different stages of life that an organism goes through
- _____ cold-blooded animals that have a backbone

Stop and Score this Exercise.

Score Correct Rescore

Study all that you have learned in this unit. It is time for the Unit Review.

Science 507 Unit Review

1. _____Amphibian
 2. _____Angiosperm
 3. _____Chlorophyll
 4. _____Chloroplast
 5. _____Cortex
 6. _____Cuticle
 7. _____Epidermis
 8. _____Geotropism
 9. _____Ground tissues
 10. _____Gymnosperm
 11. _____Hydrotropism
 12. _____Life cycle
 13. _____Merciful
 14. _____Phloem
 15. _____Phototropism
 16. _____Stele
 17. _____Stoma
 18. _____Vascular tissues
 19. _____Xylem
- A. a plant that produces seeds that are exposed to air and are grown mostly in cones
 - B. a pore on a leaf or stem that allows gases and water vapor to enter and exit the leaf
 - C. cold-blooded animals that have a backbone
 - D. fleshy part of a plant
 - E. parts of a plant that do not help transport materials in a plant
 - F. parts of a plant that help with the transport of minerals and water in the plant
 - G. plants that produce seeds in ovaries and grow mostly from flowers
 - H. showing kindness when dealing with others
 - I. the central core of a vascular plant that holds the vascular tissues
 - J. the different stages of life that an organism goes through
 - K. the outer layer of cells on a living thing; skin
 - L. the part of a plant cell that contains chlorophyll
 - M. the response of a plant to gravity
 - N. the response of a plant to light
 - O. the response of a plant to water
 - P. the substance in the chloroplasts that gives green plants their color and enables plants to carry out photosynthesis
 - Q. the vascular tissues that carry dissolved food from the leaves to the rest of the plant
 - R. the vascular tissues that carry water and minerals from the ground to the leaves
 - S. the waxy coating on leaves that prevents dehydration

Answer the following questions without looking back.

20. How are all gymnosperms pollinated? _____

21. What is the purpose of flowers? _____

22. List the four main parts of a flower.

1. _____

2. _____

3. _____

4. _____

23. Which part of a flower makes pollen? _____

24. The bending movement of plants is called _____.

25. Dicots are plants whose seeds have _____.

26. Monocots are plants whose seeds have _____.

27. Why do plants move? _____

28. Plants whose leaves have parallel veins are _____.

29. Plants that have vascular bundles that form a circle are _____.

30. Flowers with petals in multiples of three are _____.

31. After photosynthesis takes place, what happens to the “waste”
oxygen? _____

32. List the four stages of complete metamorphosis.

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

Stop and Score Questions 1-32.

Score Correct Rescore

Study all the questions that you got wrong and review all that you have learned in this unit. Ask your teacher if you can take the Unit Test.

Teacher Initials

Name _____

Date _____

Score _____

SCIENCE 507 TEST

Match the words with the correct definitions.

Each answer is worth three points. One point for name.

- | | |
|------------------------------|---|
| 33. __Amphibian | A. the waxy coating on leaves that prevents dehydration |
| 34. __Angiosperm | B. the vascular tissues that carry water and minerals from the ground to the leaves |
| 35. __Chlorophyll | C. the vascular tissues that carry dissolved food from the leaves to the rest of the plant |
| 36. __Chloroplast | D. the substance in the chloroplasts that gives green plants their color and enables plants to carry out photosynthesis |
| 37. __Cortex | E. the response of a plant to water |
| 38. __Cuticle | F. the response of a plant to light |
| 39. __Epidermis | G. the response of a plant to gravity |
| 40. __Geotropism | H. the part of a plant cell that contains chlorophyll |
| 41. __Ground
tissues | I. the outer layer of cells on a living thing; skin |
| 42. ____Gymnosperm | J. the different stages of life that an organism goes through |
| 43. ____Hydrotropism | K. the central core of a vascular plant that holds the vascular tissues |
| 44. ____Life cycle | L. showing kindness when dealing with others |
| 45. ____Merciful | M. plant that produces seeds mostly in the ovaries of flowers |
| 46. ____Phloem | N. parts of a plant that help with the transport of minerals and water in the plant |
| 47. ____Phototropism | O. parts of a plant that do not help transport materials in a plant |
| 48. ____Stele | P. fleshy part of a plant |
| 49. ____Stoma | Q. cold-blooded animals that have a backbone |
| 50. ____Vascular tissues | R. a pore on a leaf or stem that allows gases and water vapor to enter and exit the leaf |
| 51. ____Xylem | S. a plant that produces seeds that are exposed to air and are grown mostly in cones |

Answer the following questions.

- 52. Which part of a flower attracts insects? _____
- 53. Which part of a flower protects the flower while it is a bud? _____
- 54. Which part of a flower makes pollen? _____
- 55. Which part of a flower has undeveloped seeds? _____
- 56. Vascular plants can be classified by their _____ and _____ structure.
- 57. Plants with flower petals in multiples of four or five are _____.
- 58. Plants whose seeds have two parts are _____.
- 59. Plants with scattered vascular bundles are _____
- 60. Plants whose leaves have net-like veins are _____.
- 61. During photosynthesis, water and carbon dioxide are changed into _____.

List the four stages of complete metamorphosis.

- 62. _____
- 63. _____
- 64. _____
- 65. _____

Double check your answers and ask your teacher to score your test.