Biology

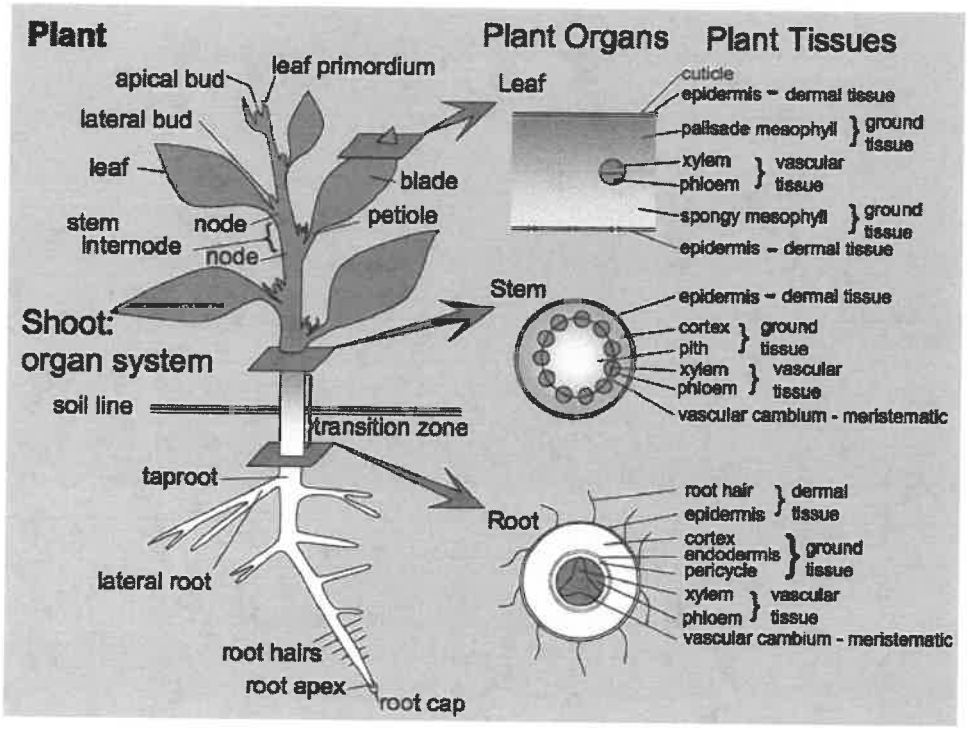
Grace

Apr 27-May 8

Name _____ Period _____

Grace | Biology Unit Packet

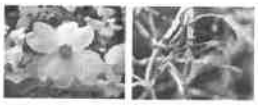
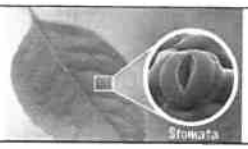
Unit 10 Plants



Unit 10 Plants | Pacing Guide				
This is the schedule you should use to complete your Biology work on time. The whole packet is due **Friday, 1 May 2020**				
Monday, April 27	**Tuesday, April 28**	**Wednesday, April 29**	**Thursday, April 30**	**Friday, May 1**
• Download Packet • Complete Vocab Activity	• Work on Guided Lecture Notes • Live Meeting @9AM on Teams	• Complete Guided Lecture Notes • Live Meeting @2PM on Teams	• Complete Activity 1 • Live Meeting @12PM on Teasm	• Complete the Unit 10 Test *either on the bubble sheet or the digital quiz on Teams*
15 pts / Quiz	50 pts / Notebook		25 pts / Labs	100 pts / Test

Digital If you are turning in your work online, you may submit each assignment individually on Teams. That way you can finish them independently and not have to worry about the answers sitting there for a few days. Please try to have all of the assignments completed and submitted by Friday, 1 May 2020.

Paper packets are due all at the same time: Friday, 1 May 2020

Unit 10 Plants | Vocabulary		
Word	**Definition**	**Example or "in other words"**
Tissue	Group of similar cells that perform a particular function	*A liver (organ) is made up of liver tissue*
Organ	Group of tissues that work together to perform closely related functions	
Transpiration	Loss of water from a plant through its leaves	*Remember capillary action*
Roots	Support plants, anchors plants to the ground, store food, and absorb water and dissolved nutrients from the soil	*Taproot or fibrous root*
Stems	Produce leaves, branches and flowers, hold leaves up to the sun, and transport substances throughout the plant	*Think: skeleton that houses vascular system*
Leaves	Absorbs light and carries out photosynthesis	
Flowers	Reproductive organs for angiosperms	
Fruits	A structure containing one or more matured ovaries	*Apple, duran, kiwi, almond, blueberry, tomato, squash, etc.*
Cones	Reproductive organs for gymnosperms	*Pollen cones (male)* *seed cones (female)*
Meristematic Tissue	Regions of unspecialized cells in which mitosis produces new cells that are ready for differentiation (told what type of cell to be) and is found where the plant grows rapidly.	*Tips of stems and roots*
Ground Tissue	Produces and stores sugars, and contributes to physical support of the plant	*Edible portions of potatoes, squash and asparagus*
Dermal Tissue	Protective outer covering of a plant	*Trunk: covered in bark* *Leaves: covered in cuticle (waxy coating, why some leaves are shiny)*
Vascular Tissue	Tissues that make it possible for plants to draw up water against the pull of gravity	*Xylem and phloem*
Guard cells	At the openings of stoma, opening and closing to regulate gas exchange	*Think: lips to a mouth*
Stomata	(single: stoma) Small openings in the epidermis that allow carbon dioxide, water and oxygen to diffuse into and out of the leaf	
Phloem	A vascular tissue that transports nutrients and carbohydrates produced by photosynthesis	*Think: move "food"*
Xylem	A vascular tissue that carries water upward from the roots to every part of the plant	*Think: move water*

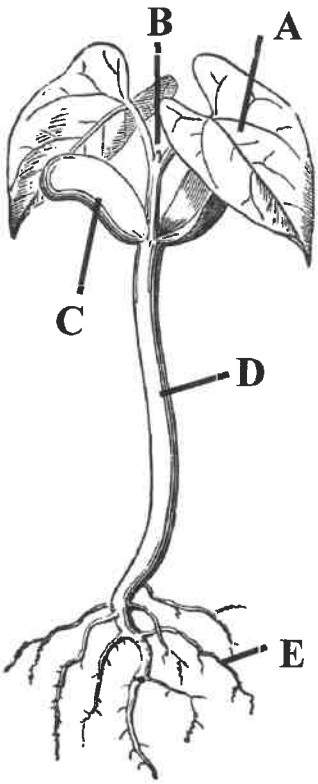
Seed	A plant embryo and its food supply encased in a protective covering	*Think: "baby" developing outside of parent*
Stamen	(Male) The pollen producing part of a flower, usually with a slender filament supporting the anther.	*Stamen = anther + filament*
Anther	The part of the stamen where pollen is produced.	*Yellow with pollen*
Filament	Stem-like structure that holds up the anther	---
Pistil	(Female) The ovule producing part of a flower. The ovary often supports a long style, topped by a stigma. The mature ovary is a fruit, and the mature ovule is a seed.	*Pistil = carpel(s)* *Carpel = stigma + style + ovary*
Carpel	House the female flower parts, a flower can have more than one of these. Collectively they are called the pistil.	*Lily (one carpel)* *magnolia (many carpels)*
Stigma	The part of the pistil where pollen germinates.	*"sticky" part at top of pistil/carpel*
Style	Stem-like structure that hold up the stigma, sperm travel down this tube to reach the ovules in the ovary	---
Ovary	The enlarged bottom portion of the pistil where ovules are produced, surround and protect the seeds, later become fruit	*Has eggs or female gametes just like in people*
Sepal	The outer parts of the flower (often green and leaf-like) that enclose a developing bud.	*green "leaves" at bottom of flower* → 
Petals	Showy part of a flower used to attract pollinators or catch wind for dispersal depending on reproductive style.	*Rose (pollinator)* *dandelion (wind pollination)*
Peduncle	The stalk of a flower.	*Stem that holds up flower*
Receptacle	The part of a flower stalk where the parts of the flower are attached.	*Thick part at bottom of flower*
Gymnosperm	Group of plants that bear their seeds directly on the scales of cones	*Plant with cones: pine, spruce, firs (like Christmas trees)*
Angiosperm	Group of plants that bear their seeds in flowers inside a special layer of tissue that surrounds and protects the seed.	*Plant with flowers: rose, Spanish moss, seagrass*
Cotyledon	Seed leaves in the embryo	*first leaves that sprout from the seed* 
Monocot	One seed leaf or cotyledon	*grasses*
Dicot	Two seed leaves or cotyledons	*Peanuts (why they fall in half)*

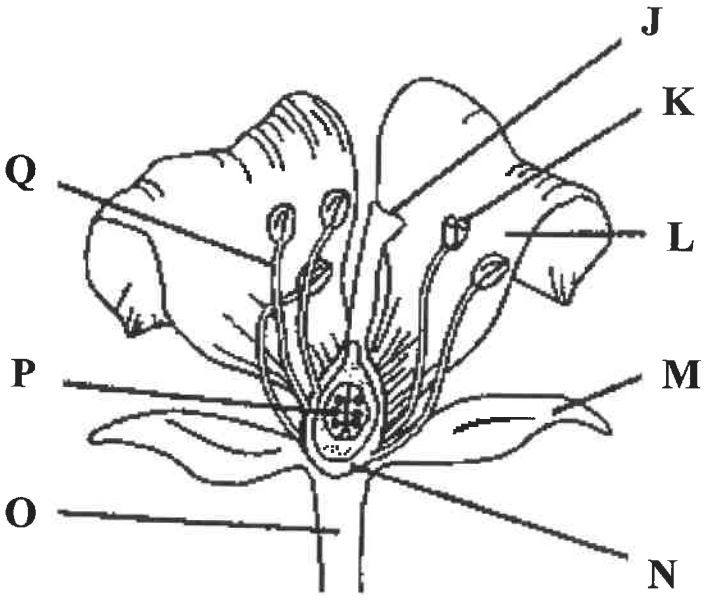
Unit 10 Vocabulary Activity

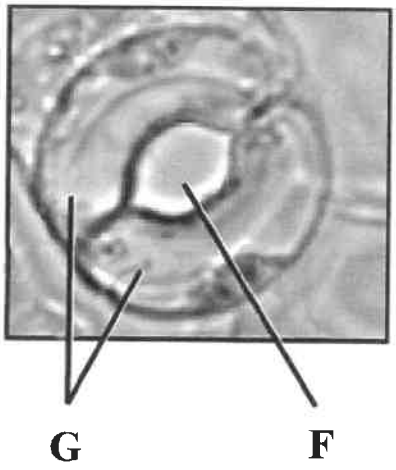
Match the description to that part of the diagram(s) below. Some letters are used more than once.

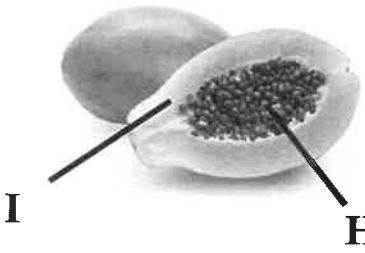
Definition List

_____ 1. site of photosynthesis
_____ 2. where water is drawn into the plant
_____ 3. only type of tissue that undergoes mitosis and is located where the plant grows the quickest
_____ 4. means "seed leaf"
_____ 5. the "sticky" female part that pollen adheres to and the sperm then travel into the ovary
_____ 6. where stomata can be found and the site of gas exchange
_____ 7. later becomes a fruit if fertilized
_____ 8. showy part of the plant to attract pollinators
_____ 9. produces seeds that are housed inside of a fruit
_____ 10. houses vascular tissue and supports the plant
_____ 11. Looks like a type of leaf, and they protect the bud while it is developing
_____ 12. Female gametes
_____ 13. Pore in leaf tissue
_____ 14. Regulates the exchange of gas in/out of the plant
_____ 15. A plant embryo









UNIT 10 PLANTS

PLANT ANATOMY AND PHYSIOLOGY

INSTRUCTIONS

Complete the
GUIDED LECTURE NOTES and QUICK QUESTIONS
as you read through the presentation.

Before we begin…

- *Unit is more of a giant vocabulary lesson. Make sure you have the vocabulary list at the ready.*
- *You're main goal is to be able to label given diagrams and know what those parts do.*

INTRODUCTION

WHAT IS A PLANT?

REVIEW

Let's see what you remember…

Quick Questions

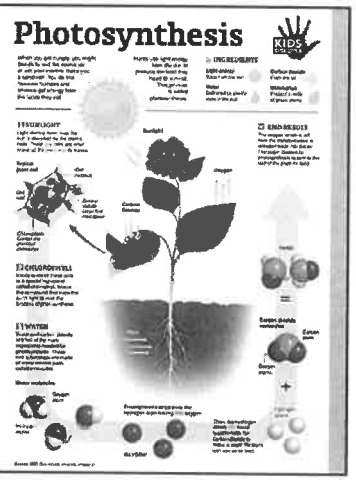
1. What 6 things do all living things have in common?
2. How do plants obtain and use energy?
3. In what process do plants create their own food?
4. Structure dictates ______________.
5. What do plants need to do photosynthesis?

PHOTOSYNTHESIS REVIEW

Light Energy + $6CO_2$ + $6H_2O$ → $C_6H_{12}O_6$ + $6O_2$

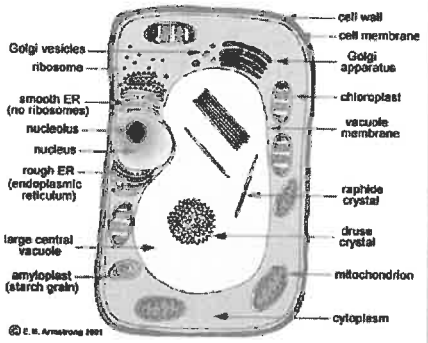
energy + carbon dioxide + water → glucose sugar + oxygen

- Occurs in the chloroplast
- Water is absorbed through the roots
- Light energy is absorbed by the leaves
- Gas is exchanged in the leaves
- Food is sugar or more specifically glucose
- Cellular respiration is the reverse and occurs in the mitochondria (which plant cells also have)



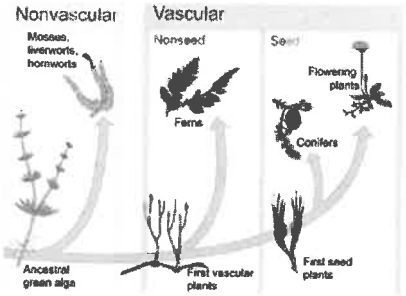
WHAT DO ALL PLANTS HAVE IN COMMON?

- **Made of plant cells**
  - Cell wall
  - Chloroplasts
  - Central vacuole
  - Organelles common to all eukaryotes (such as a nucleus, ribosomes, mitochondria, etc.)
- **Multicellular organisms**
- **Photosynthesis** = the metabolic process for converting solar energy into chemical energy for plants to use



HISTORY OF PLANTS

- The ancestors of land plants were water-dwelling like algae
- Land-plants evolved the ability to draw water from the soil, resist drying out and reproduce without water.



Quick Questions

6. What are the products and reactants of photosynthesis? How does this relate to cellular respiration?
7. What 3 unique organelles to plant cells? Meaning animal cells do not have them.
8. What would the first plant on Earth have been like?

PLANT DIVERSITY

PLANT DIVERSITY

PLANTS

Nonvascular **Vascular**

- **Vascular** means to have the "tubing" to carry water and nutrients against gravity throughout the plant
- Like our circulatory system, but no heart, plants use capillary action instead (cohesion and adhesion).
- Examples: **xylem** (carries water and nutrients from the roots) and **phloem** (carries products of photosynthesis)

NON-VASCULAR

- Do **not** have vascular tissue
  - Smaller because they can't transport water up stems
  - Water is absorbed via osmosis instead
- Lack true leaves, stems or roots
- Small enough that minerals can be distributed throughout via *diffusion*.
- MUST be near a source of water since they lack roots.
- Examples:
  - Green algae
  - Bryophytes


VASCULAR

- Contain vascular tissue (xylem and phloem)
- Allows these plants to transport water and sugars throughout
- Have specialized organs, roots, stems, and leaves
- Examples:
  - Ferns
  - Gymnosperms
  - Angiosperms


PLANT DIVERSITY

PLANTS

Nonvascular **Vascular**

green algae

bryophytes
mosses
liverworts
hornworts

Quick Questions

9. What physical characteristic do nonvascular plants share because of their lack of vascular tissues?
10. What does it mean to be "vascular"? What specific tissues do those plants have?

GREEN ALGAE

- True green algae
- NOT cyanobacteria or protists *(remember classification?)*
- Considered the first plants
- mostly aquatic: found in freshwater, salt water, and in some moist areas on land
- Able to absorb moisture and nutrients directly from their surroundings
- Can reproduce sexually and asexually

Ulva


Valonia


Caulerpa


Halimeda


BRYOPHYTES

Mosses:
- Small and dense
- Look like green carpet
- Can live in any biome
- Critical because they help prevent erosion

Liverworts:
- Have liver-shaped lobes
- Can live in any biome, but prefer tropical
- Like dim light and damp soil
- Do not have stomata for gas exchange (other two do)
- have air chambers for gas exchange but they can't open and close like stomata, so they can dry out easier than mosses and hornworts

Hornworts:
- Have horn shaped structures that protrude
- Can live in any biome, but prefer tropical
- Only have 1 chloroplast per plant cell (unlike the other two)


Moss


Hornwort


Liverwort

PLANT DIVERSITY

PLANTS

Nonvascular
- green algae
- bryophytes
  - mosses
  - liverworts
  - hornworts

Vascular
- tracheophytes
  - Ferns
  - club mosses
  - horsetails
- gymnosperms
- angiosperms

TRACHEOPHYTES

- spores instead of seeds
- Spore dispersal via water

Ferns
- leaves called fronds
- Unfurled/curled frond is called a "fiddlehead" some you can eat!

Club Moss
- Contribute to fossil fuel deposits
- Oily compounds in the cell walls ignite rapidly into a flash of light and were used by magicians and sorcerers in the Middle Ages

Horsetail
- Contribute to fossil fuel deposits
- Most primitive of vascular plants


fern


club moss


horsetail

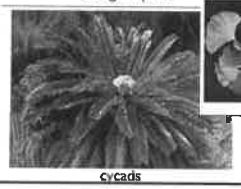
Quick Questions

11. What do tracheophytes not have that other vascular plants do have?

GYMNOSPERMS

gymno - "naked" / *sperm*- "seed"
- Have seeds
- No flowers or fruit
- Reproductive structure = **Cones**
  - Pollen cones (male)
  - Seed cones (female)
- **Pollination**: transfer sperm (housed in pollen grain) to female reproduction structure
- Seed dispersal via wind


Longleaf pines


cycads


ginkgos

ANGIOSPERMS

- *angio*- "vessel" / *sperm*- "seed"
- Have seeds
- Flowering plants
- Reproductive structure = flowers
- Seeds enclosed in an ovary (fruit)
- Seed dispersal via animals

Quick Questions

12. What characteristic do angiosperms and gymnosperms have in common?
13. What about that common characteristic is different in both angiosperms and gymnosperms?

ANGIOSPERMS

Two types:

MONOCOTS

- 1 cotyledon (seed leaf) in the seed embryo
- Parallel leaf veins
- Flower petals in multiples of 3
- Net-like/fibrous root system
- Examples: Grass, lilies, bananas, daffodils, asparagus, orchids, tulips, wheat, sugarcane, etc.

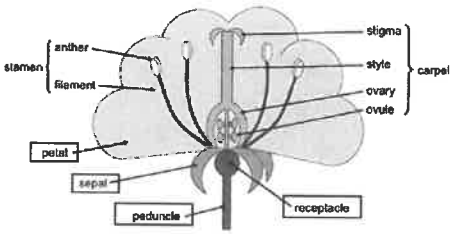
DICOTS

- 2 cotyledons in the seed embryo
- Branching leaf veins
- Flowers petals in multiples of 4 or 5
- Taproot root system
- Examples: Dandelions, daises, apples, peaches, roses, tomatoes, carrots, etc.

PARTS OF A FLOWER

Outer Parts

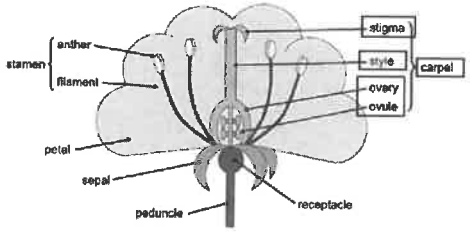
- Sepal: green tissue that covers the flower when it is a bud
- Petal: Colorful structure used to attract specific animal pollinators
- Receptacle: the part of a flower stalk where the parts of the flower are attached.
- Peduncle: the stalk of a flower.



PARTS OF A FLOWER

Female Parts

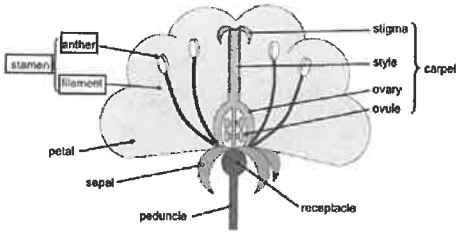
- Pistil: female organs
- Carpel: House the female flower parts, a flower can have more than one of these
- Ovule is the female germ cell that becomes a **seed** after the egg is fertilized (seed = zygote)
- Protected by the ovary which, when ripened, becomes a **fruit**
- Stigma is the opening at the top of the style which is a "neck" that sperm will travel down



PARTS OF A FLOWER

Male Parts

- Stamen: male organs
- Anther makes pollen and sits on the end of the filament
- **Pollen** is made by gymnosperms (in cones) and angiosperms (in flowers)
- Powdery substance made of pollen grains = the male gametophyte that gives rise to sperm cells



PARTS OF A FLOWER

THE CONFUSING BIT.

The thing about carpels and pistils...

- Some flowers have more than one carpel, and thus more than one ovary per flower.
  - Like the Lotus flower .

In the photo, the table top thalamus as about 15 carpels and thus 15 ovaries . Each one of them is sunk in to a socket and later on develops in to a fruit .

- So, more than one fruit/seed can develop from one flower.
  - Like the lotus or a Magnolia

All the fruits (brown, fuzzy part) with red seeds inside have developed from a SINGLE FLOWER .

Quick Questions

14. What are 3 characteristics that differentiate monocots AND dicots?
15. Why is the carpel considered female and the stamen male?
16. If a flower only has one carpel, can it be used interchangeably with pistil?

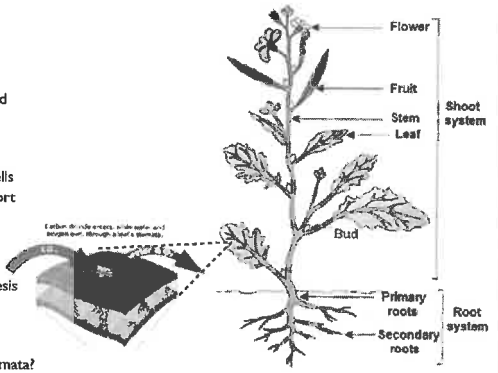
STRUCTURES

VASCALAR PLANT ANATOMY

VASCULAR PLANT STRUCTURE

Organized in 2 Systems:

1. **Root System**
   - **Roots:** absorb water and nutrients; keep plant anchored
2. **Shoot System**
   - **Stem:** transport fluids and store nutrients; specialized cells create new growth and support leaves
   - **Leaves:** collect sunlight in chloroplasts; have *stomata* for gas exchange; do photosynthesis

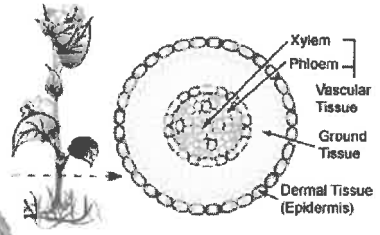


Quick Question

17. What is the function of the stomata?

VASCULAR PLANT STRUCTURE

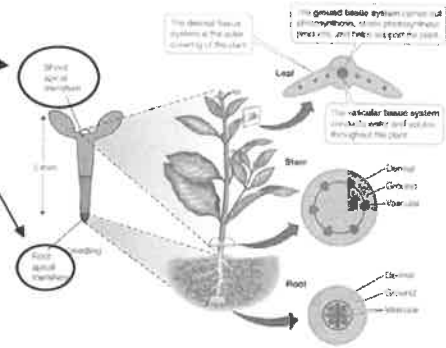
- All 3 of these structures (roots, stems, and leaves) contain the following 3 tissues:
  - Dermal tissue
  - Ground tissue
  - Vascular tissue



VASCULAR PLANT STRUCTURES

Meristematic Tissue

- Only plant tissue that uses mitosis to make new cells
- Located at the tip of the root and stem (where there is new/rapid growth)



VASCULAR PLANT STRUCTURE

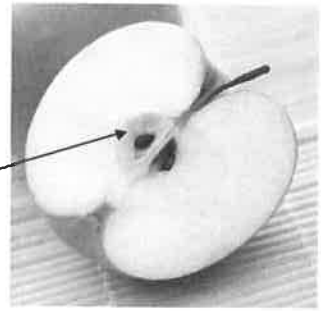
Dermal Tissue

- used for protection and to prevent water loss
- Includes epidermis (mostly) and periderm (like bark)
- Cuticle = a waxy layer that coats a leaf

VASCULAR PLANT STRUCTURE

Ground Tissue

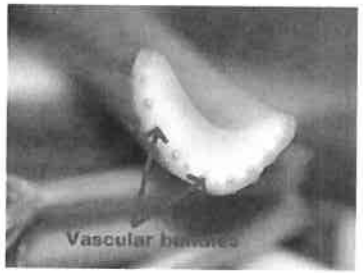
- used for metabolism, storage and support (any tissue that isn't dermal or vascular)
- Types:
  - Parenchyma: traditional plant cells
  - Collenchyma: support, like cellulose
  - Sclerenchyma: wooded and durable (like what makes up an apple core)



VASCULAR PLANT STRUCTURE

Vascular Tissue

- used for transport
  - **Xylem**: transports water from roots → shoot
  - **Phloem**: moves minerals from roots → shoot and sugars made during photosynthesis from leaves in shoot → other parts of plant

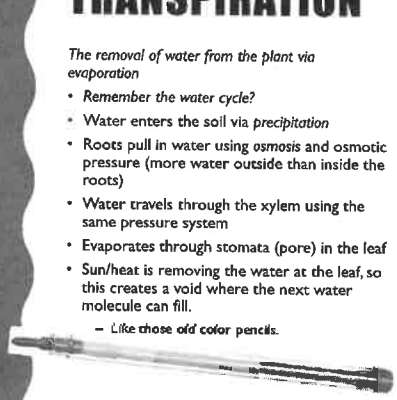


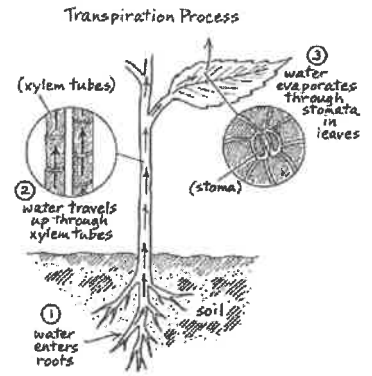
Quick Questions
18. What are the 3 types of tissues that are in the roots, stems and leaves of a plant?
19. What is an example of each type of tissue?
20. Which tissue is only found where there is growth like the stems and root tips?

TRANSPIRATION

The removal of water from the plant via evaporation

- *Remember the water cycle?*
- Water enters the soil via *precipitation*
- Roots pull in water using *osmosis* and osmotic pressure (more water outside than inside the roots)
- Water travels through the xylem using the same pressure system
- Evaporates through stomata (pore) in the leaf
- Sun/heat is removing the water at the leaf, so this creates a void where the next water molecule can fill.
  - Like those old color pencils.





Quick Question
21. What condition do plants need in order to absorb water from the soil into the roots and up into the leaves?

ANSWER KEY

TO SELECT QUICK QUESTIONS

1. Made of cells, respond to stimuli, grow and reproduce, use energy, have DNA or RNA as genetic material, adapt to their environment.
2. Plants are producers/autotrophs = self nourishers
3. Photosynthesis
4. function. Therefore a plant structure is centered around them being able to do photosynthesis.
5. Water, CO_2 and sunlight, therefore each type of plant (regardless of their various environmental adaptations) must be able to get these 3 things in order to do photosynthesis to harness and store energy in a usable form.
8. The diagram on the same slide starts with the plant that is the answer to this question.
9. Hint: do they get as tall as trees?
10. To have vascular tissue, or phloem and xylem that transport materials against the force of gravity through the plant.
12. Hint: It is the meaning of "sperm"
14. Hint: what would you need to look for in order to identify a plant outside?
21. Osmotic pressure, understand how it works.

Unit 10 Plants Guided Lecture Notes | Introduction

Key Words & Questions

I. Introduction | *What is a plant?*

General Plant Knowledge Review

Quick Questions

1. What 6 things do all living things have in common?

2. How do plants obtain and use energy?

3. In what process do plants create their own food?

4. Structure dictates _____.

5. What do plants need to do photosynthesis?

Photosynthesis

Photosynthesis Review

- Where does photosynthesis occur? _____.
- Roots _____.
- Light energy is absorbed by the _____.
- _____ is exchanged in the leaves.
- What "food" is produced by photosynthesis? _____.
- What is the inverse reaction to photosynthesis and where does it take place?

Plant cells

What do all plants have in common?

-
-
-

History of Plants

History of plants

Quick Questions

6. What are the products and reactants of photosynthesis? How does this relate to cellular respiration?

7. What 3 unique organelles to plant cells? Meaning animal cells do not have them.

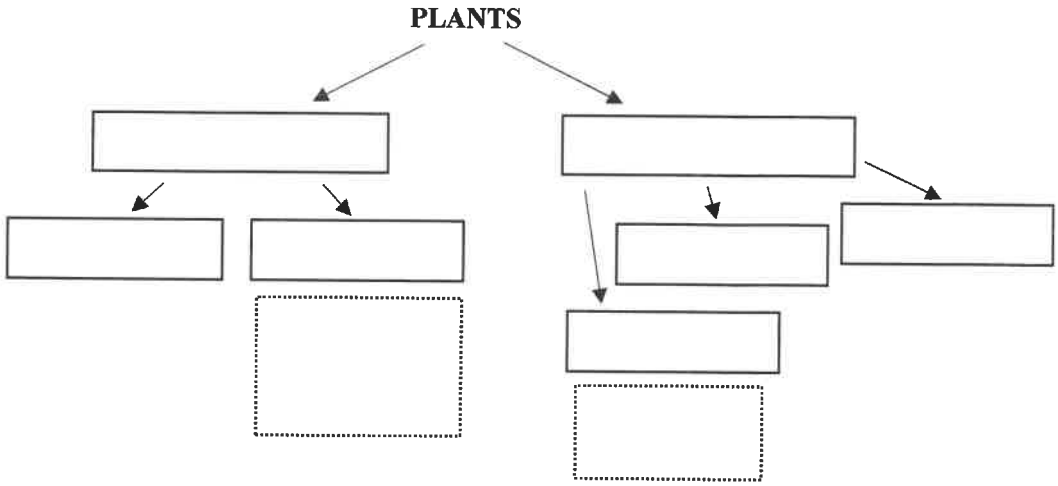
8. What would the first plant on Earth have been like?

Unit 10 Plants Guided Lecture Notes | Plant Diversity

Key Words & Questions

II. Plant Diversity

Complete the diagram as you read the notes



Vascular Tissue

Define vascular

What is the vascular system of a plant like in humans?

Vascular Tissue Examples:

Compare nonvascular plants to vascular plants

Complete the T-table with the information from the presentation including examples:

Nonvascular	Vascular

Quick Questions

9. What physical characteristic do nonvascular plants share because of their lack of vascular tissues?

10. What does it mean to be "vascular"? What specific tissues do those plants have?

Unit 10 Plants Guided Lecture Notes | Plant Diversity

Key Words & Questions

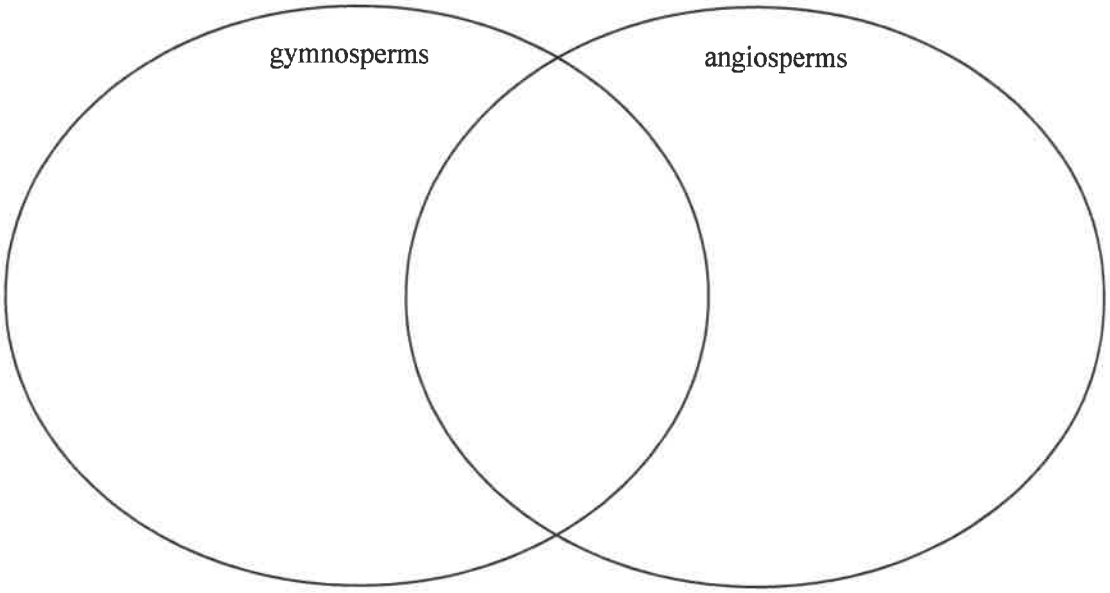
Quick Questions

11. What do tracheophytes not have that other vascular plants do have?

Angiosperms vs Gymnosperms

Complete the following diagram based on the information in the presentation:

Compare/contrast gymnosperms and angiosperms



Quick Questions

12. What characteristic do angiosperms and gymnosperms have in common?

13. What about that common characteristic is different in both angiosperms and gymnosperms?

Monocot

Dicot

Angiosperms: Monocots vs Dicots

Monocot	Dicot

Unit 10 Plants Guided Lecture Notes | Plant Diversity

Key Words & Questions

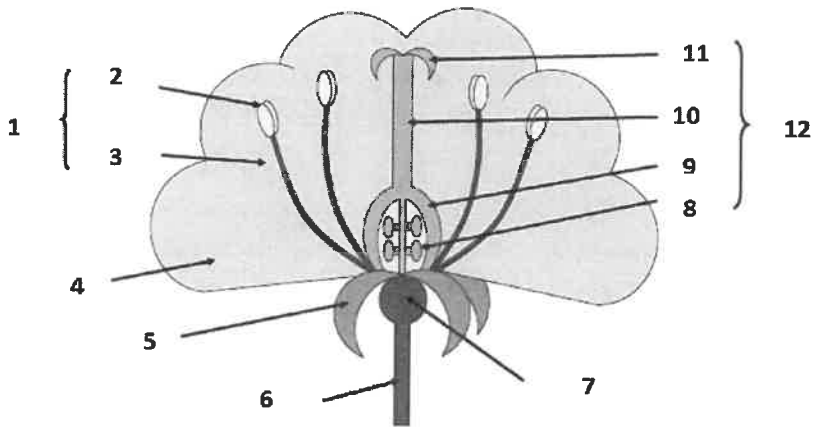
Parts of a Flower

Parts of a Flower

Complete the table using the information from the presentation. Include a description of what the "part" does and number them according to the diagram below.

Outer Parts	Female Parts	Male Parts

Flower Diagram



Quick Questions

14. What are 3 characteristics that differentiate monocots AND dicots?

15. Why is the carpel considered female and the stamen male?

16. If a flower only has one carpel, can it be used interchangeably with pistil?

Unit 10 Plants Guided Lecture Notes | Plant Structures

Key Words & Questions

III. Vascular Plant Structures

Organized in Two Systems

List the organs and give a brief description of their function.

Plant Organs

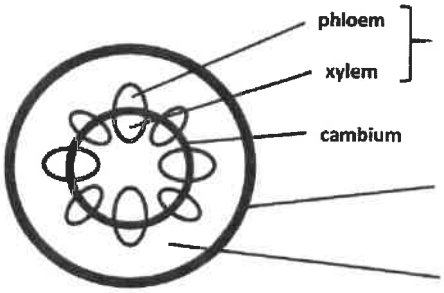
Shoots	Roots

Quick Question

17. What is the function of the stomata?

Plant Tissues

Tissue Type	Function



Quick Question

18. What are the 3 types of tissues that are in the roots, stems and leaves of a plant?

19. What is an example of each type of tissue?

20. Which tissue is only found where there is growth like the stems and root tips?

Unit 10 Plants Guided Lecture Notes | Plant Structures

Key Words & Questions

Vascular Tissues

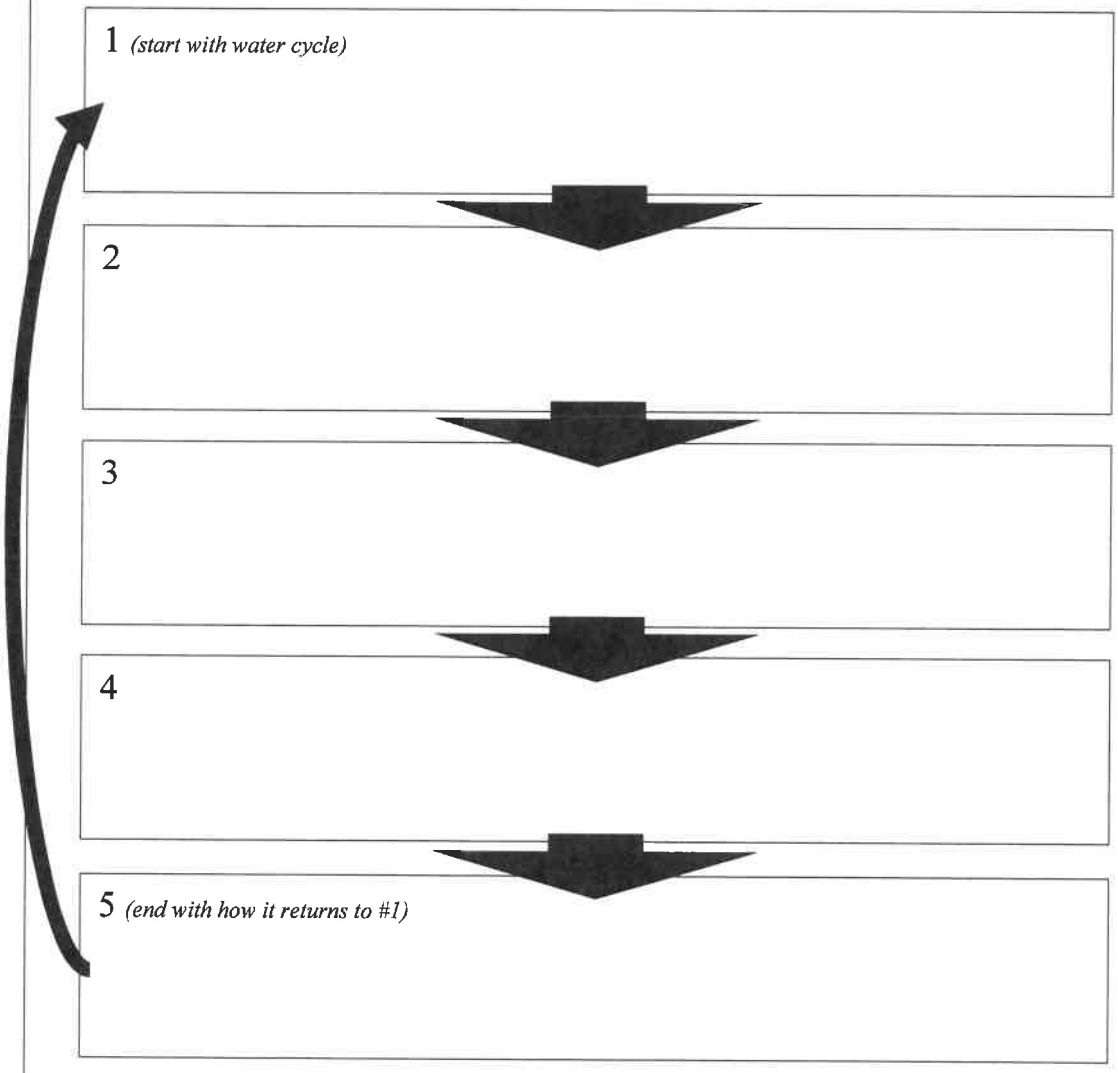
Xylem

Phloem

Transpiration

Transpiration

Complete the flow chart outlining the process of transpiration



Quick Question

21. What condition do plants need in order to absorb water from the soil into the roots and up into the leaves?

Unit 10 Plants | Activity 1

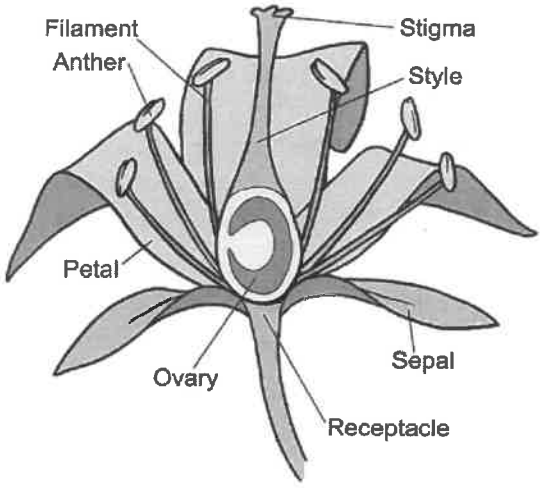
Flower Dissection Lab

Background Information

Every flower consists of a set of adaptations that help to ensure successful reproduction. For example, flowers often have bright colors, attractive shapes, and pleasing aromas. These traits help them attract insects and other animals that will carry pollen grains from flower to flower. Pollination also occurs by means other than animals carrying the pollen. For some flowering plants, the wind plays and important role in transferring pollen from plant to plant.

The seed-bearing plants that produce flowers are **angiosperms**. The flower produces the seeds, each of which contains a new plant embryo. The parts of the flower are usually found in whorls, or rings. **Petals** are one of the sets of whorls. They attract pollinators. **Sepals** lie outside the petals. They protect the bud.

The reproductive organs, the stamens and pistils, lie inside the petals. A **stamen** is a male reproductive part. It consists of an anther that is help up by a **filament**. The **anther** produces pollen grains. A **pistil** is a female reproductive part. Its top is called the **stigma**. It is sticky to ensure that when pollen grains land on it, they stick to it. The middle supporting structure is the **style**, and the large base is the **ovary**, where the eggs are produced.



Filament + Anther = Stamen
Stigma + Style + Ovary = Carpel

Objective

You will dissect a real or paper flower to learn the reproductive parts of the flower, particularly the male and female anatomy.

Materials

Collected flower from outside or use the paper flower provided

Scissors or toenail clippers

Dissection sheet (provided)

Procedure

1. Either go outside and collect a flower, any kind – bigger will be easier to dissect – or cut out the flower provided.
2. Carefully observe the flower and the diagram provided. Try to identify the parts before cutting them.
3. Carefully remove each piece, starting with the sepals and moving inward, with either your scissors or nail clippers.
4. Match each piece to the appropriately labelled box on the dissection sheet.
5. Once all of the pieces have been removed and placed in their respective boxes, take a picture of your dissection sheet with the flower pieces.
    - Alternative: if you do not have a camera/phone, draw the pieces in the boxes
6. Answer the analysis questions at the bottom of the dissection sheet.

Name _____ Period _____

Flower Dissection Lab | **Dissection Sheet**

Hypothesis

Before you begin, generate a hypothesis for the following question: Do you believe you will be able to find both male AND female reproductive parts? Why or why not.

Outer Parts

stem/peduncle

receptacle

sepals

petals

Female Parts | Pistil

stigma

style

ovary

Male Parts | Stamen

anther

filament

Name _____ Period _____

Flower Dissection Lab | **Dissection Sheet**

Analysis Questions

1. Is this an angiosperm or a gymnosperm?

2. How many petals does your flower have?

3. Would that make your flower a monocot or dicot?

4. Are the sepals green or petal colored?

5. What did you look for in order to identify the anther?

6. What did you look for in order to identify the stigma?

7. Restate you hypothesis here:

8. Was your hypothesis correct? Were you able to find both male and female parts?

9. Was there a developing fruit?

   How would you know what to look for?

   What had to have happened in order for a fruit to develop?

10. *Reflection*: What was the most difficult part of the lab? What would you do differently if you were to repeat this activity?

Paper Flower Dissection Option: Lily, *white flower with 3 petals and 3 sepals (also white)*

Name

Period

ZIPGRADE.COM

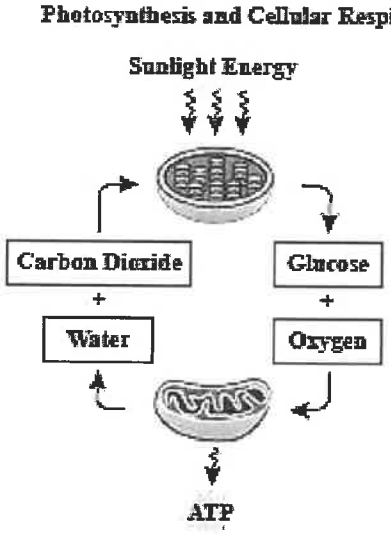
Unit 10 Plants Test (0683)

1	A	B	C	D	16	A	B	C	D	31	A	B	C	D
2	A	B	C	D	17	A	B	C	D	32	A	B	C	D
3	A	B	C	D	18	A	B	C	D	33	A	B	C	D
4	A	B	C	D	19	A	B	C	D	34	A	B	C	D
5	A	B	C	D	20	A	B	C	D	35	A	B	C	D
6	A	B	C	D	21	A	B	C	D					
7	A	B	C	D	22	A	B	C	D					
8	A	B	C	D	23	A	B	C	D					
9	A	B	C	D	24	A	B	C	D					
10	A	B	C	D	25	A	B	C	D					
11	A	B	C	D	26	A	B	C	D					
12	A	B	C	D	27	A	B	C	D					
13	A	B	C	D	28	A	B	C	D					
14	A	B	C	D	29	A	B	C	D					
15	A	B	C	D	30	A	B	C	D					

Unit 10 Test | Plant Anatomy and Physiology

Complete the following questions on the bubble sheet provided OR on the digital test in Teams Assignments.

1. The diagram below shows the relationship between photosynthesis and cellular respiration and the organelles in which they occur.



Which statement describes how photosynthesis and cellular respiration are interrelated?

a. Oxygen is produced during cellular respiration and stored during photosynthesis.

b. Carbon dioxide and water released by cellular respiration are used in photosynthesis.

c. Photosynthesis releases the energy that is stored during the process of cellular respiration.

d. Glucose is used during cellular respiration to produce food that is broken down during photosynthesis.

2. Photosynthesis allows plants to produce most of the organic molecules they need. What is the primary source of energy for photosynthesis?
   a. ATP
   b. Heat
   c. Fermentation
   d. Sunlight

3. Photosynthesis, the conversion of light energy into glucose, occurs in which organelle?
   a. Mitochondria
   b. Cytoplasm
   c. Chloroplast
   d. Nucleus

4. Which gas is removed from the atmosphere during photosynthesis?
   a. Hydrogen
   b. Nitrogen
   c. Oxygen
   d. carbon dioxide

5. Which of the following pairings shows the substance released during cellular respiration and the cellular structure that is responsible for that process?
   a. O2 and chloroplast
   b. CO2 and mitochondria
   c. ATP and chloroplast
   d. glucose and mitochondria

6. What type of biological macromolecule is produced as energy in photosynthesis?
   a. Lipids
   b. DNA
   c. proteins
   d. carbohydrates

7. Which organelle would you expect to find in a plant cell but NOT in an animal cell?
   a. Mitochondrion
   b. Chloroplast
   c. Ribosome
   d. Endoplasmic reticulum

8. Unlike the cell membrane, the cell wall is
   a. Found in all organisms.
   b. Selectively or semi-permeable.
   c. Composed of a lipid bilayer.
   d. A rigid structure.

9. You will NOT find a cell wall in which of these kinds of organisms?
   a. Plants
   b. Fungi
   c. Animals
   d. Bacteria

10. Terrestrial plants have stomata on the surface of their leaves. A single stomata is surrounded by two guard cells that change shape in response to environmental factors and open or close the stoma. Which of the following **best** explains how the structure of the leaf is used in processes that occur in plants?
   a. Water enters the plant through the surface of the leaf for transpiration
   b. Gases for photosynthesis are exchanged through the surface of the leaf.
   c. Energy for cellular reproduction is absorbed through the surface of the leaf.
   d. Carbon dioxide enters the plant through the surface of the leaf for cellular reproduction.

11. Plant cells that are specialized for cell division are ***most likely*** found in what part of the plant?
   a. root tips b. leaf epidermis c. stem epidermis d. vascular tissue

12. If the xylem in a young tree is damaged, which process is ***first*** affected?
   a. performing photosynthesis
   b. transporting water to the leaves
   c. transporting sugar to the roots
   d. absorbing water from the soil

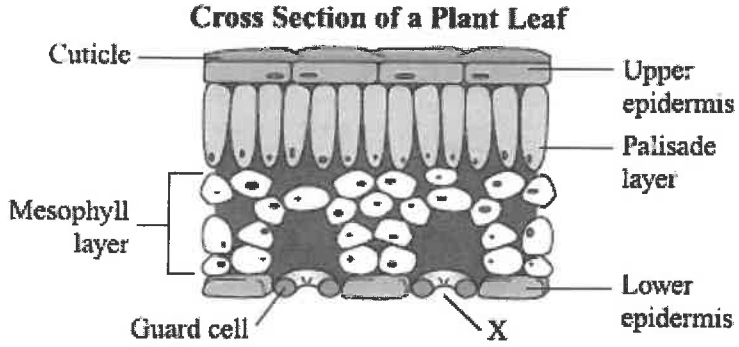
13. A plant species lives in an area with limited sunlight. Which physiological adaptation would be ***most*** useful to the plant?
   a. colorful flowers b. large leaves c. deep roots d. thin cuticle

14. What is the main function of leaves?
   a. Leaves provide support for growth and a place to store food.
   b. Leaves provide a place for photosynthesis to occur.
   c. Leaves absorb water and minerals and transport nutrients to the stem.
   d. Leaves create a barrier that prevents water in the plant's tissues from evaporating.

15. The cambuim is a section of cells in a plant that can become either part of the xylem or phloem, depending on the growth and needs of the plant. If the cambium of a particular plant was damaged, what would be the most likely effect on the plant?
   a. The plant would lose its ability to carry out photosynthesis.
   b. the plant would have uncontrolled growth.
   c. The plant would not experience any change in physiology.
   d. The plant would not be able to transport nutrients and water.

16. Which structure in the leaf controls the opening and closing of the stoma?
   a. Cuticle b. epidermis c. guard cell d. spongy mesophyll

17. The diagram below shows a cross section of a plant leaf.



How does the structure marked X contribute to the survival of the plant?

a. It allows the intake of gases necessary for photosynthesis.
b. It allows the intake of minerals necessary for plant growth.
c. It allows the intake of sunlight necessary for ATP production.
d. It allows the intake of sugars necessary for plant reproduction.

18. Which statement describes the role of flowers in plant survival?
a. Flowers can absorb carbon dioxide for sugar production.
b. Flowers produce oxygen through cellular respiration.
c. Flowers contain cells that carry out photosynthesis.
d. Flowers contain cells that produce gametes.

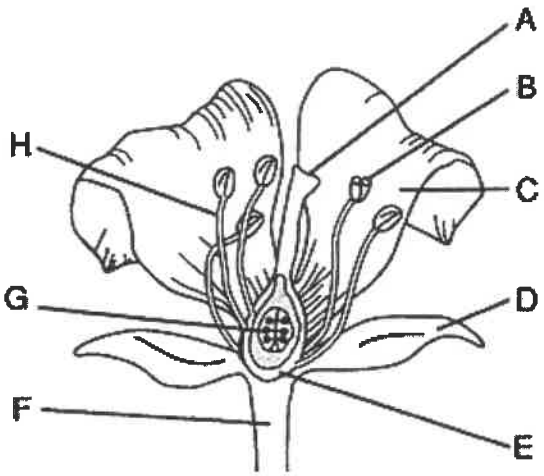
19. What is the main purpose of seeds in plants that have them?
a. To protect and distribute the zygote.
b. To entice animals to eat the plant.
c. To be fertilized by other plants.
d. To store water for the mother plant.

20. What evidence shows that apple trees are angiosperms, and not gymnosperms? Choose two answers that apply.
a. Apple seeds are protected by the fruit that surrounds them.
b. Apple trees have stems that are adapted as thick, woody trunks.
c. Sexual reproduction in apple trees involves flower.
d. Sexual reproduction in apple trees involves pollen and egg cells.

21. What are the three parts of a carpel in a flower?
a. petals, ovule, and ovary
b. ovary, stigma, and style
c. embryo, stigma, and filament
d. petals, filament, and anther

22. Which of the following do ferns lack?
a. vascular tissues
b. roots
c. leaves
d. true seeds

The diagram below represents a flower, the reproductive structure of some plants. Most flowers have both male and female structures for fertilization and reproduction. *Use the diagram below to answer questions 24-28.*



23. Which structure is represented by the Letter A in the diagram above?
    a. the stamen, a male structure which produces pollen
    b. the pistol, a female structure which collects pollen and passes it to the ovary
    c. the sepal, a modified leaf used for protection of the flower
    d. the petals, decorative structures which attract pollinators

24. Which structure is represented by the Letter C in the diagram above?
    a. the stamen, a male structure which produces pollen
    b. the pistol, a female structure which collects pollen and passes it to the ovary
    c. the sepal, a modified leaf used for protection of the flower
    d. the petals, decorative structures which attract pollinators

25. Which structure is represented by the Letter D in the diagram above?
    a. the stamen, a male structure which produces pollen
    b. the pistol, a female structure which collects pollen and passes it to the ovary
    c. the sepal, a modified leaf used for protection of the flower
    d. the petals, decorative structures which attract pollinators

26. Which structure is represented by the Letter E in the diagram above?
    a. Stigma, part of the pistol that pollen "sticks" to in order to collect sperm for fertilization.
    b. Ovary, protects the ovule and later becomes the fruit
    c. Filament, part of the stamen that holds up the anther
    d. Stamen, a male structure which produces pollen

27. Which structure is represented by the Letter H in the diagram above?
    a. Stigma, part of the pistol that pollen "sticks" to in order to collect sperm for fertilization.
    b. Ovary, protects the ovule and later becomes the fruit
    c. Filament, part of the stamen that holds up the anther
    d. Stamen, a male structure which produces pollen

28. Conifers produce two types of cones. What are the names of the types of cones?
    a. angiocones and gymnocones
    b. pollen cones and seed cones
    c. stamen cones and anther cones
    d. soft cones and scale cones

29. Vascular tissue allows a plant to transport water against the pull of gravity. Which statement best describes the trait of vascular tissue in the plant kingdom?
    a. All plants use vascular tissue to transport water.
    b. Most plants, but not mosses and green algae, use vascular tissue to transport water.
    c. Only woody plants, such as trees and shrubs, use vascular tissue to transport water.
    d. Only herbaceous plants, such as grasses and garden vegetables, use vascular tissue to transport water.

30. A cucumber is often called a vegetable because of the way it is used as a food. What property of the cucumber shows that it is properly classified as a fruit?
    a. It has a rounded shape.
    b. It has a fleshy, edible center.
    c. It develops from the sepals of a flower.
    d. It contains the seeds of the plant.

31. As plants evolved from algae, they developed the ability to live on dry land. Which of the following adaptations was most useful for this development to occur?
    a. tissues for drawing water from the soil
    b. chemicals for resisting insect attacks
    c. structures for reproducing in standing water
    d. enzymes for converting oxygen to carbon dioxide

32. Angiosperms produce flowers, while gymnosperms do not. Which is a property of the flowers of angiosperms that is not shared by the reproductive structures of gymnosperms?
    a. A flower can produce many seeds at the same time.
    b. The same plant can produce many flowers.
    c. Flowers can be pollinated without the involvement of animals.
    d. Flowers produce seeds that are encased in protective fruits.

33. Phloem functions primarily in
    a. Transport of water.
    b. Transport of products of photosynthesis.
    c. Growth of the root.
    d. Increasing stem width.

34. Bryophytes and algae use the processes of _____ to absorb water and _____ to absorb nutrients passively through their tissues.
    a. Diffusion, diffusion
    b. Pressure, passive transport
    c. osmosis, diffusion
    d. diffusion, osmosis

35. Identify the category of plant in the picture:
    a. Angiosperm, monocot
    b. Angiosperm, dicot
    c. Bryophyte, moss
    d. Gymnosperm, cycad