

University of Mary Division of Education Instructional Sequence for:

Parts of the Plant and the Process of Transpiration

By: Ann Balster

Grade Level: 10th/11th Grade

Subject(s) Area: Biology

Materials Needed:

White board, markers (green, and several other colors), bell work (see Learning Activities)

Note: This will be the 1st lesson on water transport of a leaf. Prior knowledge from previous lessons includes: structures of a plant cell, the job of chloroplasts and chlorophylls, photosynthesis, and a brief understanding of plant classification and taxonomy (the difference between trees, ferns, and other such plants).

Key:

The italicized topics are direct instruction for the teacher.

“FORMATIVE ASSESSMENTS” are indicated as such.

The normal print is on the information/ standards/ and objectives for the lesson today.

The red topics follow the objectives specifically. These are very important topics, and so it is necessary to cover these completely.

Sandard:

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

Objectives:

Students will be able to:

1. Identify the tree parts to a plant: roots, stem, and leaves.
2. Recognize and label the parts of a leaf.
3. Understand the **functions of the stomata, mesophyll, cuticle, xylem, and phloem** in reference to water homeostasis within the cell.
4. Describe the transport of water in a leaf and understand the feedback mechanisms of maintaining homeostasis (**Transpiration**).
5. Compare a xylem and phloem, and distinguish them in a diagram.

Learning Activities:

Step 1: Students enter class, sign in on attendance slip, and grab bell work slip from Bell work tray, which is located near the door and begin work. (See BELL WORK 1 document)

1. Every class period, the students will have a 10 question review of concepts from previous lessons in the Unit.
2. Since this Unit is on plants, the quiz will have numerous questions on plants. See Plant Bell Work.
3. Once the quiz is passed out, the 5-minute timer is started. *Teacher will walk between table and collect the finished sheets when they are finished with them and will simultaneously read the student question on #7 and pick the best ones or the most frequently asked questions.*
4. Students are expected to be quiet and respectful while others are finishing their bell work. They have a 5-minute limit after class starts. If any students come in late, they have the remainder of the 5 minutes to finish the Bell Work (they are not given extra time).
5. *Once the timer rings, the quizzes are collected. After all the quizzes have been collected, the teacher 1st ask if everyone has signed the attendance slip, and then will go over the questions and give the answers.*

Answers:

Question 1: Photosynthesis

Question 2: C, Carbon dioxide and Oxygen

Question 3: D, All of the above

Question 4: A, Angiosperms

Question 5: B, Pine cones

Question 6: Large central vacuole, chloroplasts, and a cell wall

Question 7: *When answering this question, the teacher will pick 2 student questions (or more depending on the amount of time) and read them anonymously. The students can help answer the questions, or if they need help the teacher can reteach. The teacher will use this as an assessment. After correcting the Bell Work that night, she will know where there is serious confusion on a certain topic. If there is a sub that fills in and he/she doesn't know the answers, the sub will let the students know that their teacher will read and answer these questions when she gets back.*

Step 2: Attention Getter: Today the class will start out with a poem about plants. *The teacher will ask the students to close their eyes. She tells them to picture a plan in their minds. Then she begins to read the poem aloud and walk between desks to encourage listening.*

Please Don't
BY TONY HOAGLAND

Tell the flowers — they think
the sun loves them.
The grass is under the same
simple-minded impression

About the rain, the fog, the dew.
And when the wind blows,
it feels so good
they lose control of themselves

and swobtoggle wildly
around, bumping accidentally into their
slender neighbors.
Forgetful little lotus-eaters,

solar-powered
hydroholics, drawing nourishment up
through stems into their
thin green skin,

high on the expensive
chemistry of mitochondrial explosion,
believing that the dirt
loves them, the night, the stars —

reaching down a little deeper
with their pale albino roots,
all Dizzy
Gillespie with the utter
sufficiency of everything.

They don't imagine lawn
mowers, the four stomachs
of the cow, or human beings with boots
who stop to marvel

at their exquisite
flexibility and color.
They persist in their soft-headed

hallucination of happiness.
But please don't mention it.
Not yet. Tell me
what would you possibly gain

from being right?

Teacher should thank the students for listening, discuss what she liked about the poem, ask if others have thoughts, and finally, tell them that the poem pertains to the lesson today.

Step 3: Give students the agenda for the day:

1. Everyone should get out their notebooks
 - a. Today they will define the terms of a plant, leaf, and structures of the stem/veins, and structures in a leaf
 - b. Tell students to write down the definitions and terms so that they can use them as a word bank for the diagram at the end of class
2. Describe the process of transpiration.
3. Finish with questions

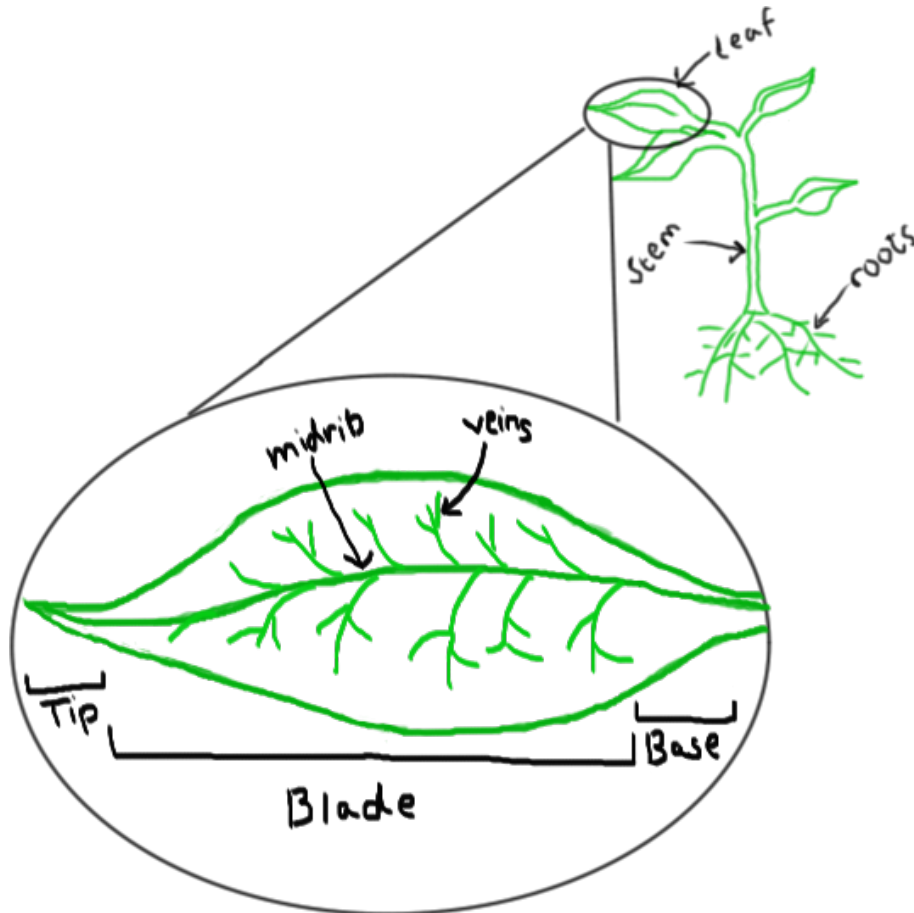
Step 4: Encourage the students to copy what the teacher writes on the board. They will be doing a bit of drawing today, and so it is encouraged to have multiple colors, especially green. If some students do not have a green marker or colored pencils, grab some from the markers box. The drawing is supposed to help make the lesson fun and keep them entertained since today holds a lot of terms.

Step 5: Terms and Definitions- Today's class is very instructional and informational, and it is important that the students understand the processes and terms that follow. Drawing the pictures up on the board will increase the student's understanding, and provide a visual model of the terms and how they are related. The diagram will also give the students a chance to make the drawings their own.

1. Use the white board and draw a "classic plant" that contains roots, a stem, and several leaves. Put the plant in green marker, labels in black (or another color) marker
 - a. Leaf- the main organ of photosynthesis and transpiration
 - b. Stem- the main body or stalk of the plant, provides structure and transport from roots to leaves
 - c. Roots- a network or fibers underground that sucks up water and nutrients from the soil around it

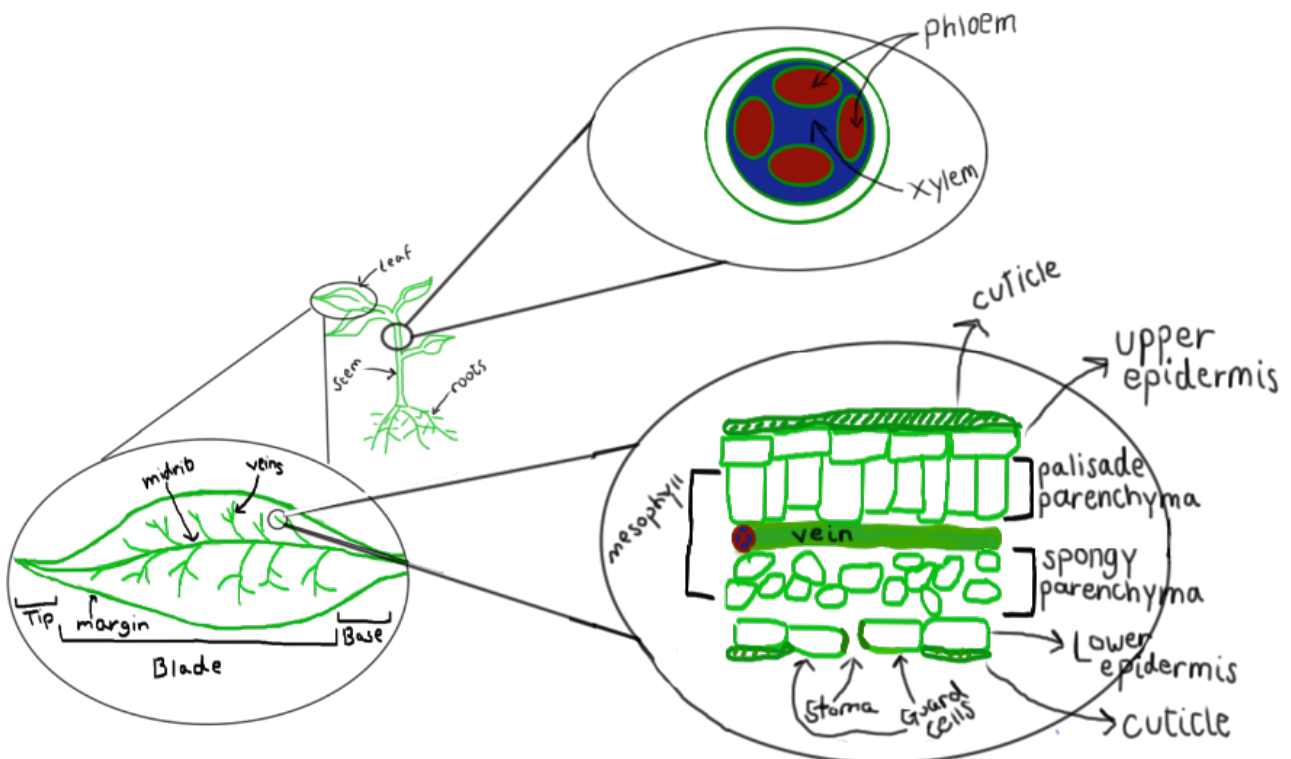


2. Next draw a “classic leaf” and label the parts
- Tip- the end of the leaf
 - Blade- center part of the leaf
 - Base- where the leaf attaches to the stem
 - Midrib- large strengthen vein in the middle of a leaf
 - Veins- circulatory system in the leaf that supplies cells with water and nutrients



3. Label the complex structure of the stem (and vein) and leaf
- Stem/vein structure
 - Phloem- vascular tissue that plants use to transport sugars and other photosynthetic products DOWN from the leaves
 - The sugars created in the processes of photosynthesis are needed everywhere in the body. Just as your body needs fats throughout the body. This is the energy that the plant needs to survive. All living organism need energy to survive!
 - Xylem- vascular tissue that plants use to transport water and nutrients UP from the roots like a straw
 - Water and nutrients allow the plant to survive and enable it to do the process of photosynthesis. All plants and animals need water and nutrients to stay alive!
 - Leaf structure (from the top down)

- i. Cuticle- protective outer layer of epidermis, waxy, prevents water loss
 - 1. In reference to homeostasis in a plant, a cuticle doesn't let it dry out!
- ii. Upper epidermis- single layer of cells (with few chloroplasts), allow for sunlight to get through
- iii. Mesophyll- site of gas exchange and photosynthesis in the leaf
 - 1. This is where the plant makes its energy! Very important and found in all leaves.
- iv. Palisade parenchyma- columnar cells rich with Chloroplasts, site of photosynthesis, beneath upper epidermis
- v. Spongy parenchyma- irregular chlorophyll-bearing cells under the palisade layer, allows for gas exchange (Converts $\text{CO}_2 \rightarrow \text{O}_2$) which is necessary in photosynthesis
- vi. Vein- not always in between the parenchyma, but it allows transport between roots and leaves
- vii. Stoma (Stomata, plural)- a pore in the epidermis of a plant that allows for gas exchange
 - 1. In the process of photosynthesis, there needs to be a constant supply of CO_2 so that the process can be completed!
- viii. Guard cells- a pair of curved epidermis cells around the stoma that open or close due to the homeostatic needs of the leaf; they are the only cells in the epidermis that contain chloroplasts
- ix. Lower epidermis- the underside of the leaf



4. Transpiration- the process of water movement throughout the plant and evaporation into the atmosphere (Very Important!)
- a. Part of the water cycle- releases water back into the atmosphere
 - b. Agents that affect transpiration
 - i. *Depending on the amount of time left of class, you could open the floor to a little bit of brainstorming. The teacher will say “turn to your neighbors” and have a table talk to hypothesize some ways transpiration might effect the homeostasis of a plant. What are some structural factors of the plant that attribute to water loss/absorption. Teacher will circulate and enter several conversations (FORMATIVE ASSESSMENT).*
 - ii. Number of leaves in a plant, and size of leaf - allows for more surface area, which means more sunlight
 - iii. Number of stomata (plural for stoma)- the more pores a leaf has, the more places where water can escape
 - iv. Light supply- the more light there is, the more a plant will photosynthesize. Therefore, they need to open the stoma to let CO₂ in to start the energy process.
 - v. Cuticle- since it is waxy, it reflects the sunlight, thus lowering the temperature of the plant. It is water resistant. Therefore, the only way water can escape is through the stomata, which opens and closes to let CO₂ in.
 - vi. Water supply- the xylem is constantly pulling water from the soil to the leaves. If the soil is wet, the stoma will open, allowing transpiration to occur so that the plant isn't over watered. Also the more water there is in the air effects whether the stomata will open or not
 - c. *Ask if there are any questions on transpiration or anything else, and make sure that everyone has all of their notes in their notebooks. Erase the board if they all have it. FORMATIVE ASSESSMENT: Call for a “Fist-5” for understanding. If any student raised less then a 4 ask if they have any questions, or need clarification. If all the hands are 4 and above, move to the Q/A section.*
 - d. Q/A section: **FORMATIVE ASSESSMENT:** *Tell the students to flip over their diagrams and close their class notes and ask a couple questions regarding the material. Get everyone involved in the assessment, give everyone a question (Allow people to phone a friend in need be):*
 - i. **Questions:**
 1. First grab an actual plant in the room (if there isn't one have one of the students come up and draw one on the board). Point to specific areas of the plant and leaf and ask who knows what structure you are pointing at.
 2. What do the xylem and phloem do, and how are they different?
 3. What is homeostasis, and what homeostatic method do plants use to regulate water loss/absorption?

4. How is transpiration part of the water cycle?
5. Which cells in the leaf have chloroplasts?
6. Which parenchyma has to do with gas exchange?
7. What are the three classic parts of a plant?

Step 6: *Hand out the diagram worksheet, and give them the rest of class time to fill in the blanks and answer the question on the back.*

1. *If they do not finish it, they can finish it at home for homework.*
 - a. *Tell them that it is easy points, especially if they were paying attention. Also say that this will likely to be on next class's bell work and future plant exam.*
 - b. *In the following class period after the bell work (which will be on this information-**FORMATIVE ASSESSMENT**, See Bell Work 2), mark the assignment as completed or late, ask if they students have any questions, go over the blank spaces with the answers so that the students can make changes, and then allow them to keep the diagram as a reference.*
2. *If there is remaining class time, they can finish other homework for Biology or other classes. If things get rowdy, the teacher can take out the questions that the students came up with in their bell work and discuss and clarify some of them together.*

Step 6: Dismissal: *Remind about homework: the diagram and other previously assigned homework. Tell them that tomorrow they will be working on the same information, but we are going to be playing a game (The Human Plant, where all the students become one big plant and have to pass the water, sugars, and nutrients (multi colored balls) around the entire plant in under 20 seconds). Tell them to make sure and review the diagram for tomorrow's bell work.*

Thank the students for listening, and tell the students to have a good rest of their day. Excuse the students.

Assessment: Throughout the lesson there are Formative Assessment indicators.

Students have their homework assignment that will help them connect ideas about plants, and when I receive the homework, I will be able to see if my students understand the topic. Tomorrow, they will be quizzed (daily bell work) on the topics discussed the day before. They will also be playing a game to test fluency.

BELL WORK!!!!

Name: _____

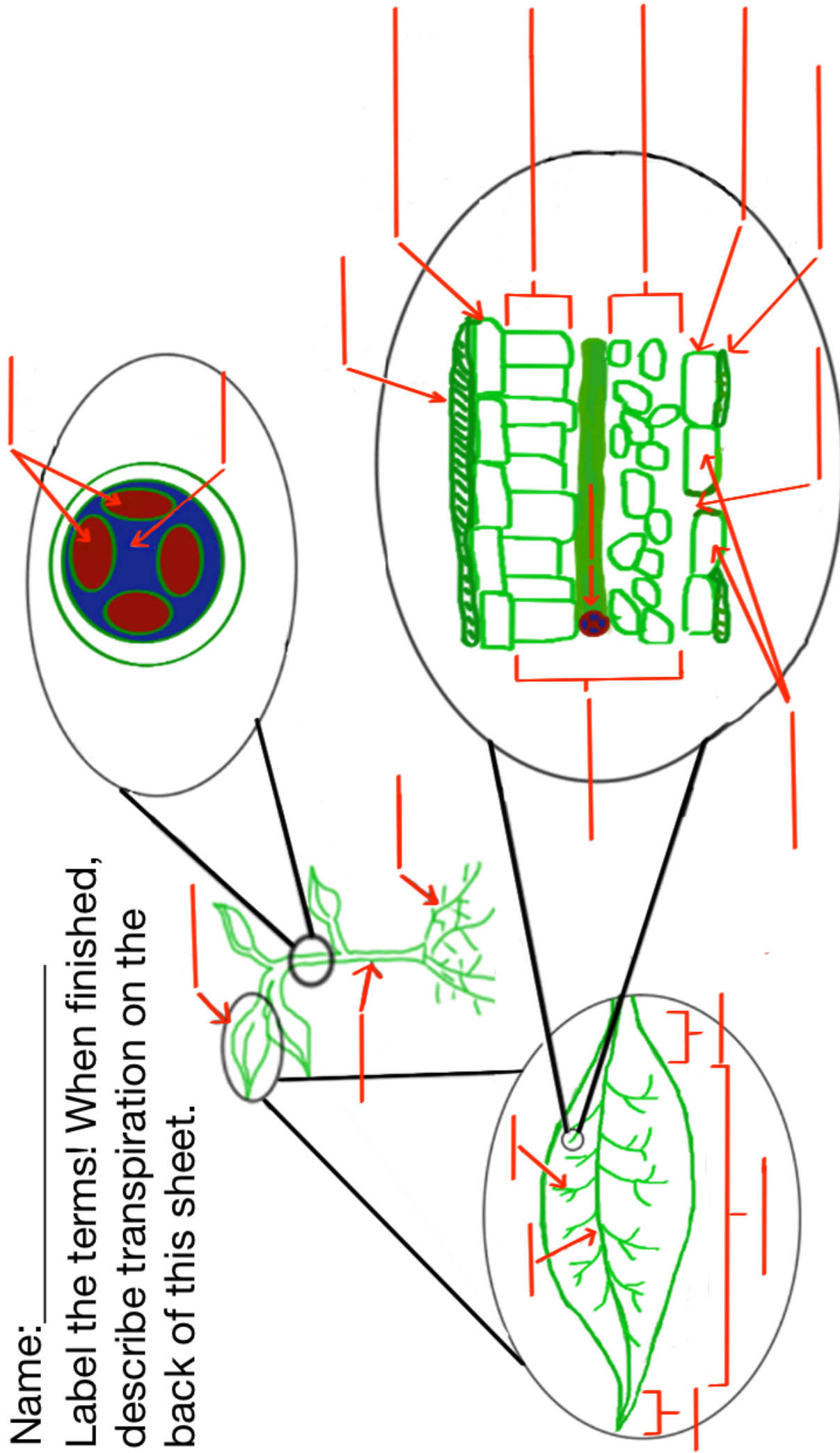
Date: _____

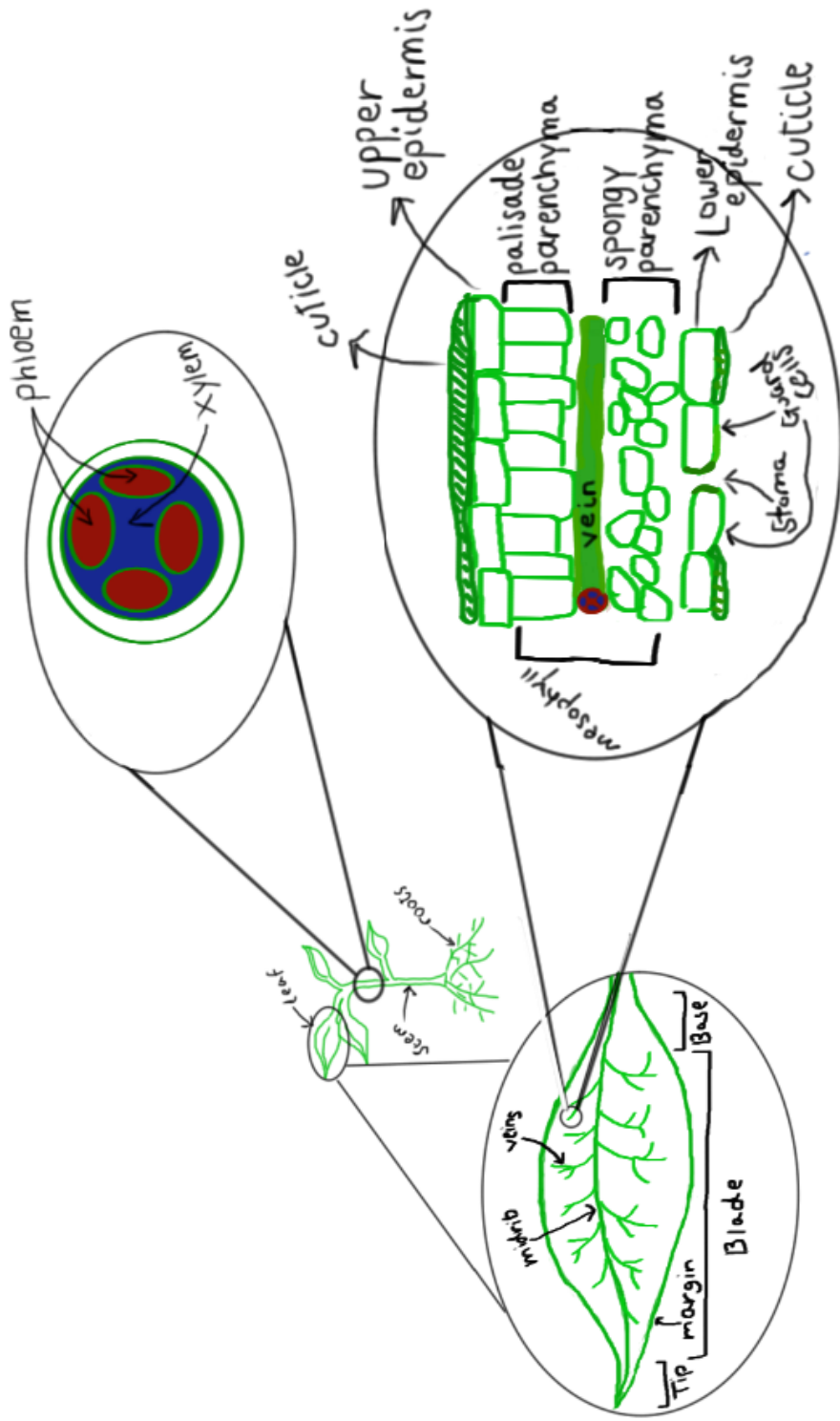
1. _____ **Photosynthesis** _____ is the process used by plants (and some other organisms) to convert light energy, usually from the Sun, into chemical energy that can later be released to give the plant energy (fuel) and life.
2. (2 pts) Plants take in _____ and release _____ during the process answered above.
 - a. Oxygen and water
 - b. Oxygen and Carbon dioxide
 - c. Carbon dioxide and Oxygen**
 - d. Water and sunlight
3. Trees and Ferns are similar because of which of the following?
 - a. They both have green leaves
 - b. They both are vascular (water and nutrients flow through “veins”)
 - c. They both use the process of photosynthesis
 - d. All of the above**
4. Which is a flowering plant?
 - a. Angiosperms**
 - b. Gymnosperms
 - c. Moss
 - d. Ferns
5. What do Gymnosperms have that are unique to them?
 - a. Flowers
 - b. Pine cones**
 - c. Leaves
 - d. Bark
6. (3 pts) What 3 things do plant cells have the animal cells do not?
 - 1. Large central vacuole**
 - 2. Chloroplasts**
 - 3. Cell wall**
7. What is a concept that you are still confused about? What is a question that you have?

Extra Credit: Draw an amazing tree on the back of this page.

Name: _____

Label the terms! When finished, describe transpiration on the back of this sheet.





BELL WORK!!!!

Name: _____ Date: _____

Make sure you turn the page over. There is an extra question on the back.

1. All can apply to the Palisade parenchyma AND the Spongy parenchyma
EXCEPT:
 - a. Both are in the mesophyll
 - b. Both contain chloroplasts
 - c. Both are involved with gas exchange
 - d. Both are needed for the process of photosynthesis
2. A pore in the epidermis of a plant that allows for gas exchange is the
 - a. Stoma
 - b. Mesophyll
 - c. Spongy parenchyma
 - d. Non of these allow for gas exchange
3. Transpiration is the process of water movement throughout the plant and evaporation into the atmosphere.
 - a. True
 - b. False
4. (2 pts) What is the difference between the phloem and xylem?
Phloem transfers sugars down from the leaves to the rest of the plant.
Xylem transfers water and nutrients up from the roots like a straw.
5. The cuticle is the
 - a. Single layer of cells that allows sunlight to get through
 - b. Protective, waxy outer layer of epidermis that prevents water loss
 - c. Allows for nutrient, sugar, and water transport between the roots and leaves
 - d. Both A and C
6. (3pts) Draw and label a "classic plant." (HINT: there are 3 structures in every plant. What are they?)



7. What is a concept that you are still confused about? What is a question that you have?

Ann Balster
Curriculum, Instruction, and Assessment
Artifact 8: Biology Lab

Lab Title: Plant Transpiration Process Experiment

My performance-based assessment will explain the transpiration process of a plant in a lab. This assessment will follow the North Dakota state standard of “HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.”

Objectives: Students will be able to:

1. Understand the functions of the stomata, mesophyll, cuticle, xylem, and phloem in reference to water homeostasis within the cell.
2. Describe the transport of water in a leaf (Transpiration).
3. Create a lab report using the scientific method (i.e. state a question, create a hypothesis, compile data, analyze data (make conclusions), and compile results including a solution section)
4. Use deductive reasoning to find solutions to the question/problem.

Part I: Set Up

Students will be put in lab groups of 2-4 (probably corresponding to the lab tablemates). They will then be in charge of planting 3 bean plants (already sprouted and full with leaves). Each plant will be put under different light. One will grow directly under the heat lamp. One will grow next a to heat lamp. The last one will grow without a heat lamp or will grow in room temperature.

The materials each group will need include:

1. 3 Styrofoam cups
2. Potting soil
3. 3 bean plants
4. 2 heat lamps
5. A measuring cup (for watering)
6. Thermometer

Then the students will be given their question: What will happen to the plants in

reference to transpiration. They will generate their hypothesis. The hypotheses do not have to be one unifying group hypothesis, meaning that an individual in the group can have a different hypothesis than his fellow group members (The groups were just put in place so that everyone doesn't get three plants, and so that they learn collaboration skills with their classmates).

Part II: Data Collection

Students will need to track their plants for a week, watering their plants 6 ounces daily. They will record information such color changes in the leaves, dryness of soil, height of plant, temperature of soil, and other changes that they see. If they collect measureable data (such as temp), they will be responsible for creating a graph in their lab report. Also they will discuss in their groups what their control variable will be. If they need help with this, I will ask them about the three plant environments. What is different between them? Which environment is closer to regular everyday life? The plant that is not placed under the heat lamp will operate as the control for this experiment because there are no conditions being added to its environment, such as a heat lamp.

Part III: Creating the Lab report

Students will follow the lab guidelines (given as a handout) to complete a lab report on their findings. They will be graded by the rubric that is made from the guidelines. This assessment is an individual project, though every student in the group should have similar responses. The point of having each of the students do the lab report separately is so that they become acquainted with the method of scientific analysis. Also it is a way of assessing whether all students understand the key concepts of this lab.

Biology Lab Report Guidelines

Type your lab reports. Put Name, Date, Class, and Lab Title at the top of the page. Every section of the lab report must be indicated with the appropriate **Heading** (HINT! They are bolded). Put the sections in your lab report in the order seen below.

Sections:

1. **Introduction**- Include some background information about the topic discussed in this lab. This only needs a couple of sentences, but make them interesting.
2. **Question**- State question
3. **Hypothesis**- State your hypothesis AND why you would expect this to happen
4. **Materials**- List them
5. **Procedure**- State the control. Provide a step by step list of how you did the experiment
6. **Recorded Data**- This can be done in a variety of ways, either put in a table of data collected, or record observations made, but whatever way you choose to do it, make it thorough and organized (understandable). Use units!
7. **Results**- What did the end result look like? With the data collected answer the lab question. State whether your hypothesis was correct/incorrect in these words "My hypothesis was _____." Remember DO NOT go into why you think these results came about, this is for the Discussion. Be clear and concise (a good Results section only needs several sentences to state what the end result was and whether your hypothesis was correct/incorrect).
 - a. NOTE: If data is measurable (numbers/ countable) create a graph.
 - i. Label the graph correctly
 1. Key Components to a graph: **Title, Horizontal and Vertical Axis Labels, and Scales** (and a Key when necessary)
 - ii. This can include but is not limited to a bar graph, pie chart, or scatter plot.
 - iii. Make sure the graph that you choose represents the data in the clearest way possible. For example, if you are working with percentages, use a pie chart rather than a bar graph.
8. **Discussion**- Restate the Question, and explain the Results. BE CREATIVE! Why did the results turn out the way they did? Provide 1 thing that shocked you and 1 thing you would change if you did the lab over.
9. **Conclusion**- Short and sweet. Wrap it all up in a pretty little package.

Rubric for Lab Reports

	Challenge	Proficient	Partially Proficient	Novice
Layout	Meets all the requirements for the Lab Guidelines and looks organized (provided bolded headings, colored graph, tables, etc)	Includes all sections of lab report, providing a heading for each of the sections of the lab report	Sections are mixed up, OR 1 is left out	Does not have section headers and is not organized Is not typed
Introduction	Provided definitions of key terms examined in the lab	Provided information about the topic examined in lab.	Provided surface level information given to support lab	Shows no clear understanding about what was examined in lab.
Question		Stated		Not stated
Hypothesis	Written clearly and is explained	Written clearly	Written semi-clear	Is not clear
Materials	Listed in order of usage	Listed	Some materials were forgotten	Not listed
Procedure	Procedure provided detailed description of each step and their purposes	Procedure provided step by step	Procedure had a step or two missing	Procedure's steps were not listed in order OR 3+ steps were skipped
Data	Organized by time/date, control, variables, and units	Organized and units are expressed	Organized, but units are not expressed	Not organized
Results	Clearly stated, answers the question, and contains: "My hypothesis was _____." Concise but rich with information	Clearly stated, answers the question, and gives hypothesis justification (correct/incorrect)	Clearly stated but doesn't answer the question, hypothesis justification is forgotten, OR results are discussed	No clear result is made
Graph (There may not be a graph necessary)	Correctly/properly represents data with key components with color and style	Correctly/properly represents data with key components	Doesn't properly represent data, OR 1 Key component of graph is missing	Doesn't represent data, OR graph is missing 2+ Key components of graph
Discussion	Restates question, gives thorough explanation with more than one possibility, and gives a shocking thing and a thing done differently	Restates question, gives an explanation, and gives a shocking thing and a things done differently	Does not restate question, gives a weak explanation, OR doesn't give a shocking thing or a thing done differently	There is no evidence that the student understands why the results came about
Conclusion	Shows understanding and enthusiasm about topic	Shows understanding about topic	Shows partial understand about topic	Doesn't show understanding about topic
Spelling/ Grammar	< 3 Spelling/ Grammatical errors	3-6 Spelling/ Grammatical errors	6-9 Spelling/ Grammatical errors	>9 Grammatical errors

10/11th Grade Biology Exam
Miss. Ann Balster
PLANTS!

Name: _____

Date: _____

True and False

Circle "T" for true and "F" for false. **If false, correct them** in the space below the question. Every True statement will be 1 pt. Every False statement will be 2 pts. (1 for answering correctly, and 1 for correcting the incorrect statement)

T / F Plant cells are cuboidal in shape.

T / F Xylem transports from the leaves to the roots.

T / F The Palisade parenchyma is the site of photosynthesis within a leaf.

T / F Guard cells surround the stoma and help with homeostatic needs.

T / F Photosynthesis only occurs on sunny days.

T / F Transpiration is the process used by plants (and some other organisms) to convert light energy into chemical energy that can later be released to give the plant energy (fuel) and life.

T / F Gymnosperms have pinecones.

T / F The Mesophyll is the site of photosynthesis ONLY.

T / F Plants take in oxygen like humans.

T / F Transpiration is equivalent to evaporation in plants.

Multiple choice (1 pt. each unless indicated). Please circle the correct answer.

1. Which is not included in the main structures of EVERY plant:
 - a. Flower
 - b. Leaf
 - c. Stem
 - d. Roots

2. (2 pts.) Plants take in _____ and release _____ during the process answered above.
 - a. Oxygen and water
 - b. Oxygen and Carbon dioxide
 - c. Carbon dioxide and Oxygen
 - d. Water and sunlight

3. The Cuticle
 - a. Is the structure that preforms photosynthesis within a leaf.
 - b. Is the waxy covering of the leaf that regulates water transpiration.
 - c. Is a hole that allows for gas exchange.
 - d. Is the "straw" in the plant that brings water up from the roots.

4. Trees and Ferns are similar because of which of the following?
 - a. They both have green leaves
 - b. They both are vascular (water and nutrients flow through "veins")
 - c. They both use the process of photosynthesis
 - d. All of the above

5. Some agents that DIRECTLY affect transpiration include:
 - a. Number of stomata (plural for stoma)
 - b. The animals the live in their area
 - c. Light supply
 - d. Surrounding vegetation
 - e. A, C, & D
 - f. All of the Above

6. The midrib is (BE CAREFUL)
 - a. The central vein of a leaf
 - b. The end of the leaf
 - c. The center part of the leaf
 - d. Where the leaf attaches to the stem.

7. Chloroplasts cause:
 - a. The waxy outer layer
 - b. The green coloring
 - c. The autumn coloring
 - d. B and A
 - e. B and C
8. The flowers of angiosperms are
 - a. Leaves that change color due photosynthesis
 - b. Involved with sexual reproduction and germination of flowing plants
 - c. There for decoration
 - d. Key components to the development of pinecones.

Matching: Match the letter from the word bank in the appropriate black space next to its definition. Use a word from the word bank ONLY once. (1 pt. each)

- _____ 1. A membranous bilayer surrounds and protects the genetic material
- _____ 2. The enzyme eater suspended in fluid in cell
- _____ 3. The fluid in the cell
- _____ 4. The storage and waste bin of a plant cell
- _____ 5. Packages sugars and enzymes and transports them out of the cell
- _____ 6. Rigid layer of polysaccharides that are outside the cell membrane
- _____ 7. The semipermeable layer the surrounds the cytoplasm and all organelles within the cell
- _____ 8. Where the genetic material is stored
- _____ 9. Home of ribosomes
- _____ 10. Double-membraned organelle that convert light energy from the Sun into sugars that can be used by the cell

Word Bank:

- a. Nucleus
- b. Nuclear membrane
- c. Cytoplasm
- d. Large Vacuole
- e. Chloroplast
- f. Golgi Apparatus
- g. Endoplasmic reticulum
- h. Cell membrane
- i. Cell wall
- j. Lysosome

Short answer:

What are the three structures in plant cells that animals cell lack? Please list them (3 pts.).

What is the difference between Palisade parenchyma and Spongy parenchyma (2 pts.)?

Diagram:

Draw a diagram of the leaf structure in a typical plant. Indicate structures with arrows and labels. (9 pts.)

Use ALL of the following words in you drawing: Mesophyll, Cuticle, Upper epidermis, Vein, Spongy parenchyma, Lower epidermis, Stoma, Palisade parenchyma, Guard cells

Essay (10pts- 5pts for content, 3pts for organization, 2pts for grammar and spelling)

You visit your grandma's house to have you family's annual Thanksgiving Day meal. You walk in the kitchen and are overwhelmed by the smells of turkey, mashed potatoes, and stuffing. Grandma has been cooking all day on her old stove/oven, and it is quite hot in the kitchen. You notice the plant on the kitchen table. Being a good Biologist, you check to see if the plant has water by touching the soil. The soil is completely dry, and yet the plant continues to look healthy and green. What is happening to the plant? Give a possible explanation. (Recall the process of Transpiration and what agents effect the total transpiration of a plant.)

Write AT LEAST 3 paragraphs, including an introduction, body paragraph, and conclusion. Remember Grammar and Spelling count!

10/11th Grade Biology Exam
PLANTS!

Name: KEY
Date: 11/23/15

True and False

Circle "T" for true and "F" for false. If false, correct them in the space below the question. Every True statement will be 1 pt. Every False statement will be 2 pts. (1 for answering correctly, and 1 for correcting the incorrect statement)

T / F Plant cells are cuboidal in shape.

T / **F** Xylem transports from the leaves to the roots.

Corrected: Phloem transports from leaves to roots OR Xylem transports from roots to leaves.

T / F The Palisade parenchyma is the site of photosynthesis within a leaf.

T / F Guard cells surround the stoma and help with homeostatic needs.

T / **F** Photosynthesis only occurs on sunny days.

Corrected: Photosynthesis can occur on cloudy days, but it is not as efficient.

T / **F** Transpiration is the process used by plants (and some other organisms) to convert light energy into chemical energy that can later be released to give the plant energy (fuel) and life.

Corrected: This process is Photosynthesis OR Transpiration is the process of water movement throughout the plant and evaporation into the atmosphere

T / F Gymnosperms have pinecones.

T / **F** The Mesophyll is the site of photosynthesis ONLY.

Corrected: Gas exchange also occurs within the mesophyll.

T / **F** Plants take in oxygen like humans.

Corrected: Plants take in CO₂ unlike humans.

T / F Transpiration is equivalent to evaporation in plants.

Multiple choice (1 pt. each unless indicated). Please circle the correct answer.

1. Which is not included in the main structures of EVERY plant:
 - a. Flower
 - b. Leaf
 - c. Stem
 - d. Roots

2. (2 pts.) Plants take in _____ and release _____ during the process answered above.
 - a. Oxygen and water
 - b. Oxygen and Carbon dioxide
 - c. Carbon dioxide and Oxygen
 - d. Water and sunlight

3. The Cuticle
 - a. Is the structure that preforms photosynthesis within a leaf.
 - b. Is the waxy covering of the leaf that regulates water transpiration.
 - c. Is a hole that allows for gas exchange.
 - d. Is the "straw" in the plant that brings water up from the roots.

4. Trees and Ferns are similar because of which of the following?
 - a. They both have green leaves
 - b. They both are vascular (water and nutrients flow through "veins")
 - c. They both use the process of photosynthesis
 - d. All of the above

5. Some agents that DIRECTLY affect transpiration include:
 - a. Number of stomata (plural for stoma)
 - b. The animals the live in their area
 - c. Light supply
 - d. Surrounding vegetation
 - e. A, C, & D
 - f. All of the Above
*****Animals affect plant life (especially if they are herbivores)
but they don't affect transpiration directly*****

6. The midrib is (BE CAREFUL)
 - a. The central vein of a leaf
 - b. The end of the leaf
 - c. The center part of the leaf
 - d. Where the leaf attaches to the stem.

7. Chloroplasts cause:
- The waxy outer layer
 - The green coloring of a leaf
 - The autumn coloring of a leaf
 - B and A
 - B and C
8. The flowers of angiosperms are
- Leaves that change color due photosynthesis
 - Involved with sexual reproduction and germination of flowering plants
 - There for decoration
 - Key components to the development of pinecones.

Matching: Match the letter from the word bank in the appropriate black space next to its definition. Use a word from the word ban ONLY once. (1 pt. each)

- B 1. A membranous bilayer that surrounds and protects the genetic material
- J 2. The enzyme eater suspended in the fluid of a cell
- C 3. The fluid in the cell
- D 4. The storage and waste bin of a plant cell
- F 5. Packages sugars and enzymes, and transports them out of the cell
- I 6. Rigid layer of polysaccharides that are outside the cell membrane
- H 7. The semipermeable layer the surrounds the cytoplasm and all organelles within the cell
- A 8. Where the genetic material is stored
- G 9. Home of ribosomes
- E 10. Double-membraned organelle that convert light energy from the Sun into sugars that can be used by the cell

Word Bank:

- Nucleus
- Nuclear membrane
- Cytoplasm
- Large Vacuole
- Chloroplast
- Golgi Apparatus
- Endoplasmic reticulum
- Cell membrane
- Cell wall
- Lysosome

Short answer:

What are the three structures in plant cells that animals cell lack? Please list them (3 pts.).

Plants have:

1. Large Vacuole
2. Chloroplasts
3. Cell Wall

What is the difference between Palisade parenchyma and Spongy parenchyma (2 pts.)?

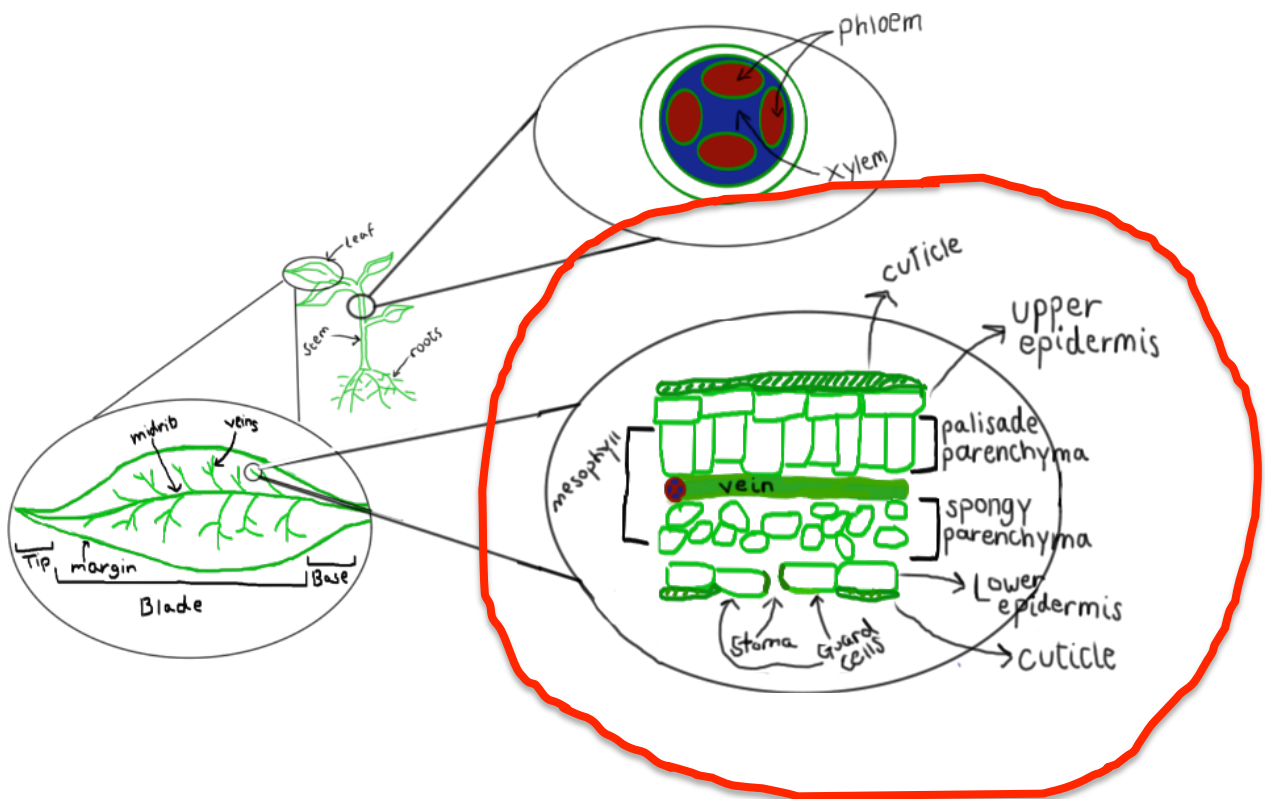
The Palisade parenchyma is the sight of photosynthesis. The Spongy parenchyma is the site of gas exchange. The Palisade parenchyma is on top of the Spongy parenchyma.

Diagram:

Draw a diagram of the leaf structure in a typical plant. Indicate structures with arrows and labels. (9 pts.)

Use ALL of the following words in you drawing: Mesophyll, Cuticle, Upper epidermis, Vein, Spongy parenchyma, Lower epidermis, Stoma, Palisade parenchyma, Guard cells

Answer circled in Red



Essay (10pts- 5pts for content, 3pts for organization, 2pts for grammar and spelling)

You visit your grandma's house to have you family's annual Thanksgiving Day meal. You walk in the kitchen and are overwhelmed by the smells of turkey, mashed potatoes, and stuffing. Grandma has been cooking all day on her old stove/oven, and it is quite hot in the kitchen. You notice the plant on the kitchen table. Being a good Biologist, you check to see if the plant has water by touching the soil. The soil is completely dry, and yet the plant continues to look healthy and green. What is happening to the plant? Give a possible explanation. (Recall the process of Transpiration and what agents affect the total transpiration of a plant.)

Write AT LEAST 3 paragraphs, including an introduction, body paragraph, and conclusion. Remember Grammar and Spelling count!

Since it is hot in the kitchen, you would expect the plant's water (and health) to deplete significantly. However the processing of transpiration is not being allowed to happen. Several explanations for this phenomena include:

1. The stomata are closed, and are not allowing gas exchange and subsequent water loss to occur.
2. There isn't a lot of direct heat.
3. The cuticle stops the evaporation from happening as well since it is water resistant.
4. There might not be a lot of leaves on the plant (thus lessening the amount of surface area and water loss).
5. The plant may not need water constantly (in cases of cacti).
6. Grandma might have just watered it this morning.
7. There might be a lot of water vapor in the air for boiling potatoes or green beans. Plants can take moisture from the air as well.

*****There could be many answers. As long as they provide some evidence as to why they think their explanation is a valid explanation, they will get fell credit on the content portion (but there key here is EVIDENCE).

Granted, the plant cannot live like this forever, and will have to be removed from this environment or be watered soon.