PLANTS

complete unit

No-prep 2 week unit all about plants!





biology roots

"Plants have always been a struggle in my curriculum and this is a great addition to my arsenal! My students are always engaged with the material we use from Biology Roots and this was no exception! Thank you!" –TX Sunrise Science

PLANTS

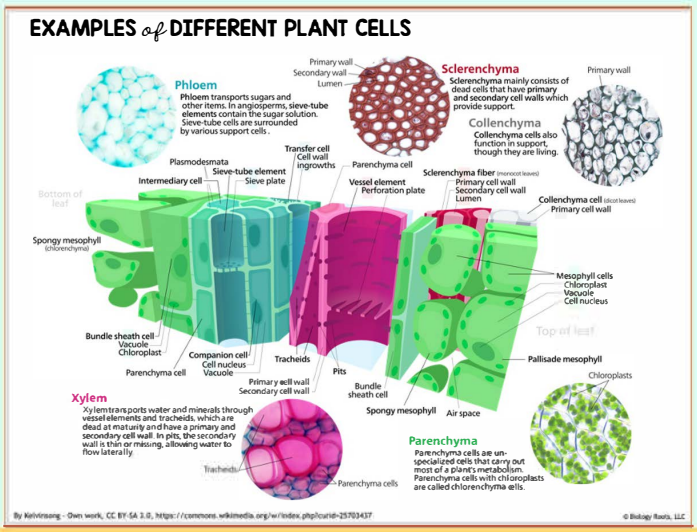
TOPICS INCLUDE:

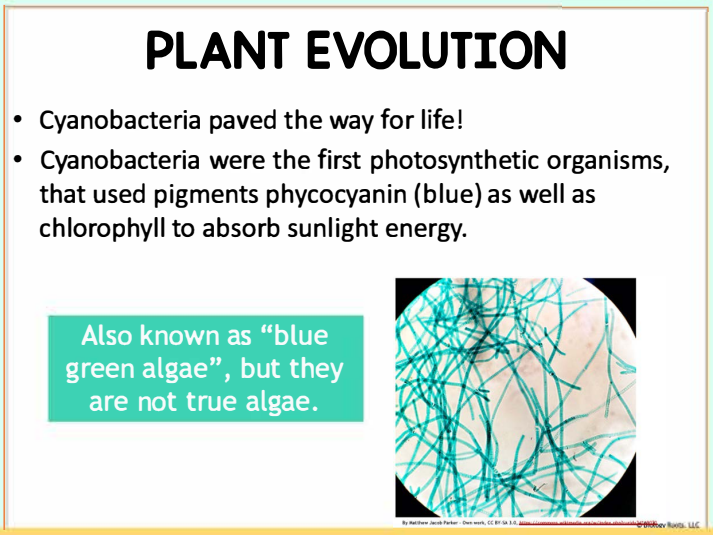
- Characteristics of Plants
- Basic Photosynthesis Station
- Nonvascular vs. Vascular Plants
- Xylem and Phloem
- Roots and Shoots
- Basic Leaf Structure
- Transpiration vs Evaporation
- Turgidity and Modeling Turgor Pressure
- Stomata
- Capillary Action
- Angiosperms vs Gymnosperms
- Hormones, Plant Response
- Phototropism
- Limiting Factors
- Adaptations... and more!

PLANTS
editable PowerPoint









59 EDITABLE SLIDES IN POWERPOINT

[No Title]

PLANT EVOLUTION

- Cyanobacteria paved the way for life!
- Cyanobacteria were the first photosynthetic organisms, that used pigments phycocyanin (blue) as well as chlorophyll to absorb sunlight energy.

Also known as "blue green algae", but they are not true algae.

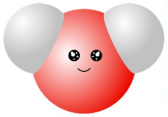


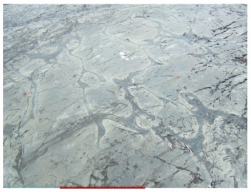
PLANT EVOLUTION

- The evolution of cyanobacteria paved the way for land animals.

WHY?

Discuss...





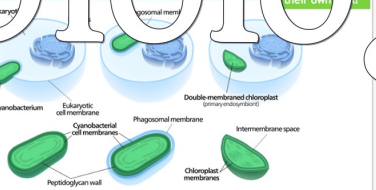
NONVASCULAR vs VASCULAR PLANTS

NONVASCULAR	VASCULAR
No specialized vascular tissue	Specialized vascular tissue (xylem and phloem) used to move food and water throughout the plants
No true roots, leaves, or stems (NO veins or tubes)	Contain roots and shoots (leaves and stems)
Low lying	Can grow very tall
Examples include mosses, hornworts, and liverworts	Examples include ferns, conifers, trees





PLANT EVOLUTION



PLANT EVOLUTION



PARTS of the NONVASCULAR PLANT



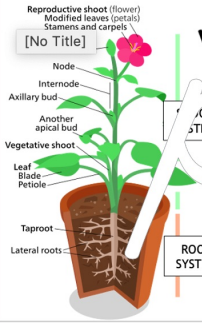
Nonvascular plants do not have true roots, instead they have structures that help anchor them to the ground. They can absorb water and minerals via capillary action.

Plants are able to get water this way as long as the plant's body is no more than a few cells thick.

-Why?

[No Title]

PARTS of the VASCULAR PLANT



SHOOT SYSTEM — The plant's leaves, and buds contain vegetative and reproductive parts of plant.

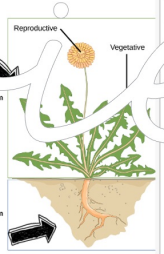
ROOT SYSTEM — Anchors the plant and absorbs nutrients and water; typically underground.

PLANT TRANSPORT

[No Title]

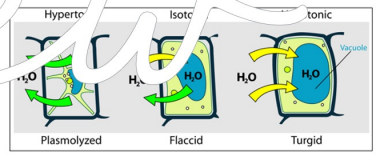
Reproduction occurs within the leaves of the shoot system via photosynthesis. The sugars leave from the leaves to the stem through the phloem.

Absorption occurs in the root system. Water and minerals are absorbed from the soil and moved from the roots to the shoots the xylem.



PLANT TRANSPORT

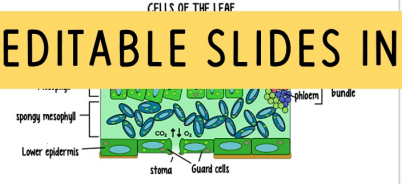
Turgor Pressure is created when the phloem has a high concentration of solutes (mainly sugars) that causes water to be [illegible] from the xylem via osmosis into other parts of the plant.



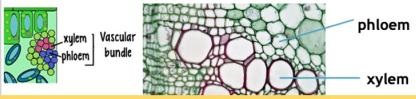
Turgid means engorged or swollen and is a sign of good health in plants. Flaccid is the absence of turgor pressure. Plasmolysis an extreme condition: the absence of turgor pressure AND shrunken cells.

PLANT TRANSPORT

Plant transport occurs in vascular plants. Vascular plants contain specialized cells that can transport, water, minerals, and nutrients, and exchange gases.

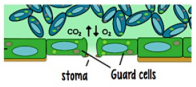


PLANT TRANSPORT



The phloem of vascular plants transports sugars and nutrients within the plants.

PLANT TRANSPORT



Guard cells also play a role in plant transport by regulating the opening and closing of the stomata (singular= stoma).

They are mostly found on the lower epidermis (bottom) of the leaf.

Can you spot the guard cells?



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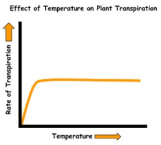
59 EDITABLE SLIDES IN POWERPOINT

PLANT TRANSPORT

[No Title]

On very hot days, the rate of transpiration (water loss) increases.

However, if too much water is lost, it can be preserved in the plant if the guard cells shrink to close the stomata. The lack of water causes them to deflate and steadies the rate of transpiration.



At which point in the graph may the guard cells have shru[illegible] close the stomata?

REPRODUCTION of VASCULAR PLANTS

[No Title]

Plants WITH seeds

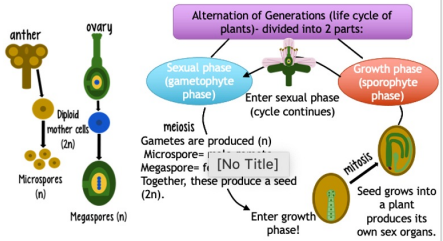
- **Angiosperms** — *Flowering plants; seeds surrounded by an ovule*
- **Gymnosperms** — *No flowers or fruit, seeds found scales such as a pinecone*

Plants WITHOUT seeds

- **Ferns**
- **Horsetails**
- **Club mosses**

Alternation of Generations

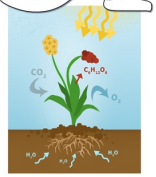
All vascular plants undergo a life cycle known as the alternation of generations.



PLANT TRANSPORT and PHOTOSYNTHESIS

Ph[illegible]osynthesis [illegible]ati[illegible]:

CO_2 [illegible] 6 H[illegible] → $C_6H_{12}O_6$ [illegible] 6

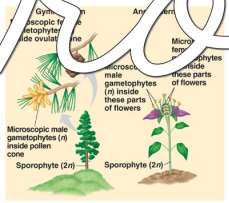


Relationship between stomata and photosynthesis?

Hint: Stomata control the exchange of oxygen and carbon dioxide

Alternation of Generations

All va[illegible]lar pl[illegible]s unde[illegible]o a [illegible]de know[illegible] the alternation of ge[illegible]ns- [illegible]e two di[illegible]t forms during [illegible]eir lives: gametophytes & sporophytes.

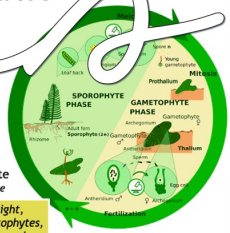


Gametophytes are haploid (n) and sporophytes are diploid (2n).

REPRODUCTI[illegible] of VASCULAR PLANTS

SEE[illegible]ES [illegible]ular plant[illegible]e [illegible]s to rep[illegible] [illegible]se[illegible]s.





Spores → Gametophyte → Sporophyte
Intermediate stage *Adult stage*

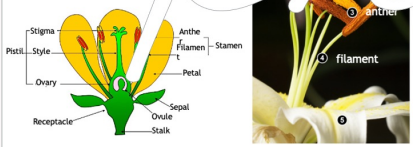
If the spores have enough moisture, sunlight, and nutrients, they will form into gametophytes, which are tiny plants that produce sperm and egg cells.

ANGIOSPERM REPRODUCTION

Angiosperms use the male and female parts of flowers to reproduce.

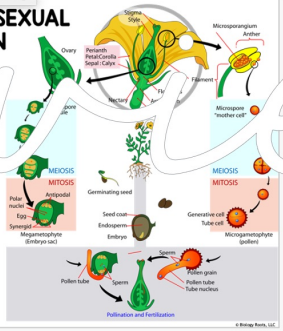
Male part of flower= sta[illegible]en

Female part of flower[illegible]stil



ANGIOSPERM SEXUAL REPRODUCTION

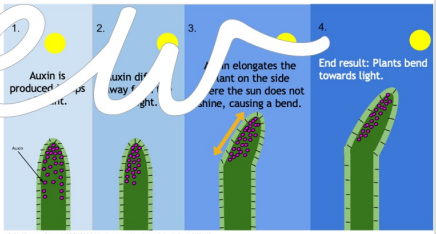
Pollen[illegible]ces sperm ce[illegible]. It s[illegible]ks to the s[illegible]ma[illegible]d travels do[illegible]style to the ov[illegible] [illegible]here fertiliz[illegible] [illegible]ke seeds.



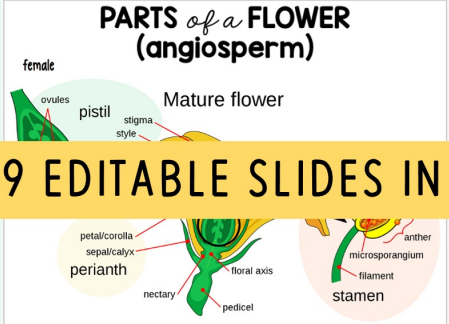
Ways flowers can fertilize:

- Self fertilization
- Bee pollination
- Pollen carried on wind from other plants

PLANT RESPONSE- PHOTOTROPISM



PARTS of a FLOWER (angiosperm)

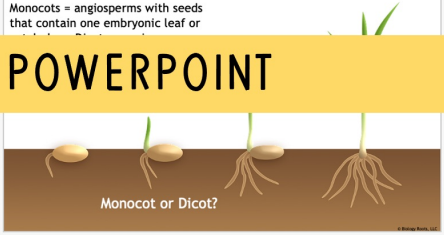


FLOWERING PLANTS: Monocots vs. Dicots

Mono= one Di= two Cot= cotyledon

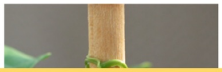
(a cotyledon is an embryonic leaf; the first to appear from a germinating seed)

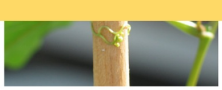
Monocots = angiosperms with seeds that contain one embryonic leaf or



PLANT RESPONSE- THIGMOTROPISM

Thigmotropism- a plant's response to





plants growing in the direction of the wind.

Auxins play a role in thigmotropism.

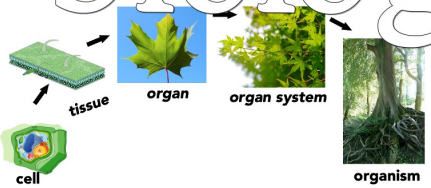
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PLANTS
EXHIBITION STATIONS

Station 1 Characteristics of Plants

Plants are classified in the kingdom *Plantae*, and are made of ***advanced eukaryotic cells***. *Their cells contain chloroplasts, which allow them to absorb light energy to make their food in a process known as* ***photosynthesis***, *and* ***cell walls*** *made of cellulose, which are a structural component of plants.*
Plants contain many different types of tissues that work together to form a complex organism.



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Station 2 Plant cells under a microscope

View the plant cells under the microscope. Sketch and label any structures you see in the space on your student answer sheet.
Structures that are possible to see under the light microscope include nucleus, cell wall, and chloroplasts. **(Typically you are only able to see either the chloroplasts OR then nucleus. Depending on your specimen and tool, you may not be able to see both).**



Hint: there will only be one nucleus in each cell but multiple chloroplasts.

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Station 16 Plant Reproduction

Plants can be separated into two categories depending on their reproduction: **seeds or seedless**

Seedless plants use **spores** to reproduce

An example of a seedless vascular plant is ferns. ALL nonvascular plants are seedless.



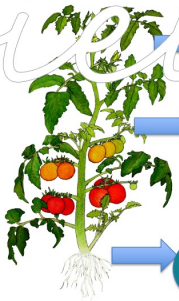
Seeded plants can be further categorized:
Angiosperms use **flowers** to reproduce
Gymnosperms use **seeds or cones** (such as pinecones) to reproduce

* Can you think of any examples of angiosperms or gymnosperms?



Station 24 More Limiting Factors

The 3 macronutrient required by plants are: nitrogen, phosphorus, and potassium (NPK).



N Nitrogen is part of the chlorophyll molecule; gives plants a healthy green color. It is also essential for flower growth and quality fruit.

K Potassium for drought protection (maintains turgor and prevents water loss); keeps plants and roots strong.

P Phosphorus for color, ripening, and strong roots!

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PLANTS
EXHIBITION STATIONS

Station 4 — Types of Plants: Transport

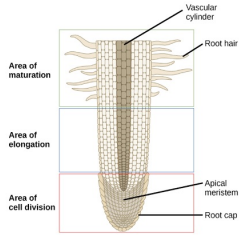
Plants can either be **vascular** or **nonvascular**.

NONVASCULAR	VASCULAR
No specialized vascular tissue- rely on diffusion/osmosis for uptake of nutrients and water.	Vascular plants have vascular tissue responsible for moving water, food, and minerals throughout the plant. The primary vascular tissues are **xylem** and **phloem**.
No true roots, leaves, or stems.	Contain a root and shoots system

ALL plants, regardless of transport method, make their food via photosynthesis. The food molecules are transported differently depending on whether they are vascular or nonvascular.

Station 6 — Roots continued

Root hairs are projections that grow out of the surface of the root, and in doing so increase the surface area. Root hairs absorb water and minerals from the soil to the vascular part of the root, and help anchor the plant.



Roots hairs very small and able to absorb water and minerals.

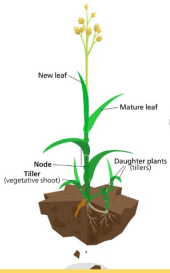


Radishes are edible roots- you can see their tiny hairs! Think of a few more edible roots...

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Station 7 — Vascular Plants: **Shoots**

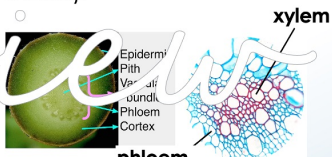
The second plant organ system, the **shoot** system, is above ground. The shoot system includes leaves, buds, stem, flowers/fruits. The shoot system is responsible for photosynthesis, reproduction, water/food storage and transportation, and the production of hormones.



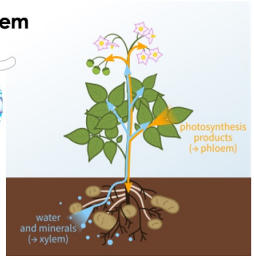


Station 9 — Xylem and Phloem con't

The xylem and phloem are in vascular bundles throughout ALL parts of the plant (roots and shoots).



OBSERVE the cross section of the stem that has been provided. Can you find the vascular bundles of xylem and phloem?



preview

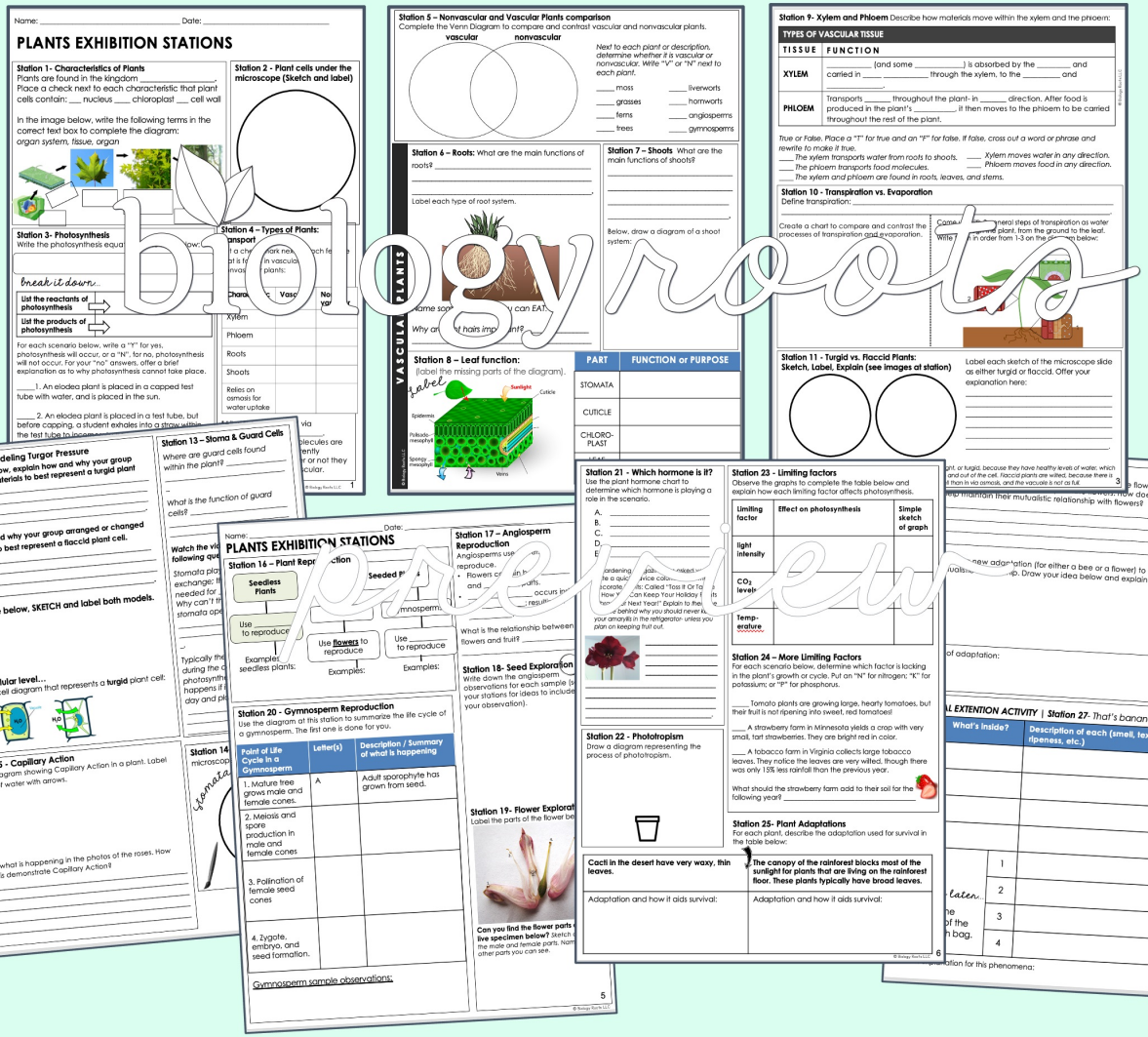
TWO VERSIONS INCLUDED: FULL VERSION WITH 27 STATIONS; SHORTENED VERSION WITH 21 STATIONS

AVAILABLE IN BOTH *paperless* AND *print*. EDITABLE.

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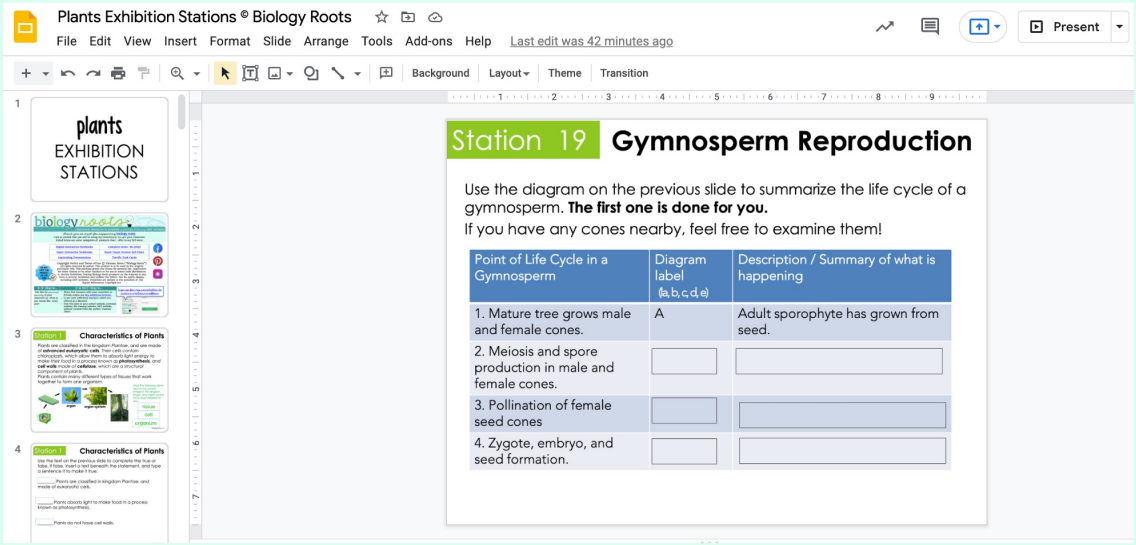
PLANTS
EXHIBITION STATIONS

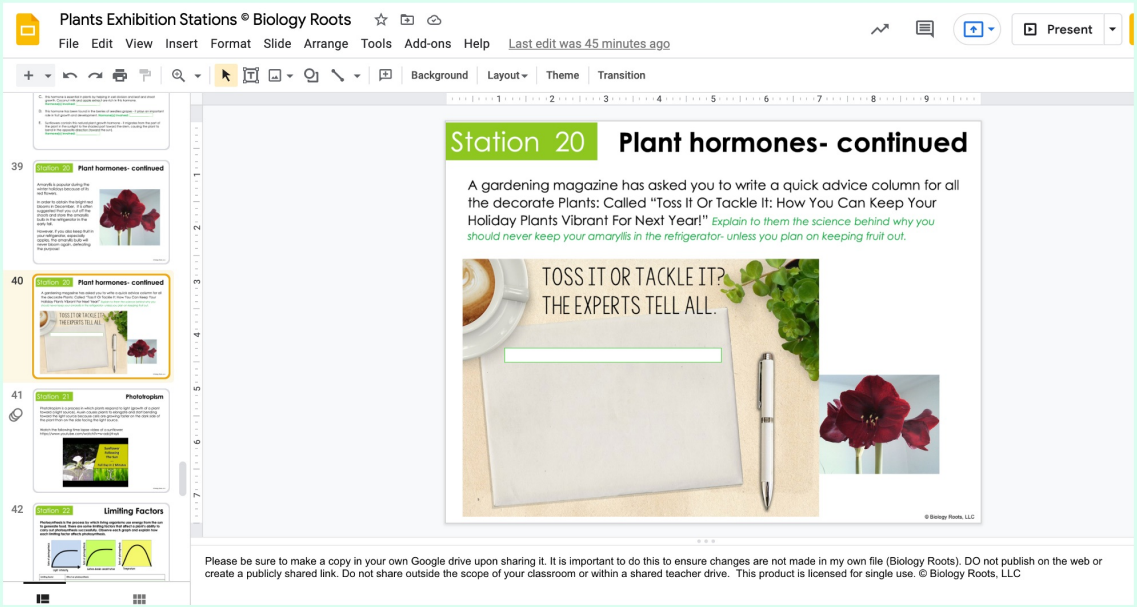
Student Answer Sheet Included
Two versions available (full and shortened)



DIGITAL version available

AVAILABLE AS BOTH *paperless* DIGITAL *and* TRADITIONAL *print*





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PLANTS LABS





NAME: _____ DATE: _____

LAB: WATER TRANSPORT AND TRANSPIRATION IN PLANTS

Question: Do varying environments affect the rate of transpiration in plants?

MATERIALS

- ✓ 2 stalks of celery, leaves attached
- ✓ 3 500 ml beakers or sturdy cups
- ✓ Water
- ✓ Digital scale
- ✓ Food coloring
- ✓ Large, deep plastic tub
- ✓ Masking tape or marker
- ✓ Large box fan
- ✓ Razor or sharp knife
- ✓ For extension activity: razor or knife, pins or tweezers, microscope, eye dropper or pipette, slide, cover slip

8. Obtain a square of plastic wrap and place
celery so that no water can escape. Use tape to secure if necessary.

Be sure your group's initials are on the beakers as you may be sharing space with other groups.

9. Beaker #1 will go in front of the fan. Ask your teacher where to place it if unsure.

10. Beaker #2 will go inside a plastic tub with a lid. If you are sharing the plastic tub with others, you may gently place it inside. If you've been assigned your own plastic tub, fill it with 1 inch of room temperature water and secure the lid on top. This is to simulate a humid environment.

11. Allow the celery to sit for 24 hours. Complete hypothesis on next page.

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RMATION

ystems to move materials throughout their bodies. Plants do not, but
ue- a network of tubes called **xylem** that carry water. Xylem is
tubes formed by cells. As the cells grow, they stretch out and elongate.
ehind hollow cavities that are interconnected to form one long tube.

thesizing, it opens tiny holes in the underside of the leaf
ow carbon dioxide to flow in, but water vapor also diffuses *out* of the
the leaves is called transpiration. The higher the rate of transpiration,
through the xylem from the roots. For example, on hot days, there is
er rate of transpiration. Any water lost through transpiration is
m; the xylem moves water from the ground up via cohesion and

_____

do you think might increase the rate of transpiration?

_____

om beaker #1 (fan) into the beaker on the scale. Do so

table below for day two. Repeat steps 2-4 for the boxed

s (DRY)	Beaker 2 water mass in grams (HUMID)

pour out water into a sink.

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TA COMPARISON

g your day one and day two masses, fill out the chart below. You will also need to look at the
es on the celery stalks to compare the colors of the humid and dry environments.

Beaker	DAY ONE (initial mass in g)	DAY TWO (final mass in g)	Color/pattern of leaves (indicate darker/ lighter as one celery stalk may have darker leaves than the other).
(dry)			
(humid)			

water content of the beaker in the dry environment (circle one) [gained I lost] _____ g.
water content of the beaker in the humid environment (circle one) [gained I lost] _____ g.

ive an explanation for the difference in water mass observed: _____

glass slide, use the eye dropper and cover slip to create a wet mount specimen of a celery
s section. Using color, sketch what you see below. Label the xylem.

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transpiration in plants

Dependent Variable: What you are observing and measuring throughout the experiment to determine your results.

Possible materials to use during seed germination experiment (check with your teacher to see what is available): seeds (required), plastic cups or flower pots, soil or sand, water, sunlight, grow lights, paper towels, plastic baggies, refrigerator, vinegar, coffee grounds, sugar, etc. ***Important: before designing your experiment, be sure that any materials you would like to use are available!***

Title of your experiment: _____

Independent variable (the variable you'll

Dependent variab

Design a procedur
experiment should

Offer a hypothesis based

DATA and OBSERVATIONS- ➞ In the chart below, record your data in the chart as you move through the experiment. **For days you cannot observe, such as weekends, record the date but leave the box blank.*

Day	Control	Experimental
8		

In the space below, provide a simple sketch of both plants over the 14 day period.

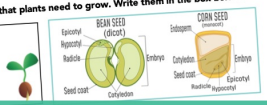
ol	Experimental	Day	Control	Experimental
		8		

Name: _____ Date: _____

SEED GERMINATION INVESTIGATION

Seeds are found inside the fruit of plants. The three primary parts of the seed are the embryo, endosperm, and seed coat. Seeds contain everything necessary to form a new plant.

1. Brainstorm some resources or factors that plants need to grow. Write them in the box below:



2. What are some different ways that light could affect seed germination?

3. What are some ways that soil composition could affect seed germination?

4. What are some different ways temperature

5. What is another factor that could drastically affect seed germination and how

EXPERIMENTAL DESIGN

Choose a factor that can affect seedling growth to design an experiment with one independent variable among two groups. For example, your plant groups might have the same amount of water and sunlight, but one might be exposed to different temperatures. *Just be sure that whatever factor you choose to be different, all the other factors are exactly the same.*

Design your experiment by using at least two groups:

A control group: a group that does not receive treatment, or receives standard treatment. For example, if you were to test the amount of light as your variable, the control group would simply be placed on a window will in the sun.

An experimental group: a group that is affected by your experiment (used to compare to the control group). The experimental group contains one variable known as the **independent variable: this is what you are adding to the experiment to make it different from the control group. (An example might be different amounts of water, varying light exposure, different types of soil, etc.)**

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Please note you will need to tend to your plants in class daily!

Question: Formulate a question that your experiment will aim to answer:

➞ ➞ *On the following two pages, record your observation and provide sketches of the plants as they grow over a 14 day period.*

CONCLUSIONS (come back to after day 14)

1. Summarize the results of your experiment:

2. Simplify the results above to 1-2 sentences to answer your experiment's question formed at the top of this page: _____

3. How did your experiment compare to your prediction?

4. How might you change this experiment if you were to repeat it again?

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seed germination lab

Name: _____ Date: _____

FLOWER DISSECTION

Label the diagram below representing the parts of the flower.
Word bank: stigma anther stamen anther ovule sepal filament ovary pistil

Parts of a Flower

ESSENTIAL INFORMATION: The reproductive parts of the flower can be separated into male and female. The male part is called the stamen, which includes the anthers and filaments. Pollen grains are produced in the anthers. The pollen grains contain the male gametes, or sperm. The filaments support the anthers. The filaments enable the anthers to sit high on the flower so the pollen is easily accessible to pollinators and wind.

The female part is called the pistil, which includes the stigma, style, and ovary. The stigma typically sits above the anthers, to discourage self-pollination. The stigma can be hairy or sticky in order to hold pollen. Once pollen is on the stigma, it creates a pollen tube through the style in order to get to the ovary. The style is a stalk between the stigma and ovary that assists with fertilization. The ovaries contain ovules, which make eggs. Once sperm cells fuse with egg cells inside the ovule, fertilization occurs, and eventually seeds are formed.

MATERIALS: one flower, paring knife or other knife, dissection mat or board for cutting, tweezers, Q-tip, magnifying glass or microscope.

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PROCEDURE AND QUESTIONS

1) Place the flower on a cutting board and remove one of the petals gently using your hands. (If dissecting a daffodil, you will need to gently tear apart the corona, the round cup in the middle, and remove it.)

2) Gently remove 1-2 sepal(s) from underneath the removed petal. Please note that in some species, such as lilies, the sepal can look similar to a petal. In this case, you will be removing a structure that looks similar to an outer petal.

3) Examine the reproductive parts of the flower. Make note of the parts as compared to the diagram on the first page.

11) Why are filaments useful? _____

12. Carefully using a Q-tip, swab some pollen gently from the anther. Observe it under a magnifying glass, or, if using a microscope, transfer it to a slide to observe under 100x magnification.

Sketch the pollen up close in the circle at right.

13. What is pollen? What is its function? _____

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14. Take the remains of the plant and separate them according the chart below. Using colored pencils, do a simple sketch of each structure. Be sure to write the name of your flower species.

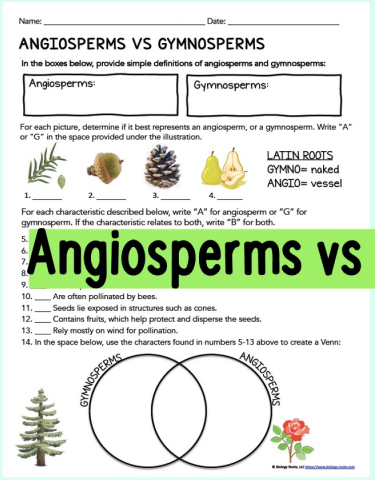
Flower Species:		
PETAL	SEPAL	STEM

16. Recall that the stigma sits higher on the flower than the anthers. Explain how this would prevent self-pollination. Come up with one reason why discouraging self-pollination is beneficial for the plant (no wrong answers!)

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flower dissection lab

PLANTS
Practice Sheets


Name: _____ Date: _____

ANGIOSPERMS VS GYMNOSPERMS

In the boxes below, provide simple definitions of angiosperms and gymnosperms:

Angiosperms:	Gymnosperms:

For each picture, determine if it best represents an angiosperm, or a gymnosperm. Write "A" or "G" in the space provided under the illustration.

LATIN ROOTS
GYMNO= naked
ANGIO= vessel

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

For each characteristic described below, write "A" for angiosperm or "G" for gymnosperm. If the characteristic relates to both, write "B" for both.

5. _____
6. _____
7. _____
8. _____
9. _____
10. ____ Are often pollinated by bees.
11. ____ Seeds lie exposed in structures such as cones.
12. ____ Contains fruits, which help protect and disperse the seeds.
13. ____ Rely mostly on wind for pollination.
14. In the space below, use the characters found in numbers 5-13 above to create a Venn:

GYMNOSPERMS ANGIOSPERMS

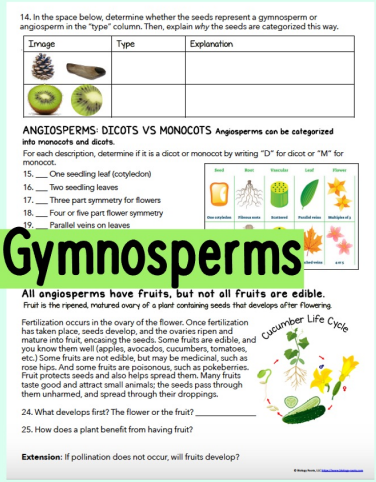

14. In the space below, determine whether the seeds represent a gymnosperm or angiosperm in the "type" column. Then, explain *why* the seeds are categorized this way.

Image	Type	Explanation

ANGIOSPERMS: DICOTS VS MONOCOTS **Angiosperms can be categorized into monocots and dicots.**

For each description, determine if it is a dicot or monocot by writing "D" for dicot or "M" for monocot.

15. ___ One seedling leaf (cotyledon)
16. ___ Two seedling leaves
17. ___ Three part symmetry for flowers
18. ___ Four or five part flower symmetry
19. ___ Parallel veins on leaves

Seed | Root | Vascular | Leaf | Flower

All angiosperms have fruits, but not all fruits are edible.
Fruit is the ripened, matured ovary of a plant containing seeds that develops after flowering.

Fertilization occurs in the ovary of the flower. Once fertilization has taken place, seeds develop, and the ovaries ripen and mature into fruit, encasing the seeds. Some fruits are edible, and you know them well (apples, avocados, cucumbers, tomatoes, etc.) Some fruits are not edible, but may be medicinal, such as rose hips. And some fruits are poisonous, such as pokeberries. Fruit protects seeds and also helps spread them. Many fruits taste good and attract small animals; the seeds pass through them unharmed, and spread through their droppings.

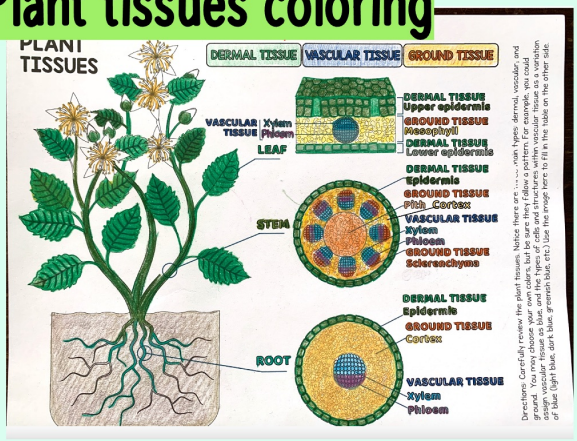
Cucumber Life Cycle

24. What develops first? The flower or the fruit? _____
25. How does a plant benefit from having fruit?

Extension: If pollination does not occur, will fruits develop?

Angiosperms vs Gymnosperms

Plant tissues coloring



Name: _____ Date: _____

PLANT REPRODUCTION

ALTERNATION OF GENERATIONS

Vascular plants undergo alternation of generations, which is simply the name for the reproductive cycle. The stages of the cycle are classified as sexual (gametophyte) and asexual (sporophyte).

Gametophyte stage	Sporophyte stage
Haploid (n) generation in the life cycle of a plant that produces gametes for sexual reproduction.	Diploid (2n) generation in the life cycle of a plant that produces spores for asexual reproduction.

Haploid cells undergo **mitosis** to produce a gametophyte.
A diploid (2n) sporophyte undergoes meiosis to produce haploid (1n) reproductive cells, often called spores.
The gametophyte produces haploid gametes which fuse to form a diploid sporophyte.

Seeds are produced from vascular plants t... A seed is diploid (2n), and germinates to form a new plant. The plant matures into a sporo... specialized tissue called sporangium that... number, resulting in haploid spores. The s... chromosome number) to produce gamete... directly through meiosis). The gametes th... developing into a seed. The cycle repeats.

Use the paragraph above to help you label the boxes below as mitosis or meiosis. In the circles found at the upper and lower left corners, determine if the stage best represents the haploid or diploid stage of the reproductive cycle by writing "n" or "2n".

gametophyte
spores
gametes
Sporangium
zygote
sporophyte

** Seedless plants, such as ferns, also have alternation of generations. Like other plants, the spores are used to form gametes, but the zygote never develops into a seed.*

PLANT REPRODUCTION

6. In the chart below, put the following terms where they best fit in according to the descriptions: diploid, haploid, sexual, asexual, spores, gametes.

Gametophyte	Sporophyte

7. Explain how the gametophyte and sporophyte phases rely on each other:

ASEXUAL REPRODUCTION

Some plants can reproduce asexually or sexually. In asexual reproduction, a new plant grows from a part of a single parent plant, such as bulbs, cuttings, roots, or tubers. In asexual reproduction, the offspring is identical to the parent plant, and

...ickly, and save energy.
...overcrowding can occur.

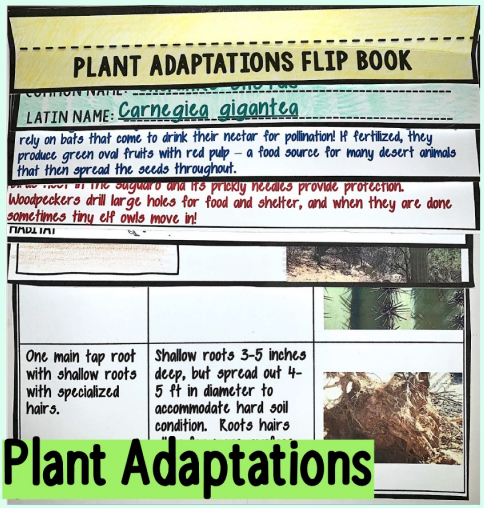
...A" if it describes asexual reproduction or "S" if it describes

____8. Does NOT require gametes.
____9. Self pollination.
____10. Seeds created in the fruits or cones of some plants.
____11. Spores that are used to reproduce in seedless plants such as ferns.
____12. Vegetative budding that occurs when "plantlets" grow on from buds of the parent plant.

13. In the space below, create a basic Venn Diagram comparing asexual and sexual reproduction in plants:

ASEXUAL BOTH SEXUAL

Plant Reproduction


PLANT ADAPTATIONS FLIP BOOK

LATIN NAME: Carnegiea gigantea

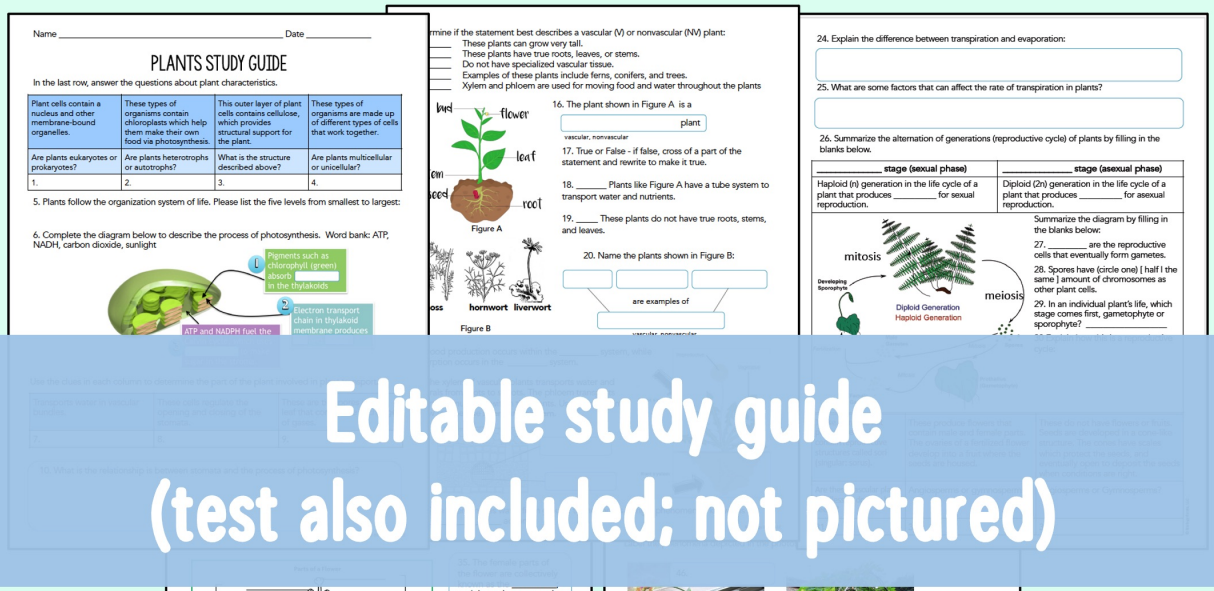
rely on bats that come to drink their nectar for pollination! If fertilized, they produce green oval fruits with red pulp – a food source for many desert animals that then spread the seeds throughout.

...Woodpeckers drill large holes for food and shelter, and when they are done sometimes tiny elf owls move in!

One main tap root with shallow roots with specialized hairs.	Shallow roots 3-5 inches deep, but spread out 4-5 ft in diameter to accommodate hard soil condition. Roots hairs

Plant Adaptations

PLANTS
Study Guide


Name _____ Date _____

PLANTS STUDY GUIDE

In the last row, answer the questions about plant characteristics.

Plant cells contain a nucleus and other membrane-bound organelles.	These types of organisms contain chloroplasts which help them make their own food via photosynthesis.	This outer layer of plant cells contains cellulose, which provides structural support for the plant.	These types of organisms are made up of different types of cells that work together.
Are plants eukaryotes or prokaryotes?	Are plants heterotrophs or autotrophs?	What is the structure described above?	Are plants multicellular or unicellular?
1.	2.	3.	4.

5. Plants follow the organization system of life. Please list the five levels from smallest to largest:

6. Complete the diagram below to describe the process of photosynthesis. Word bank: ATP, NADH, carbon dioxide, sunlight

1. Pigments such as chlorophyll (green) absorb _____ in the thylakoids
2. Electron transport chain in thylakoid membrane produces
ATP and NADPH fuel the

mine if the statement best describes a vascular (V) or nonvascular (NV) plant:
These plants can grow very tall.
These plants have true roots, leaves, or stems.
Do not have specialized vascular tissue.
Examples of these plants include ferns, conifers, and trees.
Xylem and phloem are used for moving food and water throughout the plants

flower
leaf
root
Figure A

16. The plant shown in Figure A is a _____ plant
vascular, nonvascular

17. True or False - if false, cross of a part of the statement and rewrite to make it true.

18. _____ Plants like Figure A have a tube system to transport water and nutrients.

19. _____ These plants do not have true roots, stems, and leaves.

20. Name the plants shown in Figure B:

hornwort liverwort
Figure B

_____ are examples of
_____
vascular, nonvascular

24. Explain the difference between transpiration and evaporation:

25. What are some factors that can affect the rate of transpiration in plants?

26. Summarize the alternation of generations (reproductive cycle) of plants by filling in the blanks below.

_____ stage (sexual phase)	_____ stage (asexual phase)
Haploid (n) generation in the life cycle of a plant that produces _____ for sexual reproduction.	Diploid (2n) generation in the life cycle of a plant that produces _____ for asexual reproduction.

mitosis
meiosis
Developing Sporophyte
Diploid Generation
Haploid Generation

Summarize the diagram by filling in the blanks below:

27. _____ are the reproductive cells that eventually form gametes.

28. Spores have (circle one) [half] the same] amount of chromosomes as other plant cells.

29. In an individual plant's life, which stage comes first, gametophyte or sporophyte? _____

petal
receptacle
pedicel

and the male parts are the called the _____.

36. What are 3 ways plants can pollinate?
1. _____
2. _____
3. _____

37. What is the relationship between fruits and flowers?

Read the descriptions to determine if they belong to Monocots (M) or Dicots (D)

DOUBLE COTYLEDON	VASCULAR BUNDLES are in a ring	LEAVES are long and narrow with parallel veins	FLORAL PARTS in multiples of 3
38.	39.	40.	41.
LEAVES are broad with a network of veins	FLORAL PARTS in multiples of 4 or 5	SINGLE COTYLEDON	VASCULAR BUNDLES are scattered
42.	43.	44.	45.

46. Compare and contrast angiosperms and gymnosperms in the space below:

GYMNOSPERMS
ANGIOSPERMS

47.

48. How do auxins play a role in the illustrations above?

49. Define limiting factor in regards to plant growth. Name 5-6 limiting factors:

50. How can thin leaves or broad leaves act as a plant adaptation?

Editable study guide
(test also included; not pictured)

biology roots

Still not sure if you need this resource?

This bundle is perfect to use as a unit in your biology curriculum. The bundle covers everything you need to teach plants; including notes, stations, labs, practice sheets, study guide, and more! It has been carefully designed for student understanding. Because no plants unit is the same, nearly every resource is editable so that you can make it your own. There is even a pacing guide or printable packet for easy planning.



PLANTS UNIT BUNDLE - ~50 MINUTE BLOCKS		PAGE # TEACHER PACKET
DAY/DATE	STUDENT ACTIVITY	
1 _____	Begin Seed Germination Lab (p. 1-3) (the goal is to get the experiment designed and the seeds planted, the hypothesis and question can wait, either next day or as homework).	1-3
2 _____	Work on seed germination lab (p. 4-5)- observe/measure seedlings Plant Notes (p. 6) slides 1-27 (up through Plant Transport, roughly 40 minutes). Begin Plant Tissues Coloring (p. 11) or if short on time assign page one of plant tissues coloring as homework	3-5 6 11
3 _____	Observe /measure seedlings (p. 4,5) Lab: Transpiration (p. 14) (up to procedure day 2). IF there is time after, have students work on plant tissues coloring.	4,5 13
4 _____	Observe measure seedlings (p. 4,5) Finish Transpiration Lab. (p. 15) IF there is time after, have students work on plant tissues coloring	4,5 16 11
5 _____	Observe/measure seedlings (p. 4,5) Plant Notes (p. 17) slides 28-46 (up through reproduction, roughly 40 minutes). Begin Angiosperms vs. Gymnosperms (p. 21) or assign one page or both for homework.	4,5 20 23
6 _____	Observe/measure seedlings (p. 4,5) Flower Dissection Lab (p. 23)	4,5 25
7 _____	Observe/measure seedlings (p. 4, 5) Do Plant Reproduction (p. 26) (as a class if you see fit) Finish Notes (p. 28) **Assign plant adaptations project (p. 37)**. IF laptops are available, they can begin today in class. Otherwise, assign some for homework. *NOTE* For students that choose flip books for their adaptation project, you will need to **print those separately** and hand them out accordingly.	4,5 29 31 63-68
8 _____	Observe/measure seedlings (p. 4, 5) •ask students to bring in cardboard for plant maze project using their seedlings. Begin Plant Stations (p. 31), •Please note SHORTENED stations are being used in student packet. The remaining stations can be used as extension (see folders) **Work on plant adaptations** for homework.	4,5 31-61 63,64
9 _____	Observe/measure seedlings •Remind students to please bring in cardboard (depending on if and when you choose to do to the phototropism extension). Finish plant stations (p. 31) • Plant open note quiz *(requires separate printing). Could also be done next class.*	4,5 35-61

"I have loved using all my products from biology roots. This unit on plants is super helpful and my students enjoy everything from the notes, to the images and activities. 10/10!"

Danielle M.

"Plants are hard for students to grasp at times. This resource helped to make it more understandable for students."

Arial R.