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# **BOTANY**

Grades 7-8 ====

# STUDENT

#### INSTRUCTIONS



This student journal accompanies The Good and the Beautiful Botany science unit. It contains all the worksheets and journal pages that are needed to complete the unit. Each student will need his or her own copy of the science journal.

The lesson extensions are also found here. These extensions are optional for older students (grades 7–8) to complete on their own. Each extension is accompanied by lined paper so the student can keep his or her work in one place.

Have each student take his or her time to create high-quality work as the activities and worksheets are completed. Students may enjoy looking back on their past discoveries when they've finished.



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# SHOW AND TELL

To be completed outdoors in any season: Circle items that you hear, smell, feel, and see outside. Draw pictures in the circles as desired.













#### & EXTENSION

#### Instructions:

- Read the information below.
- 2. Write 1—2 sentences about each of the following prompts:
  - a. How did others positively influence George Washington Carver's life?
  - b. How did George Washington Carver affect the field of agriculture?
  - c. What inspired you the most about George Washington Carver?

#### **Botanist: George Washington Carver**



George Washington
Carver was born into
slavery on July 12, 1864,
near Diamond Grove,
Missouri, but he would
eventually gain a college
education and become a
prominent scientist. These
accomplishments were not
easily achieved, considering

the circumstances of his day. George was kidnapped shortly after his birth, along with his mother and a sibling. He was found and returned to his slaveholder, Moses Carver. Moses and his wife, Susan, raised and educated George and his brother after the Civil War ended slavery in 1865.

As a young boy, George developed a love for plants. He spent time gardening and exploring the woods. The joy he found there resonates in his words: "Nothing is more beautiful than the loveliness of the woods before sunrise." He collected flowers and rocks, and he helped friends take care of their sick plants. Because of this tender gift, he was called the "Plant Doctor."

At only 12 years old, George left home to acquire more education. He attended several different schools. After high school, he wanted to further his education but was rejected at some universities because he was black. Even though the 13th Amendment abolished slavery, heavy discrimination continued in the United States for many years. Despite this injustice, George still found ways to educate himself. With his friends' encouragement, he applied to Simpson College and was accepted. At first he studied art, but when his art teacher noticed his love for plants, she advised him to pursue the study of botany at lowa State Agricultural College. George applied, was accepted, and became the first black student at lowa State. He earned his

bachelor's degree in science in 1894, and he continued his education by learning to identify and treat plant diseases. Later he received a master's degree in agriculture and began teaching.

George developed many new ideas that helped improve agriculture and the livelihood of farmers. In studying soil, George realized that the practice of crop rotation would greatly benefit agriculture. When the planting and growing of cotton was not rotated with a different sort of crop in successive years, the nutrients in the soil became depleted. As a result, cotton plants became less productive over the years. Rotating different types of crops each growing season increased yields. When farmers planted nitrogen-fixing crops (such as peanuts, soybeans, and sweet potatoes), nitrogen was restored back into the soil, making the soil healthier for the cotton plants the following season. In order to teach this science of crop rotation, George made a demonstration lab on a wagon called the Jessop Wagon, which he drove around to farmers, distributing pamphlets that taught them how to rotate crops. He believed this was his most significant contribution toward educating farmers.

George's contributions greatly impacted the world for the better. He was known for his good heart, his desire to help others (especially farmers), his promotion of racial harmony, and his faith as a Christian. George left a lot of his work unpatented and said his talents and gifts came from God.

"It is not the style of clothes one wears, neither the kind of automobile one drives, nor the amount of money one has in the bank, that counts. These mean nothing. It is simply service that measures success."

—George Washington Carver







# GROWING SEEDS—HYPOTHESIS

DATE PLANTED: _	 4.3
In three days, I think my seeds will look like this:	
In one week, I think my seeds will look like this:	
In two weeks, I think my seeds will look like this:	
In one month, I think my seeds will look like this:	









#### Instructions:

- 1. Read the information below.
- 2. Summarize the differences between annual, perennial, and biennial plants.

# 3. Optional: Sketch one of the plant illustrations on this page.

#### Plant Growth Cycles

Just like all plants come in different shapes, sizes, and colors, they also have different life cycles. Some plants may take only a month to complete their life cycles, while others may take several years! Plants are classified as annual, perennial [per-EN-ee-ull], or biennial [by-EN-ee-ull], depending on how long it takes them to complete their full life cycles.

#### Annual

Annual plants go through their entire life cycle from seed to death within one year or growing season. Plants that grow best starting in the cooler months are called cool-season annuals. Peas are an example of this; they are planted in the early spring and are resistant to frost. Annuals that must be planted after the last chance of frost in order to survive, such as tomatoes, are called warm-season annuals.

#### Perennial

Plants that live for more than two years (or two growing seasons) are called **perennials**. These plants become **dormant**, or stop growing to conserve energy, during colder months. When conditions are favorable and warm again, they resume growing. Perennial plants continue this cycle of growth and dormancy year after year. Woody perennials, such as trees and shrubs, tolerate the cold temperatures, but herbaceous [er-BAY-shuss] perennials have soft stems that die during the winter. New stems grow in the spring from the dormant parts.

#### **Biennial**

Biennial plants complete their growing cycle in two years (or two seasons). During the first year, biennials grow their roots, stems, and leaves; then they enter a state of dormancy. During the second year, they continue to grow, mature, form flowers and fruit, and then disperse seed. In a garden, it is common to allow biennials to only grow for their first growing season, and then to harvest them so they will not enter the second season (flowering, etc.). Onions and parsley are examples of plants that are harvested after their first growing season.

Gardening Note: Some plants are botanically classified as perennials based on their potential to grow back year after year. However, if gardeners know that a perennial will die over the winter because the climate is too cold, they will say they are "growing the perennial as an annual."



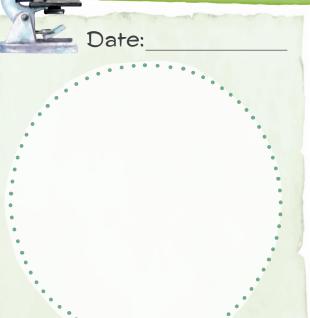








## Microscope Lab



Notes:

Specimen Observed:

Date:\_\_\_\_

Specimen Observed:

Notes:

#### & EXTENSION

#### Instructions:

Read the following information. The content in this lesson extension will be referred to in Lessons 6-13.



#### **Botany Experiment: Introduction**

Everything you've learned about in science has been the result of someone testing ideas, carefully recording the observations of those tests, and forming conclusions based on those observations. When experiments are repeated over and over again and the same results consistently occur, scientists can then form theories. For the remainder of the lesson extensions in this unit, you will design and perform an experiment in the field of botany. Designing and performing experiments are great ways to learn how scientific discoveries are made. Valuable life skills, such as critical thinking, patience, and problem-solving, are also learned through performing scientific experiments.

#### Scientific Method

Before you begin experimenting, you will learn how scientists perform experiments. Scientists follow the scientific method. This is a list of steps that are followed during an experiment, though not every experiment follows these steps exactly; they are more like guidelines to help scientists organize what they're studying. The proper steps greatly depend on what is being tested. For example, scientists who study astronomy use mathematical calculations and observations for their research since it's physically impossible to travel to a nearby star to study it.

The scientific method generally flows as shown in the image at the bottom of this page.

#### Question

Many discoveries begin with a question. What happens to the growth of my plant if it has no sunlight? Which type of soil is best for my plant? How much water does my plant need?



#### **Hypothesis**

Research is often done to help scientists form a hypothesis (an educated guess) that may answer their question. Through research, scientists can make

better predictions about what to expect during experiments. For example, a scientist may do some research and learn that plants need 7-8 hours of sunlight per day. Then the scientist may form a more educated hypothesis. In this example, the scientist may hypothesize that plants grow faster when there is more sunlight. Notice how this example hypothesis is one that can be tested; this is also an important part of forming a hypothesis.

#### Plan and Test

The next steps—defining traits of science—are to plan and test an experiment. You will learn more about the planning and testing of an experiment when you design your own.

#### Record Observations

During experimentation, scientists analyze and record their observations. It is crucial for them to take careful and organized notes so that they can form accurate conclusions.

#### Results & Conclusion

A conclusion is a report of the results of the experiment that includes a statement about the outcome.

Scientists' experiments will often lead to more questions and new or revised experiments, so the scientific method becomes more like a cycle than a pathway.

**Hypothesis** 

**Experiment** 

Record **Observations**  Results &



Test the





#### My Botany Experiment



Write the name of your botany experiment below.



Record which variable you're testing and under which conditions you're testing the plants. (Make sure this is approved by your parent or teacher.)

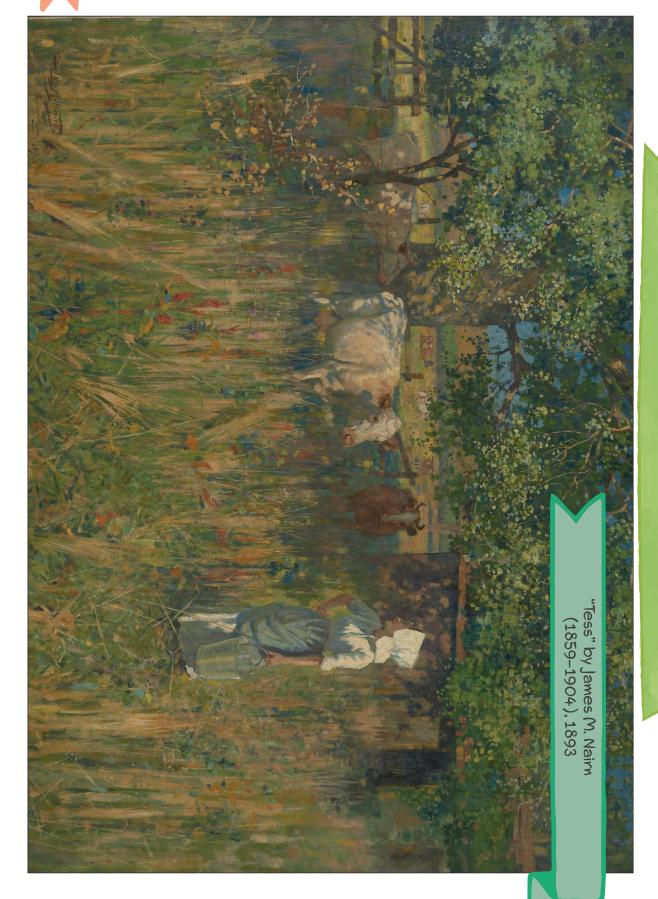
Example: Variable: Light; Conditions: no light, low light, more light, and regular light exposure (the control). Each plant except for the "control" will be covered with a cardboard box. The "low light" plant will have small slits cut in its cardboard box, and the "more light" plant will have large slits cut in its cardboard box. The "no light" plant's box will have no slits cut.

Variable: Conditions:

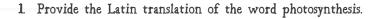




4	Record which <u>plant type</u> you will be testing. If you will be starting from seed, it is recommended that you use a plant type that germinates quickly, such as bean, tomato, or sunflower. You may also decide to use a flowering plant, such as a petunia. Be sure to choose a plant that isn't too sensitive.	
	Example: I will be using tomato plants in my experiment.	
		-
D	Record where you will be conducting your experiment. Keep in mind that all other variables must not change.	
	Example: I will place my plants on the table by the window.	Design of the second
		-
0		
D	Following the scientific method, next write a QUESTION for your experiment. Be sure to identify your control.	
D P		
	your control.  Example: What are the effects of light on indoor tomato plants when I expose them to no light,	
Sue	your control.  Example: What are the effects of light on indoor tomato plants when I expose them to no light, low light, more light, and regular light exposure (the control)?	
	your control.  Example: What are the effects of light on indoor tomato plants when I expose them to no light, low light, more light, and regular light exposure (the control)?  stion:	
	your control.  Example: What are the effects of light on indoor tomato plants when I expose them to no light, low light, more light, and regular light exposure (the control)?	
	your control.  Example: What are the effects of light on indoor tomato plants when I expose them to no light, low light, more light, and regular light exposure (the control)?  stion:	



# WHAT IS PHOTOSYNTHESIS?



PHOTOSYNTHESIS

PHOTO - SYNTHESIS -

2. Hypothesis: What do you think plants are "putting together with light"? Write or draw your response.

3. Diagram: Draw a picture of photosynthesis.

4. In addition to sunlight, what two things do plants need to start the photosynthesis process? What do plants make during photosynthesis? What does the plant use, and what is released?

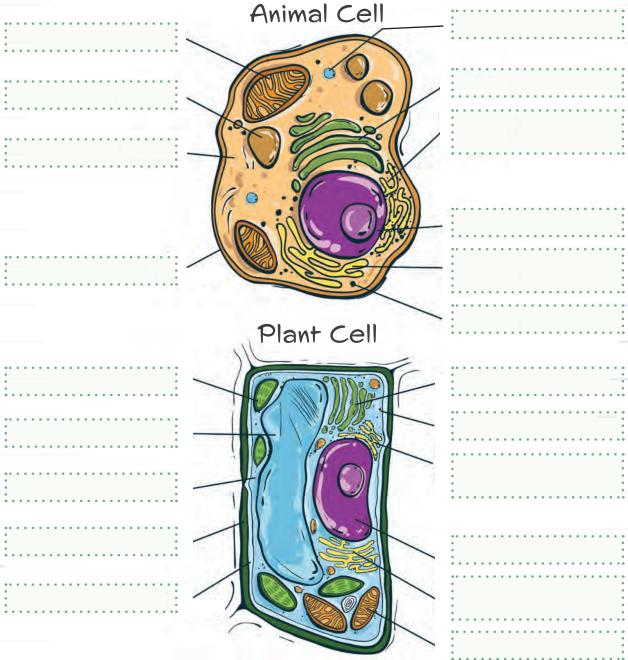






# ANIMAL AND PLANT CELLS

Using the word bank as a guide, label the animal cell and plant cell. Hint: Blue words are unique to the animal cell, green words are unique to the plant cell, and black words are shared by both cell types.



Note: The rough endoplasmic reticulum has ribosomes on it. The smooth endoplasmic reticulum does not have ribosomes.

Vacuoles Golgi body Rough endoplasmic reticulum Lysosomes Ribosomes Mitochondrion Vacuole Smooth endoplasmic reticulum Cell membrane Cytoplasm Cell wall Chloroplasts Nucleus





### WHAT'S IN A NAME?

Use the page titled "Plant Latin Words" in the Botany course book and your own word skills to match each scientific name to its common name.

- 1. Pinus cembra
- 2. Juglans nigra
- 3. Umbellularia californica
- 4. Solanum nigrum
- 5. Quercus alba
- 6. Rose virginiana
- 7. Rosmarinus officinalis
- 8. Allium giganteum
- 9. Toxicodendron radicans

- A. California bay tree
- B. White oak
- C. Virginia rose
- D. Rosemary
- €. European black nightshade
- f. Black walnut
- G. Cembrian pine
- H. Giant onion
- I. Poison ivy

Give your own names to each of the flowers pictured below using the "Plant Latin Words" page.



My scientific name:



My scientific name:



My scientific name:



My scientific name:





#### Instructions:

Follow the instructions below and complete the assignment to conclude your experiment.



#### **EXTENSION**

#### Botany Experiment: Results and Conclusion

After you have completed your experiment, make final observations and record the final date. <u>If you have completed</u> the *Botany* unit and your plants have not had enough time to show an effect from the experiment, extend your experiment as long as you wish.

Once you have completed your final observations, summarize your results in a concluding statement explaining whether or not your hypothesis was correct. Here is an example of a concluding statement:

Plant growth is not affected by the acidity of water. Over a one-month period of testing, I observed that each of the plants grew in height by approximately the same amount.

#### Assignment:

Use the following page to record your final observations. Then summarize the results of your experiment and write a concluding statement.



