



The Functions of a Plant

Middle School Food and Agricultural Literacy Curriculum

Precepts

- B. Relationships
 - B2. Interact and work with others
 - B5. Participate effectively as a team member

National Standards

- PS.01.02.02.a. Identify the components, the types and the functions of plant roots.
- PS.01.02.03.a. Identify the components and the functions of plant stems.
- PS.01.02.04.a. Discuss leaf morphology and the functions of leaves.
- PS.01.02.05.a. Identify the components of a flower, the functions of a flower and the functions of flower components.
- PS.01.02.06.a. Explain the functions and components of seeds and fruit.
- CS.01.02.02.b. Utilize communication skills to collaborate in a group setting.
- NL-ENG.K-12.3 – Evaluation Strategies
- NL-ENG.K-12.4 – Communication Skills
- NL-ENG.K-12.5 – Communication Strategies
- NS.5-8.3 – Life Science

Student Learning Objectives

- As a result of this **unit** the students will...
- Utilize plant science concepts in the agriculture industry.
- As a result of this **lesson** the students will ...
- Discuss the basic functions of plant parts.

Content Outline

Objective 1. Discuss the basic functions of plant parts.

- I. **Plant parts and their functions**
 - A. **Roots**

Time

Instruction time for this lesson: 45 minutes.

Resources

Arizona Cooperative Extension.(1998). Botany: Plant Parts and Functions. Retrieved July 10, 2009, from University of Arizona College of Agriculture, Cooperative Extension Website. <http://ag.arizona.edu/pubs/garden/mg/botany/seeds.html#seeds> — National FFA Organization. (2009). LifeKnowledge Online. Retrieved July 9, 2009, from <http://agedlearning.org> — National FFA Organization. (2003). LifeKnowledge Precepts and Signs of Success.

Tools, Equipment, and Supplies

Overhead projector/transparencies
Sample plant (fruiting tomato plant would be ideal)
Six easels or large pieces of construction paper
Coloring pencils, markers, or crayons
MS.PS.1.1.AS.A – one per student
MS.PS.1.1.TM.A – one per teacher
MS.PS.1.1.TM.B – one per teacher
MS.PS.1.1.AS.B – six copies for group work, sections cut prior to class
MS.PS.1.1.ASSESS.A – one per student

Key Terms

The following terms are presented in this lesson and appear in **bold italics**:

Flowers

Fruits

Leaves

Roots

Seeds

Stems

1. Location: ***Roots*** usually are located at the bottom of the plant, or the part of the plant that has contact with the soil or other medium (water in the case of hydroponics).
2. Functions:
 - a. Absorb water and nutrients from soil
 - b. Anchor the plant to the ground
 - c. Support the ***stem*** structure
 - d. Store food (energy) for the plant

B. ***Stems***

1. Location: ***Stems*** are usually the central structure of the plant to which ***flowers***, ***leaves***, and ***roots*** are all attached.



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2. Functions:

- Channel for the transportation of water, minerals, and sugar from the **roots** and **leaves** to the rest of the plant
- Support buds and **leaves**

C. Leaves

- Location: **Leaves** are generally connected to the stem by leaf petioles but are arranged on the stem in various patterns depending on the plant.
- Functions:
 - The site of photosynthesis (energy factory for the plant)
 - Provide a large surface area to increase the absorption of sunlight that is essential to photosynthesis
 - Also the major site of plant transpiration (the diffusion of water, carbon dioxide, and oxygen to and from the plant)

D. Flowers

- Location: **Flowers** are usually the most flashy part of the plant
- Functions:
 - Primary function is reproduction
 - Color and fragrances have evolved to attract pollinators
 - Can contain male (stamen) and/ or female parts (pistil)

E. Fruit

- Location: **Fruits** are formed from the fertilized ovule (**seeds**) and the ovary walls of the female part of the flower.
- Functions:
 - Protect the seed
 - Assist in the dispersal of **seeds** (by attracting animals that may consume the fruit and disperse the seed)

F. Seeds

- Location: **Seeds** are the mature ovule which is originally found in the female part of the flower and are usually housed in a type of fruit or cone.
- Functions:
 - Contain the embryo which will germinate and become a new plant

- Usually protected by a seed coat to protect from moisture and extreme conditions
- Contain endosperm which is a built-in food supply for the embryo during germination

Interest Approach

Before class, have the sample material (**root** examples, **fruits**, **leaves**, and **stems**) organized on a table at the front of the class or other most visible part of the room.

Welcome class! Thank you so much for making the effort to come to class on time and eager to learn today. To get started, let's put on our thinking caps and begin evaluating the contents that are on the table in front of you.

Think about this plant for a minute. This small plant has the ability to collect its own food and water, create enough energy to sustain its life and growth, reproduce and multiply each year, and produce food for animals and us.

Pause

Take a minute to think silently about the following questions. Do particular parts of the plant perform specific tasks? Could this plant continue to live, grow, and reproduce if one or more of its parts were missing?

Pause between each question for 10-30 seconds to allow students to contemplate these thoughts. Discuss with the students the importance of all the parts of the plant working together. And explain that missing one part or one important plant need would hinder the plant's ability to grow, live, and reproduce. Then prepare to utilize the Descartes Moment® to have the students discuss what they know about plant parts and their functions, what they think they know, and what they would like to learn about plant parts and functions. They will divide a sheet of paper using three vertical lines and jot down responses to these questions in each section.

Demonstrate the process or show a completed sample chart.

When I say GO, we will individually brainstorm these thoughts. Divide a sheet of paper into three sections using two vertical lines. Label the three sections: Know, Think I Know, and Want to Learn.



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In the first section you will jot down thoughts about what you know about plant parts and their function, in the second row you will record thoughts of what you think you may know, and finally, write specific questions you have or facts you would like to learn today as we discover plant parts and their functions. You will have two minutes to complete this task. What questions are there?

OK, GO!

Monitor the class during this activity to ensure students are on task and understand the activity. Allow three minutes for this activity. Provide a warning announcement when 30 seconds remain. Then ask for volunteers to share with the class a few examples of what they know about plant parts and functions and what they wish to learn.

Please refocus your attention to the front. Thank you for working so diligently. Who will share a few things they already know about plant parts and functions?

Ask three to five volunteers to share responses with the class.

Great. Thank you for sharing. Who will share a few things they hope to learn during today's activities?

Ask three to five volunteers to share responses with the class. You may wish to take notes on the board to ensure you address all of the students' questions throughout the lesson.

Great. Thank you for your interest. I hope we will discover answers to all of these questions today and throughout our unit on plant science. We will discover how all of the plant parts work together like a very efficient factory to create the plant's own energy and its ability to reproduce and survive in a variety of climates. Keep these thoughts in mind as we prepare for an engaging activity.

Summary of Content and Teaching Strategies

Objective 1. Discuss the basic functions of plant parts.

Before class, make sure you have enough student copies of **MS.PS.1.1.AS.A** and six group copies of **MS.PS.1.1.AS.B**. Students will then complete a group project in which each group will be assigned one of the plant parts.

Groups will receive information cards for their assigned part, and they will work for 5-10 minutes to study the functions and create a picture depicting the functions of their plant part. Note: if Internet access is available at enough computers in the room, you may wish to direct the groups to research their plant part rather than giving them the information using **MS.PS.1.1.AS.B**. If you have a classroom set of horticulture books, allow students to collect information from there.

After the allotted time, groups will present their pictures to the class. The class will guess which plant part each group has. Once the class has guessed correctly, the group will explain the functions they learned from **MS.PS.1.1.AS.A** (or from Internet research) as their classmates complete **MS.PS.1.1.AS.A**. You may wish to complete **MS.PS.1.1.TM.A** on the projector to help guide the students. Allow the students to teach each other in this modified Little Professor e-Moment.

Now that we have discussed what we know about plant parts and function and what we hope to learn, let's explore even more. I hope everyone is ready to exercise their creativity and teaching skills.

When I say GO, you will research a particular plant part: **roots, stems, leaves, flowers, fruits, or seeds**. You will want to pay particular attention to the function of your assigned plant part. After researching the part, you will work with your group to create a picture that describes the function of the plant part without drawing the actual structure of the part or using words. You will have ten minutes to complete this project. We will be working in groups of three to complete this activity. What is needed to make an effective team?

Elicit responses to review teamwork skills and attitudes.

Divide the class by having the students count off from one to three and then moving into the respective groups. You may wish to have group assignments already prepared to ensure that students are placed in groups that will complement their abilities. Group sizes should be no more than four students and no less than three. Allow more time if Internet or textbook research is being used rather than the student handout.

When the ten minutes time has elapsed, we will meet back as a class. Each group will show the class the picture you worked on. The class will guess the plant part your picture describes. Once the class has guessed the correct plant part, your group will describe the functions of that part, and we will record this information on our student handout.



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Are there any questions?

Pause for 10-15 seconds to allow time for students to express any questions.

How long do you have?

10 minutes

Will you be using words?

No

When will you start?

When the teacher says GO.

GO!

Patrol the classroom to monitor students while they work. Give time reminders after five minutes have elapsed and again when one minute remains. Redirect their attention to the front of their class in the last 30 seconds.

Thank you for working so hard. Please take your seats and face the front so that we can begin to share the results of each group's work and creativity with the rest of the class.

Distribute **MS.PS.1.1.AS.A.**

Remember, when your group is called to the front, you will show your pictures to the class. The class will use your picture to guess which plant part you were assigned. Then your group will teach the rest of the class how the plant part is important to the plant and its main functions. We will record this information on the worksheet I have passed out as well as on the diagram you see projected on the board. What questions are there?

Wait 10-15 seconds for responses.

Begin calling groups to the front to share their drawings with the class. After each group, direct the students' attention to the transparency. Fill in the blanks using **MS.PS.1.1.TM.B** as a reference. Address any questions regarding each particular plant part. Then call the next group to present until all six plant parts have been discussed.

Review/Summary

Thank you very much for sharing what you learned with your classmates. Looking at the diagram you have on your handout and that is projected on the board, it seems we have a better understanding of the major plant parts and their functions. Let's review each part and its functions using our worksheets.

Call on individual students for responses to these questions or ask for volunteers.

What are the functions of **roots**?

Absorb nutrients, anchor plants, support stem

What are the functions of **stems**?

Transport water, minerals, and sugar throughout the plant

Which plant part is the primary site of photosynthesis?

Leaves

Which plant part houses and protects **seeds**?

Fruit

Which part of the plant is usually bright and possibly fragrant?

Flowers

Which plant part has potential to develop into a new plant?

Seeds

Address any areas that still seem "muddy" after these review questions.

Great review! Think back to the activity we completed at the beginning of the class, and when I say GO, silently read the list of things you hoped to learn at the beginning of this lesson, think about what we learned today, and scratch off each topic that we have covered. You will have 30 seconds to complete this activity. What can I clarify? GO!



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Watch the time and allow 30 seconds for the completion of this review. The goal is for students to realize all that they wanted to learn has been covered in the lesson.

Time is up. Please wrap up your thoughts. My hope is that everything you hoped to learn today has been addressed. What questions do you still have regarding plant parts and their functions?

Allow 10-15 seconds for student questions. If there are still questions, address them. If students are curious about subject matter you will cover later, encourage them to save these thoughts for the future.

Great! Well, our time is up. Today was a great discussion on the parts of the plant and their functions. I hope you are looking forward to even more discoveries as we begin to learn how our food and shelter are all commonly created by plants. We will also learn how plant production impacts the environment and about how we are working in innovative ways to create environmentally friendly plant growth practices. As we continue with this unit, please feel free to keep a list of interesting questions you would like us to answer. I will see everyone tomorrow. Hope you have a great afternoon and come tomorrow with as much enthusiasm as you did today!

Application

Extended classroom activity:

Further study of the plant parts and their functions may follow this lesson. Organize and conduct a plant part scavenger hunt in the school greenhouse, garden, or anywhere with bountiful flowering /fruiting plants (even weeds). Give students note cards with the names of the basic plant parts and allow them a reasonable amount of time to search for and locate examples of all of these parts.

FFA activity:

Students who enjoy this lesson may be interested in the floriculture FFA CDE which requires students to have extensive knowledge of plant parts, functions, needs, and uses as well as to be able to identify common floriculture plants. For more information visit: ffa.org.

SAE activity:

This lesson can be used to introduce the many opportunities students have to pursue a Supervised Agricultural Experience Program in plant science. Students may wish to conduct an experimental SAE that measures how plant growth is affected when **leaves** are removed or **roots** are cut, or they may wish to track how different **seeds** are spread. Also students who find this lesson interesting may wish to pursue an SAEP in plant production or greenhouse management.

Evaluation

MS.PS.1.1.ASSESS.A

Answers to Evaluation

1. Leaves
2. Roots
3. Fruits
4. Seeds
5. Flowers
6. Stems

Part Name: 1. Leaves

Functions:

Part Name: 2. Flower

Functions:

Part Name: 4. Stems

Functions:

Part Name: 3. Fruit

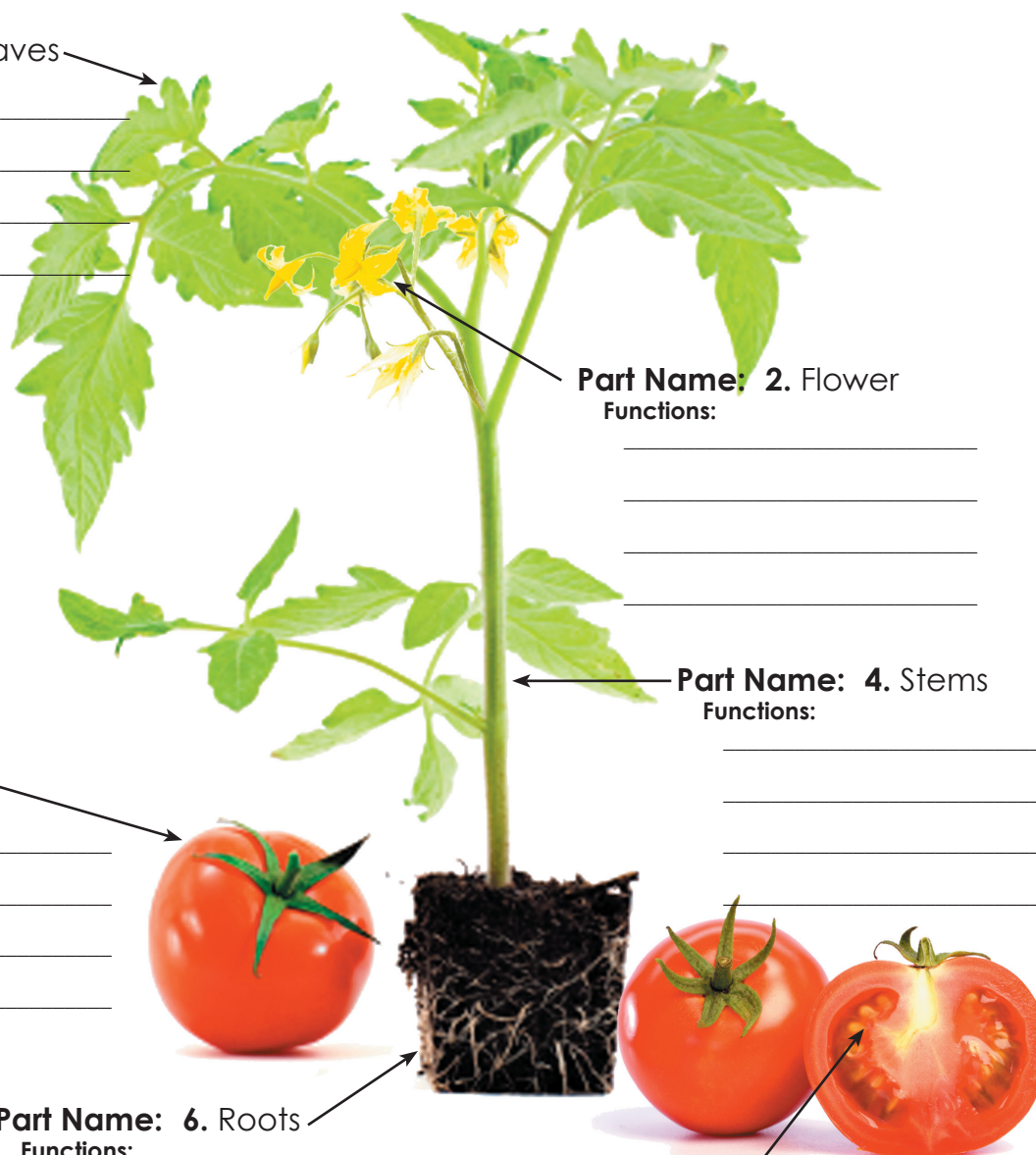
Functions:

Part Name: 6. Roots

Functions:

Part Name: 5. Seeds

Functions:



Part Name: 1. Leaves

Functions:

Part Name: 2. Flower

Functions:

Part Name: 4. Stems

Functions:

Part Name: 3. Fruit

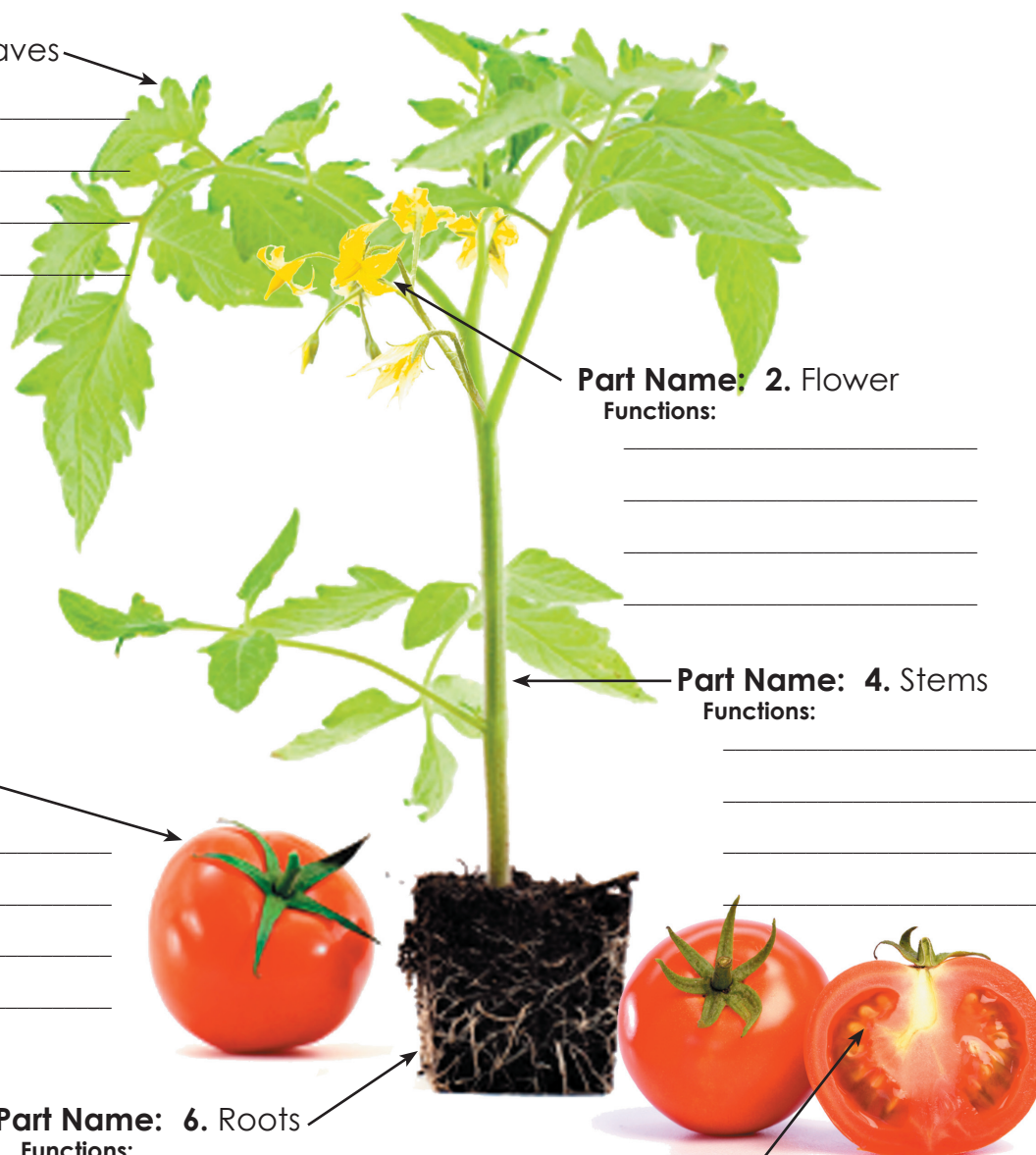
Functions:

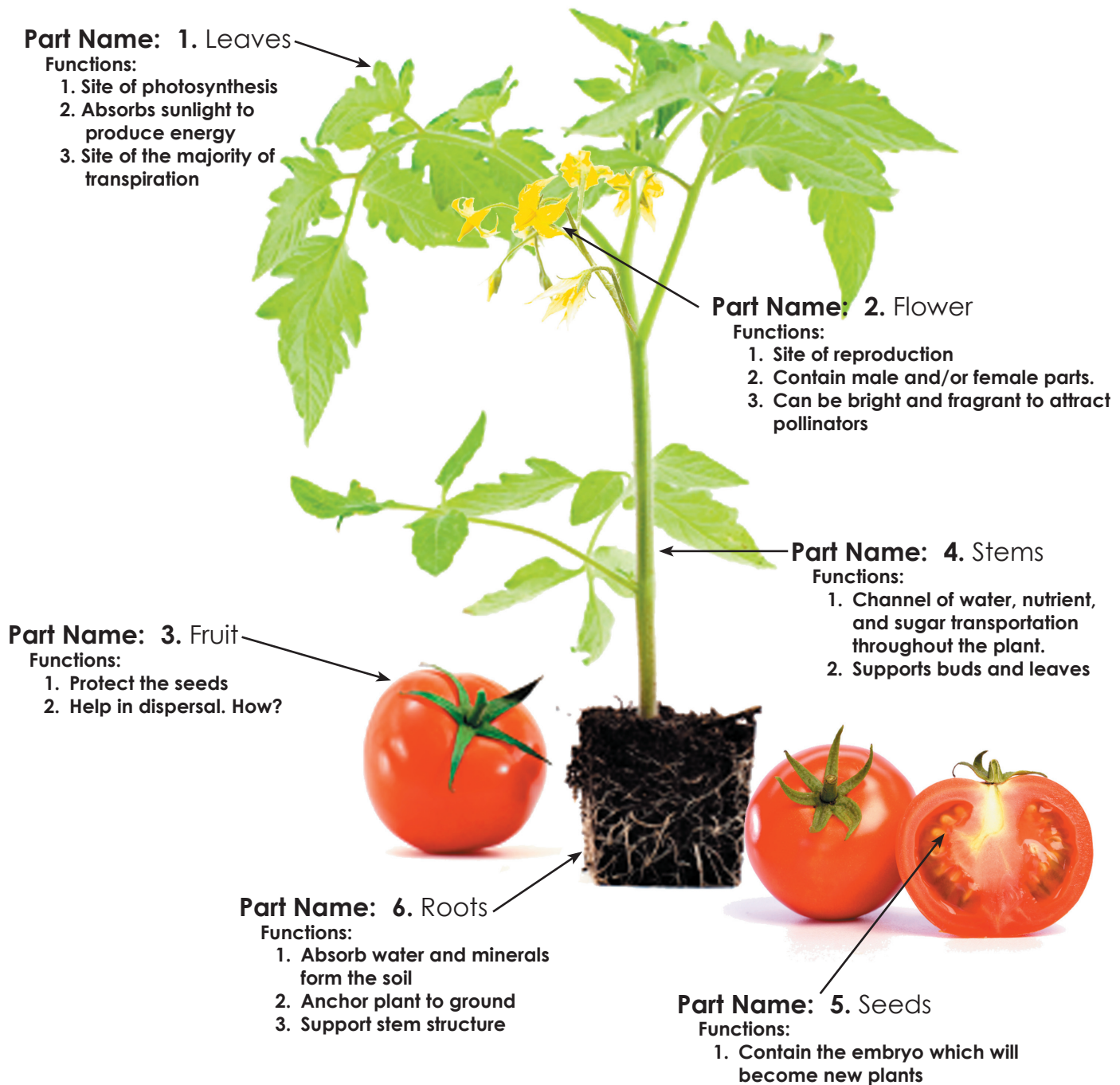
Part Name: 6. Roots

Functions:

Part Name: 5. Seeds

Functions:





Roots

Location: Roots usually are located at the bottom of the plant, or the part of the plant that has contact with the soil or other medium (water in the case of hydroponics).

Functions:

1. Absorb water and nutrients from soil
2. Anchor the plant to the ground
3. Support the stem structure
4. Store food (energy) for the plant



Stems

Location: Stems are usually the central structure of the plant to which flowers, leaves, and roots are all attached.

Functions:

1. Channel for the transportation of water, minerals, and sugar from the roots and leaves to the rest of the plant
2. Support buds and leaves



Leaves

Location: Leaves are generally connected to the stem by leaf petioles but are arranged on the stem in various patterns depending on the plant.

Functions:

1. The site of photosynthesis (energy factory for the plant)
2. Provide a large surface area to increase the absorption of sunlight that is essential to photosynthesis
3. Also the major site of plant transpiration (the diffusion of water, carbon dioxide, and oxygen to and from the plant)



Flowers

Location: Flowers are usually the most flashy part of the plant

Functions:

1. Primary function is reproduction
2. Color and fragrances have evolved to attract pollinators
3. Can contain male (stamen) and/ or female parts (pistil)



Fruit

Location: Fruits are formed from the fertilized ovule (seeds) and the ovary walls of the female part of the flower.

Functions:

1. Protects the seed
2. Assists in the dispersal of seeds (by attracting animals that may consume the fruit and disperse the seed)



Seeds

Location: Seeds are the mature ovule which is originally found in the female part of the flower and are usually housed in a type of fruit or cone.

Functions:

1. Contain the embryo which will germinate and become a new plant
2. Usually protected by a seed coat to protect from moisture and extreme conditions
3. Contain endosperm which is a built-in food supply for the embryo during germination





Name _____

Directions: Using the word bank provided below, fill in the name of the plant part that primarily performs the functions described in each of the six problems.

Word Bank					
Roots	Stems	Flower	Leaves	Fruit	Seeds

- _____ are the primary site of photosynthesis in plants. This is where plants gather the most sunlight to be converted to energy.
- _____ anchor the plant to the ground and absorb water and nutrients.
- _____ are formed from the ovary of the flower and protects seeds.
- With proper conditions such as temperature, light, and moisture, _____ will eventually become a new plant.
- Bees and other pollinators are often attracted to the color and fragrance of the reproductive structure of a plant which is the _____.
- _____ are the primary channel through which water, sugar, and minerals travel through a plant.