

Transport and Reproduction in Plants

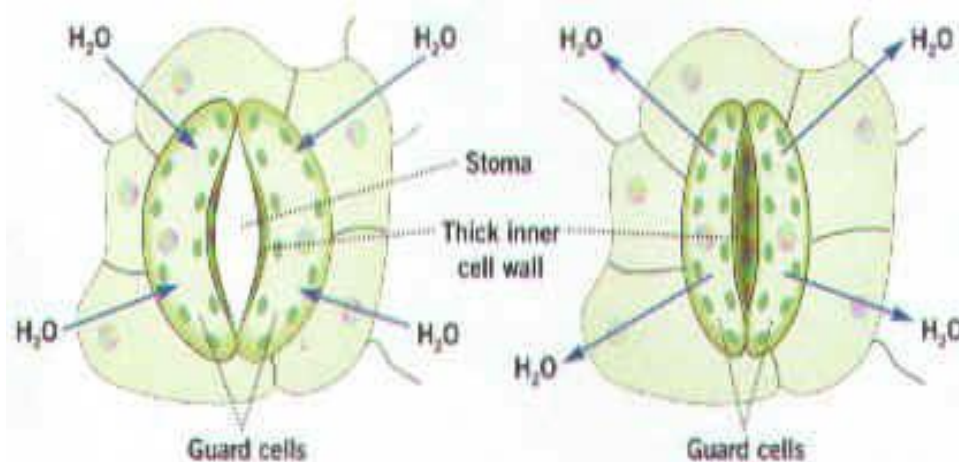
Plant Structure - Stomata

Instructions: *Have one member of the group read the background information below out loud to everyone before completing this activity.*

Stomata

During **photosynthesis** plants use carbon dioxide, water, and light to create sugars for energy. Gas exchange between plant tissues and the atmosphere occurs in the leaf of a plant, the major organ of photosynthesis, through tiny pores called **stomata** (plural). Besides being a pathway for the uptake of carbon dioxide, these stomata are also a source of water loss through transpiration. **Transpiration** is when water leaves the plant through a stoma and turns into water vapor in the environment. This creates a dilemma for many plants. How can plants maximize the uptake of carbon dioxide and minimize water loss? What to do? Among other methods, it turns out that plants are able to regulate the opening and closing of the stomata.

On each side of each stoma (singular) are **two guard cells**. When both guard cells swell with water, a gap opens between them, and the stoma is **OPEN**. When the water is removed from the guard cells, the cells shrink, the edges of the guard cells come into contact, and the stoma is **CLOSED**. In this way, the plant can regulate the uptake of carbon dioxide and the loss of water. The following diagram shows a closed stoma on the left and an open stoma on the right.



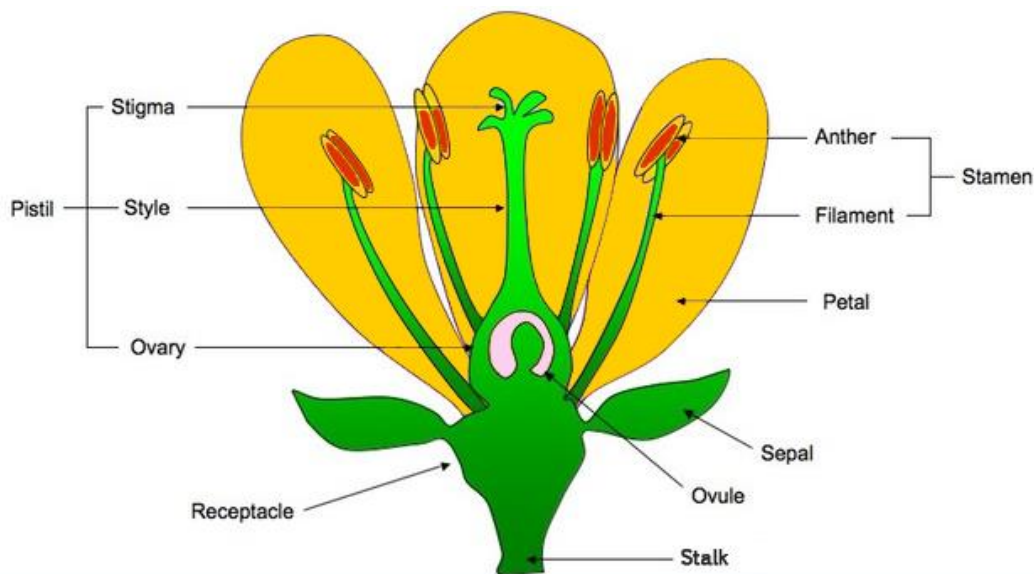
Transport and Reproduction in Plants

Plant Reproduction -

Instructions: Have one member of the group read the background information below out loud to everyone before completing this activity.

Sexual Reproduction in Flowering Plants

Flower structures can be divided into two groups: the essential organs and the accessory organs. The essential organs are the reproductive structures, which include the stamens (male parts) and the pistils (female parts) – sometimes called carpels. The accessory organs are the **sepals** and **petals**, which surround and protect the essential organs. The **stamen** is the male reproductive organ and consists of two parts: the anther and the filament. The **anther** is the enlarged structure at the top of the stamen. Inside the anther are pollen sacs. Special cells within the pollen sacs undergo meiosis to form pollen grains. When the pollen grains mature, the pollen sacs split open to release the dust-like pollen. The **filament** is a thin stalk that supports the anther. The **pistil** (carpel) is the female reproductive organ and consists of three parts: the stigma, style, and ovary. The **stigma** is an enlarged portion at the top of the pistil that becomes moist and sticky when mature. The **style** is the middle portion of the pistil. It can be long and slender, short, or even absent, depending upon the species. The **ovary** is the enlarged structure at the bottom of the pistil. The ovary contains one or more **ovules**. Special cells within the ovary undergo meiosis to form ova (eggs). Pollen leaves the anther, sticks to the stigma, moves down the style (pollen tube) and into the ovary where it will fertilize an egg cell (ova).



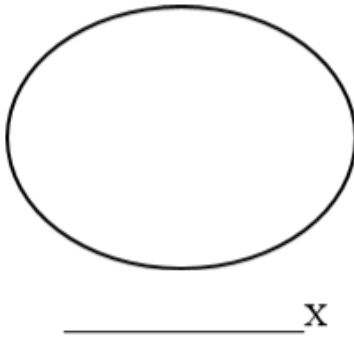
Parts of a flower



Transport and Reproduction in Plants

Station ONE: Plant Structure - Stomata

1. Look at the stomata in the microscope. Draw the stomata below.



A. Are the stomata open or closed?

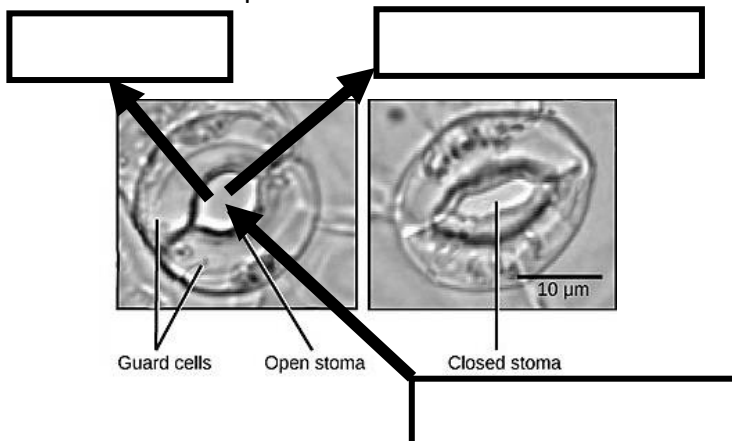
B. Label guard cells and a stoma.

C. Record the power of magnification.

2. _____ gas moves into the stomata because it is a _____ of photosynthesis. _____ gas moves out of the stomata because it is a _____ of photosynthesis.
3. What role does the stoma play in transpiration.
4. When transpiration is occurring at too fast of a rate, what do the guard cells do and why?
5. Why might a cactus have fewer stomata than a plant found in a tropical region?

Go to www.biologybynapiet.com, the Plant Unit, scroll down to today's date and watch the **Stomata and Gas Exchange** video as a group.

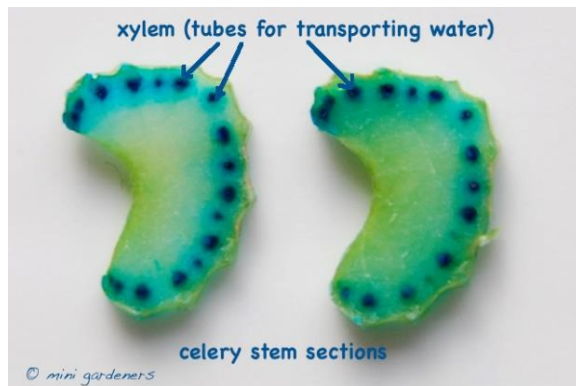
6. Label the picture below.



7. When the stoma is closed what two plant processes cannot occur?

Station TWO: Plant Structure – Vascular Tissue (Xylem & Phloem)

Plants have vascular tissue, **xylem** and **phloem**, that transport materials. Go to www.biologybynapiers.com, the Plant Unit, scroll down to today's date and watch the **Xylem and Phloem** video as a group.



TWO transport systems in plants:

Xylem:

Transports water and minerals
Uses no energy
Travels up the plant from the roots

Phloem:

Transports glucose and other nutrients
Uses energy (ATP)
Travels up and down the plant from the leaves

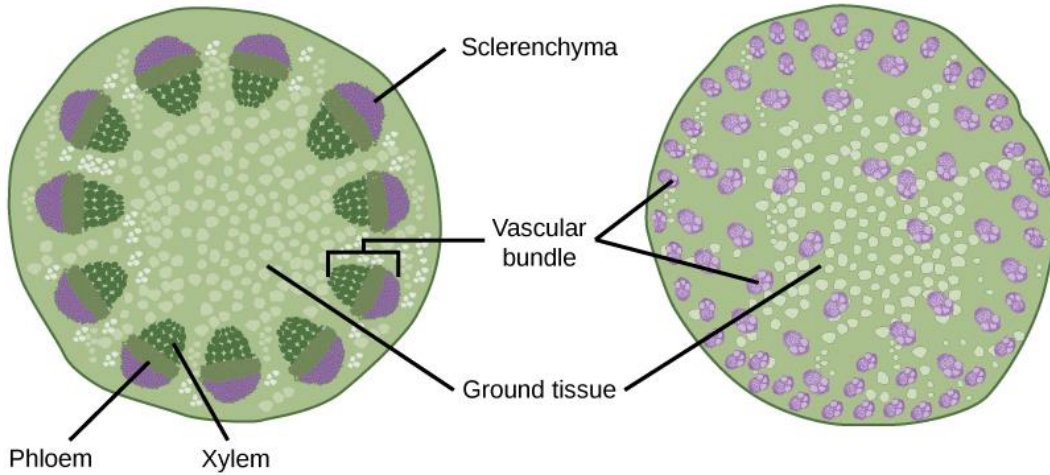
Look at the celery and flowers on stems that were placed in colored water overnight.

Remove a piece of celery and carefully slice off a small section, about ¼ inch thick, of the stem. See the image above.

1. How is the xylem arranged in the celery stem?
2. Explain what the food color in the celery is demonstrating.
3. Why are the flowers different colors?
4. In which direction is the water traveling in the plants?
5. Which vascular tissue is transporting water and requires no energy?
6. Number the following from 1 to 4 in the correct order:
_____ water enters the leaves
_____ roots absorb water
_____ water exits the stomata
_____ water moves up the shoot system in stems

Dicot stem

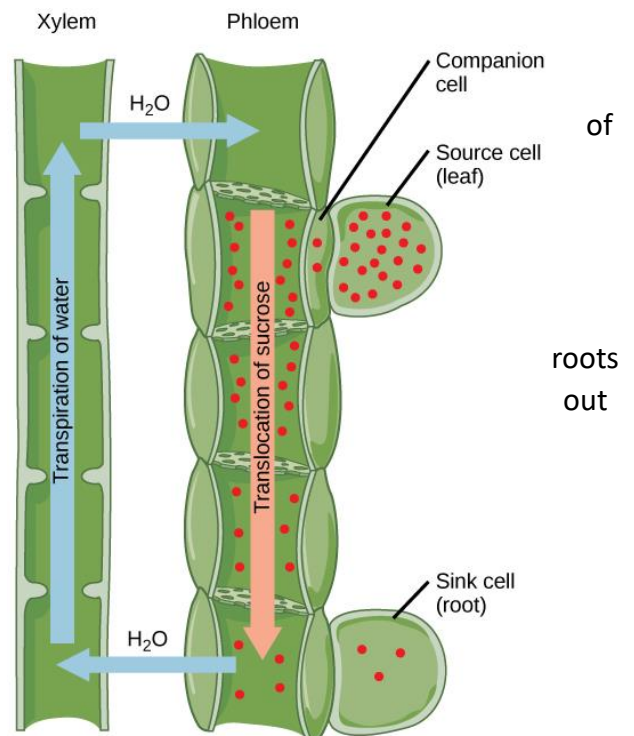
Monocot stem



7. Study the image above. What two types of tissue does the vascular bundle contain?
8. Of the two, which tissue is visible in the celery?
9. Why do you think phloem is not visible in the celery?
10. What is the function of phloem?

11. Study the image to the right. What is the source of the glucose transported through phloem?

12. What is the movement of water from the roots through the stems to the leaves and the stomata called?



Station THREE: Sexual Reproduction in Plants

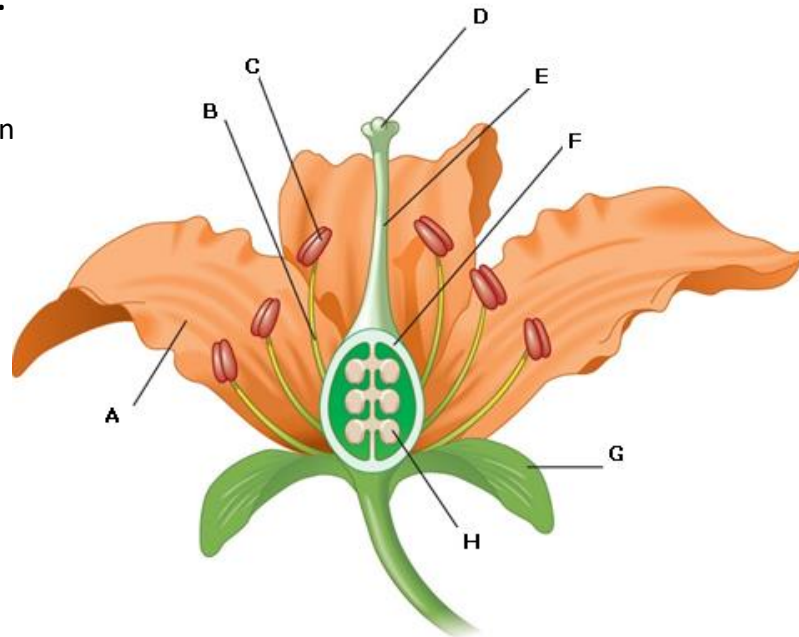
Study the diagrams below. Now, look at the flowers at your station. Without touching them see if you can identify the stamens and the pistils on the different flowers. You may be able to see one or both depending on the type of flowers at your station. You may use your pencil or pen to carefully move parts of the flower if you need to but try not to damage the flowers.

Go to www.biologybynapier.com, the Plant Unit, scroll down to today's date and watch the *Sexual Reproduction in Plants* video as a group.

Label the diagram below:

Circle the pistil

Draw a box around the stamen



1. Which structures make up the stamen and what gamete does it make?
2. Which structures make up the pistil and what gamete does it make?
3. What is the primary function of a flower?
4. In which structure(s) does meiosis occur?
5. Where does fertilization occur?
6. In which part of the male reproductive organ are the pollen grains made?
7. In which part of the female reproductive organ are the egg cells made?

Carefully remove one stamen from a flower using the forceps.

Place the stamen on the dissecting scope and look at it.

8. Draw and label the stamen in the box.



Station FOUR: Plant Response to Stimuli - Tropisms

Plants respond to environmental stimuli with the help of hormones. Go to www.biologybynapier.com, the Plant and Body Systems Unit, scroll down to today's date and watch the following videos as a group.

Click on the video for ***Plants, Tropisms and Hormones*** and answer the following questions.

1. Define Tropism.
2. The most crucial plant tropisms are in response to what 3 environmental factors?
3. Name the 3 tropisms for the above factors.
4. What do plants produce that make these responses possible?
5. How does knowing about these hormones help us?

Geotropism is also referred to as **Gravitropism**. Both terms mean the same thing.

Click on the videos for ***Gravitropism (1 and 2)*** and watch this tropism (Geotropism) in action.

6. What happens in this video?

Click on the videos for ***Phototropism*** and watch this tropism in action.

7. Why do the sunflowers move?

Thigmotropism is a plant's response to touch. Both the plant touching something and something touching the plant. Watch the following two videos to see the difference.

Click on the videos for ***Thigmotropism (1 and 2)*** and watch this tropism in action.

8. What are the differences between these two types of thigmotropism?

FOUR Plant Tropisms:



Tropism	Description
Geo/Gravitropism	Growth of root towards earth's gravity (down) and growth of shoot away from earth's gravity (up).
Hydrotropism	Growth of root toward water source
Phototropism	Growth toward light
Thigmotropism	Response to touch (closing leaves, vines clinging)

More on back . . .

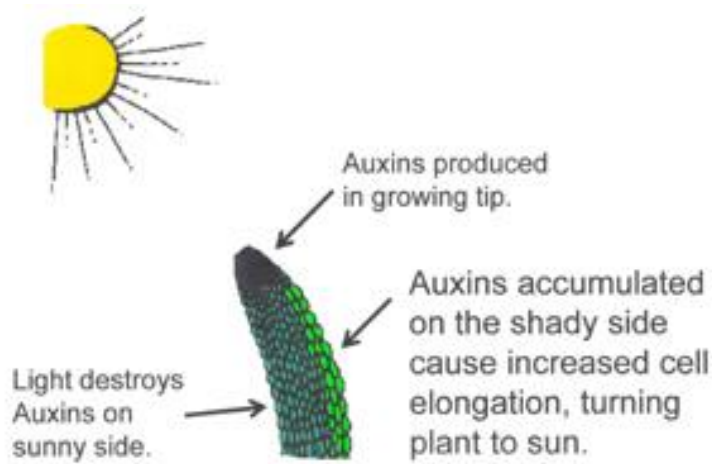
Answer the following:

1. Which tropism involves response to light?
2. Which tropism involves response to water?
3. Which tropism involves response to touch?
4. Which tropism involves response to gravity?

Tropic responses can be:

<p>Positive – if growth is towards the stimulus</p> 	<p>Negative – if growth is away from the stimulus</p> 
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5. Explain the difference between positive and negative tropism in reference to hydrotropism. See image above right.



6. Auxin is a hormone produced by plants. Study the image above. What role does auxin play in phototropism?

Label each image below with the correct tropism.

Gravi/Geotropism – G

Hydrotropism – H

Thigmotropism – T

Phototropism – P

