

Name: _____

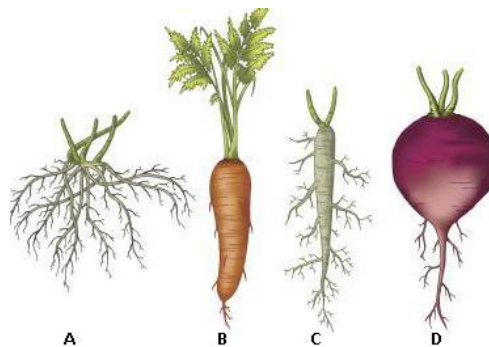
Plant Structures: Shoots & Roots Option 1

Many plants, such as trees and flowers, have vascular systems. These vascular plants have a system of tubes they use to transport nutrients and water to different parts of the plant. Vascular plants all have similar parts, such as stems, leaves and roots. The roots, for example, have several important functions. They pull water and minerals from the environment to nourish the plant. This is why they grow down, because the water and minerals needed for growth are below the ground in the soil. They also provide support and help anchor a plant to the ground. Without a strong root system, trees would not be able to stand tall and withstand high winds. Roots can also store food and nutrients. A well-developed root system can also prevent soil erosion. Some roots are even edible. For example, the carrots we eat are the roots of the carrot plant!

Two basic types of root systems exist. One type is the taproot, which grows vertically and has lateral branches. The other type has fibrous, branching roots that make a network close to the soil surface. Some plants have either a taproot or fibrous roots, and other plants combine the two systems.

Not all roots are underground, though. For example, water plants may have roots that float in the water. Epiphytes are plants that live in trees with roots that cling to tree branches. There are even some plants that don't have roots at all. Remember: the plant kingdom is huge. It's hard for the human mind to grasp the number and wide variety of plants that exist on Earth. Not all plants have vascular systems. Mosses and liverworts, for example, conduct photosynthesis, but they don't have a classical plant structure like vascular plants, and are called non vascular plants. Mosses grow in damp places and soak up the water and minerals they need directly from their environment. They anchor themselves to rocks and trees with rhizoids, thread-like growths that are not roots.

1. What is the main difference between vascular and nonvascular plants?
2. List the three functions of roots.
3. Which root is more likely to be a food source – a fibrous or tap root? Explain. Give an example of a taproot that you eat.



4. Identify the specimens above as a fibrous root or a taproot.

A: _____ B: _____ C: _____ D: _____

Roots and Mycorrhizae

Go to the link below (also posted on the class web page as Mycorrhizae Symbiosis) and watch the short video about mycorrhizae.

<https://youtu.be/5ZKexZImuDw>

Mutualistic associations have played a key role in the initial occupation of organisms on land. Mycorrhizae are symbiotic relationships between fungi and the roots of plants. The fungus lives within the root cells. The plants provide the fungi with carbohydrates and other organic molecules made by photosynthesis. The fungi absorb from the soil phosphorous and other minerals needed by plants since the first plants lacked roots. Therefore, botanists think that these relationships may have enabled the first plants to absorb minerals from Earth's rock surfaces.

1. Where are mycorrhizae located on the plant?
2. How do you think this evolutionary relationship played a key role in the initial occupation of organisms on land?
3. How do the mycorrhizae benefit plants?
4. What type of symbiotic relationship exists between the mycorrhizae and plant roots (name the specific type of relationship)?

To study the effect of mycorrhizal associations on plant growth, an investigator grew six seedlings in nutrient solution. The seedlings illustrated in the diagram on the left were then planted in soil that contained no mycorrhizal fungi. The seedlings illustrated on the right were grown first in forest soil rich in mycorrhizal fungi and then transferred to the soil without mycorrhizal fungi. All the plants grew for the same amount of time.



5. What was the independent variable in this investigation?
6. What was the dependent variable in this investigation?
7. What was the control in this investigation?
8. Name three constants in this investigation.
9. From the results, what could you infer about the relationship between plants and fungi?

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)

Tropism

☞ Response to an external stimulus from a particular direction.

- Positive tropism: plant grows toward stimulus.
- Negative tropism: plant grows away from stimulus.



Tropic responses can be:

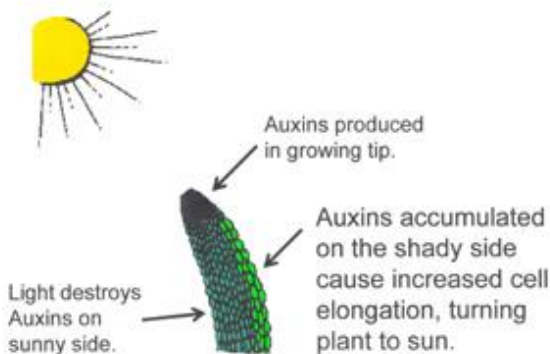
Positive –
if growth is towards
the stimulus



Negative –
if growth is away
from the stimulus



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?
5. Explain the difference between positive and negative tropism in hydrotropism.



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

Label each image below with the correct tropism.

Gravitropism – Gravi

Hydrotropism – Hydro

Thigmotropism – Thigmo

Phototropism – Photo

