

G.L.I.

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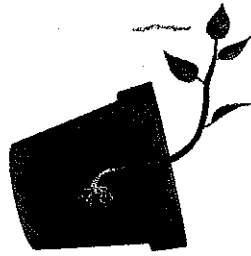
## Plant Behavior

Plants can't move like animals can, but they will still respond to a **stimulus**, or change in the environment. A plant growth in response to a stimulus is called a **tropism**. Plants respond to stimuli such as gravity, light, and touch.

When you drop a seed in soil, you don't have to worry about which direction the seed faces. Why? Because plant roots respond to gravity and so grow down toward Earth's center. Stems, on the other hand, grow upward, or away from the pull of gravity. Plant growth in response to gravity is called **gravitropism** (grav-ih-TROH-piz-um), or geotropism.

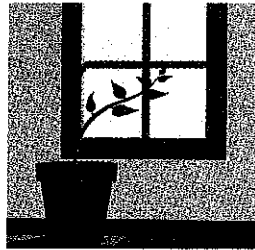
If you place a plant near a window, you will notice that, eventually, most of the leaves will be facing the sun. The leaves turn when cells on one side of the stem grow longer than cells on the other side. This change in the growth of a plant in response to light is called **phototropism**. Phototropism is important because plants need light to carry out photosynthesis.

Some plants respond to touch. For example, vines of beans, peas, and other plants will grab onto and grow upward along a vertical support to maximize the amount of sun they receive. The response of a plant to touch is called **thigmotropism** (thig-ma-TROH-piz-um).



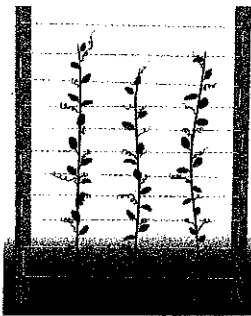
Gravitropism

SEE  
ALSO  
276 Gravity



Phototropism

SEE  
ALSO  
107 Plant  
Physiology



Thigmotropism

Science  
Alert

The hinged leaf of a Venus' flytrap plant will snap shut when an insect lands on it. This response is not a tropism, however, because it does not involve growth. The leaf can return to its original position within minutes.

## Plant Life Cycles

Like animals, plants too have life cycles. Let's look at the life cycle of flowering plants, those that produce flowers.

**Science Alert**

Not all plants reproduce using flowers. Some, like pine trees, use cones. The part of the potato plant used for food storage, the potato tuber, can sprout buds that can grow into new plants.

Flowering plants reproduce by forming seeds. A **seed** consists of a young plant and a food supply enclosed in a protective seed coat. Seeds are formed when the female part of a flower is **pollinated** by the male part.

A seed can **germinate**, or grow, if environmental conditions such as water and temperature are right. As it begins to germinate, the seed's protective coating splits open and a primary root is sent out from the young plant. Food stored in the seed nourishes the young plant until it can develop the roots, stems, and leaves that will allow it to make its own food.



From seed to plant

The young plant develops new leaves as its stem grows up and its roots push deeper into the soil. In some plants, like corn and daisies, the stem grows thicker and stronger but remains green and fleshy, or **herbaceous**. Other plants, like oaks or maples, develop woody stems.

Eventually the plant develops into an adult capable of producing its own seeds. And so the life cycle continues.

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**SEE  
ALSO**

153 Plant  
Kingdom

**SEE  
ALSO**

114 Sexual  
Reproduction

In some species the young resemble the adults. In other species the young do not resemble the adults. Some insects and amphibians undergo **metamorphosis** as they mature. This is a series of changes the organism undergoes during its development from egg to adult. The moth undergoes four stages of development: the egg, larva (caterpillar), pupa, and adult.

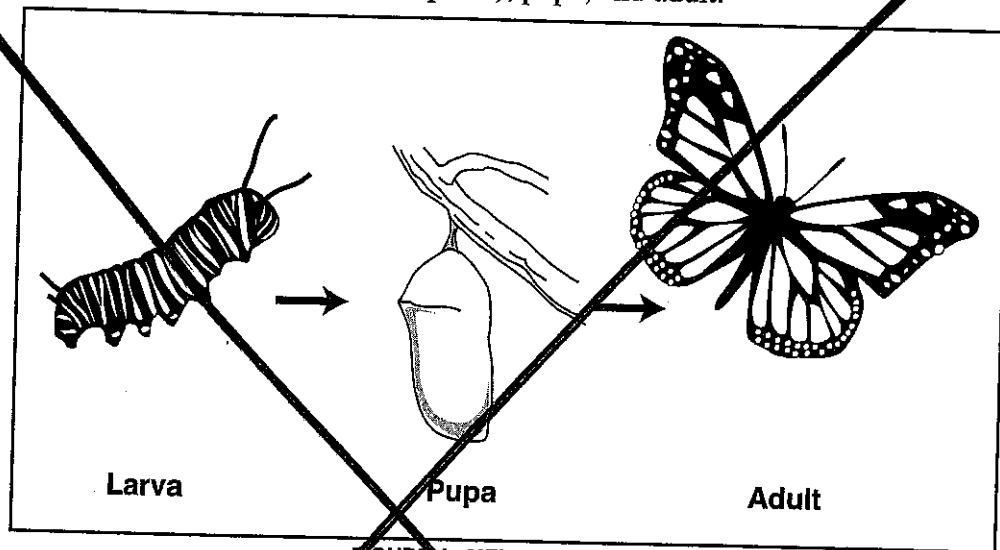


FIGURE 4. METAMORPHOSIS

Development into adulthood is characterized by varying growth patterns. Various body structures and functions change as an organism goes through its **life cycle**. After the adult stage is reached, the structures and functions of the body systems weaken. This is called aging, which is a natural part of development.

### Review Questions

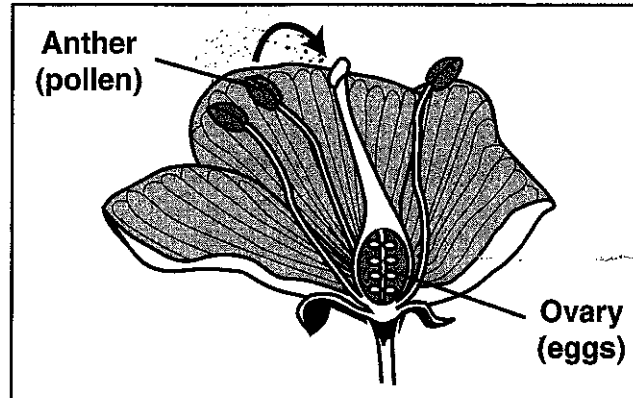
16. The fertilized egg undergoes many \_\_\_\_\_ divisions as it becomes a multicellular organism.
17. Each body cell has \_\_\_\_\_ genetic information.
18. In humans, tissues and organ systems develop before \_\_\_\_\_.
19. Some insects and amphibians undergo body changes called \_\_\_\_\_.
20. As an organism ages, many structures and organ systems will \_\_\_\_\_.

### Reproduction in Plants

Some plants reproduce asexually so that each offspring is exactly like the parent. Vegetative reproduction is the process by which the roots, stems, and leaves of a plant give rise to a new plant. The new plant has the same exact hereditary information as its parent. A bulb is a short underground stem containing stored food. As the plant grows, new bulbs sprout from the old one. Daffodils and garlic reproduce by bulbs. A runner is a horizontal stem with buds, a new plant grows where the runner roots into the ground. Strawberry plants reproduce from runners.

Plants can also reproduce sexually. The **flower** of a plant is the reproductive organ. Female eggs are in the ovary at the base of the flower bud. **Pollen** produced in the flower contains male sperm cells. **Pollination** is the transfer of pollen to the ovary. Fertilization occurs when the sperm in the pollen merges with the egg cell in the flower's ovary. Some plants self-pollinate when pollen grains join with the eggs of the same flower. Cross-pollination is the transfer of pollen from one plant to another. Wind, insects, rain, and birds carry pollen from one plant to another.

FIGURE 5.  
FLOWER



The fertilized egg develops into a young plant found in the **seed**. The seed contains food for the new plant. In order for the seed to sprout or germinate and develop into a plant, it needs the proper temperature, oxygen, and water.

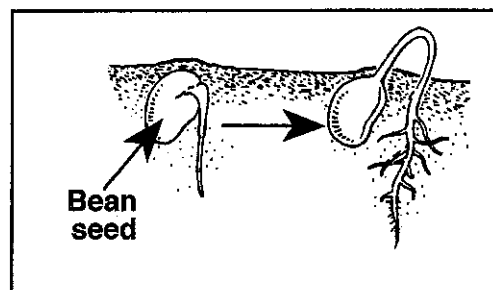


FIGURE 6. GERMINATION OF A SEED

### Review Questions

21. A \_\_\_\_\_ is a short, underground stem containing stored food.
22. The \_\_\_\_\_ is the reproductive organ of a plant.
23. Pollen contain \_\_\_\_\_ cells
24. The transfer of pollen from one plant to another is \_\_\_\_\_.
25. Wind, water, and animals carry \_\_\_\_\_ from one plant to another.
26. The THREE conditions necessary for seeds to germinate are (1) \_\_\_\_\_  
(2) \_\_\_\_\_ (3) \_\_\_\_\_

## Carbon Dioxide-Oxygen Cycle

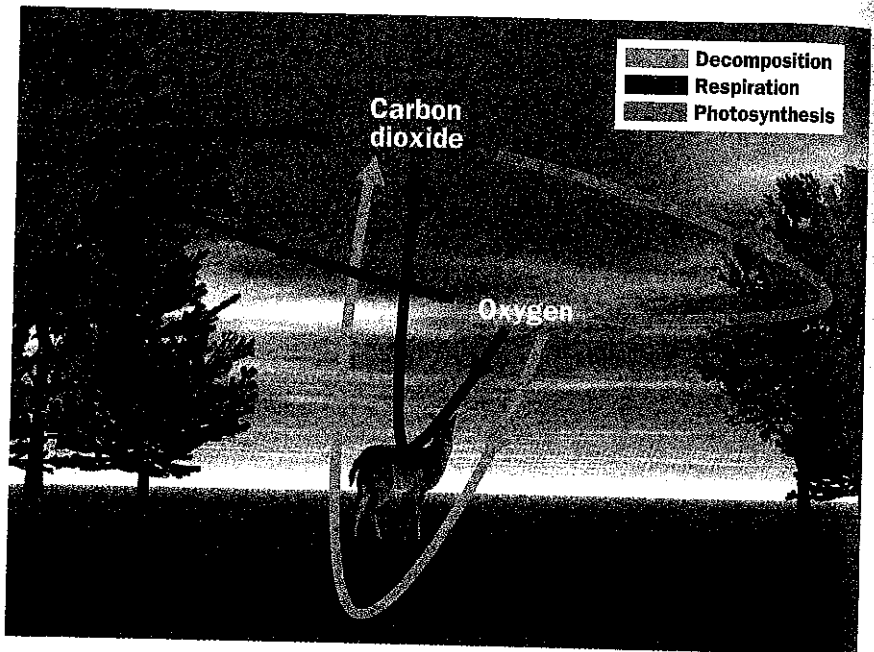
Matter moves in cycles through the environment, getting used over and over again. Carbon dioxide and oxygen are two important forms of matter that cycle through an ecosystem. The continual movement of carbon dioxide and oxygen between living things and the environment is known as the **carbon dioxide-oxygen cycle**.

### SEE ALSO

250 Matter

### SEE ALSO

079 Cell  
Processes  
330 Renewable  
Material  
Resources



**Carbon dioxide-oxygen cycle**

Several important processes are part of the carbon dioxide-oxygen cycle.

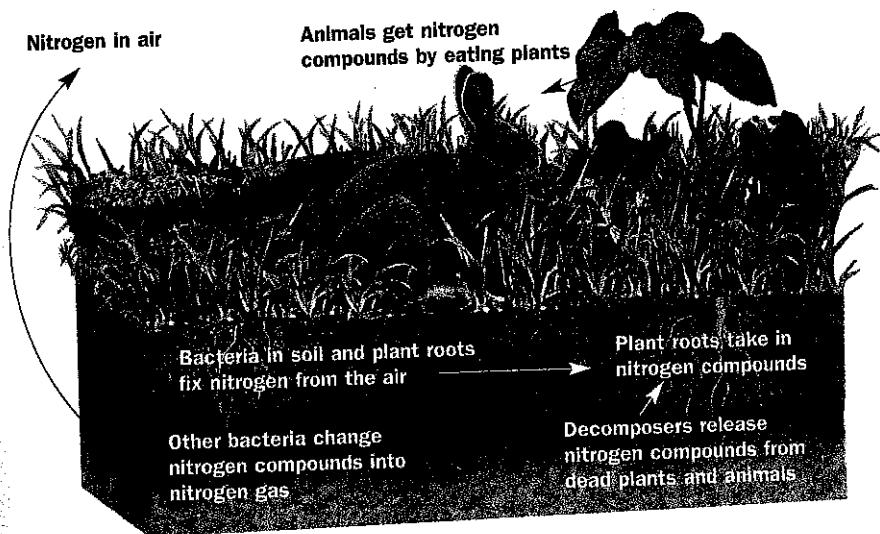
### SEE ALSO

107 Plant  
Physiology  
105 Animal  
Physiology  
133 Feeding  
Relationships

- **Photosynthesis** Plants, algae, and some bacteria take in carbon dioxide from the environment and use it to make food through the process of photosynthesis. Oxygen is released back to the environment as a waste product of this process.
- **Respiration** Most organisms get energy by combining oxygen from the air with food in a process known as cellular respiration. Carbon dioxide is released back into the environment as a waste product of respiration.
- **Decomposition** Fungi and some bacteria obtain energy by breaking down the wastes or remains of other living things into smaller molecules. Carbon dioxide is released back to the environment through this process.

## Nitrogen Cycle

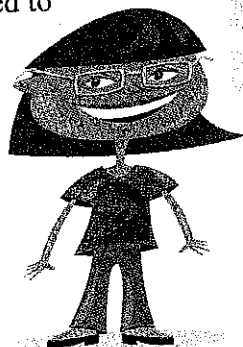
Nitrogen is one of the elements needed to build the proteins that make up the structures of living things. Almost 78 percent of Earth's atmosphere is made up of nitrogen gas. But most organisms cannot use this nitrogen until it is combined with other elements to form nitrogen compounds. At the same time, nitrogen compounds found in the bodies of dead organisms must be broken down in order to return nitrogen gas back to the air where it can be used again. The constant movement of nitrogen between living things and the environment is represented by the **nitrogen cycle**.



### Nitrogen cycle

**Nitrogen fixation** is the changing of nitrogen gas from the air into nitrogen compounds plants can use. Bacteria that live in soil carry out most nitrogen fixation. After plants take in these compounds from soil, the compounds can be passed to animals through the food chain.

Plants and animals return nitrogen compounds, such as ammonia, to the environment in their wastes. Bacteria break down the nitrogen compounds and release nitrogen gas back into the atmosphere.



Peas, clover, alfalfa, and soybeans are all legumes, plants that house nitrogen-fixing bacteria in their roots. The bacteria get the energy they need from the plant, and nitrogen compounds fixed by the bacteria fertilize the plant. Both organisms benefit from this relationship.

### SEE ALSO

- 079 Cell Processes
- 214 Composition of the Atmosphere
- 133 Feeding Relationships

- 132 Relationships Between Po

## Review Questions

24. Disease breaks down the structure or \_\_\_\_\_ of an organ system.
25. Disease can upset the internal balance or \_\_\_\_\_ in the organism.
26. Microbes that can be passed from organism to organism cause \_\_\_\_\_ disease.
27. Specialized \_\_\_\_\_ in the blood protect the body from infectious disease.
28. The chemicals produced by some specialized cells identify and destroy \_\_\_\_\_.
29. A poor diet can cause a \_\_\_\_\_ disease that can not be passed to another organism.

## Plants

Green plants must carry out all the life functions through unique structures. The most important structures of the plant are the roots, stems, leaves, and flowers.

The **roots** absorb water and nutrients from the soil that the plant needs to stay alive. The roots anchor the plant to the ground.

The **stem** transports water and nutrients from the roots to the leaves. It also transports the food made in the leaves throughout the plant body. The stem supports the plant and its structures such as branches, leaves, and flowers.

The **leaf** is where the processes of gas exchange and photosynthesis take place. Through pores in the leaf, water vapor and carbon dioxide are exchanged with the air. In sunlight, chloroplasts in the leaf cells use carbon dioxide and water to produce oxygen and food by the process of **photosynthesis**.

Photosynthesis is a chemical reaction that occurs when chlorophyll in the chloroplasts absorbs light energy. Oxygen is eliminated from the plant through the leaf pores. The food, glucose, is then transported throughout the plant.

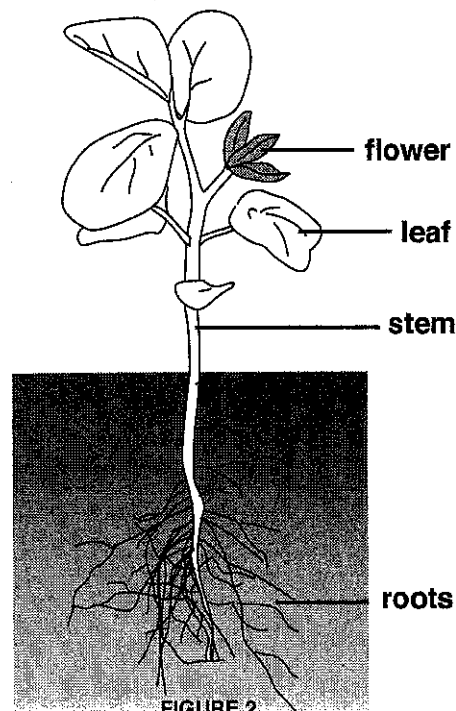


FIGURE 2.  
PLANT STRUCTURES

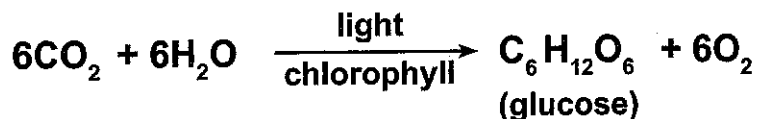


FIGURE 3. CHEMICAL REACTION OF PHOTOSYNTHESIS

Reproduction in flowering plants takes place in the flowers. Here fruits and seeds are produced.

## Review Questions

30. Water and nutrients are taken out of the soil by \_\_\_\_\_.
31. The plant structures, such as branches and leaves, are supported by the \_\_\_\_\_.
32. Photosynthesis occurs in the \_\_\_\_\_ of the leaf cells.
33. Photosynthesis uses the compounds \_\_\_\_\_ and \_\_\_\_\_.
34. Green plants excrete \_\_\_\_\_ gas through their leaves.
35. The life process that occurs in flowers is \_\_\_\_\_.

## VOCABULARY

Calorie

carbohydrate

chloroplast

circulatory system

diet

digestive system

disease

endocrine system

excretion

fat

gas exchange

homeostasis

hormone

infectious disease