5 Multicellular organisms

What you will learn
A variety pack
Success with seeds
Photosynthesis - The making of food
Respiration - The breaking of food
The world around us contains millions of living organisms of different types. These examples show a great variety of organisms on the Earth.

Divide them into two main groups of living things—animals and plants.

Flowering plants

Look at the picture of the plant. Both animals and plants are living organisms which carry out characteristics of living organisms, but do they perform each of the seven characteristics that you have studied before in a similar way?

Make a table to show some of the ways in which plants are different from animals.

Do you know?

The largest flower is the giant rafflesia, which can grow up to 105cm in diameter and weigh up to 7kg.
Same plant, different cells

Like the animals, plants have different types of cells and tissues which have special features to do their job or function.

Some special features include:

⇒ Many leaves are broad and flat to absorb as much sunlight as they can.
⇒ The palisade cells which are on the upper layer are packed with chloroplast.
⇒ They have thin tubes to carry food, water and minerals up and down the plant.
⇒ Roots help to anchor the plant to the ground and to absorb water and minerals from the soil.

Questions:

1. Which part of the leaf cell is important for photosynthesis?
2. What two things do roots do?
3. Why do all plants need water?
4. A palisade cell and a root cell are both plant cells, but they look very different. Why are they different?
5. Why are there as many palisade cells as possible packed into the top layer of a leaf?
A seed looks dead. But inside a seed is a tiny plant called an embryo. The young plant waits for the right conditions before it starts to grow. When the conditions are right, the embryo will begin to grow or germinate.

**Seed structure**

The embryo in a seed has three parts. It has a root or radicle, a shoot or plumule and one or more seed leaves called cotyledons. The embryo needs its stored food for growth, until it has enough leaves to make food by photosynthesis.
When the time is right

The conditions necessary for germination of a seed are the right **temperature**, and the availability of **water** and **oxygen**.

The need for water

See whether if you could guess what is going to happen to the seeds in each container. Set up three containers as shown and find out the result.

1. Rewrite the following in the correct order for germination in a broad bean seed.
   a. Root hairs form
   b. radicle grows down into soil
   c. testa splits
   d. radicle comes out
   e. epicotyl lengthen
   f. epicotyl straightens

2. What three things does a seed need to grow?

3. What is inside a seed?

4. What is
   a. radicle?
   b. plumule?
   c. cotyledon?

5. Why do you think seeds need a store of food?

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Inside a seed is a tiny plant called an **embryo**.

The embryo consist of a root *(radicle)*, a shoot *(plumule)* and one or more seed leaves called **cotyledons**.

A seed begins to germinate when it has the right **temperature**, **water**, and **oxygen**.
Think about the plants you have seen at home or at school. What do they need to keep them healthy and make them grow?

**Thinking about food?**

All living things need food for energy, but plants don’t eat food. Plants need three main things, which are water, light and air. Plants use these to make their own food.

The main ingredients for the plant’s food are water and carbon dioxide, a gas in the air. Carbon dioxide is only a small part of the air, but it is very important to a plant.

Light provides the energy to turn water and carbon dioxide into food. The plant uses the carbon dioxide and water to make food substances called carbohydrates.

When carbohydrates are formed, another gas called oxygen is produced. This is the waste product of the process.

Making food using energy from the sun is called photosynthesis.

**The leaf factory**

Photosynthesis happens in the leaves of plants.

Water enters the plant through its roots and travels up the stem to the leaves. Carbon dioxide enters through tiny holes in the leaf.

When light energy hits the leaf, chloroplasts that contain chlorophyll trap the light energy so they can use it to make food.

Carbohydrates are made in the leaf and transported all over the plant to be used for growth. Oxygen escapes through the tiny holes in the leaf’s surface.

There are over 275000 flowering plants and trees presently known to science.
Testing a leaf for starch

Why do you test a leaf for starch?

The carbohydrates that are made in the leaves are converted to starch in the leaf. So if we test a leaf for the presence of starch, we could find out whether photosynthesis has taken place in those leaves of the plant.

How to test?

1. Take a leaf from the experimental plant and boil it for 30 seconds to kill it and make its cells more permeable to iodine.
2. Boil the leaf in alcohol (using a hot water bath to avoid risk of fire) to remove chlorophyll and make the starch/iodine reaction easier to see.
3. Soften the leaf by dipping it in boiling water again.
4. Spread the leaf on a tile and drop iodine on it. A blue-black colour indicates that starch is present.

1. What is photosynthesis and where does it occur?
2. What is the green substance in leaves called?
3. What does this green substance do?
4. What does a plant need to make glucose?
5. What else is produced during photosynthesis?
6. How can one determine whether photosynthesis has taken place in a leaf?

Ideas

Glucose that is made in the leaves is converted into starch.

Iodine changes into blue black colour in the presence of starch.
One of the main characteristics of all living things is, they get energy by breaking down food into simpler substances. The process by which energy is released from the breaking down of glucose or other food substances is called **respiration**.

In case of plants, even though they make their own food, they too have to breakdown food to release energy the plants need to do various functions.

Some organisms including plants breakdown food in the presence of oxygen. Carbon dioxide and water are the waste products formed.

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\text{Glucose} + \text{oxygen} \rightarrow \text{energy} + \text{carbon dioxide} + \text{water}
\]

**Breathing**

We breathe all the time. The oxygen needed for respiration is taken into our body when we breathe in the surrounding air. The waste products or respiration (carbon dioxide and water) are removed from our body when we breathe out.

The air that we breathe in is called inhaled air and the air we breathe out is called exhaled air.

**Do you Know?**

A bull sperm whale can hold its breath for nearly two hours in a deep dive.
Breathe all the time

Respiration takes place all the time. While you are sleeping or walking or eating respiration takes place. So plants and animals need a steady supply of oxygen. That is why breathing is necessary.

Animals such as mammals, birds, reptiles, and amphibians breathe through special organs called lungs. Fish breathe through gills.

How do you think the green plants breathe? They breathe through the stomata.

Day and night

Compare the two equations. What is the difference between them?

This means green plants alone release all the oxygen needed by the entire living world. So this tells us how important green plants are for our survival in supplying food as well as oxygen.

During the day plants use oxygen they produce for respiring and release the excess but during the night plants and animals take in oxygen from the air for respiration. However, plants take in less oxygen during the night compared to the amount they give out during the day.

1. Fill in the blanks with the appropriate words.
   a. We breathe in _________ and breathe out _________.
   b. Crocodiles use _________ to breathe and tuna use _________ for breathing.
   c. During respiration that is produced in _________.
   d. _________ takes place only during day time.

2. Write the word equation for respiration.

3. People breathe in oxygen and breathe out carbon dioxide. Some people claim that talking to house plants makes plants grow better. Can you think of a scientific explanation for this?

The process of breaking down food to release energy is called respiration.

Breathing is taking in oxygen (inhalation) and giving out carbon dioxide (exhalation).

Photosynthesis takes place only during the daytime.

Respiration takes place all the time in all the living organisms.
Gregor Mendel was born in Austria on July 22, 1822. He was the only son of a peasant farmer. Mendel’s first presentation was on his eight years of experimentation with artificial plant hybridization. During the middle of Mendel’s life, Mendel did groundbreaking work into the theories of heredity. Using simple pea pod plants, Mendel studied seven basic characteristics of the pea pod plants.

He found actual proof of the existence of genes, and is considered to be the father of genetics, though his work was relatively unappreciated until the early 1900’s. Mendel died never knowing that he would come to be known as the father of genetics.