

# How bees make honey



Honey bees collect nectar and pollen from flowers, but only nectar is used to make honey. Nectar is a "reward" given by the plant to attract bees. Pollen is transported back to the hive in the pollen baskets on the hind legs whereas the nectar is transported in the stomach. Nectar is mostly water with dissolved sugar. The amount of sugar varies greatly but is usually 25-50%. Back in the hive the nectar is placed into wax honeycomb cells and the excess water evaporates until the honey is approximately 83% sugar and 17% water. This takes a few days. The cell is then covered over with a layer of wax which is later removed when the bees need to eat the honey. When large amounts of nectar are being collected the bees speed up evaporation by using their wings to ventilate the hive.

The sugar is also changed. Sugar in nectar is mostly sucrose (table sugar). Sucrose has large molecules. The bees produce an enzyme which breaks each sucrose molecule into two smaller sugar molecules, glucose and fructose. By evaporating the excess water and converting the sucrose into smaller sugars the bees make the honey too concentrated for yeasts and other microorganisms to grow. Preventing spoilage is important to the bees because the honey made in the summer is used as winter food.

Without at least 10kg of honey a bee colony cannot survive the winter, when there are no flowers. In addition to sugar, nectar contains other chemicals. Although these are only present in small amounts they are important because they give different honeys their distinctive colours and flavours. Although the bees from one

colony collect nectar from many species of plants, at certain times they collect most of their nectar from one or a few species of plants that are very abundant. These "nectar flows" are responsible for most of the honey that actually gets stored. Beekeepers often harvest honey after a nectar flow, thereby producing honey predominantly from a single plant species and with a characteristic flavour and colour.



## Did You Know?

- \* Beekeepers often move their hives to places where there are lots of flowers. The hives are moved by vehicle at night when the bees are all inside.
- \* A full-time bee farmer usually keeps 1000 or more hives. With 30,000 bees per hive that makes 30 million bees to look after.
- \* The bees in a hive help each other to forage more efficiently by telling each other the direction and distance of flower patches using the "waggle dance".
- \* The Quran says this about bees and honey "From its belly comes forth a fluid of many hues, a medicinal drink for men". In other words, honey is good for you!

## How Amazing!

- \* When full, the honey stomach can weigh more than half a forager bee's unladen weight and the forager's abdomen is visibly longer.
- \* It takes approximately 50,000 bee loads of nectar to make one pound of honey.
- \* Honey bees will collect nectar as far as 14km (8 miles) from their hive.
- \* The ancient Egyptians used honey to help wound healing. Modern science has shown that honey kills bacteria and honey is coming back as an antiseptic.

## How to Fly a Hot Air Balloon

A hot air balloon consists of a basket, four big gas tanks, a burner and the balloon or 'envelope'.

First, the pilot puts four nylon poles into sockets on top of the basket. Then she puts the burner on top of the poles. Next, she connects the cables to the burner frame. The cables also go under the basket in order to hold everything together.

After this, she connects the hoses from the full gas tanks to the burner so that she can test it.

Next, two people hold the mouth of the balloon open while it is filled with cold air from the fan until it is quite fat and tight.

Now for the difficult bit. The pilot lies on the ground, half in the basket. She turns on the gas burner and points the flame into the 'mouth' of the balloon. This is so that the balloon slowly stands up.

When the pilot is ready to go, she heats up the air in the balloon a bit more. This results in the air in the balloon to be hot enough to get the balloon to rise off the ground.

## The water cycle

The water cycle is also known as the hydrological cycle. There is the same amount of water on the Earth now as there was when the Earth began. The water cycle is how the earth's water recycles itself.

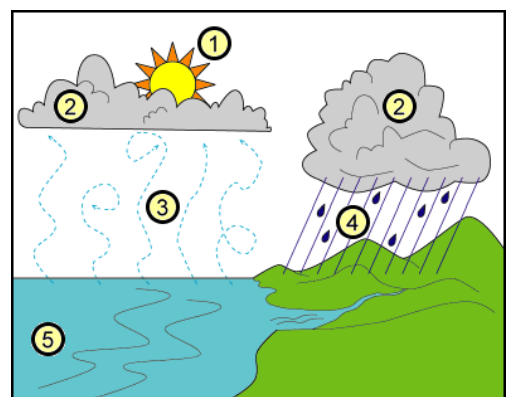
The cycle includes, precipitation, evaporation, condensation, and accumulation. Earth's water keeps changing from liquid water to vapour and then back again. This cycle happens because of the sun's heat and gravity.

### How does the Water Cycle work?

1. First of all, water molecules from lakes, rivers, streams, reservoirs, and the sea get heated up by the sun and then turn into vapour that rises into the air.
  2. Next, these water molecules form into clouds, this is because a process called condensation occurs.
  3. When the air and the water cool, they form drops of water which then fall to the earth as rain. If they are frozen, they become snow or sleet.
  4. Once the water reaches the ground, it can flow across the land until it reaches rivers, lakes, streams, or the sea.
- It can also sink into the ground and flow because of gravity through gaps in rock, gravel and sand. Because of this, it reaches these bodies of water too.
5. Now the cycle begins again, when water is evaporated once more.

### Why is water important?

Many of us think water will always be there for us when we want it. Without water, living things would die. You will die if you go without water for more than a week. Plants will die without water and that would kill all of the animals that eat the plants.



## **The Super Solar System!**

Our planet Earth is part of a solar system that consists of eight planets orbiting a giant, fiery star we call the sun. For thousands of years, astronomers have studied the movements of the planets across our solar system. These spherical bodies march across the sky in a predictable way: the length of their days and years remaining reliably constant. Although scientists have learned a great deal about the solar system, there are still further questions to answer and many mysteries to explore.

### **The Sun: The Centre of Our Solar System**

The sun, which is only a medium-size star, is larger than any of the planets in our solar system: it has a diameter which is over one hundred times bigger than the Earth's. More than one million Earths could fit inside the sun. The large mass of the sun produces an enormous gravitational pull which keeps all of the planets of the solar system in their orbits. The surface temperature of the sun is around 5500 degrees Celsius. If an astronaut travelled too close to the sun (even three million miles would be a dangerous distance), then it wouldn't be long before their space suit would be turned into a deadly sauna!

### **Planets in Our Solar System**

Each planet in our solar system is unique, but they all have a few things in common, too. For example, every planet rotates on its axis, although while some planets rotate quickly; others rotate slowly. As each planet in our solar system rotates on its axis, it also revolves around the sun. The time that it takes for a planet to make a complete revolution around the sun is the planet's year. The path that the planet follows around the sun is called its orbit. Different planets have different orbits which can take different shapes. Some orbits are nearly circular; others are more elliptical (egg-shaped.)

### **What Else Is in Our Solar System?**

Although we tend to think only about the sun and the planets when we consider our solar system, there are many other types of bodies that huddle around the sun along with Earth and its planetary brothers and sisters. The solar system includes moons (and some of those moons have moons), supernova explosions, comets, meteors, asteroids, and plain, old space dust. There are even more objects in our solar system, which have yet to be discovered.

