

1st

What is science?



What

you will learn

What is science?

The scientific method

Doing experiment

Planning

Keep your eyes open!

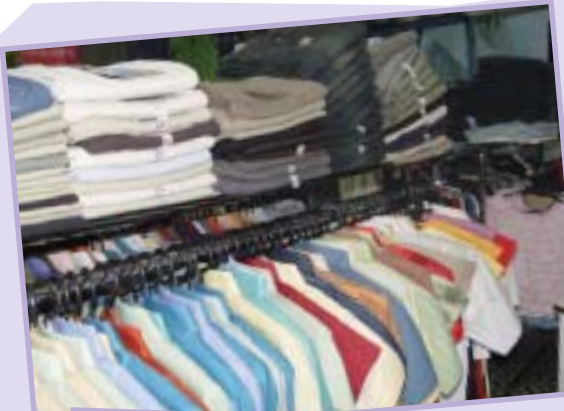
What is science?

A

What is science?

Have you noticed that our daily lives are closely related to science? Think about the food we eat, the clothes we wear, the transport we take or the energy we use.

How do you think these are related to science?



The study of science is not just for scientists. An artist needs to know the science of mixing colours and painting materials. A photographer needs to know science to understand the nature of light so that he or she can take better pictures.

A homemaker needs to know science so that he or she can cook well-balanced and nutritious food for the family. Studying science helps us to understand the things around us, solve problems and train our minds to think logically and systematically.

Science is divided into many branches. The following are some examples.

| | |
|-----------|--|
| Biology | The study of living things |
| Chemistry | The study of substances |
| Physics | The study of matter, energy and natural forces |
| Astronomy | The study of the Sun, Moon and the stars |
| Geology | The study of structures of the Earth |

Who is a scientist?

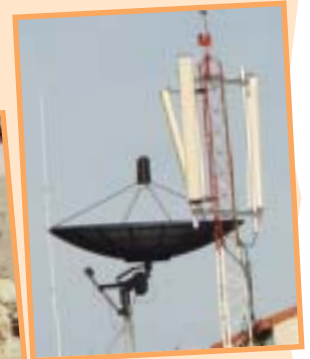
Look at the table in the above. All the branches of science listed there have to do with the world around us and with ourselves. They are all concerned with finding out about how things work and how things are made including our selves and other living things.

People who spend their working lives finding out these facts are called **scientists**. Their discoveries often help us to have a more healthy, interesting and useful life.

Science and technology

Science is the systematic study of nature and how it affects us and the environment. With the rapid progress in science, our standard of living has improved greatly. The way in which scientific discoveries are used to build machines and to make our lives easier and more comfortable is called **technology**.

However, the misuse of scientific discoveries has also resulted in pollution, and the invention and use of deadly weapons that are harmful to us and our environment. So we need to use science with great care.



The scientific method

You will do lots of practical activities in your science class. In this unit, you will learn the scientific method which is the most common method used by scientists in their investigations.

✦ Making careful **OBSERVATION** or accurate measurements

You should be able to:

- pick out the important things about an object
- find similarities in a group of objects
- find differences among the objects in a group.



✦ **RECORDING** the observations or readings in an appropriate way.

You should be able to:

- record observations or measurements appropriately using tables, charts, graphs, labeled drawings etc. for easy future references.



✦ Coming up with a **HYPOTHESIS** or a question that can be tested.

You should be able to:

- make inference and develop a hypothesis.
An inference is a statement made, based on observation or measurements.
The skill of making an inference involves thinking and discussing with others to come up with the best possible explanation for an observation.



✦ Planning and carrying out **INVESTIGATION** to test the hypothesis.

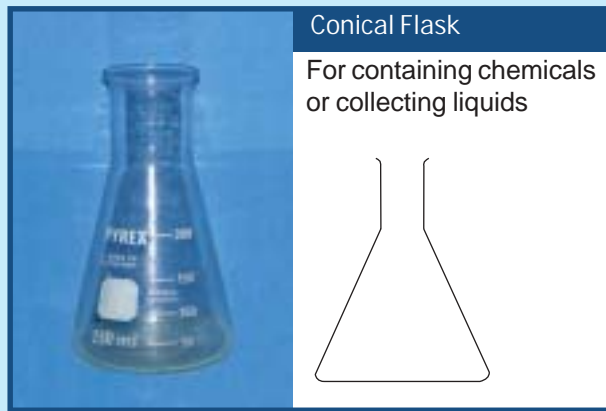
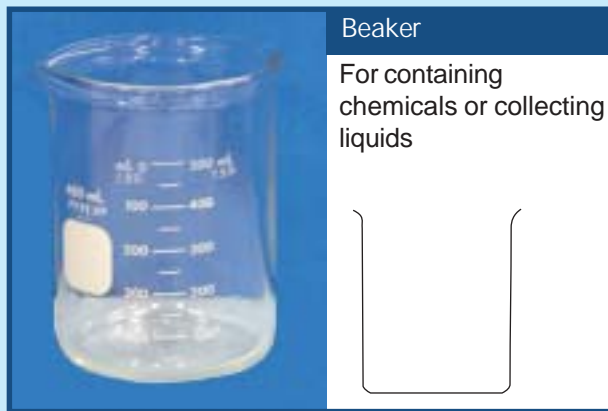
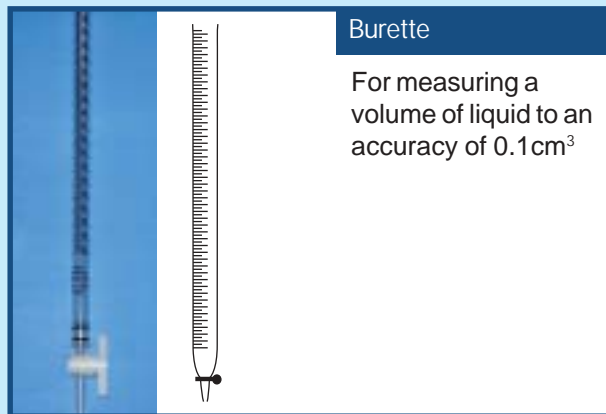
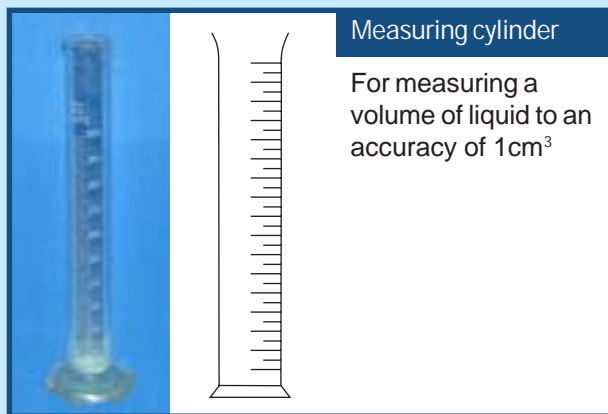
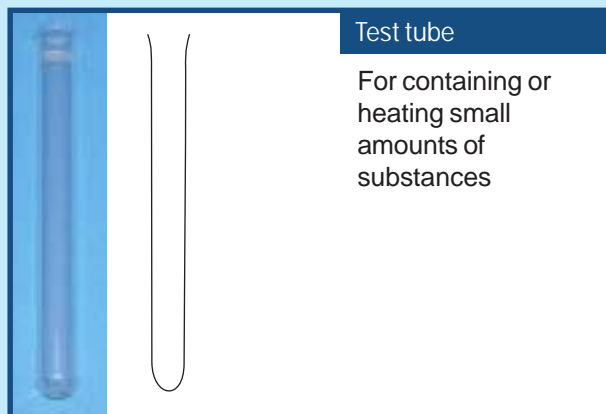
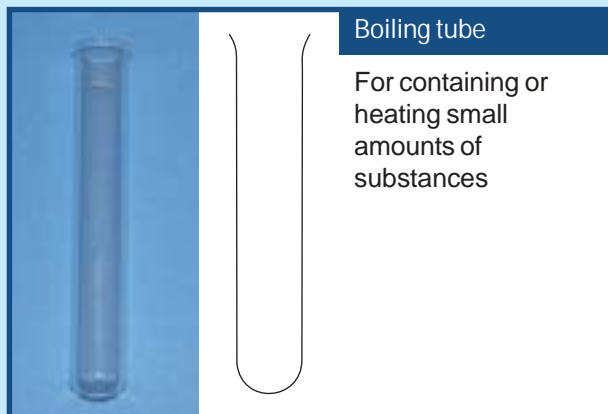
You should be able to:

- Design an investigation to solve a problem
- Decide what equipment to use
- Decide what measurements to take
- Decide how to do a fair test.



Laboratory apparatus

Many types of apparatus are used for scientific work in laboratories. They enable us to carry out experiments successfully and make accurate measurements or observations.



Doing experiments

A good scientist always thinks carefully about what is happening in an experiment.

What happens in the experiment?

Why does this happen?

These two questions will help you to keep thinking.

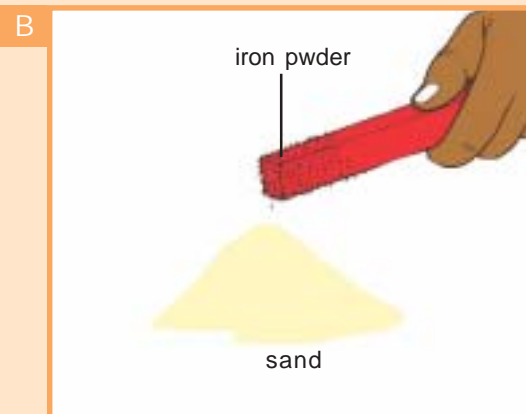
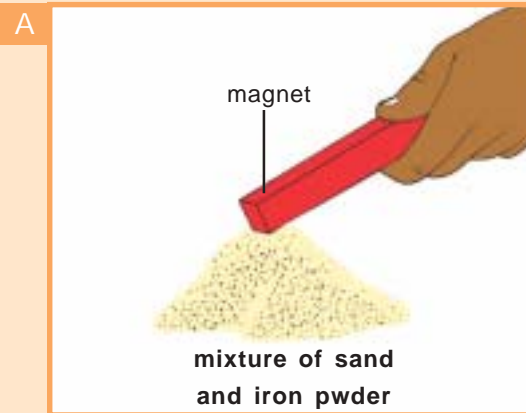


- Look at these drawings of three 'separating' experiments. Try to work out what is happening in each experiment.

Separating sand and gravel



Separating iron and sand



• Safety rules

Science experiments that you do in a laboratory or your science room or in your class may be fun, but it can be dangerous too, if you are not careful. For your own safety as well as the safety of the others in your class, you must follow safety rules.

GENERAL SAFETY RULES

- Open all doors and windows unless otherwise instructed by your teacher.
- Do not carry out any test or experiments without the teacher's permission.
- Read the instructions first and understand them before starting your experiment. If you have any doubt, always ask your teacher.
- Handle all apparatus and chemicals carefully and correctly. Always check the label on the container before using the substance in it.
- Do not pour any unused chemical back into its container to avoid contamination.
- Do not taste any chemical unless otherwise instructed by your teacher.
- Do not eat, drink or play in the laboratory.
- Do not play with the electrical mains and other fittings in the laboratory.
- Work neatly. Wash up all used apparatus and dispose waste correctly.
- Keep the apparatus in their proper places after cleaning.
- Do not take away any apparatus or chemical from the laboratory.
- Wash your hands after all laboratory work.

Safety rules when heating or mixing chemicals

- ⇒ Wear goggles when mixing or heating chemicals.
- ⇒ Do not place flammable substances near naked flames.
- ⇒ Do not point the mouth of test tube or a boiling tube, which is being heated towards your self or your friends.

When accidents occur

- Report all accidents, injuries, breakages and spillages immediately to your teacher.
- Should a chemical come into contact with any part of your body or clothing, wash thoroughly with plenty of water and report to your teacher.

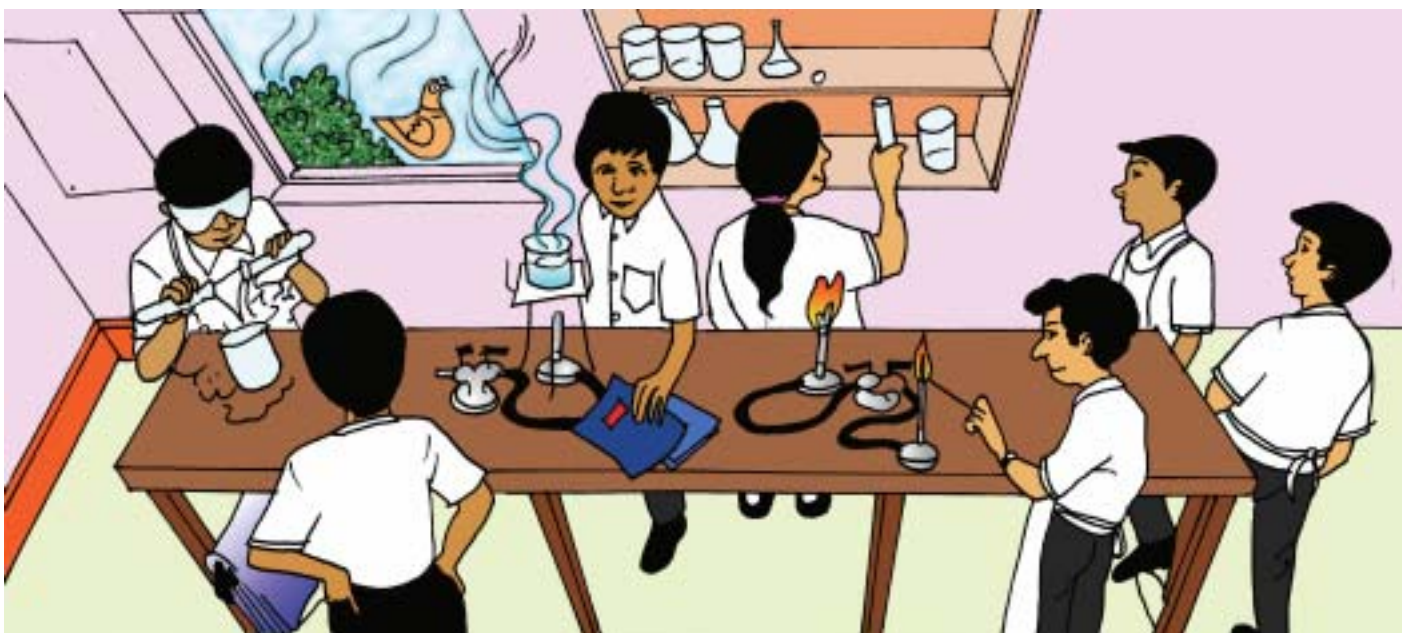


Planning

Inappropriate behaviour in a laboratory



Appropriate behaviour in a laboratory



✦ Planning is necessary

A good scientist plans out each experiment carefully.

In class 6B Ms Fathimath, the science teacher was telling the students about the experiment for the day. “ I want you to get a partner and find out if the yellow flame from a bunsen burner is hotter than the blue flame.

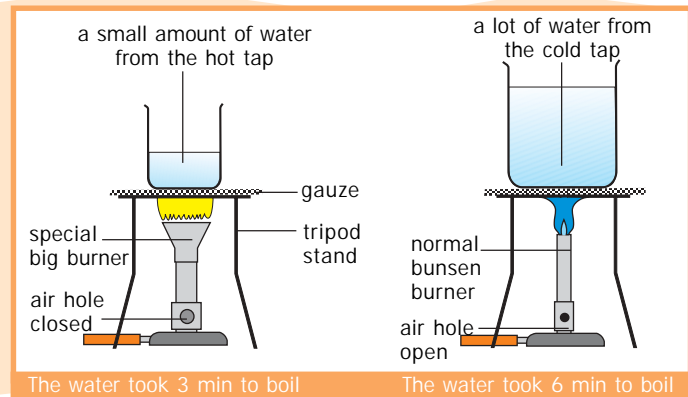
She gave a hint. “ You can’t do this by putting a thermometer in the flames the bulb will crack. You’ll get the answer by using the flames to boil some water”.

Ahmed and Aminath was a pair. Shaneez and Kulsooma was another pair. Both pairs did the experiment in very different ways.

Ahmed and Aminath’s rush

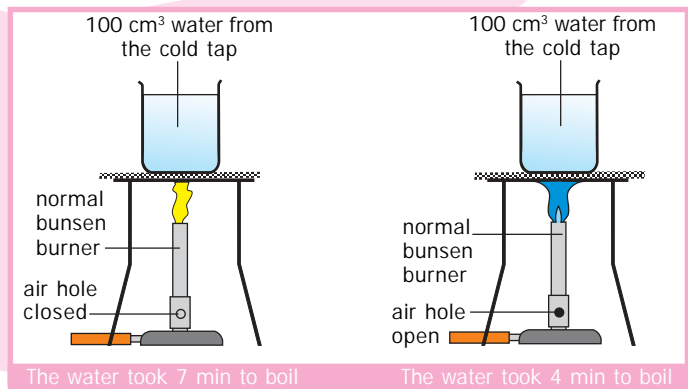
They wanted to be the first with the answer. They rushed around the lab, grabbing the first apparatus they could find. They quickly ran water into two beakers. Then they lit the gas and started timing.

Three minutes later they shouted out, ‘The yellow flames the winner.’



Shaneez and Kulsooma’s plan

Shaneez spent five minutes thinking, on how to make a fair test. Then they searched for the correct apparatus. They set it up carefully, lit the gas, and started timing. Their results showed that the blue flame was the hotter.



Ms Fathimath didn’t agree with Ahmed and Aminath. She told them to think again and then repeat the experiment. But she was pleased with Shaneez and Kulsooma. They had worked carefully and found the correct answer.

- 1 Why did Ahmed and Aminath decide that the yellow flame was hotter?
- 2 How did Shaneez and Kulsooma make a fair test?
- 3 Give reasons why Ahmed and Aminath got the wrong answer?

What is science?

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Keep your eyes open!

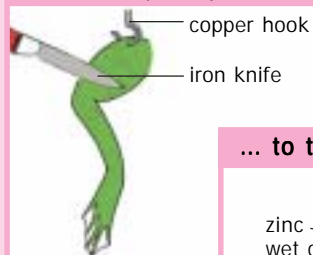
Many important scientific discoveries have been made after a sharp eyed scientist has noticed and noted down something unusual. These unusual observations lead to great discoveries. Here are two of them.

A good scientist notes down everything he or she **observes**.

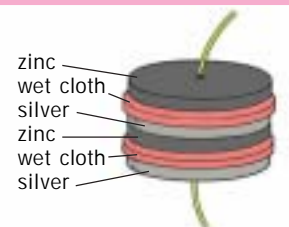
The observation In 1791, an Italian called Galvani was cutting up or dissecting a frog's leg. He hung the leg from a copper hook. When he cut into it with an iron knife, the leg twitched.

And the discovery Galvani's friend, Volta, realized that electricity had made the leg twitch. He discovered that electricity had been produced when the two metals touched moisture in the frog's leg. In 1800 he used this discovery to make the first battery. It was made of silver and zinc discs separated by pieces of cloth soaked in water.

From this (1791) ...



... to this (1800)



The first battery

The observation In 1928, Sir Alexander Fleming noticed a fungus growing on a dish of bacteria. The fungus was killing the bacteria.

And the discovery It was later discovered that the fungus was producing a bacteria-killing chemical called penicillin. The first penicillin drugs were produced in 1943.

From this (1928) ...



... to this (1943)



The first bacteria-killing drugs

?

- 1 What did
 - a. Sir Alexander Fleming
 - b. Galvani observe?Why were these observations important?



Read about The TRUTH

We were taught to believe that it was the western and /or American minds that invented basic sciences and made great discoveries.

Galileo, Copernicus, Kepler, Bacon, Newton, Da Vinci, Benjamin Franklin, etc were often mentioned names. Most texts give little or no mention of the advancements made by ancient Indian, Chinese or, particularly, Muslim scholars.

What is Taught: C.W.

Long, an American, conducted the **first surgery** performed under inhalation anesthesia in 1845.



surgeons, performed hundreds of surgeries under inhalation anesthesia with the use of narcotic-soaked sponges, which were placed over the face.



The truth: Six hundred years before Long, Islamic Spain's **Az-Zahrawi** and **Ibn Zuhr**, among other Muslim

It is true that western civilization has made great contributions to the development of science. So have other cultures and they need to be credited for them.

Unfortunately, Westerners have long been credited with discoveries made many centuries before by Islamic scholars.

Here are just a very few of those discoveries made by Muslim scientists.

What is Taught: Galileo (17th century) was the world's **first great experimenter**.

The truth: **Al-Biruni** (d. 1050) was the world's first great experimenter. He wrote over 200 books, many of which discuss his precise experiments.

His literary production in the sciences amounts to some 13,000 pages, far more than that written by Galileo or, even, Galileo and Newton both combined.



What is Taught: The concept of **quarantine** was first developed in 1403. In Venice, a law was passed preventing strangers from entering the city until a certain waiting period had passed. If, by then, no sign of illness could be found, they were allowed in.

The truth: The prophet **Muhammad** (peace be upon him), who wisely warned against entering or leaving a region suffering from plague, first introduced the concept of quarantine in the 7th century A.D. As early as the 10th century, Muslim physicians innovated the use of isolation wards for individuals suffering with communicable diseases.

ABU RAIHAN AL-BIRUNI

973 - 1048 A.D.



Abu Raihan Mohammad Ibn Ahmad al-Biruni was Born in the city of Kheva near "Ural" in 973 A.D.

Al-Biruni was a multi talented scholar and scientist who had equal facility in physics, metaphysics, mathematics, geography and history.

Al-Biruni wrote his famous book *Qanun-i Masoodi (al-Qanun al-Masudi, fi al-Hai'a wa al-Nujum)*, which he dedicated to Sultan Masood. The book discusses several theorems of astronomy, trigonometry, solar, lunar, and planetary motions and relative topics. In another well-known book *al-Athar al-Baqia*, he has attempted to write an account of ancient history of nations and the related geographical knowledge. In this book, he has discussed the rotation of the earth and has given correct values of latitudes and longitudes of various places. He has also made considerable contribution to several aspects of physical and economic geography in this book.

His other scientific contributions include the accurate determination of the densities of 18 different stones. He also wrote the *Kitab-al-Saidana*, which is an extensive medical knowledge that combines the then existing Arabic knowledge on the subject with the Indian medicine. His book the *Kitab-al-Jamahir* deals with the properties of various precious stones.

He has been considered as one of the very greatest scientists of Islam, and, all considered, one of the greatest of all times. His critical spirit, love of truth, and scientific approach were combined with a sense of toleration. His enthusiasm for knowledge may be judged from his claim that the phrase *Allah is Omniscient does not justify ignorance*.