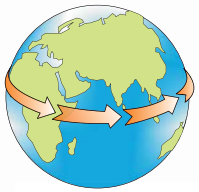


3

MOTIONS OF THE EARTH

Let's Do

Take a ball to represent the earth and a lighted candle to represent the sun. Mark a point on the ball to represent a town X. Place the ball in such a way that the town X is in darkness. Now rotate the ball from left to right. As you move the ball slightly, the town will have its sunrise. As the ball continues to move, the point X gradually gets away from the sun. This is sunset.

As you know that the earth has two types of motions, namely rotation and revolution. **Rotation** is the movement of the earth on its axis. The movement of the earth around the sun in a fixed path or orbit is called **Revolution.**

The axis of the earth which is an imaginary line, makes an angle of 66½° with its **orbital plane**. The plane formed by the orbit is known as the orbital plane. The earth receives light from the sun. Due to the spherical shape of the earth, only half of it gets light from the sun at a time (Figure 3.2). The portion facing the sun experiences day while the other half away from the sun experiences night. The circle that divides the day from night on the globe is called the **circle of illumination**. This circle does not coincide with the axis as you see in the Figure 3.2. The earth takes about 24 hours to complete one rotation around its axis. The period of rotation is known as the *earthday*. This is the daily motion of the earth.

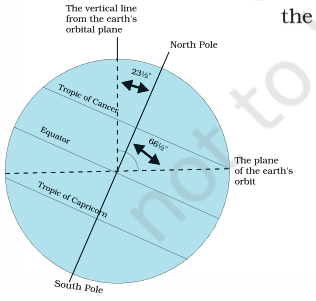


Figure 3.1 : Inclination of the Earth's axis and the orbital plane

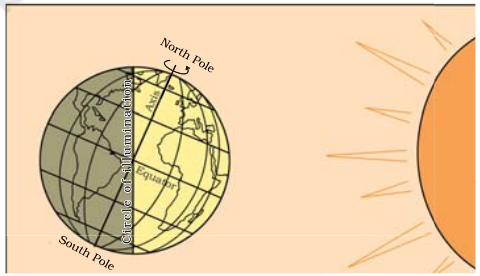


Figure 3.2 : Day and Night on the Earth due to rotation

What would happen if the earth did not rotate? The portion of the earth facing the sun would always experience day, thus bringing continuous warmth to the region. The other half would remain in darkness and be freezing cold all the time. Life would not have been possible in such extreme conditions.

The second motion of the earth around the sun in its orbit is called **revolution**. It takes 365¼ days (one year) to revolve around the sun. We consider a year as consisting of 365 days only and ignore six hours for the sake of convenience.

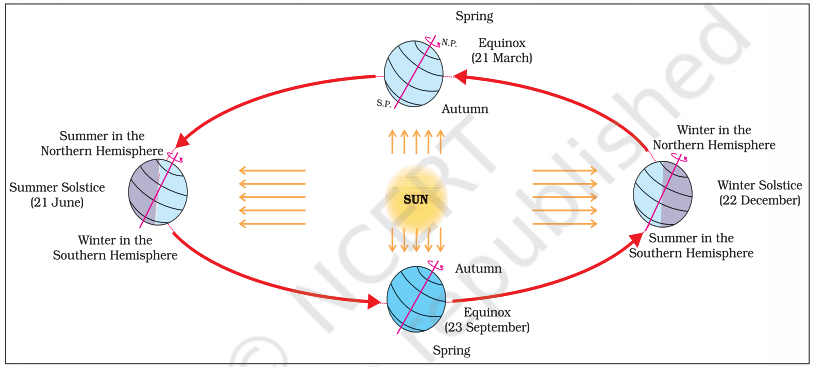


Figure 3.3 : Revolution of the Earth and Seasons

Six hours saved every year are added to make one day (24 hours) over a span of four years. This surplus day is added to the month of February. Thus every fourth year, February is of 29 days instead of 28 days. Such a year with 366 days is called a **leap year**. Find out when will the next leap year be?

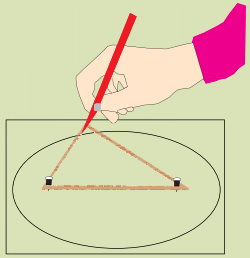
From the Figure 3.3, it is clear that the earth is going around the sun in an **elliptical orbit**.

Notice that throughout its orbit, the earth is inclined in the same direction.

A year is usually divided into summer, winter, spring and autumn seasons. Seasons change due to the change in the position of the earth around the sun.

Let's Do

Do you know how to draw an ellipse? Take a pencil, two pins and a loop of thread. Now fix these pins on a paper as shown in the figure. Put the loop on the paper enclosing these two pins inside the loop. Now hold the pencil and draw the line keeping the thread tight and moving the pencil along it. The figure represents an ellipse.



Let's Do

To understand the earth's inclination in the same direction, draw a big ellipse on the ground and take a flag with a stick. Stand anywhere on the line of the ellipse. Point your flag to a fixed point far away like on a tree-top. Now move along the ellipse keeping your flag always pointing towards that fixed point. In this way, the axis of the earth remains inclined permanently in the same position. The revolution of the earth and the inclination of the earth's axis in a fixed direction cause seasons.

Look at the Figure 3.3. You will see that on 21st June, the Northern Hemisphere is tilted towards the sun. The rays of the sun fall directly on the Tropic of Cancer. As a result, these areas receive more heat. The areas near the poles receive less heat as the rays of the sun are slanting. The North Pole is inclined towards the sun and the places beyond the Arctic Circle experience continuous daylight for about six months. Since a large portion of the Northern Hemisphere is getting light from the sun, it is summer in the regions north of the equator. The longest day and the shortest night at these places occur on 21st June. At this time in the Southern Hemisphere all these conditions are reversed. It is winter season there. The nights are longer than the days. This position of the earth is called the **Summer Solstice**.

On 22nd December, the Tropic of Capricorn receives direct rays of the sun as the South Pole tilts towards it. As the sun's rays fall vertically at the Tropic of Capricorn (23½° S), a larger portion of the Southern Hemisphere gets light. Therefore, it is summer in the Southern Hemisphere with longer days and shorter nights. The reverse happens in the Northern Hemisphere. This position of the earth is called the **Winter Solstice**. Do you know that Christmas is celebrated in Australia in the summer season?

On 21st March and September 23rd, direct rays of the sun fall on the equator. At this position, neither of the poles is tilted towards the sun; so, the whole earth experiences equal days and equal nights. This is called an **equinox**.

On 23rd September, it is autumn season in the Northern Hemisphere and spring season in the Southern Hemisphere. The opposite is the case on 21st March, when it is spring in the Northern Hemisphere and autumn in the Southern Hemisphere.

Thus, you find that there are days and nights and changes in the seasons because of the rotation and revolution of the earth respectively.

EXERCISES

1. Answer the following questions briefly.

(a) What is the angle of inclination of the earth's axis with its orbital plane?

(b) Define rotation and revolution.

(c) What is a leap year?

(d) Differentiate between the Summer and Winter Solstice.

(e) What is an equinox?

(f) Why does the Southern Hemisphere experience Winter and Summer Solstice in different times than that of the Northern Hemisphere?

(g) Why do the poles experience about six months day and six months night?

2. Tick the correct answers.

(a) The movement of the earth around the sun is known as

(i) Rotation (ii) Revolution (iii) Inclination

(b) Direct rays of the sun fall on the equator on

(i) 21 March (ii) 21 June (iii) 22 December

(c) Christmas is celebrated in summer in

(i) Japan (ii) India (iii) Australia

(d) Cycle of the seasons is caused due to

(i) Rotation (ii) Revolution (iii) Gravitation

3. Fill in the blanks.

(a) A leap year has _____ number of days.

(b) The daily motion of the earth is _____.

(c) The earth travels around the sun in _____ orbit.

(d) The sun's rays fall vertically on the Tropic of _____ on 21st June.

(e) Days are shorter during _____ season.

Things To Do

1. Make a drawing to show the inclination of the earth.
2. Record the timings of sunrise and sunset at your place taking help from your local newspaper on the 21st of each month and answer the following :

   (a) In which month are the days the shortest?

   (b) In which months are the days and nights nearly equal?

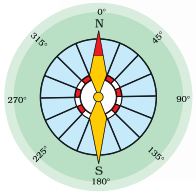
For Fun

1. Draw different shapes of ellipses by placing two pins nearer and farther using the same loop of thread. Notice when the ellipse becomes circular.
2. On any sunny day, take a straight stick that is one metre long. Find out a clean and level place on the ground. Place this stick into the ground where it casts a distinctive (sharp) shadow.

   Step (1): Mark the tip of the shadow with a stone or a twig or by any other means. The first shadow mark is always towards the west. See after 15 minutes and mark the tip of the shadow again. By then it would have moved a few centimetres away. Now join the two points and you have an approximate east-west line.

   Step (2) : Stand with the first mark to your left and the second mark to your right you are now facing north. This fact is true everywhere on the earth because the earth rotates in west to east direction.

   An alternative method is more accurate but requires more time. Set up your shadow stick and mark the first shadow in the morning. Use a piece of string to draw a clean arc through this mark around the stick. At mid-day, the shadow will shrink or disappear. In the afternoon, it will lengthen again and at the point where it touches the arc, make a second mark. Draw a line through the two marks to get an accurate east-west line.



4

MAPS

You have learnt in the previous chapter about the advantages of a globe. However, globe has limitations as well. A globe can be useful when we want to study the earth as a whole. But, when we want to study only a part of the earth, as about our country, states, districts, towns and villages, it is of little help. In such a situation we use maps. A **map** is a representation or a drawing of the earth's surface or a part of it drawn on a flat surface according to a scale. But it is impossible to flatten a round shape completely.

We find that maps are useful to us for various purposes. One map shows a small area and a few facts. Another map may contain as many facts as a big book. When many maps are put together we get an Atlas. Atlases are of various sizes, measurements drawn on different scales. Maps provide more information than a globe. They are of different types. Some of them are described below.

Let's Do

Take an old rubber ball and draw whatever you like all over it. You may also mark north pole and south pole on it. Now cut this ball with a knife and try to flatten it. Notice how the drawings are distorted.

Physical Maps

Maps showing natural features of the earth such as mountains, plateaus, plains, rivers, oceans etc. are called **physical or relief maps**.

Political Maps

Maps showing cities, towns and villages, and different countries and states of the world with their boundaries are called **political maps**.

Thematic Maps

Some maps focus on specific information; such as road

maps, rainfall maps, maps showing distribution of forests, industries etc. are known as **thematic maps**. Suitable titles are given on the basis of information provided in these maps.

There are three ***Components of Maps*** – distance, direction and symbol.

Distance

Maps are drawings, which reduce the entire world or a part of it to fit on a sheet of paper. Or we can say maps are drawn to reduced scales. But this reduction is done very carefully so that the distance between the places is real. It can only be possible when a small distance on paper represents a large distance on the ground. Therefore, a scale is chosen for this purpose. **Scale** is the ratio between the actual distance on the ground and the distance shown on the map. For example, the distance between your school and your home is 10 km. If you show this 10 km. distance by 2 cm on a map, it means, 1 cm on the map will show 5 km. on the ground. The scale of your drawing will be 1cm = 5 km. Thus, scale is very important in any map. If you know the scale, you will be able to calculate the distance between any two places on a map.

When large areas like continents or countries are to be shown on a paper, then we use a small scale. For example 5 cm. on the map shows 500 km. of the ground. It is called a **small scale map**.

When a small area like your village or town is to be shown on paper, then we use a large scale that is 5 cm. on the map shows 500 metres only on the ground. It is called a **large scale map**.

Large scale maps give more information than small scale maps.

Direction

Most maps contain an arrow marked with the letter 'N' at the upper right hand corner. This arrow shows the north direction. It is called the north line. When you know the north, you can find out other directions, for example east, west and south. There are four major

Let's Do

Look at the Figure 4.1. There is a scale. It may be used for measuring distance between places. For example the distance between the well and the tree is 5 cm. It means that the actual distance is 50 metres. Now the distance between the PO (A) to Karim's house (E) is 12 cm. It means 120 metres on the ground but you can not fly like a bird directly from E to A. You will have to walk on the road. Let us measure the total walking distance from E to C, then C to M, M to B and B to A. Add all these distances. This will be the total walking distance from Karim's house to the post office.

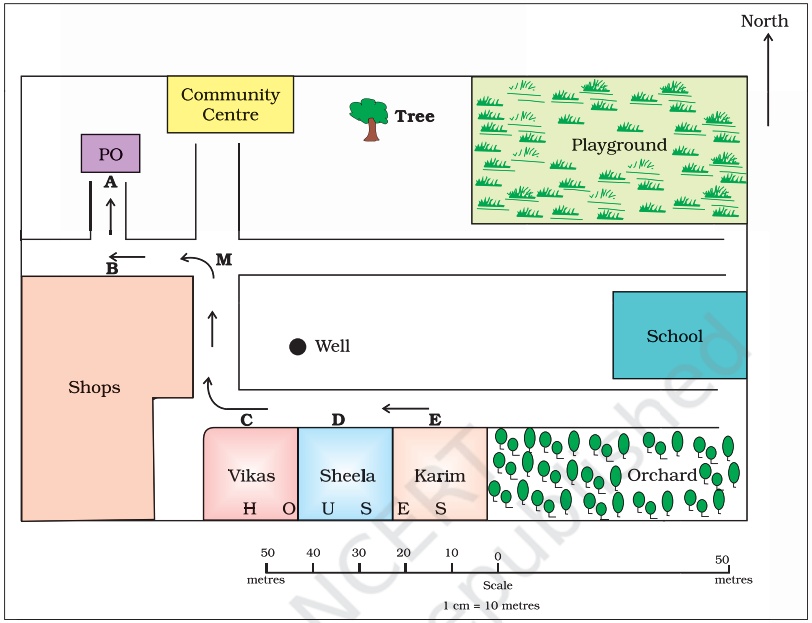


Figure 4.1 : Map of a village

directions, North, South, East and West {Figure 4.2 (a)}. They are called **cardinal points**. Other four intermediate directions are north-east (NE), south-east(SE), south-west (SW) and north-west (NW). We can locate any place more accurately with the help of these intermediate directions.

Find out the following directions from the Figure 4.1: (a) The direction of the Community Centre, the playground from Vikas's house (b) the direction of school from shops.

We can find out the direction of a place with the help of a compass. It is an instrument used to find out main directions. Its magnetic needle always points towards north-south direction {Figure 4.2 (b)}.

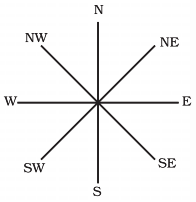


Figure 4.2 (a) : Cardinal Directions

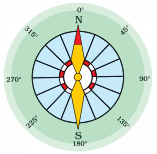


Figure 4.2 (b) : A compass

Symbols

It is the third important component of a map. It is not possible to draw on a map the actual shape and size of different features such as buildings, roads, bridges, trees, railway lines or a well. So, they are shown by using certain letters, shades, colours, pictures and lines These symbols give a lot of information in a limited space. With the use of these symbols, maps can be drawn easily and are simple to read. Even if you don't know the language of an area and therefore cannot ask someone for directions, you can collect information from maps with the help of these symbols. Maps have a universal language that can be understood by all. There is an international agreement regarding the use of these symbols. These are called **conventional symbols**. Some of the conventional symbols are shown in the Figure 4.3.

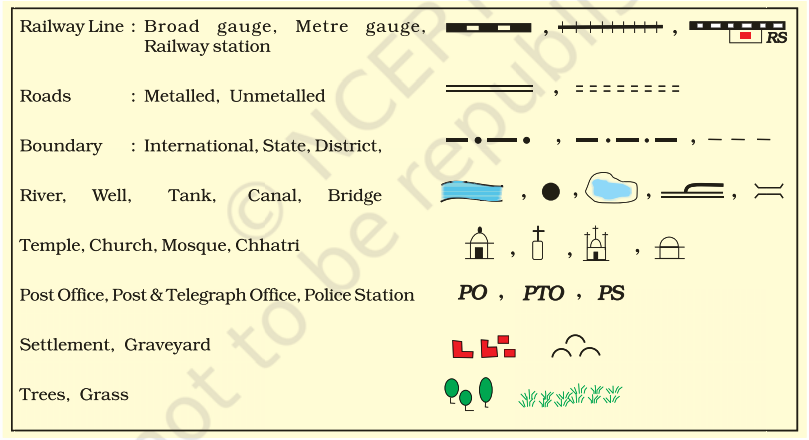


Figure 4.3 : Conventional Symbols

Various colours are used for the same purpose. For example, generally blue is used for showing water bodies, brown for mountain, yellow for plateau and green is used for plains.

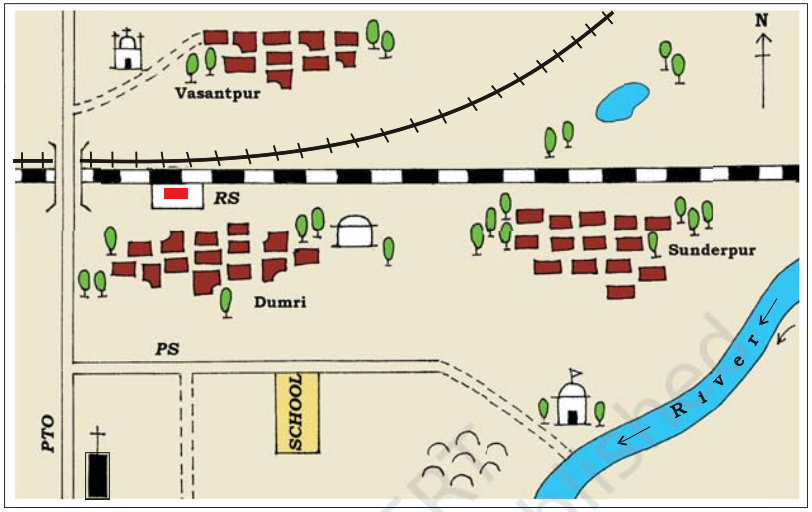


Figure 4.4 : Sunderpur village and its surrounding areas

Sketch

A **sketch** is a drawing mainly based on memory and spot observation and not to scale. Sometimes a rough drawing is required of an area to tell where a particular place is located with respect to other places. Suppose, you want to go to your friend's house, but you don't know the way. Your friend may make a rough drawing to show the way to his house. Such a rough drawing is drawn without scale, and is called a *sketch map.*

Plan

A **plan** is a drawing of a small area on a large scale. A large-scale map gives lot of information, but there are certain things which we may sometimes want to know for example the length and breadth of a room, which can't be shown in a map. At that time, we can refer drawings drawn to scale called a *plan.*

Look at the Figure 4.4 and find out :

(i) In which direction is the river flowing?
(ii) What kind of road passes by the side of village Dumri?
(iii) On what type of railway line is Sunderpur situated ?
(iv) On which side of the railway bridge is the police station situated?
(v) On which side of the railway line do the following lie :
  (a) Chhatri
  (b) Church (c) Pond
  (d) Mosque (e) River
  (f) Post and Telegraph Office
  (g) Graveyard

EXERCISES

1. Answer the following questions briefly.

(a) What are the three components of a map?

(b) What are the four cardinal directions?

(c) What do you mean by the term 'the scale of the map'?

(d) How are maps more helpful than a globe?

(e) Distinguish between a map and a plan.

(f) Which map provides detailed information?

(g) How do symbols help in reading maps?

2. Tick the correct answers.

(a) Maps showing distribution of forests are

(i) Physical map (ii) Thematic Map (iii) Political map

(b) The blue colour is used for showing

(i) Water bodies (ii) Mountains (iii) Plains

(c) A compass is used –

(i) To show symbols

(ii) To find the main direction

(iii) To measure distance

(d) A scale is necessary

(i) For a map (ii) For a sketch (iii) For symbols

THINGS TO DO

1. Draw a plan of your classroom and show the teacher's table, blackboard, desks, door and windows.
2. Draw a sketch of your school and locate the following :

(a) the principal's room (b) your classroom

(c) the playground (d) the library

(e) some big trees (f) drinking water

FOR FUN

1. Make the plan (in the space given below) of a fun-park where you can enjoy several activities : for example swings, slides, see-saw, merry-go-round, boating, swimming, looking into funny mirrors, etc. or anything else that you can think of.

5

MAJOR DOMAINS OF THE EARTH

As you have read in the first chapter, the earth is the only planet which has life. Human beings can live here because the life sustaining elements of land, water and air are present on the earth.

The surface of the earth is a complex zone in which three main components of the environment meet, overlap and interact. The solid portion of the earth on which we live is called the **Lithosphere**. The gaseous layers that surround the earth, is the **Atmosphere**, where oxygen, nitrogen, carbondioxide and other gases are found. Water covers a very big area of the earth's surface and this area is called the **Hydrosphere**. The Hydrosphere comprises water in all its forms, that is, ice, water and water vapour.

The **Biosphere** is the narrow zone where we find land, water and air together, which contains all forms of life.

Word Origin

In the Greek language, *Lithos* means Stone; *Atmos* means Vapour; *Hudor* means Water; and *Bios* means Life.

Can you make words using the above?

LITHOSPHERE

The solid portion of the earth is called the *Lithosphere*. It comprises the rocks of the earth's crust and the thin layers of soil that contain nutrient elements which sustain organisms.

There are two main divisions of the earth's surface. The large landmasses are known as the **continents** and the huge water bodies are called the **ocean basins**. All the oceans of the world are connected with one another. Look at the map of the world (Figure 5.1). Are all the land masses connected with one another?

The level of seawater remains the same everywhere. Elevation of land is measured from the level of the sea, which is taken as zero.

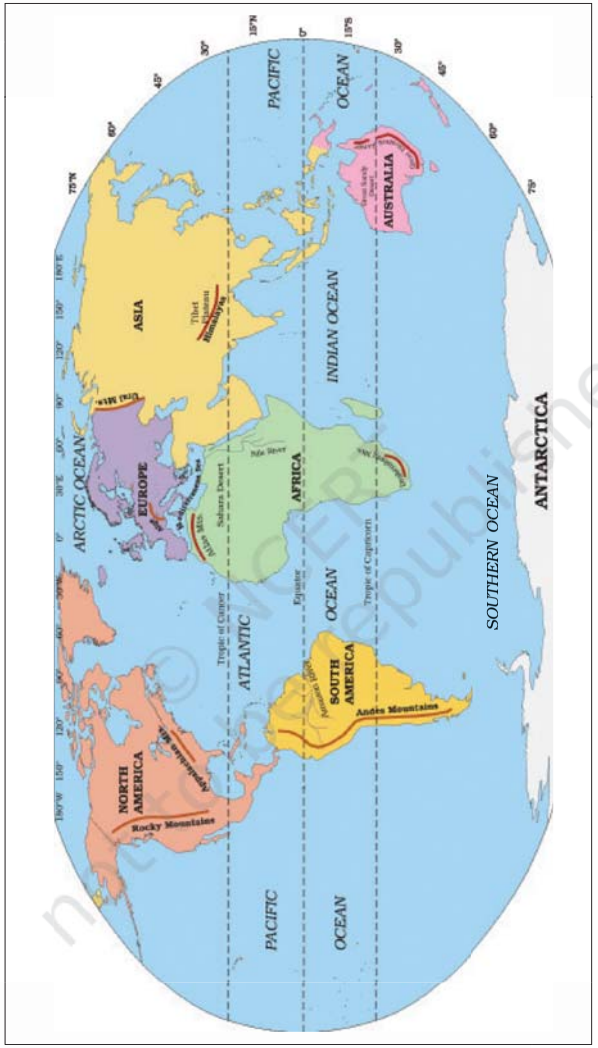


Figure 5.1 : The World : Continents and Oceans

Do you know?

Edmund Hillary (New Zealand) and Tenzing Norgay Sherpa (India) were the first men to climb the highest mountain peak Mt. Everest on the planet earth on 29th May, 1953.

Junko Tabei (Japan) was the first woman to reach the summit on 16th May, 1975. The first Indian woman to climb the highest peak on 23rd May, 1984 was Bachendri Pal.

The highest mountain peak Mt. Everest is 8,848 metres above the sea level. The greatest depth of 11,022 metres is recorded at Mariana Trench in the Pacific Ocean. Could you imagine that depth of sea is much more than the highest point?

Continents

There are seven major continents. These are separated by large water bodies. These continents are – Asia, Europe, Africa, North America, South America, Australia and Antarctica. Look at the map of the world (Figure 5.1) and notice that the greater part of the land mass lies in the Northern Hemisphere.

Asia is the largest continent. It covers about one-third of the total land area of the earth. The continent lies in the Eastern Hemisphere. The Tropic of Cancer passes through this continent. Asia is separated from Europe by the Ural mountains on the west (Figure 5.1). The combined landmass of Europe and Asia is called the *Eurasia* (Europe + Asia).

Europe is much smaller than Asia. The continent lies to the west of Asia. The Arctic Circle passes through it. It is bound by water bodies on three sides. Look at the map of the world and locate it.

Africa is the second largest continent after Asia. The Equator or 0^0 latitude runs almost through the middle of the continent. A large part of Africa lies in the Northern Hemisphere. Look at the Figure 5.1; you will find that it is the only continent through which the Tropic of Cancer, the Equator and the Tropic of Capricorn pass.

The Sahara Desert, the world's largest hot desert, is located in Africa. The continent is bound on all sides by oceans and seas. Look at the world map (Figure 5.1). You will notice that the world's longest river the **Nile**, flows through Africa. Notice where the Equator, the Tropic of Cancer and the Tropic of Capricorn pass in the map of Africa.

North America is the third largest continent of the world. It is linked to South America by a very narrow strip of land called the Isthmus of Panama. The continent lies completely in the Northern and Western Hemisphere. Three oceans surround this continent. Can you name these oceans?

South America lies mostly in the Southern Hemisphere. Which two oceans surround it on the east and the west? The Andes, world's longest mountain range, runs through its length from north to south (Figure 5.1). South America has the world's largest river, the Amazon.

Australia is the smallest continent that lies entirely in the Southern Hemisphere. It is surrounded on all sides by the oceans and seas. It is called an *island continent*.

Figure 5.2 : Isthmus and Strait

Antarctica, completely in the Southern Hemisphere, is a huge continent. The South Pole lies almost at the centre of this continent. As it is located in the South Polar Region, it is permanently covered with thick ice sheets. There are no permanent human settlements. Many countries have research stations in Antarctica. India also has research stations there. These are named as **Maitri** and **Dakshin Gangotri**.

Hydrosphere

The earth is called the *blue planet*. More than 71 per cent of the earth is covered with water and 29 per cent is with land. Hydrosphere consists of water in all its forms. As running water in oceans and rivers and in lakes, ice in glaciers, underground water and the water vapour in atmosphere, all comprise the hydrosphere.

More than 97% of the Earth's water is found in the oceans and is too salty for human use. A large proportion of the rest of the water is in the form of icesheets and glaciers or under the ground and a very small percentage is available as fresh water for human