

The Four Great Realms of Our Planet Earth

Summary

1. The earth is unique because of the three realms in it which sustain life - Lithosphere, Hydrosphere and Atmosphere.
2. The lithosphere includes all landmasses - the continents and the ocean floors.
3. There are seven continents into which the land surface is broadly divided. They are: Asia, Africa, North America, South America, Europe, Australasia and Antarctica.
4. Three-fourths of the earth is water or hydrosphere which comprises of oceans, seas, rivers and ponds, and also includes groundwater, glaciers, ice caps and water vapour.
5. The planet contains five oceans namely the Arctic, Atlantic, Indian, Pacific and Southern Oceans. Oceans and seas comprise 97 per cent of earth's total water.
6. The atmosphere is the envelope of gases that surrounds the earth and is divided into many concentric layers.
7. The troposphere is the nearest to the surface and contains half of the earth's atmosphere. Weather occurs in this layer.
8. The next layer is the stratosphere where jet aircraft fly. The ozone layer here absorbs the harmful rays emitted from the Sun.
9. Meteors or rock fragments bum up in the mesosphere.
10. The thermosphere is a hot layer where the space shuttles orbit.
11. The exosphere is the upper limit of our atmosphere. The atmosphere merges into space above this layer.
12. The biosphere is the zone of living organisms penetrating the lithosphere, hydrosphere and atmosphere.
13. Human activities have disturbed the natural balance between the various elements of the biosphere leading to global warming, ozone depletion, pollution etc.

We have read in the first chapter that the Earth is the only planet in the Solar System which supports life. And life exists here due to the presence of a congenial environment comprising three main components—land, air and water. The landmasses that are found on the earth's surface form the solid domain called the lithosphere. It provides living space for many organisms and is formed of soil and rock material. The vast expanse of air that surrounds the earth forms the gaseous domain called the atmosphere.

The water that fills the depressions of the Earth's surface forms the liquid domain called the hydrosphere. This consists of water bodies like the oceans, seas, rivers and ponds, and forms a habitat for many organisms. There is yet another domain—the biosphere—the zone which contains all forms of life penetrating the lithosphere, hydrosphere and the atmosphere.

LITHOSPHERE

The term Lithosphere comes from the Greek word Lithos which means 'rock'. The lithosphere consists of the earth's solid outermost shell generally known as the crust. The lithosphere includes large land masses known as continents, huge water bodies are called wide bodies are called wide ocean basins and smaller land masses surrounded by water called islands.

About 71 per cent of the surface of the earth is water and 29 per cent is land. Conventionally continents are large, continuous, distinct masses of land, ideally separated by large water bodies or other physical barriers like mountain ranges.

The landmasses are broadly divided into seven continents: Asia, Africa, North America, South America, Europe, Australia and Antarctica. The smaller land areas are islands and the island chains are known as archipelagos. If you see



the globe you will find that most of the land masses lie in the Northern Hemisphere, while the Southern Hemisphere is mainly covered with water. Now, let us get a brief account of the continents.

CONTINENTS

Asia

Asia is the largest continent, occupying one-third of the land surface of the globe. Two-thirds of the population of the world lives here. Asia is separated from Africa by the Suez Canal and the Red Sea, and by the Bering Sea from North America. The Ural Mountains separate it from Europe. It is surrounded by the Pacific Ocean in the east, the Arctic Ocean in the north and the Indian Ocean in the south.

The entire Asian continent lies to the Northern Hemisphere with just a few island groups extending to the Southern Hemisphere.

Asia has the highest mountain ranges of the world—the Himalayas with the highest peak, Mt Everest (8,858 m)—lying along the Nepal- Tibet border.

It has the lowest part of the earth—the Dead Sea (418 m - 392 m below sea level)—lying between Jordan and Israel. It also has the highest plateau—the Tibetan Plateau, and vast deserts like the Gobi Desert and the Thar Desert.

Due to its large size and huge difference in relief features, Asia has varied climatic conditions and vegetation. The climate is bitterly cold in the polar north; hot and dry in the centre and the southwest; and hot and humid in the tropical south. Asia is also home to some wonderful animals like the Bengal tiger, Bactrian camel, Angora goat and the red panda.

Geography Reveals

Europe is a huge peninsula joined to Asia. Hence the term 'Eurasia' is often used for Europe and Asia together.

Africa

Africa is the second largest continent after Asia, covering about one-fifth of the earth's land. Both the prime meridian and the equator pass through Africa. A large part of Africa lies in the Northern Hemisphere. This makes it the largest tropical area in the world. The continent is separated from Europe by the Mediterranean Sea and from Asia by the Red Sea. The Strait of Gibraltar in the north-west, the Suez Canal in the north-east and the Strait of Bab-el Mandeb connect Africa to Eurasia. The Indian Ocean lies along its east coast. On the west it is bounded by the Atlantic Ocean.

To the north the Sahara, the world's largest desert; and the Kalahari Deserts lie in its southern part. River Nile, which drains into the Mediterranean Sea is the longest river in the world.

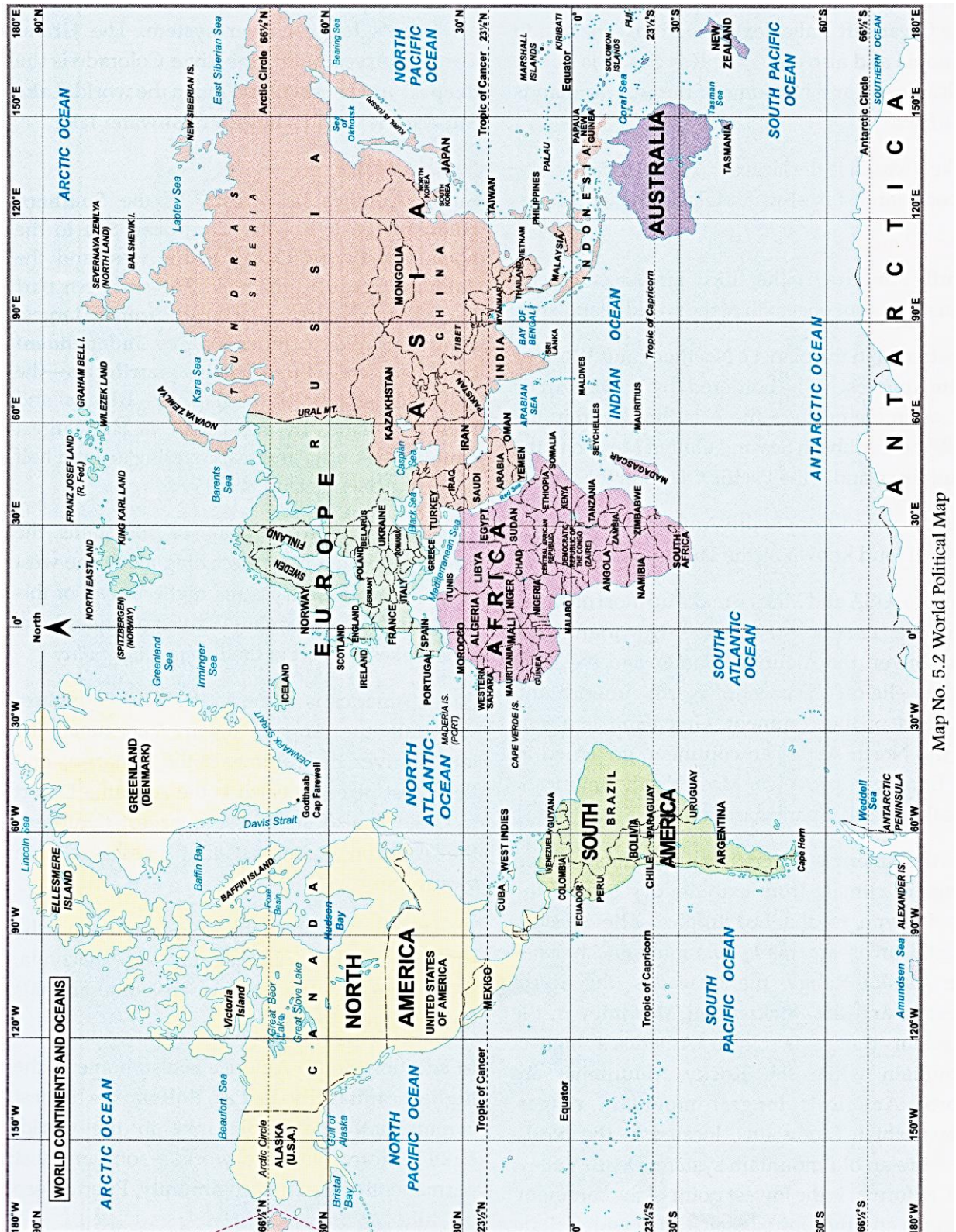
The Congo Basin is covered with the world's second largest rainforest. On the edges of tropical rainforests is a land of rolling grassland on either side of the equator. This grassland is called Savanna.

Some animals unique to this grassland are the two-horned rhino, zebra, antelope, hyena, African elephant and the African lion, among others.

Geography Reveals

Africa was described as the Dark Continent in the 19th century. The map-makers often left this region dark since little was known about the geography of the continent's interior.

The Atlas Mountain Range, extending from Morocco to Tunisia, forms Africa's longest mountain chain. Mt Kilimanjaro in Tanzania



The Great Rift Valley extends from Tanzania to Ethiopia and also along the Red Sea. It is rich in volcanic soil and has some of the best farmlands of Africa. Lake Victoria is the largest lake in Africa and the second-largest freshwater lake in the world.

North America

North America is the third largest continent, covering about one-sixth of the world's land area.

Positioned in the planet's Northern and Western Hemispheres, it is bordered by • the Arctic Ocean in the north, • the Atlantic Ocean in the east, the Caribbean Sea and Gulf of Mexico in the south-east, and • the Pacific Ocean in the west.

It is separated from South America by a narrow strip of land known as the Isthmus of Panama.

Canada, USA and Mexico make up most of North America. A series of islands—Newfoundland, Vancouver, the Aleutian Islands, and the West Indies—lie off the coast of North America and are part of the continent. Greenland is a part of the North American continent, governed as an European province. Most North Americans speak English, Spanish or French.

North America experiences the most varied range of climate from extreme dry cold of the Arctic type to the hot tropics. The western coastal areas are made of mountain chains— the Alaska Range, the Cascades, the Sierra Nevada and the Rockies. Mt McKinley in the Alaskan Range is North America's highest mountain while the Rocky Mountains are North America's longest mountain ranges. Appalachian Mountains, located in the north- east, are an old mountain system. Death Valley, in California, is the lowest point of the continent. Canada and the United States have wide rolling plains. The Mississippi-Missouri-Ohio is the continent's longest river system. The Grand Canyon carved out by the River Colorado is the deepest and largest of its kind in the world. Lake Superior is world's largest freshwater lake.

South America

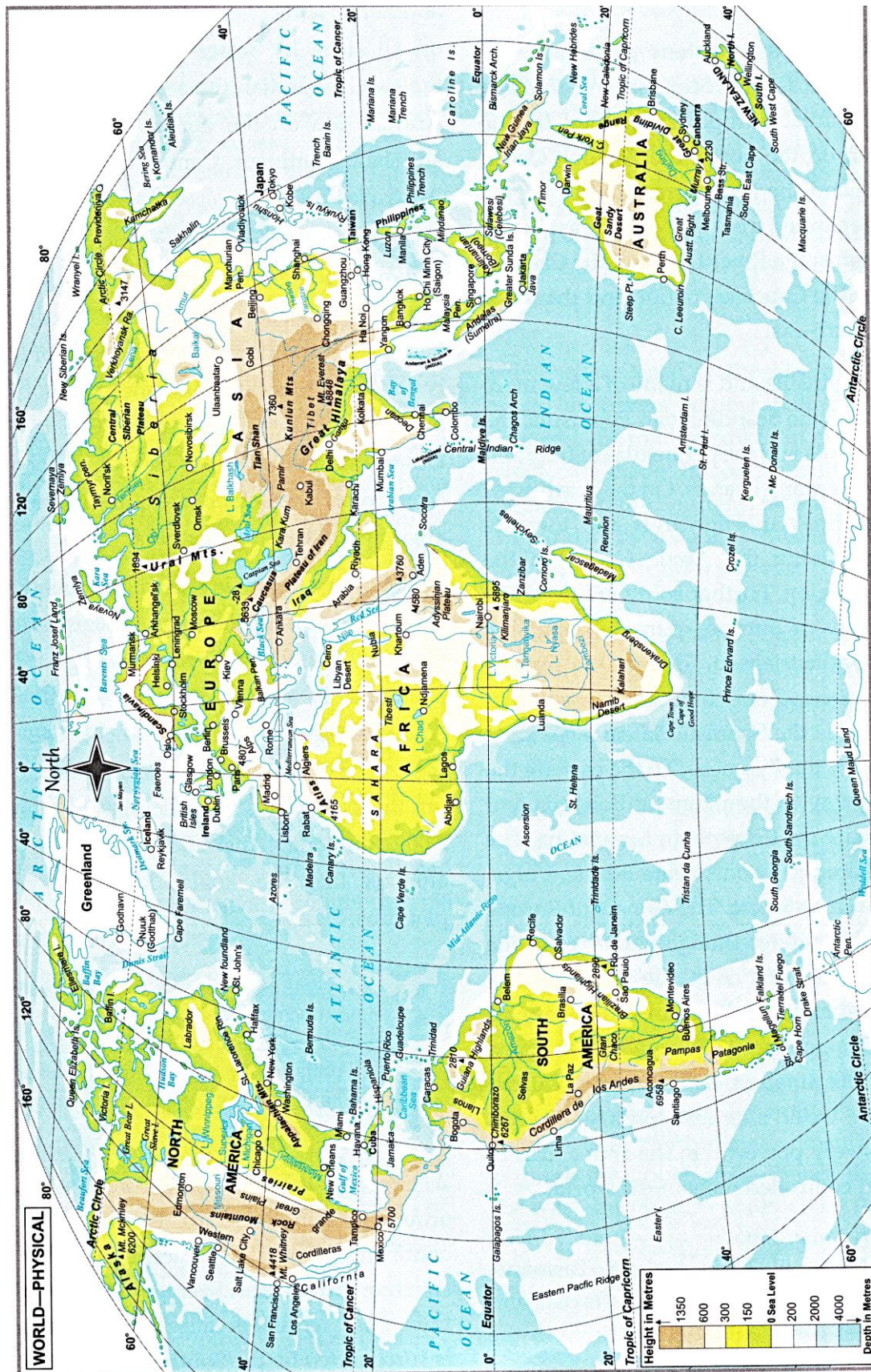
South America lies mostly in the Southern Hemisphere. It has the Caribbean Sea to the north, the Pacific Ocean to the west and the Atlantic Ocean to the east. The southern part is close to Antarctica. It is the fourth largest continent and includes twelve independent countries and three major territories—the Falkland Islands, the Galapagos Islands and French Guiana. By far Brazil is the largest country in South America, covering around half of the continent's land area.

The longest broken chain of mountains, the Andes is located here, stretching along the west coast. Mt Aconcagua is the highest peak of this range and there are many active volcanoes here. This makes it a part of the Pacific Ring of Fire.

South America is home to the world's highest waterfall, the Angel Falls in Venezuela; the largest river by volume is the Amazon; and the driest place on earth is the Atacama Desert in Chile. It also includes the largest rainforest, the Amazon Rainforest that possesses high biodiversity.

The Giant Anteater, the spider monkey, the squirrel monkey, the jaguar, the anaconda, the toucan and the macaws are some animals unique to this forest.

In addition. South America is also home to the highest capital city. La Paz, Bolivia; the highest commercially navigable lake in the world, Lake Titicaca; and the world's southernmost permanently inhabited community, Puerto Toro of Chile.



Map No. 5.3 World Physical Map

Europe

Europe, covering the western portion of the Asiatic landmass, is the world's second-smallest continent by area. Europe is bounded by the Arctic Ocean on the north, the Atlantic Ocean on the west and the Mediterranean Sea on the south. It is separated from Asia in the east by the Ural Mountains, the River Ural and the Caspian Sea, and has the Caucasus region and the Black Sea on the south-east.

It is itself a peninsula and is made of a few more peninsulas like the Scandinavian Peninsula, the Iberian Peninsula and the peninsulas of Italy and Greece with its many islands. On the north-west are the Scandinavian Highlands and towards the east, bordering the Arctic Ocean, is the vast Tundra region. Further south are the great northern plains of Europe—densely populated and highly industrialised. This makes Europe the third most populous continent in the world. Further south is the Spanish Plateau separated from France by the Pyrenees. To the east are the Alps giving way to the plains of Bohemia and beyond this are the Carpathian Mountains. The main rivers are the Rhone, Seine, Rhine, Volga, Danube, the Dniester etc. The climate of Europe is considerably milder though countries in the north experience bitter cold. The grey wolf, sea eagle and Dalmatian pelican are some animals unique to this continent. Europe is also home to the world's smallest country—the Vatican City, and the world's largest country—Russia. Europe was very powerful in the 17th and 18th century, and controlled most of the world.

Australia

Australia along with New Zealand, Tasmania and the nearby islands, is called Australasia and is the smallest continent. It lies entirely in the Southern Hemisphere. Australia is surrounded on all sides by water—the Pacific Ocean on the east, the Indian Ocean on the west and the Arafura Sea on the north. Hence it is called an island continent. Canberra is the capital of Australia.

The main physical features include the Great Dividing Range towards the east which is actually a collection of smaller mountain ranges, and the Central Lowland to the west of it which is famous for its cattle and sheep stations. Most of Australia is arid with the Great Western Desert occupying 70 per cent of the continent. Majority of the settled areas lie in the coastal areas and in eastern Australia.

The Western Desert is rich in iron ore and gold, and the Nullabor Plain has the largest deposit of limestone. Lake Eyre, the largest lake of Australia, is mostly dry. The largest rock in Australia is Uluru (Ayres Rock), 348 metres high. The Great Barrier Reef built of corals off the east coast of Australia is more than 2,000 km long. Australia is home to unique animals like the koala, kangaroo and the platypus.

Q. Have you observed the map of Australia? Have you noticed that borders of most of the states in Australia are straight lines unlike those of other land masses which are crooked. Find out the reasons for this?

Antarctica

Antarctica, earth's southernmost continent, around the South Pole is the fifth largest continent. About 98 per cent of Antarctica is covered with ice that averages at least 1.6 km in thickness. Hence it is called the Icy Continent. It is surrounded by the Southern Ocean.

Geography Reveals

The Antarctic Treaty (in 1959),—12 countries got together to sign the treaty. To date, 46 countries have signed it. The treaty promotes scientific research protecting the continents ecozone, and prohibits military activities and mineral mining. Several scientific stations have been established here. India established the Dakshin Gangotri in 1982 and the Maitri in 1988-89.

HYDROSPHERE

Hydrosphere is the 'water sphere' that includes all the water bodies on the earth. Three-fourths of the earth is water. This includes all the three forms of water—solid (ice), liquid (water) and gaseous (vapour). Water is present in liquid form on the earth as surface water that includes lakes, rivers, seas and oceans, and as groundwater that at times comes out in the form of springs. Water is present in gaseous form in the atmosphere as water vapour. On snow-capped mountains, it is found in frozen form or solid form, as ice caps in polar regions and as *icebergs*¹ in *glaciers*². All this makes up the hydrosphere. The large bodies of water—seas and oceans—make up about 98 per cent of the hydrosphere. All the oceans and seas are interconnected. Hence, the level of water in the ocean and sea is the same throughout. This is called the mean sea level.

World Water Distribution	
Water System	Per cent
Oceans and Seas	97.200
Polar Ice And Glaciers	2.015
Groundwater	0.630
Rivers and Lakes	0.017
Water Vapour	0.001

OCEANS

The oceans are vast areas of water interconnected with one another. The average depth of an ocean is about 3,800 m below the mean sea level³, much more than the average height of land which is only about 850 m above sea level. The planet contains five oceans namely the Arctic ocean, the Atlantic ocean, the Indian ocean, the Pacific ocean and the Southern Ocean. Their borders are indicated on the map in varied shades of blue.

Pacific Ocean

The Pacific Ocean is the largest and deepest ocean. It covers almost half of the earth's surface—181 million sq km in area. It is almost circular in shape. It extends from the Arctic in the north to the Southern Ocean in the south. It is bounded by Asia and Australia in the west, and the Americas in the east. The most active volcanoes in the world—The Ring of Fire are found in the Pacific Ocean and its coastal landmasses. The deepest point (about 11,022 m deep) is at Mariana Trench lying on the eastern side of the Pacific Ocean.

Atlantic Ocean

The Atlantic Ocean is the second largest of the oceans. It forms a broad S in shape. It is bounded by the Americas in the west, and Europe and Africa in the east. The coastline is indented and this makes it ideal for natural harbours. It is thus the busiest ocean in the world.

Indian Ocean

The Indian Ocean is the third largest of the world's oceanic divisions, having approximately 20 per cent of the earth's water in it. It forms a large triangle with the Indian peninsula protruding through the upper apex—hence the name. On the west, the ocean is bounded by Africa, on the east by the Indian subcontinent and Australia, and on the south by the Southern Ocean.



Map No. 5.4 The oceans and the water bodies of the world

Arctic Ocean

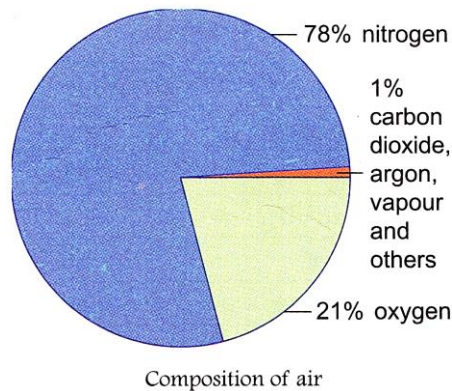
The Arctic Ocean located around the North Pole, lies within the Arctic Circle. It is the smallest and the shallowest of the oceans. It is surrounded by the continents of Asia, Europe, North America and the country of Greenland.

Southern Ocean

The Southern Ocean or the Antarctic Ocean comprises the southernmost extremities of three major oceans — the Pacific, Atlantic and Indian. It surrounds the continent of Antarctica.

THE ATMOSPHERE

Hold your breath for some time. How do you feel? You feel suffocated. Living beings breathe in air to survive. Nature has given us the gift of air in abundance. Earth is surrounded by a thick blanket of air. The layer of air that envelopes the earth is called the atmosphere. This blanket of air extends up to several kilometres above the earth's surface. Air is a mixture of gases. It consists of nitrogen and oxygen in the ratio about four to one — nitrogen 78 per cent, oxygen 21 per cent. Oxygen is essential for the survival of most organisms. The other gases like—argon, carbon dioxide, neon, helium, krypton, hydrogen and xenon are present in smaller quantities. Air also holds water vapour in various amounts depending on the temperature. The atmosphere is held in place by the earth's gravitational pull.



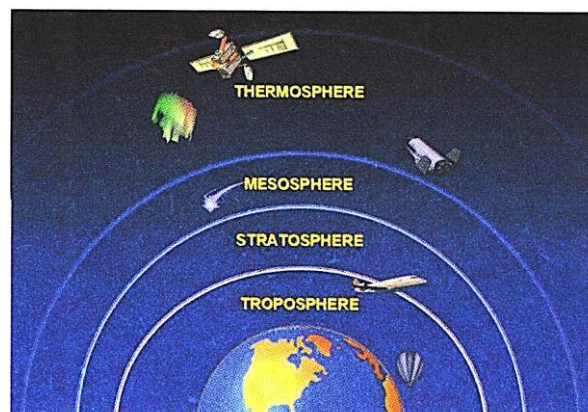
On the basis of its composition, temperature and density, the atmosphere is divided into five concentric layers— Troposphere, Stratosphere, Mesosphere, Thermosphere and Exosphere. It is densest near the surface and thins out with height until it eventually merges with the outer space.

Q. Why do you think the layer of air near the earth's surface is the densest?

Troposphere is the layer of the atmosphere closest to the Earth's surface, reaching up to a height of about 10-15 km. It contains 75 per cent of the total air of the atmosphere. The temperature and the pressure drops as one goes higher up the troposphere. The temperature decreases by 1°C for every 166 metres of ascent and this is known as the lapse rate.

The stratosphere lies directly above the troposphere. It is the layer where all weather changes occur. Strong winds called jet streams blow here. This helps aircrafts to fly. The stratosphere contains a thin layer of ozone gas which absorbs most of the harmful ultraviolet *radiation*⁴ emitted from the Sun.

The next layer is the mesosphere. Temperature drops as low as -110°C here. Meteors or rock fragments burn up here.



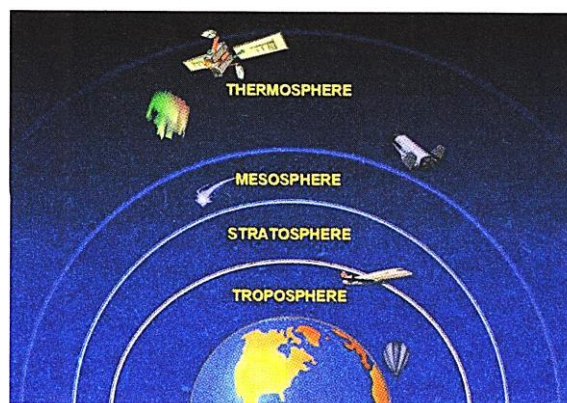
The layers of the atmosphere

The ionosphere or thermosphere is a hot layer where temperature rises steadily to 1400°C. This layer contains electrically charged particles called 'ions' which help in transmitting radio-waves back to the earth.

Satellites, which help in transmitting signals back to earth are located here. The exosphere is the outermost layer of the atmosphere and extends from 80 km above the earth's surface to the outer space.

THE BIOSPHERE

The biosphere is the sphere of earth where living organisms exist penetrating the lithosphere, the hydrosphere and the atmosphere. The biosphere is made up of the parts of Earth where life exists. The biosphere extends from the deepest root systems of trees to the dark environment of ocean trenches to lush rainforests and high mountain tops. For this reason, mapping the exact borders of the biosphere is difficult. The life forms that make up the biosphere also interact with different realms of the earth and bring about great changes here. Consider the atmosphere. Our atmosphere is comprised of approximately 21% oxygen. The early earth did not have much oxygen in the air. Slowly over millions of years, plants released oxygen into the air through photosynthesis⁵, increasing the amount, and making animal life possible. Living organisms breathe in oxygen and give out carbon dioxide thus keeping a perfect balance of the two gases in the environment. Even though carbon dioxide constitutes only 0.03% of the air, it is an important gas. Plants require this gas to carry out the process of photosynthesis. This gas also traps the heat of the Sun and does not let all of it go back into space. This keeps the earth warm at night and is essential for germination of plants and survival of life. This process is known as the greenhouse effect.



The layers of the atmosphere

MAN AND THE BIOSPHERE

People play an important part in maintaining the flow of energy in the biosphere— However, they have disturbed the natural balance between the different elements of the biosphere by their activities. This has led to serious environmental problems— threatening the very existence of many species. Man has excavated mines and extracted coal, petroleum and natural gas from the earth. The burning of coal, oil and natural gas, and cutting down of trees and recklessness in industrial practices are altering the composition of the gases in the atmosphere and polluting it. Increase in the level of carbon dioxide and some harmful gases has led to global warming, climate change, *depletion*⁶ of the ozone layer, changes in sea level, melting of ice caps and high levels of pollution. Our earth is the only planet with a congenial environment for life. It is for us to ensure that the earth remains an ideal place to live in for the future generations of which you are also a part.

Geography Reveals

In the early 1970's the United Nations established a projects called Man and the Biosphere Program (MAP) which promotes sustainable development. A network of biosphere reserves exists to establish a working and balanced relationship between people and the natural world. Currently there are 563 biosphere reserves all over the world.

FOREST DEPLETION IN MADHYA PRADESH

There has been a severe degradation and depletion of our forest resources in Madhya Pradesh. The dense forests are losing their productivity and more than 17,800 hectare of forest cover has been degraded in last two years. Main cause of degradation is the over use of forest resources without consideration. According to FSI (Forest Survey of India) report, forest cover has shrunk mostly in Balaghat (19 sq km), Satna (16 sq km), Dindori (11 sq km) and Chhindwara and Sheopur (10 sq km). Degradation of forests can be preserved only if we check the use of this precious resource. This requires the involvement of the local communities and the management responsible for the protection and development of forests. "Joint Forest Management Programme" has come up with an important program for sustainable forest management.

