7. Indian Geography

GEOGRAPHICAL OVERVIEW OF INDIA

India is a country of great geographical extent; it extends from the ice caped ranges of the Himalayas in the north to the shores of Indian Ocean in the south. India lies in the North Eastern Hemisphere in the south of the continent of Asia which is the biggest continent of the world.

The total area of India is 32, 87,263 sq.km which is roughly 0.57% of the total area of the earth and 2.42% of the total land area of the earth. India is the 7th largest country of the world after Russia, Canada, China, USA, Brazil and Australia. The area of India is almost one-third of Canada, one-fifth of Russia, eight times of Japan and almost twelve times of United Kingdom.

The location of India on the globe is between 8^0 4′ N and 37^0 6′ N latitudes and 68^0 7′E and 97^0 25′ E longitudes. However away from the mainland of India, lies the southernmost point of the country the Indira point or the Pygmalion point is located at 6^0 45′ N latitude.

The North- South extend of India is 3214 kms which extends from Indira Col in Kashmir to Kanniyakumari in Tamil Nadu. The East – West extend of India is 2933 kms which extend from the Rann of Kutch to Arunachal Pradesh.

The highest point of India is Mt. K2/ Godwin Austin (POK) which is 8611mts above the Sea level, but if we talk about the highest point of India inside the territory of India it is Kanchenjunga which is 8598mts which lies in the state of Sikkim. The lowest point of India is Kuttanad which lies in the Indian state of Kerala.

The Tropic of Cancer $23^1/_2{}^0$ N latitude passes through 8 Indian states of Gujarat, Rajasthan, Madhya Pradesh, Chhattisgarh, Jharkhand, West Bengal, Tripura and Mizoram.

The Coastal boundary of India is 7516 kms (including islands) and 6100 kms (excluding islands). 9 Indian states are having the Coastal boundary (Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa and West Bengal)

Gujarat has the longest Coastal boundary in India whereas Goa has the smallest coastal boundary in India.

The land frontier of India is 15,200 kms. India shares the common boundary with 7 neighbouring countries.

Bagladesh ---------- 4096 kms
China ---------- 3917 kms
Pakistan ---------- 3310 kms
Nepal ---------- 1752 kms
Myanmar ---------- 1458 kms
Bhutan ---------- 587 kms
Afghanistan ---------- 80 kms

The States of India sharing boundary with Neighbouring Countries

Pakistan	Jammu and Kashmir, Punjab, Rajasthan and Gujarat
Afghanistan	Jammu and Kashmir
China	Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh
Nepal	Uttarakhand, Uttar Pradesh, Bihar, West Bengal and Sikkim
Bhutan	Sikkim, West Bengal, Assam, Arunachal Pradesh
Myanmar	Arunachal Pradesh, Nagaland, Manipur and Mizoram
Bangladesh	West Bengal, Meghalaya, Assam, Tripura and Mizoram

The population of India is 121crores (2011 census) which is the second highest in the world after China. 17.5% of the world's total population live in India. The population of India is more than the combined population of USA, Russia, Australia, Canada and Japan.

The latitude position of India is 8^0 4'-37^0 6'N

The longitude position of India is $68^0$7'E-$97^0$25'E

The Standard Meridian of India is $82^1/_2{}^0$ E which passes through Naini near Allahabad in Uttar Pradesh. India is 5 hours and 30 minutes ahead of the GMT (Greenwich Mean Time). Sri Lanka is the only country of the world which shares the same time zone of India.

Some Other Facts

Jammu and Kashmir, Himachal Pradesh, Sikkim and Arunachal Pradesh are the states of India which lies completely in the Himalayas

Uttarakhand is the only state of India which lies partly in the Himalayas and partly in the plains.

Gujarat and West Bengal are the only states which are having the Coastline as well as the International boundary.

Haryana, Madhya Pradesh, Chhattisgarh, Jharkhand and Telangana are the only states of India which are neither having the Coastal boundary neither the International boundary.

Assam and Uttar Pradesh has maximum number of boundary i.e. 9 each

Assam has 2 international boundary and 7 state boundary whereas Uttar Pradesh has 8 state boundaries and 1 international boundary.

Nagpur is the Zero Mile Centre of India

Sonbhadra district in Uttar Pradesh is the only district of India which is surrounded by four states from four sides i.e. Madhya Pradesh, Chhatisgrah, Jharkhand and Bihar

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TRANSPORT SYSTEM OF INDIA

ROAD TRNASPORT NETWORK

India's road network is the second largest road network of the world after United States of America. The total length of roads in India is around 56 lakhs kms.
For the purpose of maintenance and construction roads are classified into the National Highways, State Highways, District Highways, Village Roads, Border Roads, etc.
At present the total length of National Highways in India is 1,01,000kms which is only 2% of the total road network but covers 40% of the road traffic in India.
The state of Maharashtra has the maximum length of surfaced roads (pakka roads) in India whereas the state of Odisha has the maximum length of unsurfaced roads (kaccha roads) in India.

LIST OF IMPORTANT NATIONAL HIGHWAYS

NH1 - Amritsar-Jalandhar- Ambala- Karnaal- Panipat- Sonipat- New Delhi- 456kms
NH2 - New Delhi – Mathura – Agra – Kanpur - Allahabad-Varanasi-Sasaram-Dhanbad-Durgapur – Kolkata - 1490kms
(NHI + NH2 combined make the famous GT Road built by Sher Shah Suri between Kolkata and Peshawar)
NH3- Agra- Gwalior- Shivpuri-Indore- Dhulia -Nasik- Thane - Mumbai- 1161 kms
NH5- Bahargagora (near Kolkata)- Cuttack- Visakhapatnam- Chennai- 1533 kms
NH6- Kolkata- Sambalpur- Raipur- Nagpur- Dhule- 1645kms
NH7- Varanasi- Rewa- Jabalpur- Hyderabad- Madurai- Kanyakumari- 2369kms
NH8 - Delhi-Jaipur-Ajmer-Ahmedabad-Vadodara-Mumbai-1428kms (Busiest NH of India)
NH9- Pune- Solapur- Hyderabad- Vijayawada- 791kms
NH10- Delhi- Rohtak- Fazilka- 403kms
NH11- Agra- Jaipur- Bikaner- 582kms
NH12- Jaipur- Kota- Bhopal- Jabalpur 890kms
NH24- Delhi- Bareilly- Lucknow – 483kms
NH28- Barauni- Gorakhpur- Lucknow – 570kms
NH47 (A) Kundanoor- Wellington Islands- 6kms (Shortest NH of India)
NH44 – Srinagar- Kaniyakumari-3745kms (Longest in India)

LIST OF IMPORTANT EXPRESS HIGHWAYS

	Expressway Name	Distance	State
1	Ahmedabad Vadodara Expressway	95 km (59 mi)	Gujarat
2	Mumbai-Pune Expressway	93 km (58 mi)	Maharashtra
3	Jaipur-Kishangarh Expressway	90 km (56 mi)	Rajastan
4	Delhi-Gurgaon Expressway	28 km (17 mi)	Delhi/Haryana
5	Noida-Greater Noida Expressway	24.53 km (15.24 mi)	Delhi/Uttar Pradesh
6	Yamuna Expressway	165 km (103 mi)	Uttar Pradesh
7	Lucknow- Agra Expressway	303 km	Uttar Pradesh (Longest)

Current Projects

GOLDEN QUADRILATERAL PROJECT

This project was started on 6 Jnauary 1999 by Mr. Atal Bihari Vajpayee. The Golden Quadrilateral is one of the biggest programme of road development ever taken up in the country. This project will cover the total distance of 5846 kms and it is under National Highways Development Project (NHDP).

The Golden Quadrilateral will connect New Delhi- Mumbai- Chennai- Kolkata- New Delhi
Delhi – Mumbai - 1419 kms on NH8
Mumbai – Chennai - 1290 kms on NH4
Chennai - Kolkata –1684 kms on NH5
Kolkata - New Delhi 1453 kms on NH2
Total Length - 5846 kms on NH 2, 4, 5 and 8.

NORTH-SOUTH ---- EAST WEST EXPRESS CORRIDOOR

The is the biggest ongoing express highway project of India covering a total distance of 7300 and this project is under the NHDP (National Highways Development Project).
In the North- South direction it will connect
Srinagar- Kanyakumari- 4000 kms
In the East- West direction it will connect
Silchar (Assam) – Porbander (Gujrat)- 3300 kms
The North-South - East West Express corridor will intersect each other at Jhansi in Uttar Pradesh

List of Updated National Highways

NH 44 – 3,745 km (Old NH 7)

National Highway 44 (NH 44) is the longest National Highway in India, starts from Srinagar and terminates in anyakumari. The NH 44 highway has come into being by merging seven major national highways of old number that include NH 1A, NH 1, NH 2, NH 3, NH 75, NH 26 and NH 7. Major stretch of NH 44 are part of North South Corridor and the Golden Quadrilateral, connects several important Indian cities from Srinagar to Kanyakumari.

NH 27 – 3,507 km

National Highway 27 (NH 27) is a part of North South and East West Corridor of India, starts from Porbandar and terminates in Silchar. The 3,507 km long road is the second longest National Highway in India after National Highway 44 (old NH 7). Jhansi is the junction of North South and East West Corridors.

NH 48 – 2,807 km (Old NH 8)

National Highway 48 (NH 48) starts from Delhi and terminates at Chennai. The national highways of old NH 8, stretch from Delhi to Jaipur including Kishangarh expressway, National Expressway 1, Udaipur to Vadodara and Baroda to Bombay (NH 8 old) were merged and renumbered to NH 48. Ahmedabad Vadodara Expressway, Delhi Gurgaon Expressway, Jaipur-Kishangarh Expressway and Western Express Highway are the part of new numbered National Highway 48.

NH 52 – 2,317 km

National Highway 52 (NH 52) is a 2,317 km long highway that connects north to south India. NH 52 passes through the major cities of Hisar, Jaipur, Kota, Indore, Dhule, Aurangabad, Bijapur to Hubli.

NH 30 – 2,010 km

National Highway 30 (NH 30) was previously National Highway 221, connecting Sitarganj in Uttarakhand with Ibrahimpatnam in Andhra Pradesh. NH 30 passes through 6 major states of India covering a distance of 2,010 km through the cities of Lucknow, Allahabad,Jabalpur, Raipur and Bhadrachalam.

NH 6 – 1,873 km

National Highway 6 (NH 6) starts near Jorabat in Meghalaya and terminates at Selling in Mizoram. The 1,873 km long highway is the longest national highway in north east India and passes through the states of Meghalaya, Assam and Mizoram.

NH 53 – 1,781 km

National Highway 53 (NH 53) is a 1,781 km long highway connecting Hajira in Gujarat and Pradip port in Odisha. NH 52 runs through four states of Gujarat, Maharashtra, Chhattisgarh and Odisha.

NH 16 – 1,659 km (Old NH 5)

National Highway 16 (NH 16) is a part of the Golden Quadrilateral project, runs along east coast of West Bengal, Odisha, Tamil Nadu and Andhra Pradesh. The 1,659 km long road highway connects various cities and towns of four states and terminates at Chennai in Tamil Nadu.

NH 66 – 1,593 km (Old NH 17)

National Highway 66 (NH 66) was previously known as NH 17, that runs parallel to the Western Ghats of India. It starts at Panvel and terminates at Kanyakumari, passing through all the major cities and towns of different states of Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu. NH 66 offers the most beautiful road journey in India along the western coast of Karwar, Chiplun, Mangaon, Maravanthe and Alappuzha.

NH 19 – 1,435 km (Old NH 2)

National Highway 19 is one of the top 10 longest national highways of India, Often referred as Delhi Kolkata Road. The 1,435 km long highway is one of the busiest National Highways in India, runs through the major cities of Delhi, Agra, Varanasi, Barhi,Asansol and Kolkata. It was part of the Golden Quadrilateral and a major portion is the historical Grand Trunk Road.

NH 34 – 1,426 km

National Highway 34 (NH 34) runs from Gangotri Dham in Uttarakhand and ends at NH44 near Lakhnadon, Jabalpur. The 1,426 km long national highway route include Uttarkashi, Rishikesh, Haridwar, Ghaziabad, Bulandshahr, Aligarh, Damoh and Jabalpur.

NH 2 – 1,214 km

National Highway 2 (NH 2) starts near Dibrugarh and connect Assam, Nagaland, Manipur, Mizoram states with Sivasagar, Kohima, Imphal and Tuipang. The NH 2 1,214 km long highway is the second longest national highway in North East India.

NH 13 – 1,150 km

National Highway 13 (NH 13) was previously known as NH 229, running from Tawang in Arunachal Pradesh to Pasighat in Assam. The 1,150 km long highway passes through beautiful town of Sela Lake, Dirang, Bomdila, Ziro Town, Biru and Pasighat in Assam.

NH 47 – 1,080 km

National Highway 47 (NH 47) starts from Bamanbore in Gujarat and terminates at Nagpur in Maharashtra. The 1,080 km long highway route include Bamanbore, Limbdi, Godhra, Indore, Harda Betul and connect to NH44 at Nagpur.

NH 31 – 968 km

National Highway 31 (NH 31) starts from Uttar Pradesh and terminates at West Bengal. The 968 km long highway passes through Bihar state and crossed with West Bengal State Highway 10.

RAILWAYS IN INDIA

India has the second largest railway network of Asia and the fourth largest railway network of the world after USA, Russia and China. The credit to start the railway network in India goes to the Britishers who started the railways in India in 1853. The first train in India was started on April 16th 1853 from Bombay to Thane (34 kms). The second train in India started in 1854 between Howrah to Hooghly. India has the second largest electric system in the world after Russia.

The total length of railways in India is around 66,700 kms. India has around 7000 railway stations in India. Gorakhpur in Uttar Pradesh has the longest railway platform which is also the longest railway platform of the world measuring 1378 meters.

The Vivek Express is the longest running train in India which runs from Dibrugarh(Assam) to Kanniyakumari in Tamil Nadu covering approximately 4300 kms.

Gatimaan Express is the fastest train of India running from Hazrat Nizamuddin to Agra

The Indian railways operate on the three different gauges.

Broad Gauge (Distance between two rails is 1.67 meters)

Metre Gauge (Distance between two rails is 1.00 meters)

Narrow Gauge (Distance between two rails is 0.762 or 0.610 meters)

The first metro was started in India was in Kolkata in the year 1984.

The Indian railways is divided into 17 railway zones

Railway Zone	Headquarter
1. Central Railways	Mumbai CST
2. Northern Railways	New Delhi
3. Eastern Railways	Kolkata
4. Southern Railways	Chennai
5. Western Railways	Mumbai Church
6. North Eastern Railways	Gorakhpur
7. North East Frontier Railways	Maligaon
8. North Central Railways	Allahabad
9. North Western Railways	Jaipur
10. South Central Railways	Secundrabad
11. South Western Railways	Hubli
12. South Eastern Railways	Kolkata
13. South East Central Railways	Bilaspur
14. East Coast Railways	Bhubaneswar
15. East Central Railways	Hajipur
16. West Central Railways	Jabalpur
17. Kolkata Metro	Kolkata

KONKAN RAILWAYS

The Konkan railway was started in the year 1998 to reduce the distance between Maharashtra, Goa and Karnataka. It covers the total distance of 760 kms. It runs from Ruha in Maharashtra via Madgaon in Goa to Thokur near Mangalore in Karnataka.

AIR TRANSPORT IN INDIA

The airways in India was started in the year 1935 by the name of Tata Air Lines by J.R.D Tata between Mumbai to Trivandrum, however the first solo flight in India was by J.R.D Tata in the year 1932 between Mumbai to Karachi.

In the year 1953 the airline companies were nationalized by the government of India and Indian Airlines and Air India came into existence, in the year 2005 the Indian Airlines was given the name of Indian but again in the year 2007 it was merged with the Air India.

At present apart from Air India there are other major private airline companies are operating in India such as Vistara, Air Asia India, Jet Airways, Spice Jet, Go Air, Indigo etc There are total 125 airports in India out of which 18 are International. The Indira Gandhi airport at Delhi is the biggest International airport of India.

The government of India has setup a civil aviation center for the training of pilots known as IGRUA (Indira Gandhi Rashtriya Uran Academy) at Fursatganj near Raebareilly in Uttar Pradesh.

WATER TRANSPORT

It is the most economical and ecofriendly mode of transport. The total length of water transport in India is 14,500kms. The government of India has recognized six major waterways in India.

NWW-1 Allahabad to Haldia on river Ganga (longest waterway of India)
NWW-2 Sadiya to Dhubri on river Brahmaputra
NWW-3 Kollam to Kottapuram on canal (shortest waterway of India)
NWW-4 Bhadrachalam to Rajmundri on river Godavari and
Wazirabad to Vijaywada on river Krishna
NWW-5 Mangalagarhi to Paradeep on river Mahanadi and
Talcher to Dhamara on river Brahmani
NWW-6 Bhanga to Lakhipur on Barak river

PORTS IN INDIA

There are total 13 major ports and 187 minor ports in India. Andhra Pradesh has maximum number ports in India. The 13 major ports of India are

KANDLA

It is situated in the Gulf of Kutch in Gujarat. It is natural port and is also known as the Child of Partition.

MUMBAI

It is the biggest and busiest port of India also known by the name of Nhava Sheva

JAWAHAR LAL NEHRU PORT

It is also situated in Mumbai. It is the biggest container port of India

MARMUGOA

It is situated in Goa and is the naval base of India. It is the leading iron ore port of India.

MANGALORE

It is also known as the Gateway to the Karnataka.

KOCHI

It is a natural port situated in Kerala. It is famous for handling the export of tea, coffee and spices.

KOLKATA (HALDIA)

It is an example of Riverine Port situated on river Hooghly in Kolkata.

PARADEEP

It is located in Odisha and it is famous for exporting iron ore to Japan.

VISHAKAPATNAM

It is situated in Andhra Pradesh and it is the deepest port of India.

CHENNAI

It is the oldest artificial port of India and the second busiest port of India.

ENNORE

It is situated in Tamil Nadu. It is the only port of India which is privately handled by the Ennore Port Limited Company.

TUTICORIN

It is situated in Tamil Nadu and it is the southernmost port of India.

PORT BLAIR

It is situated in Andaman and Nicobar recently added in the year 2010 by the Government of India.

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PHYSIOGRAPHY OF INDIA

Out of the total area of India about 43.2% area is covered by Plains, 27.7% is covered by Plateaus, 18.5% is covered by hills and nearly 10.6% is occupied by the mountains.

India can be divided into 6 physiographic regions

1. The Great Mountains
2. The Northern Fertile Plains
3. The Desert of India
4. The Plateaus of India
5. The Coastal Plains
6. The Islands of India

The Great Mountains

The Himalayas

Himalayas means 'Abode of Snow'. The Himalayas are the youngest fold mountains of the world. The Himalayas comprises mainly of the sedimentary rocks. The length of the Himalaya is approx 2400. However the width of the Himalayas varies at different places. The Himalayas extends from the Kashmir in the north to the Arunachal Pradesh in the east. The total area of the Himalayas is nearly 5, 00,000 sq.kms.

The Pamir popularly known as the roof of the world is the connecting link between the Himalayas and the high ranges of the Central Asia.

The Himalayas have the highest mountain peaks in the world with more than hundreds of peaks are above 7000 meters. Many of the peaks above 6000 meters have not been counted and still they have not been given any name. The Himalayas has been divided into 3 major parts on the basis of the height.

The Great Himalayas or the Himadari

The average height of the land is more than 6000 meters. The Great Himalayas are around 25 kms wide. Some of the world highest peaks also lie here which are more than 8000 meters in altitude such as Mt. Everest/ Sagarmatha/Chomo Langma (8848 meters) in Nepal, Kanchenjunga (8598 meters) in India Dhaulagiri (8172 meters) in Nepal, Annapurna (8078 meters0 in Nepal etc.

Some of the world's greatest passes also lies here such as

Shipkila and Bara Lacha La in Himachal Pradesh

Burzil and Zoji La in Jammu and Kashmir

Niti La and Thag La in Uttarakhand

Bomdila in Arunachal Pradesh

Nathu La and Jelep La in Sikkim

Lesser Himalayas or the Himachal

The average height of the land in the lesser Himalayas varies from 3000 meters to 5000 meters. Some of the important mountain ranges lies here such as Dhauladhar, Pir Panjal, Nag Tibba, Mussoorie and Mahabharat ranges.

Due to the good elevation the famous hill stations of India such as Shimla, Chail, Ranikhet, Almora, Nainital, Kasauli, Darjeeling etc are situated in the lesser Himalayas.

In the lesser Himalayas there also lies number of small grass lands which are called merg in Kashmir such as Sonmerg, Gulmerg, Tanmerg etc. The best known pass here is Banihal pass which is between Jammu and Srinagar.

The Outer Himalayas or the Shiwaliks

The average height of the land in the outer Himalayas is around 1300 meters above the sea level. The outer Himalayas are known by the different names such as the Jammu Hills (Jammu and Kashmir), Dundwa (Uttarakhand), Churia Muria (Nepal), Abor and Mishmi (Arunachal Pradesh).

The Shiwalik range comprises of the tectonic valleys known as Duns such as Dehra, Kotah, Patli, Kothri, Chumbi and Kyanda.

The Trans Himalayan Zone

It lies in the north of the Himadari. It is also known as the Tibetian Himalayas as most of the part lies in the Tibet.

Some of the important mountain ranges also lies here as Karokaram, Zaskar, Laddakh and the Kailash.

Mt. K2(8611meters) also known as the Godwin Austin lies here in the Karokaram range. The world's biggest glaciers Siachen, Hispar, Baltoro lies here.

Karokaram and Aghil pass leis in Jammu and Kashmir is part of the Trans Himalayan Zone.

The Eastern Hills or the Purvanchal

The hills are known as the Purvanchal because they lie in the eastern part of India. Arunachal Pradesh, Nagaland, Manipur and Mizoram are collectively known as the Purvanchal. The hills situated here are known by various local names such as Patkai Bum, Naga Hills, Kohima Hills, Manipur Hills, Mizo Hills and Barail range. Saramati (3826 meter)s is highest peak in the Purvanchal.

The Peninsular Mountains

The peninsular mountains in India are divided into 7 major parts

The Aravalis

The Aravalis are the oldest mountain range of the world. They lie in the state of Rjasthan. Guru Sikhar(1722meters) near Mt.Abu is the highest point of the Aravalis.

The Vindhyas

They extend from Jobat in Madhya Pradesh to Sasaram in Bihar.

The Satpura

They lie in the state of Madhya Pradesh. The Satpura are divided into 3 parts

Rajpipla Hills, Mahadeo Hills and the Maikal Hills. Dhupgarh (1350meters) near Panchmarhi is the highest point.

Western Ghats (Shyadris)

They run from river Tapti to the Cape Comorin. Some of the important passes lies in the western Ghats such as

Palghat between Pallakad and Coimbatore

Shenkota between Kollam and Madurai

Thalghat between Mumbai and Nashik

Bhorghat between Mumbai and Pune

Anaimudi 2865 mts in Kerela is the highest peak.

Eastern Ghats

They form the eastern boundary of the Deccan plateau. Jindaghada 1690 meters) Andhra Pradesh is the highest point.

The Nilgiris or the Blue Mountains

It is the meeting point of the Western Ghats and Eastern Ghats. Dodabetta (2637 meters) in Tamil Nadu neat Ooty is the highest point

Cardamom Hills or the Ealaimalai

It is the southernmost mountain range of India located in the state of Kerela and Tamil Nadu

The Northern Fertile Plains

The Northern Fertile plains are formed by the alluvial deposits of the Ganga, Brahmaputra and the Indus River. This area is very rich in the alluvial soil. The Northern Plains stretches from Punjab in the north to the Ganga- Brahamaputra delta in the east.

Farming is the major occupation of the people living in the Northern plains and they practice Subsistence agriculture. Production of food crop is very dominant in the northern plains of India. The plain area of India consists of Punjab, Haryana, Delhi, Uttar Pradesh, Bihar and some parts of West Bengal, Jharkhand, Madhya Pradesh and Rajasthan. The great plains are divided into

Bhabar Plains

They lie along the foothills of the Shiwaliks and continue from river Indus to river Tista.

Terai Plains

They lie in the south of the Bhabar plain. The terai plain appears more in the eastern part rather than the western part due to higher amount of rainfall in the eastern part. The terai plains are the area of high dampness, rich wild life and thick forest.

Bangar Plains

They are formed by the older alluvium deposits. They mainly consist of clay.

Khadar Plains

They are formed by the younger alluvium deposit along the river banks. They mainly consist of clay, silt, sand and mud.

Delta Plains

They are the extension of the khaddar plains and are found in the lower parts of the Ganga river in West Bengal. It consists of old mud, new mud and marsh.

The Desert of India

The Desert of India lies in the western part of the country in the state of Rajasthan and Gujarat. The Desert of India is known as the "THAR" Desert. Thar Desert is the 18th largest Sub Tropical Desert of the world.

The area continuously receives high temperature throughout the year and the rainfall is very scanty less than 25 cms in the year.

Vegetation is almost absent thus it is also known as Marusthali or the dead land. Sand Dunes are the only landforms found in the deserts.

Peninsular Plateaus of India

The peninsular plateaus are basically triangular in shape with the base coinciding with the southern edge of the great plain in the north to the Kanniyakumari in the south. The important ranges of plateaus in India are

The Marwar Upland

They are also known as upland of the eastern Rajasthan. They are made up of sandstone, shale and the limestone.

The Central Highland

They are also known as the Madhya Bharat Pathar. It is made up of old rocks which interspersed with the rounded hills made up of sandstone. Thick forest is grown here.

The Bundelkhand Upland

They lie in the state of Uttar Pradesh and Madhya Pradesh covering the five districts of U.P. (Jalaun, Jhansi, Lalitpur, Hamirpur and Banda.) and four districts of M.P (Datia, Tikamgarh, Chattarpur and Panna).

The Malwa Plateau

It is composed of extensive lava flow and is composed of the black soil. The Malwa plateau has two system of drainage, towards Arabian Sea (Narmada, Tapti and Mahi) and towards Bay of Bengal (Chambal and Betwa)

The Chota Nagpur Plateau

It consists of the areas of Jharkhand, Chhattisgarh and West Bengal. The Chota Nagpur Plateau is made up of Granite and Gneisses.

The Meghalaya Plateau

The area consists of quartzite, shale and schist. The Western, Central and Eastern part of the plateau is known as Garo Hills, Khasi- Jayantiya hills and Mikir Hills.

The Deccan Plateau

They are the largest plateau in India. They are further sub divided in to the Maharashtra plateau, Karnataka Plateau and the Telangana Plateau.

The Coastal Plains of India

There are four major coasts in India, Kathiawar Coast, Konkan Coast, Malabar Coast and The Coromandel Coast. The Coastal Plains of India are divided into 3 major parts

Gujarat Coastal Plains

They are formed by the alluvium deposits of the Sabarmati and the Mahi rivers.

Western Coastal Plains

They lie between the Shayadris and the Arabian Sea.

Eastern Coastal Plains

They lie between the Eastern Ghats and the Bay of Bengal. The eastern coastal plain has a straight shoreline with well defined beaches of sand and shingles. The most famous among them is Marina Beach at Chennai.

The Islands of India

There are total 247 islands in India out of which 204 lie in the Bay of Bengal and 43 Islands lie in the Arabian Sea. There are 2 major groups of islands in India

Andaman and Nicobar group in the Bay of Bengal

Lakshadweep group in the Arabian Sea

Arabian Sea Islands

It consists of the Lakshadweep group of Islands. Only 25% Islands in the Arabian Sea are inhabited. Lakshadweep basically consists of the Coral Islands made up of 'Polyps".

The Northernmost group is known as the Amindivi and the central group is known as Laccadive. The Southernmost Island is known as Minicoy which is the biggest island of the Lakshadweep group is separated by the Maldives by the Eight Degree Channel.

Bay of Bengal Island

It consists of the Andaman and Nicobar group of Islands which are separated by the 10 Degree Channel. The Andaman and Nicobar basically consist of the Volcanic Islands.

The biggest Island of Andaman group is Middle Andaman whereas the biggest Island in the Nicobar group is Great Nicobar. The Duncan Passage separates the South Andaman and the Little Andaman.

Saddle peak (732 meters) in the North Andaman is the highest point. Barren Island situated in Andaman Sea is the only Volcano of India.

Andaman and Nicobar is also the home various ethnic groups of India such as Onges Tribe (Little Nicobar), Sentineleese (Sentinel Island), Jarawa Tribe (Middle and South Andaman), Andamanese (Strait Island), Shompen Tribe (Great Nicobar) and Nicobarese (Great Nicobar).

INDIA-DRAINAGE SYSTEM

The total yield of water in the rivers of India is 18, 58,100 million cubic meters. There are total 14 major river basin, 49 medium river basin and hundreds of minor river basin.

On the basis of the origin, the rivers of India are divided in to the Himalayan Rivers and the Peninsular Rivers.

Over 77% of the total drainage area of the country is towards the Bay of Bengal and the remaining 23% towards the Arabian Sea.

Drainage Pattern

- Following are the major drainage patterns –
  - Dendritic
  - Radial
  - Centripetal
  - Trellis
- A drainage pattern which looks like tree branches with lots of twigs is known as **Dendritic drainage pattern**. For example, the rivers of northern plain.
- **Radial drainage patterns** form when rivers originate from a hill and flow in all directions. For example, the rivers originating from the *Amarkantak*.
- **Centripetal drainage pattern is formed** when rivers discharge their waters from all directions into a lake or a depression. For example, *Loktak*lake in Manipur.
- **Trellis drainage pattern is formed** when the primary tributaries of main rivers flow parallel to each other and secondary tributaries join them at right angles. For example, rivers in the upper part of the Himalayan region.

HIMALAYAN RIVERS

INDUS RIVER SYSTEM

It originates near Lake Mansarovar at an elevation of 5182 meters in Tibetean plateau. The total length of the river Indus is 2880 kms out of which only around 700 kms is in India. In the state of Jammu and Kashmir the Himalayan tributaries of the river Indus are Zanskar, Dras, Gartang, Shyok, Shigar, Nubra etc.

The most important tributaries of Indus are the five rivers that flows through Punjab (land of 5 rivers) which are Sutlej, Beas, Jhelum, Chenab and Ravi). In the Nari Khorsan province of Tibet the Indus has created an extraordinary canyon which is sometimes compared to the Grand Canyon of USA on the river Colorado.

Finally after travelling the long distance the river Indus fells into the Arabian Sea in Pakistan.

Origin of the main Tributaries

Jhelum- It originates from a spring at Verinag in Jammu and Kashmir

Chenab- It originates near the Bara Lapcha La pass in the Lahaul-Spiti district of Himachal Pradesh.

Ravi- It originates from the Kullu hills near the Rohtang pass in Himachal Pradesh

Beas- It originates from the Rohtang pass near the river Ravi

Sutlej- It originates from the Mansarovar- Raka lake near Darma pass in Tibet.

Brahmaputra River System

The river Brahmaputra originates from the the Chemayundung glacier in the Kailash range near the lake Masarovar in Tibet. The total length of the Brahmaputra is 2900 kms but only one-third of its part flows into India. It is known as Tsangpo in Tibet. It enters from the state of Arunachal Pradesh where it is known as Dihang.

After entering into Assam it is known as Brahmaputra where it crosses one of the biggest Riverine Island of the world known as the Majuli Island in the Jorhat district of Assam. It enters into Bangladesh near the Gwalpara where it is known as Jamuna and meets the Ganga at Goalondo in Bangladesh.

The National Waterway Number 2(NWW-2) is situated on the river Brahmaputra from Sadiya to Dhubri.

The river Brahmaputra is the largest river of India. It empties itself in the Bay of Bengal. The major tributaries of the Brahmaputra are Subansiri, Dhansiri, Kemeng, Teesta and Manas.

The Ganga River System

It originates in the form of 2 different streams known as Bhagirathi and Alaknanda from a place known as Gaumukh in the Gangotri glacier. The Bhagirathi and the Alaknanda meets at the Devprayag district of Uttarakhand where it is known as Ganga.

The total length of the river Ganga is 2510 kms but since the major part of the river flows into India it is known as the longest river of India. The Ganga meets with one of its major tributary Yamuna at Allahabad in Uttar Pradesh.

The National Waterway Number 1 (NWW-1) is situated on it which is also the longest waterway in India from Allahabad to Haldia West Bengal, after crossing the Farraka in the state of West Bengal it is known as Padma in Bangladesh.

There are hundreds of tributaries of river Ganga but major amongst them are

Yamuna- It originates from the Yamunotri glacier in the Garhwal range of Uttarakhand.

Chambal- It originates near Mhow in the highlands of Janapao Hills near Indore in Madhya Pradesh.

Son- It originates from the Amarkantak plateau in Madhya Pradesh.

Damodar- It originates from the hills of the Chota Nagpur plateau in the Palamau district of Jharkhand. It is also known as Sorrow of Bengal.

Ramganga- It originates from Garhwal district of Uttarakhand.

Ghagra- It originates from the south of the Mansaroavar near Guria Mandhoa peak in Tibet.

Gandak- It originates near the Tibet- Nepal border.

Kosi- It consists of seven Himalayan tributaries. It is also known as Sorrow of Bihar.

Apart from the tributaries the river Ganga also has a distributary known as Hooghly which flows through Kolkatta.

After meeting with the river Brahmaputra in Bangladesh the joint stream of both the rivers which is known as Padma fell into Bay of Bengal where it is known as Meghna thus makes the biggest delta of the world known as Sunderban delta.

The Peninsular River System

The rivers of the Peninsular India are divided on the direction of their flow i.e. east flowing (fell into Bay of Bengal) and the west flowing (fell into Arabian Sea).

The East Flowing River

Mahanadi

It originates from the Sihawa in the Raipur district of Chhattisgarh. The main tributaries are Seonath, Hasdo, Mand, Jonk, Tel etc.

Godavari

It is the longest river of the peninsular India. It is also known by the name of Vridha Ganga. It originates near Nashik in Maharashtra. The major tributaries are Majra, Penganga, Wardha, Indravati, Wainganga, Sabari etc.

Krishna

It originates from near Mahabaleshwar in the Western Ghats. The major tributaries are Koyana, Dhudhganga, Panchganga, Ghatprabha, Bhima, Tungbhadra, Musi etc.

Cauvery

It is the largest river of the Peninsular India. It is also known as the Ganga of the South due to the religious importance. It originates from the Brahamagiri hills in the Western Ghats. The major tributaries are Hemavati, Lokpawni, Shimsa etc. The famous Shivasamundram waterfall lies on this river.

The others east flowing rivers are Subarnrekha, Brahmani and the Penneru.

West Flowing Rivers

Narmada
It is the largest west flowing river of the Peninsular India. It originates from the Amarkantak plateau in Madhya Pradesh. The famous Dhuan Dhar waterfall is formed by the river Narmada at Jabalpur.The major tributaries of the Narmada are Hiran, Burhner, Banjar, Shar, Shakkar, Tawa etc.

Tapti
It originates from Multai in the Betul district of Madhya Pradesh. It is also known as the twin of the Narmada. The major tributaries are Purna, Betul, Arunavati, etc.
The Narmada and the Tapti both flow westwards and do not make delta they both merge with the Arabian Sea near the Gulf of Khambatt in Gujarat.

Sharavati
It originates from the Western Ghats in Karnataka. The Jog Waterfalls/ Mahatma Gandhi falls / Gerespa Waterfalls near Bangalore in Karnataka which is the highest Waterfall of India is formed by the river Sharavati.
The other important rivers of the Peninsular India flowing westwards are the Luni, Sabarmati, Mahi (Cuts Tropic of Cancer twice in Gujarat).

Important Indian Cities Situated On the Major Rivers

River	Town
Ganga	Hardwar, Rishikesh, Allahabad, Kanpur, Varanasi, Patna
Brahmaputra	Guwahati, Dibrugarh
Alaknanda	Badrinath
Sutlej	Firozpur, Ludhiana
Jhelum	Srinagar
Yamuna	Agra, Delhi, Mathura
Gomti	Lucknow
Saryu	Ayodhya
Kshipra	Ujjain
Swarnarekha	Jamshedpur/ Tatanagar
Hooghly	Kolkata
Chambal	Kota
Sabarmati	Ahemadabad
Mahanadi	Cuttack, Sambhalpur
Musi	Hyderabad
Mandavi	Panjim
Godavari	Nasik
Narmada	Jabalpur, Varodara
Tapti	Surat
Krishna	Vijaywada
Cauvery	Tiruchilapalli, Serirangapatnam

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8. Physical & World Geography

THE UNIVERSE AND THE SOLAR SYSTEM

On the fine bright night when we look up in the sky it seems to be full of stars, but very few of us know that each of the stars we see is far bigger than the size of the earth on which we live. The galaxy in which the earth is situated is known as Milky Way and it consists of around 1, 00,000 million stars.

Nearest Star (Except Sun) –
Proxima Centauri (4.2 light years)
Alpha Centauri (4.3 light years)
Brightest Star - Sirius
Star with a Tail - Comet

If the star is large the final stage of the star can be a supernova explosion which sometimes leaves behind neutron stars called pulsars or they can collapse and compact to form black holes.

The knowledge of the universe in the ancient times was a mystery. In the year 140 A.D Ptolemy propounded the theory that the earth was the centre of the universe and the sun and other heavenly bodies revolve around it. In the year 1543, Copernicus argued that the sun and not the earth was the centre of the universe. Later Kepler supported Copernicus but said that the sun was the centre of the solar system but not the universe. In the year 1805, Hershel made it clear that the solar system was a part of the much larger system of stars known as galaxy.

The study of universe is known as Cosmology and the person who study it known as Cosmonaut.

THE SOLAR SYSTEM

The solar system consists of the sun, eight planets, five dwarf planets their respective satellites and other heavenly bodies.

The planets revolve around the sun in the anti clock wise direction except the Venus and the Uranus which revolves in the clockwise direction.

Mercury, Venus, Earth and Mars are known as inner planets or the Terrestrial planets as they are made up of rocks whereas Jupiter, Saturn, Uranus and Neptune are known as Outer planets or the Jovian planets as they are made up of gases. All the planets do not produce the light of their own.

There are also five dwarf planets in our solar system namely Pluto, Ceres, Eris, Makemake and Haumea.

The planets according to the size are Jupiter, Saturn, Uranus, Neptune, Earth, Venus, Mars and Mercury.

MERCURY

It is the innermost planet and the smallest planet of the solar system. It has the fastest revolution and it completes its one revolution around the sun in around 88 days.

It has no atmosphere and no satellites.

It is also the Roman god of commerce.

VENUS

It is known as the Earth's twin as it has the similar size, density and the mass. It is also known as the Morning Star and the Evening Star. It is the hottest planet of the Solar System (due to high content of Carbon di Oxide CO_2). Unlike the other planets it revolves clockwise i.e. from East to West.

The rotation and the revolution time of the Venus are nearly same. It has no satellites

It is also known as the Roman goddess of beauty.

EARTH

It is also known as the Blue planet because of 71% water. It is the third planet of the third planet from the Sun and the fifth largest planet is terms of size. At present it is the only planet of the solar system which supports all forms of life.

It has an atmosphere and Moon is the only one natural satellite of the Earth.

MARS

It is known as the Red planet due to the high presence of the FeO (Iron Oxide).

Olympus Mons is the mountain spotted at the Mars and the size of it is approximately three times the size of the Mt. Everest.

It has two natural satellites Phobos and Deimos.

It is also known as the Roman god of war.

JUPITER

The lord of the Heavens it is the biggest planet of the Solar System. It has the fastest rotation time i.e. 9.8 hours. It has 63 natural satellites out of which Ganymede is the biggest which is also the biggest satellite of the Solar System.
It is also known as the Roman king of Gods.

SATURN

It is the second largest planet of the solar system known as the elegant planet. It is surrounded by the rings which are made up of particles of dust and ice.
It has 62 natural satellites out of which Titan is the biggest.
It is also known as the Roman god of agriculture.

URANUS

It is a unique planet as its axis of rotation is inclined at only 8^0 to its orbital plane. So unlike the other planets which spin on their axis, Uranus actually rolls apparently from North to South.
It is known as the Green planet due to high content of the Methane gas.
It has 27 natural satellites out of which Miranda is the biggest.
It is also known as the Ancient Greek god.

NEPTUNE

It has 14 natural satellites out of which Triton is the biggest
It is also known as the Roman god of Seas.

FACTS ABOUT THE MOON

- The moon is not a planet, but a satellite of the Earth.
- The surface area of the moon is 14,658,000 square miles or 9.4 billion acres
- The moon is 3,84,000 kms from the Earth
- Only 59% of the moon's surface is visible from earth.
- The diameter of the Moon is 3500 kms
- The Circumference of the Moon is 11000 kms
- The Revolution time of the Moon is 27 days and 8 hours
- The gravitational pull of the Moon is around $1/6^{th}$ of the Earth
- The moon is about 1/4 the size of the Earth.
- The moon rotates at 10 miles per hour compared to the earth's rotation of 1000 miles per hour.
- When a month has two full moons, the second full moon is called a blue moon. Another definition of a blue moon is the third full moon in any season (quarter of year) containing 4 total full moons.
- From Earth, we always see the same side of the moon; the other side is always hidden.
- The dark spots we see on the moon that create the image of the man in the moon are actually craters filled with basalt, which is a very dense material.
- The moon is the only extraterrestrial body that has ever been visited by humans. It is also the only body that has had samples taken from it.
- The first space craft to send back pictures from the moon was Luna 3 (built by the Soviet Union) in October 1959.
- The moon has no global magnetic field.

FACTS ABOUT THE SUN

- The Sun is one among the 200 billion stars in our Milky Way galaxy.
- The Sun is one among the 6000 stars, which is visible to naked eye from the Earth.
- The mass of Sun is 1.989×10^{30} kg (Approximately 2 million trillion trillion kilograms).
- The Sun's energy output is 386 billion megawatt.
- The Earth receives 94 billion megawatt of energy from Sun. This is equivalent to 40,000 times the power requirement of United States of America.
- The reaction taking place in Sun is nuclear fusion, same as a Hydrogen bomb.
- The Sun's temperature at its core is 14 million Kelvin.

- If the Sun were to stop producing energy today, it would take 50 million years for significant effects to be felt at Earth.
- The diameter of Sun is equivalent to the diameter of 109 earths.
- The surface area of Sun is equivalent to that of 11990 earths.
- The volume of Sun is equivalent to the volume of 1.3 million earths.
- The gravity at the surface of Sun is 28 times that of Earth.
- A man weighing 60 kg in the Earth will weigh 1680 kg in the Sun.
- By weight, Sun comprises of 73% hydrogen, 25% helium, 1.5% carbon, nitrogen, and oxygen, and 0.5% all other elements.
- The Sun is at a mean distance of 149.60 million km from Earth.
- The light takes 8.3 minutes to travel from the Sun to Earth.
- The Sun's gravitational pull is so strong that, even Pluto, a planet 5.9 billion kilometer away from Sun, is kept in it's orbit.
- Escape velocity of any planet or star is the velocity required for any object to escape from the gravitational pull of that planet or star. The escape velocity of the Sun is 2.22 million km/hr.
- The Sun rotates about it's own axis once every 25.38 days.
- The Sun orbits around the center of our Milky Way galaxy once every 240 million years.
- Sunspots appear as dark spots on the surface of the Sun. Sunspots are the intense magnetic regions of Sun with magnetic field strengths thousands of times stronger than the Earth's magnetic field.
- If the sun stopped shining, all living organisms in the Earth would freeze to death, the tropics would be as cold as the poles, and the 7 seas would turn to solid ice.
- In Spit Bergen, Norway at one time of the year the sun shines continuously for three and a half months.
- At one time of the year, for 186 days you cannot see the Sun in the North Pole of Earth.
- The age of Sun is 4.57 billion years.
- The expected life time of Sun is another 5 billion years or so.

ASTEROIDS

Asteroids are essentially chunks of rock that measure in size from a few feet to several miles in diameter. (Small asteroids are called meteoroids.) The largest asteroid, Ceres, is about 590 miles (950 kilometers) wide. Like most asteroids, it lies in the **asteroid belt** between Mars and Jupiter. Many astronomers believe the belt is primordial material that never glommed into a planet because of Jupiter's gravitational pull. Other astronomers say the belt is a planet that was broken apart during a collision.

METEORITES

The meteorites are the small fragments of rock and metal travelling through the space, when they come in the Earth's gravitational field they become white hot through friction as they fall through the atmosphere and we can see them as Meteors and Shooting Star. Upon reaching the Earth they are known as the meteorites.

Some other Facts

4 October 1957: Soviet Union launched the first Earth-orbiting artificial satellite called Sputnik I to initiate the space race. Sputnik\'s radio signals continued for 22 days until the transmitter batteries run out.

3 November 1957: The **dog Laika** became the first living creature to orbit the Earth by the satellite Sputnik II. However, she died a few hours after launch.

12 April 1961: The space exploration's history named Yuri Gagarin from Soviet Union as the first human in outer space and the first to orbit **of the Earth. Flight Name -Vostok 1**

20 July 1969: Neil Amstrong and Edwin "Buzz" Aldrin set a new record when they were the first humans to walk on **the moon.** Flight Name- Apollo 11

3 April 1984: Rakesh Sharma became the first India to go into Space with the Soviet Union Space Program. Flight Name- Soyuz T11

28 January 1986: The explosion of space shuttle Challenger after 73-second take-off became a major catastrophe for **NASA.**

28 April 2001: An American multimillionaire, Dennis Tito, became the first space tourist with 7 days, 22 hours and 4 minutes in space.

1 February 2003: Space Shuttle Columbia disintegrated over **Texas** during re-entry into the Earth's atmosphere after 16 days in space.

Baikanour Constrodrom, Kazakashtan is the world's first and the largest operational space launch facility.

ISRO- Indian Space Research Organization situated at Bangalore is the Space Agency of India

NASA- National Aeronautics and Space Administration situated at Houston, Texas, USA is the largest Space agency of the world

Vikram Sarabhai Space Centre situated in Trivandrum, Kerala is the largest Space centre of India

Chandrayan -1 on 22nd October 2008 launched by ISRO became the first Indian mission to Moon.

Discovery is the oldest Space Shuttle of the world retired in the year 2011 completed 39 missions in 27 years of time.

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A volcano is an opening in the earths crust that allows molten rocks, gases, ashes, dust particles and debris to escape to the surface. Erupted lava and other debris can flow upto 200 mph, destroying everything in their path.

There are two main types of volcano :

1. Composite volcano ➡ They are found at destructive plate margins. When the oceanic plates sinks into the mantle and melts, it forms magma.

- It made up of alternate layers of ash and lava
- The lava is acidic and sticky, so it does not flow far
- Eruptions can be violent but they don't happen very often

2. Shield volcano ➡ They are found at constructive plate margin. As the two plates move apart magma rises up from the mantle.

- Lava is basic so that it flows a long way
- Eruption are not violent but frequents

Fissure Vent

It is a linear volcanic vent through which lava erupts, usually without any explosive activity. The vent is often few meters wide and may be many kilometers long.

Types of Lava

1. Acidic/Andesitic/composite/strato volcanic : These lave have a high percentage of silica therefore highly viscous with a high melting point. They flow slowly resultant cone is therefore steep sides.

The rapid solidifying of lava in the vent obstructs the flow of outpouring lave, resulting in loud explosion.

2. Basic/Basaltic/Shield : These lave have a low percentage of silica but rich in iron and magnesium and are highly fluid so that it flow out volcanic vent quietly (Not very explosive).

They effect extensive areas spreading out as thin sheets over great distances before they solidify.

Volcano based on Eruptions

(1) Active Volcano – Erupt fairly frequently

For example (1) Mount St. Helena – U.S.A.

(2) Mount Merapi – Indonesia

(3) Barren – Andman (India)

(2) Dormant Volcano – Eruption has not occur regularly i.e., undergo long interval of repose

For example

(1) Vesuvius – Italy

(2) Krakatao – Indonesia

(3) Chimbarazo – Eqhader

(4) Kilimanzaro – Tanzania

(5) Kenya – Kenya

(6) Narcondum – India

(3) Extinct/Ancient Volcano – Eruption has been recorded in historic times. For example

(1) Popa – Myanmar

(2) Fujiyama – Japan

Structure formed by Volcano

(1) Craters and Calderas – These are circular depressions that collect rainwater or snowmelt and are created by very explosive and gaseous eruptions. They are formed by a collapse of a volcanic structures.

Craters are smaller in size (less than 1 km) and calderas are larger (Between (1 – 50 km). Eg. (1) Aaso Caldera – Japan

(2) Long valley caldera – Eastern California

(3) valles caldera – New Mexico

(2) Magma Chamber – A larger underground pool of molten rock found beneath the surface of the earth.

(3) Lava – Hot molten rocks when it reaches the surface

(4) Vent – A pipe like structure which allows, hot magma ash and gases to escape

(5) Ash cloud – Clouds of steam gases and hot ash that is spread out from a volcanic eruption.

(6) Crater/Caldera lake – If after eruption of magma has ceased the crater and caldera are filled with water resulting crater/caldera lake. For example

(a) Lake Toba – Indonesia, Largest Volcanic crater lake in the world

(b) Lake Titicaca – On the border of Bolivia and peru. World highest navigable lake also known as Honeymoon lake.

(c) Loner lake – Buldhana – Maharashtra it is example of Meteor crater lake.

(8) Baitholith – These are large rock masses formed due to cooling down and solidification of hot magma inside the earth. (Generally Granitic)

(9) Laccolith – These are dome shaped Intrusive bodies formed due to cooling down and solidification of hot magma.

(10) Lapolith – As and when the lava moves upwards, a portion of the same may tend to move in a horizontal direction wherever it finds a weak planes. It may get rested in different forms like concave saucer shaped sky bodies known as lapolith.

(11) Phacolith – A wavy mass of intrusive rocks known as phacoliths.

(12) Sills – These are solidified horizontal lava layers inside the earth. If it is thinner one known as sheets while thick deposits are called sills.

(13) Dykes – When intrusive cooled rock developed a wall like structure are called dykes.

(14) Trapp – When intrusive lava formed a large huge thick sedimentation, it is known as trapp.

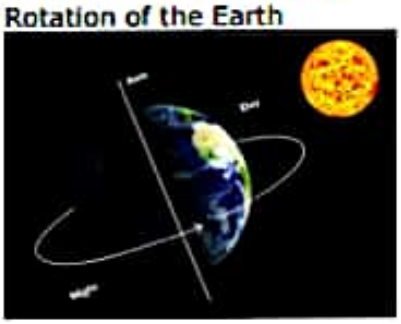
•••

EARTH

The Earth which is also known as the blue planet due to high content of water i.e. 71% covers approximately 510 million sq.kms. The earth is the densest of all the planets in the solar system and it is the only planet which supports all forms of life. The shape of the earth is oblate spheroid or oblate ellipsoid i.e. it is almost spherical, flattened at the poles and slightly bulge at the equator.

Movement of the Earth

Rotation of the Earth



The Earth rotates from West to East on its own axis in 23 hours, 56 minutes and 41 seconds. The rotational velocity of the Earth is maximum at the equators i.e. 1667 kms/hrs and minimum at the poles i.e. zero.

The rotation of Earth causes the day and night in the world and it is also responsible for the rise and fall of the tides everyday. The longest day in the Northern Hemisphere is June 21st and the longest day in the Southern Hemisphere is 22nd December whereas the shortest day in the Northern Hemisphere is 22nd December whereas the shortest day in the Southern Hemisphere is 21st June. The days and the night at the Equator almost remains the same throughout the year.

Revolution of the Earth

The Earth revolve around the sun in the elliptical orbit at a orbital velocity of 1, 07,218 kms/hrs. The earth takes 365 days, 5 hours, 48 minutes and 45.51 seconds to complete its one revolution.

Revolution of the Earth results in the change of the seasons and the variation in the day and nights at different times of the year. The revolution of the earth is also responsible for the shifting of the wind belts.

Inclination of Earth

The axis is an imaginary line that runs from North to South and passes through the centre of the earth. It is always remains inclined at an angle of 66.5 degree to the plane of the earth's orbit and is tilted at 23.5 degree from a line perpendicular to this plane. As the earth revolve around the sun the increase and decrease in the amount of the sunlight is caused by the tilt of the Earth's axis.

Change in Seasons

The seasons are basically divided into 4 types

Spring

On the 21st March the sun rays are directly on the equator. Thus on the 21st March the spring season starts in the Northern Hemisphere.

Summers

On 21st June the sun rays are directly on the Tropic of Cancer. Thus on the 21st June the summer season starts in the Northern Hemisphere.

Autumn

On 23rd September the sun rays again come back on the equator thus on 23rd September Autumn season starts in the Northern Hemisphere.

Winters

On 22nd December the sun rays are directly on the Tropic of Capricorn thus on 22nd December the winter season starts in the Northern Hemisphere.

Note: The conditions in the Southern Hemisphere are just opposite

Equinoxes

Equinoxes are those days when the days and nights are equal. It happens twice in a year on these two days the sun rays are directly over the equator

March 21st- Vernal Equinox in Northern and Autumnal equinox in the Southern Hemisphere

September 23rd – Autumnal equinox in the Northern and Vernal equinox in the Southern Hemisphere

Solstice

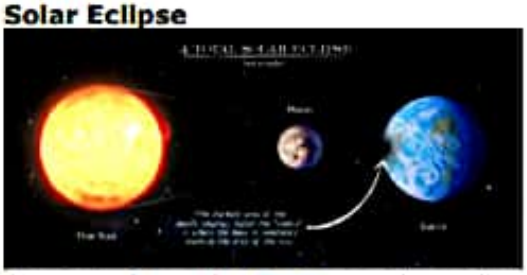
It is time during the year when the difference between the length of days and nights is the largest. During these days the sun rays are directly over the tropics
June 21st – Summer Solstice in Northern and Winter Solstice in the Southern Hemisphere
December 22nd – Winter Solstice in the Northern and the Summer Solstice in the Southern Hemisphere

Midnight Sun

This is the phenomenon observed at the latitudes 66.5 degrees North and South of the equators where the sun never sinks below the horizon during the summers due to the tilt of the earth's axis in each hemisphere during the summers. The phenomenon increases towards the equators.
North Pole experiences day from 21st March to 23rd September
South Pole experiences day from 23rd September to 21st March

ECLIPSES

Solar Eclipse

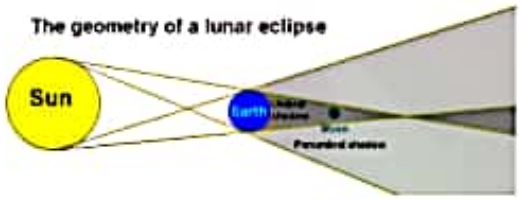


As seen from the Earth, a solar eclipse occurs when the Moon passes between the Sun and Earth, and the Moon fully or partially blocks the Sun. This can happen only at new moon, when the Sun and the Moon are in conjunction as seen from Earth.

Solar Eclipse can be of four types

- Total Eclipse- It occurs when the dark silhouette of the Moon completely obscures the intensely bright light of the Sun, allowing the much fainter solar corona to be visible. During any one eclipse, totality occurs at best only in a narrow track on the surface of Earth.
- Annular Eclipse- It occurs when the Sun and Moon are exactly in line, but the apparent size of the Moon is smaller than that of the Sun.
- Hybrid Eclipse- It shifts between a total and annular eclipse. At certain points on the surface of Earth it appears as a total eclipse, whereas at other points it appears as annular.
- Partial Eclipse- It occurs when the Sun and Moon are not exactly in line and the Moon only partially obscures the Sun.

Lunar Eclipse



It occurs when the earth comes between sun and the moon. The lunar eclipse basically occurs on the full moon day. However it does not occur on every full moon day because the moon is so small and the planer of its orbit is tilted about 5 degree which represents to the plane of the Earth's orbit due to this reason only the eclipse does not occur every month.

The Lunar Eclipse can last up to the maximum of 1hours and 40 minutes, the moon does not becomes completely dark during the most lunar eclipse however in many of the cases it becomes reddish.

TIDES

Tides are periodic rises and falls of large bodies of water. Tides are caused by the gravitational interaction between the Earth and the Moon. The gravitational attraction of the moon causes the oceans to bulge out in the direction of the moon. Another bulge occurs on the opposite side, since the Earth is also being pulled toward the moon (and away from the water on the far side). Since the earth is rotating while this is happening, two tides occur each day. The interval between the two tides is 12 hours and 26 minutes.

There are basically two types of tides

Spring Tides

In every two weeks' time the positions of the sun, moon, and Earth forma straight line. At these times of new and full moon phases as viewed from Earth, the lunar- and solar-related ocean bulges also line up (and add up) to produce tides having the greatest monthly tidal range (that is, the highest high tide and lowest low tide); these are called spring tides.

Neap Tides

Between **spring tides**, at the first and third quarter phases of the moon, the sun's pull on Earth is at right angles to the pull of the moon. At this time, tides have their minimum monthly tidal range that is, unusually low high tide and unusually high low tide these are **called neap** tides or *fortnightly tides.*

Some Important Facts about Earth

Age of the Earth: 4.5 to 4.6 billion years

Human Population of the Earth: 7,039,191,305 (approximately)

World Population Growth: 1.092%

Earth's Circumference at the Equator: 40,075 km

Earth's Circumference between the North and South Poles: 40,008 km

Earth's Diameter at the Equator: 12,755 km

Earth's Diameter at the Poles: 12,713 km

Average Distance from the Earth to the Sun: 14, 96, 69,180 km

Average Distance from the Earth to the Moon: 3, 84,400 km

Highest Elevation on Earth - Mt. Everest, Asia: 8848 meters

Lowest Elevation on Land - Dead Sea 396 meters deep

Deepest Point in the Ocean - Challenger Deep, Mariana Trench, Western Pacific Ocean 11,033 meters deep

Highest Temperature Recorded: 134°F (56.7°C) - Greenland Ranch in Death Valley, California, July 10, 1913

Lowest Temperature Recorded: -128.5°F (-89.2°C) - Vostok, Antarctica, July 21, 1983

Mean Temperature: 15.4 degree Celsius

Water vs. Land: 70.8% Water, 29.2% Land

Rotation Time: 23 hours 56 minutes 40.91 seconds

Revolution Time: 365 days 5 hours 48 minutes 45.51 seconds

Satellite: Moon

Tilt of axis from Orbital plane: 23°27'

Average depth of Oceans: 3554 meters

Date of perihelion (minimum distance from sun): January 3rd

Date of aphelion (maximum distance from sun): July 4th

Average Orbital Velocity: 29.783 km/sec or 1, 07, 218 km/hr

Orbital Circumference: 92, 43, 75, 700 km

Escape Velocity: 11.2 km/sec

Average Solar Constant: 1.94 calories/cm^2/min

INTERIOR OF THE EARTH

The earth is divided into three parts i.e. the outer layer which is known as Crust, the middle layer Mantle and the innermost layer which is known as the Core.

The temperature and the pressure of the earth increase with the increase of depth inside the earth. It increases at the average rate of 1^0 Celsius for every 32 meters to be specific in the first 100 km it increases at the rate of 12^0 Celsius per km. In the next 300 km it increases at the rate of 2^0 Celsius per km and after that it increases at the constant rate of 1^0 Celsius per km.

It has been a great dilemma for the people that inner core of the earth is in the solid state as the temperature is so high inside the earth, but since the pressure at such great depths is also very high the melting point is higher than the prevalent temperature and the inner Core is in solid state.

The Core and the Mantle are separated by the Guttenberg discontinuity whereas the Mantle and the Crust are separated by the Mohorovicic discontinuity.

LAYERS OF THE EARTH

THE CRUST

It is the outermost and the thinnest layer of the earth's surface and it is about 8 to 40 km thick. The crust of the earth varies greatly in thickness and composition as small as 5km thick and beneath the oceans it can extend up to 70km in depth. The crust of the earth is made up of two layers the upper layer which is known as the Sial(Silica and Aluminum) and the lower layer which is known as Sima(Silica and Magnesium). The density of the crust is 3gm/cc

THE MANTLE

The Mantle extends up to the depth of 2900 km. The mantle is made up of two layers the upper mantle which is also known as the Asthenosphere and the lower mantle.

THE CORE

It lies beyond the depth of 2900 km. The core is also divided into two parts i.e. the outer core which is 2100 km thick is in the molten state due to the high temperature but not very high pressure. The inner core is 1370 km thick and it is in the solid state due to both high heat and pressure It is also known as Nife(Nickel and Iron). The temperature of the core lies in between 2200 to 2750°celsius.

COMPOSITION OF EARTH

The earth is made up of more than 100 elements out of which 8 are most important

Oxygen	46.5%
Silicon	27.72%
Aluminum	8.13%
Iron	5.01%
Calcium	3.63%
Sodium	2.85%
Potassium	2.62%
Magnesium	2.09%

ATMOSPHERE

The atmosphere is the mixture of various types of gases. Due to the gravity of the earth the atmosphere is inseparable from the earth.

The atmosphere contains the life giving gases like the Oxygen for the human being and the animals and carbon di oxide for the plants. The atmosphere acts like the blanket for the earth.

The atmosphere basically composed of various gases

Nitrogen	78%
Oxygen	21%
Argon	0.93%
Carbon di Oxide	0.03%
Neon	0.0018%

In traces- Water vapour, Dust particles, Helium, Ozone, Krypton, Xenon, Methane etc

Water vapour besides being the immediate cause of condensation and precipitation it absorbs the insolation coming from the sun, reducing the amount of heat reaching the earth's surface.

Carbon di oxide is important for the absorption of heat from the sun as well as from the earth. A high concentration of Carbon di Oxide leads to the Greenhouse Effect.

Dust particles help in the formation of the clouds.

LAYERS OF THE ATMOSPHERE

TROPOSPHERE

Troposphere means region of mixing, it is derived from the Greek word 'troops' meaning mixing of turbulence. The height of the troposphere at the poles is about 8 km while at the equator is about 16 km this is because there is more heating at the equator.

All the weather phenomena take place in this layer only. It is the densest of all the layers and contains water vapour, moisture and dust. Dust particles present in this layer hold the water vapour and contribute to the occurrence of twilight and the red colour of sunlight and sunset.

In this, at every 165 meters there is a drop of 1°Celsius. This is called Normal Lapse Rate of Temperature.

STRATOSPHERE

It extends from 16 to 50 km height. The temperature ceases to fall with the increase of height in this layer.

Large airplanes prefer travelling in the stratosphere because no weather change takes place in this layer and there are also no vertical winds.

The stratosphere contains the ozone layer (25-30 km) from the earth surface (Unit of Ozone- Dopson). The Ozone absorbs the ultra violet rays of the sun. This layer has a comparatively higher temperature due to the absorption of the ultra violet radiations from the sun.

MESOSPHERE

It extends up to height of about 80 km. In this layer of atmosphere the temperature decreases to about -100° Celsius at 80 km height.

It protects the earth from falling meteorites, as most of them burn out in this region.

IONOSPHERE

It extends up to the height of 500-600 km. It is known as the Ionosphere as it contains the electrically charged particles (ions) that reflects the radio waves back to the earth and thus makes the radio communication possible.

EXOSPHERE

The limit of the exosphere is quite uncertain. Here gravity of the earth is very weak. The final boundary between the earth and the outer space is known as 'Magnetopause'

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HYDROSPHERE

A hydrosphere in physical geography describes the combined mass of water found on, under, and over the surface of a planet. The total mass of the Earth's hydrosphere is about 1.4×10^{24} grams, which is about 0.023% of the Earth's total mass. Around 2×10^{19} grams of this is the Earth's atmosphere. In addition, 71% of the Earth's surface, an area of 361 million square kilometers, is covered by ocean.
The world's oceans contain 97% of the water in the hydrosphere, most of which is salt water. Ice caps, like that found covering Antarctica, and glaciers that occupy high alpine locations, compose a little less than 2% of all water found on earth. Although that is a small amount, the water stored as ice in glaciers would have a great impact on the environment if it were to melt into a liquid.

Ocean Trenches

There are 5 major oceans in the world. The sizes of the ocean in terms of water content in the decreasing order are

Ocean	Deepest Point
Pacific Ocean	Mariana Trench (11002 meters)
Atlantic Ocean	Puerto Rico Trench (8500 meters)
Indian Ocean	Java Trench (7500 meters)
Southern Ocean	South Sandwich Trench (7100 meters)
Arctic Ocean	Eurasian basin (5449 meters)

Salinity of the Oceans

Most of the salt in the oceans came from land. Over millions of years, rain, rivers, and streams have washed over rocks containing the compound sodium chloride (NaCl), and carried it into the oceans.
The average ocean salinity is 35 ppt. This number varies between about 32 and 37 ppt. Rainfall, evaporation, river runoff, and ice formation causes the variations. For example, the Black Sea is so diluted by river runoff; its average salinity is only 16 ppt.
Freshwater salinity is usually less than 0.5 ppt. Water between 0.5 ppt and 17 ppt is called brackish. Estuaries (where fresh river water meets salty ocean water) are examples of brackish waters.

Composition of Ocean Water

Sodium Chloride	77.8%
Magnesium Chloride	10.9%
Magnesium Sulphate	4.7%
Calcium Sulphate	3.6%
Potassium Sulphate	2.5%
Others	2.5%

Don Juan Pond in Antarctica is the most saline water body of the world which has the salinity of 440ppt (440gm per 1000 gm of water) followed by Lake Assal in Djibouti which has the salinity of 350ppt (350 gm in 1000 gm of water). However Dead Sea on the border of Jordan and Israel is the most popular saline water body having the salinity of 340ppt. Red Sea is the most saline sea of the world whereas the Atlantic Ocean is the most saline Ocean of the world.

Ocean Currents

Ocean currents are the vertical or horizontal movement of both surface and deep water throughout the world's oceans. Currents normally move in a specific direction and aid significantly in the circulation of the Earth's moisture, the resultant weather, and water pollution. Ocean currents are found all over the globe and vary in size, importance, and strength.
Ocean currents circulate in clockwise direction in Northern Hemisphere and anticlockwise direction in the Southern Hemisphere.

Ocean currents are of two types

Warm water Current moves from Equator towards the Pole.
Cold water Current moves from Poles towards the Equator
The place where the warm and cold current meets it makes the biggest foggy zone of the world and also the biggest fishing zone of the world.
For example: Dogger bank near Newfoundland England is the biggest fishing zone of the world where the warm current Gulf stream meets with the cold current Labrador.

List of some Important Ocean Currents

Agulhas Current	Indian	Warm
Alaska Current	North Pacific	Warm
Benguela Current	South Atlantic	Warm
Brazil Current	South Atlantic	Warm
California Current	North Pacific	Cool
Canaries Current	North Atlantic	Cool
East Australian Current	South Pacific	Warm
Equatorial Current	Pacific	Warm
Gulf Stream	North Atlantic	Warm
Humboldt (Peru) Current	South Pacific	Cool
Kuroshio (Japan) Current	North Pacific	Warm
Labrador Current	North Atlantic	Cool
North Atlantic Drift	North Atlantic	Warm
North Pacific Drift	North Pacific	Warm
Oyashio Current	North Pacific	Cool
West Australian Current	Indian	Cool
West Wind Drift	South Pacific	Cool

Major Shipping Canals

THE PANAMA CANAL

The Panama Canal is 58 kms long and links the Pacific and Atlantic Oceans with over 13,000 vessel transits per annum. It was started in the year 1914.

THE MALACCA STRAIT

More than 50,000 vessels per year transit the 621 mile long Strait of Malacca. Linking the Indian and Pacific Oceans, the Straits of Malacca is the shortest sea route between three of the world's most populous countries -- India, China, and Indonesia -- and therefore is considered to be the key choke point in Asia.

KIEL CANAL

It is situated between the London and the Baltic ports. It is 98 km long and links North Sea with the Baltic Sea.

SUEZ CANAL

The Suez Canal is one of the world's most heavily used shipping lanes, with an average of 55 ships using it daily. Completed in1869, the masterpiece of Ferdinand De Lesseps, the Suez Canal immediately cut the distance between Europe and the Far East, allowing vessels to avoid the long and arduous voyage around the Cape.
It connects the Mediterranean Sea with the Red Sea. It is 169 km long and was commissioned by Colonel Nasser on 26th July 1956. It is also nicknamed as the highway of India. It is the bussiest canal of the world.

MAJOR RIVERS OF THE WORLD

Mekong-It is the longest and the largest river of South East Asia. It flows through China, Myanmar, Laos, Vietnam and Thailand.
Hwang Ho/Yellow River- It is known as the Sorrow of China
Yangtze – It is the longest and the largest river of Asia. It flows through China
Tigris- It flows through Turkey and Iraq.

Baghdad city in Iraq is situated on this river.
Euphrates- It is the longest and the largest river of West Asia. It flows through Turkey, Syria and Iraq.
Irrawaddy- Capital of Myanmar Rangoon is situated in the banks of this river.
Nile- It is the longest river of the world.
Alexandria city in Egypt is situated on the banks of this river.
This river flows through 11 countries including Tanzania, Uganda, Rwanda, Burundi, Democratic Republic of the Congo, Kenya, Ethiopia, Eritrea, South Sudan, Sudan and Egypt
Congo- It cuts the Equator line twice.
Tse Tse is a fly found in the jungles of the Congo River causes the sleeping sickness.
It is in Democratic Republic of Congo
Limpopo- It is in South Africa. This river cuts the Tropic of Capricorn twice.
Amazon- It is the largest river of the world. It flows through Brazil, Columbia and Peru.
Caroni- It is in Venezuela.
World's highest waterfall known as Salto Angels waterfall lies on this river.
Hudson- It is in USA.
New York is situated on the banks of this river.
Niagara- It is USA and Canada
World's largest waterfall Niagara Waterfall is situated on this river.
Mississippi- Missouri – It is in USA
Volga- It is in Russia.
It is the longest river of Europe.
Thames- London is situated on this river.
Seine- Paris is situated on this river
Tiber- Rome is situated on this river.
Spree- Berlin is situated on this river
Danube- It is the second longest river of Europe.
This river passes through the four national capitals
Serbia- Belgrade
Hungary- Budapest
Romania- Bucharest
Austria- Vienna
Rhine- This river flows through Germany, Switzerland, Austria, France and Netherlands
It is also known as the Coal River
Murray and Darling- It is in Australia

MAJOR LAKES OF THE WORLD
Largest Lake- Caspian Sea in Russia
Largest Saline Lake- Caspian Sea in Russia
Largest Fresh Water Lake- Lake Superior in USA and Canada
Highest Lake- Lake Titicaca in Bolivia
Deepest Lake- Lake Baikal in Siberia
Longest Lake- Lake Tanganyika in Tanzania
Lake with longest Coastline- Lake Huron in North America
Finland is known as the Land of Thousand Lakes.
Canada has more than 60% of the world's lake.
North America is the land of 5 great lakes namely Lake Superior, Lake Erie, Lake Huron, Lake Michigan and Lake Ontario

MAJOR LAKES OF INDIA
Largest Lake – Chilka Lake in Orissa
Largest Fresh Water Lake - Wular Lake in Jammu and Kashmir
Largest Saline Water Lake - Sambhar Lake in Rajasthan.

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