Thoroughly Revised & Improved Edition

GENERAL STUDIES

2025

SSC | RAILWAYS | BANKING | PSUs | UPSC
State Public Services & State Engineering Exams

by

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General Studies

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Preface

This comprehensive text book on General Studies explains the subject matter in a brief and simple style. The authors are very well aware of the requirements of examinations conducted by UPSC, SSC, State Public Service Examinations, Railways Examinations and Public Sector Examinations. This book has been very well targeted covering all the aspects of subject matter required for various examinations.

Since last one decade, authors have closely studied the marks of various candidates appeared & selected in government sectors and other examinations and found that those who have scored below average or poor marks in General Studies section, are either not able to get selection or get poor ranks, hence it has been realized that general studies section should be given significant importance.

There is no good book available to the readers in the market, which covers all the aspects of Geography, Polity, History, Life Science, Economy, General knowledge, General Science, Environment, Basics of Computer Applications and Science & Technology that may satisfy the requirements of various competitive examinations conducted for aspirants. In this edition authors have put sincere efforts to satisfy all the requirements of various examinations. The book is thoroughly revised and updated. Authors have tried to incorporate previous year questions of UPSC, SSC, State Public Service Examinations, Railways examinations and Public Sector Examinations.

The authors feel that this book will be sufficient and highly useful for all the competitive examinations conducted for graduates from every discipline.

Any suggestions from the readers for the improvement of the book are most welcome.

B. Singh
A.P. Singh

GENERAL STUDIES

CONTENT

CHAPTER

1 GENERAL KNOWLEDGE

Basic General Knowledge of
India & World

NATIONAL SYMBOLS

National Flag

- The National Flag of India is a horizontal tricolour of deep saffron (Kesaria) at the top, white in the middle and dark green at the bottom in equal proportion. The ratio of width of the flag to its length is 2:3. In the centre of the white band a navy-blue wheel is located which represents the Chakra.
- It was adopted by Constituent Assembly of India on July 22, 1947.
- A tricolour flag was first accepted by the Indian National Congress in 1931, having Charkha in place of today's Chakra.
- The horizontal colour strip of deep Saffron at top represents courage, sacrifice and renunciation, White at middle shows truth and purity in thoughts and dark Green at the bottom is the symbol of life abundance and prosperity.
- A wheel (Chakra) in centre of the white strip is the symbol of progress and movement. It has 24 spokes.
- Supreme Court declared the right to hoist flag as a Fundamental Right under Article 19 (i) (a) of the Constitution in 2002. Flag hoisting in India is regulated by Flag Code of India, 2002.
- The Flag was designed by **Pingali Venkayya** and first time, the flag was hoisted by **Sacchindra Prasad Bose** in 1906 in Calcutta and later on in the year 1907 an another tricolour flag was unfurled by **Madam Bhikaji Cama** in Stuttgart, Germany.
- The first flag committee was headed by **Dr. Rajendra Prasad**.

National Emblem

- The National Emblem of India is an adaptation from the Sarnath Lion Capital of Ashoka. It was adopted by the Government of India on January 26, 1950.
- In this emblem, only three lions are visible, the fourth lion being hidden from view. The wheel appears in relief in the centre of the abacus with a **bull** on **right** and a **horse** on **left**. The bell shaped lotus (as in the original) has been omitted. The other animals present in the emblem are an Elephant and a Lion.
- The words *Satyameva Jayate* are inscribed below the abacus in Devanagri script. These words are taken from *Mundaka Upanishad.*

National Anthem

- The song *Jana gana mana* is the National Anthem of India which was composed by **Rabindra Nath Tagore**, originally in Bengali.
- It was adopted by Constituent Assembly on January 24, 1950 in its Hindi version.
- The song Jana gana mana was first published in January, 1912 under the title **'Bharat Vidhata'** in Tattva Bodhini Patrika.
- The song was translated in English in 1919 with the title **"Morning Song of India''.**
- It was first sung at the Calcutta Session of Congress on December 27, 1911.
- Playing time of full version of National Anthem is 52 seconds while it is 20 seconds for first and last lines of the stanza.

National Song

- "*Vande Mataram*" is the National song of India, which was composed by **Bankim Chandra Chatterjee**, originally in Sanskrit.
- It was adopted on January 24, 1950, providing it equal status with National Anthem *Jana gana mana.*
- It is taken from his novel **Anand Math** published in 1882. Its English translation was done by Sri Aurobindo.
- It was sung for the first time at the Congress Session of 1896.

National Calendar

- National Calendar is based on Saka Era (began on 78 A.D.) with Chaitra as its first month and Phalguna as its last month with a normal year of 365 days adopted from March 22, 1957 along with the Gregorian Calendar.
- First day of Chaitra normally falls on March 22 and on March 21 in leap year.

National Animal

- The Tiger (Panthera Tigris) is the National Animal of India. It has a thick yellow coat of fur with dark stripes.
- Lion was the National Animal of India till 1972. Later on, it was replaced by Tiger.

Other Indian National Symbols	
National Bird	Peacock *(Pavo Cristatus)*
National Flower	Lotus *(Nelumbo Nucipera Gaertn)*
National River	Ganga
National Tree	Banyan *(Ficus Benghalensis)*
National Fruit	Mango *(Mangifera Indica)*
National Aquatic Animal	Ganges River Dolphin
National Heritage Animal	Elephant
National Game (De-facto)	Hockey

National Emblems of Countries	
Country	**Emblem**
India	Sarnath Lion Capital
Australia	Kangaroo
Bangladesh	Water Lily
Canada	White Lily
France	Lily
Germany	Corn flower
Iran	Rose
Italy	White Lily
Japan	Chrysanthemum
Pakistan	Crescent
Spain	Eagle
Sri Lanka	Sword & Lion
Russia	Sickle and Hammer
Norway	Lion
United Kingdom	Rose
USA	Golden Rod

Significance of Signs and Symbols	
Symbol	**Meaning**
Red triangle	Family planning
Red cross	Hospital/Ambulance
Red light	Danger/Emergency
Green light	Line clear signal
Olive branch	Peace
Black arm-band	Sign of mourning/protest
Dove	Peace
Black flag	Demonstration of protest
Red flag	Sign of danger, revolution
Yellow Flag	Displayed by ship with infectious disease on board or ship in quarantine.
White Flag	Truce
Tricolour	National Flag of India

Significance of Signs and Symbols	
Symbol	**Meaning**
Union Jack	National Flag of UK
Lotus	Culture and civilization
Wheel	Progress
Flag flown half mast	National mourning
Flag flown upside down	Distress
A blind-folded woman holding a balance	Justice
Pen	Symbol of Culture and Civilization

Country Symbols	
Country	**Symbol**
India	Royal Bengal Tiger
China	Dragon
Russia	Brown Bear
USA	Bald Eagle
Spain	Red Carnation
Japan	Cherry Blossom
England	Rose
Australia	Golden Wattle Flower
South Africa	Blue Crane
Greece	Olive Branch

Official Publications of Countries/Organizations	
Publication	**Issued/Released by**
Blue Book	Report by the British Government
Green Book	Government of Italy and Iran
Grey Book	Japanese and Belgium Government
Orange Book	Government of the Netherlands
White Book	Official publication of Germany, Portugal and China
White Paper (Shwet Patrika)	Issued by the Government of India
Yellow Book	Issued by the Government of France
Economic Survey	Ministry of Finance (Government of India)
Report on Currency and Finance	Reserve Bank of India
Wholesale Price Index	Ministry of Commerce and Industry
National Accounts Statistics	Central Statistical Organization

Some Disputed Territories of the World Area	
Territory	**Dispute Between**
Banaba Island	Kiribati and Fiji
Bougainville	Papua New Guinea & the Soloman Island.
Shebba farms	Israel, Syria and Lebanon
Lower Kurile Islands	Russia and Japan
Minerva Reef	Tonga and Fiji
Sir Creek	India and Pakistan
Sabah (North Borneo)	Philippines and Malaysia
South Sandwich Islands	UK and Argentina
Hans Island	Denmark and Canada
Falkland Island	UK and Argentina
Strail of Juan de Fuca	USA and Canada
Isla Pereji-I	Spain and Morocco
Ilemi Triangle	Sudan and Kenya
Bakassi	Nigeria and Cameroon
Melilla	Spain and Morocco

PRACTICE QUESTIONS

GENERAL KNOWLEDGE

Q.1 'World Development Report' is an annual publication of
(a) United Nations Development Programme (UNDP)
(b) International Bank for Reconstruction and Development (IBRD)
(c) World Trade Organization (WTO)
(d) International Monetary Fund (IMF)

Q.2 Commonwealth of Independent States (CIS) is made up of
(a) 10 Members (b) 15 Members
(c) 11 Members (d) 8 Members

Q.3 Maastricht Treaty is related to
(a) Global warming
(b) Bio-diversity
(c) Biological weapons
(d) European Community

Q.4 Which of the following is not a member of SAARC?
(a) Bhutan (b) Bangladesh
(c) Myanmar (d) Maldives

Q.5 The first regular session of the General Assembly of the UN was held at
(a) New York (b) Paris
(c) London (d) Moscow

Q.6 The first month of Indian National Calendar is
(a) Phalguna (b) Magha
(c) Jaishtha (d) Chaitra

Q.7 The National Anthem of India (Jana gana mana) was first sung in
(a) 1912 (b) 1919
(c) 1929 (d) 1911

Q.8 Which of the following is correctly matched with regard to thermal power projects?
(a) Korba .....UP
(b) Ramagundam..... MP
(c) Talcher .....AP
(d) Kawas .....Gujarat

Q.9 Which of the following types is used by computed tomography employed for visualisation of the internal structure of human body?
(a) X-rays
(b) Sound waves
(c) Magnetic resonance
(d) Radio isotopes

Q.10 The nearest planet to the sun is
(a) Venus (b) Mars
(c) Mercury (d) Jupiter

Q.11 Which one of the following is not correctly matched?
(a) Indian Rare Earths Ltd. – Mumbai
(b) Uranium Corporation of India – Jaduguda
(c) Radio Astronomy Centre – Mysuru
(d) Saha Institute of Nuclear Physics – Kolkata

Q.12 Nomadic elephant is the exercise between?
(a) India-Mangolia
(b) India-US
(c) India-Japan
(d) India-China

Q.13 START (Strategic Arms Reduction Treaty) is a treaty between/among
(a) China and Japan
(b) USA and Russia
(c) USA and European Union
(d) China, India, USA and Russia

Q.14 Pinaka is a
(a) Multi barrel Rocket Launcher System
(b) Unmanned Aerial Vechicle
(c) Anti Tank Missile System
(d) Nuclear Submarine

Q.15 India's first indigenously built sub-marine is
(a) INS Shahkul
(b) INS Savitri
(c) INS Vibhuti
(d) INS Shalki

Q.16 With which one of the following games is the Hopman Cup associated?
(a) Badminton
(b) Lawn Tennis
(c) Hockey
(d) Football

Q.17 Who of the following is not associated with Sitar?
(a) Amir Khusrau
(b) Ravi Shankar
(c) Vilayat Hussain Khan
(d) Amjad Ali Khan

Q.18 Which of the following Indian States has the largest number of Scheduled Tribe population?
(a) Bihar (b) Odisha
(c) MP (d) Assam

Q.19 Who of the following was not the acting President of India?
(a) V. V. Giri
(b) B. D. Jatti
(c) Muhammad Hidayatullah
(d) Zakir Hussain

Q.20 The first Chief Justice of India was
(a) M. Patanjali Sastri
(b) Mehar Chand Mahajan
(c) Hiralal J. Kania
(d) B. K. Mukherjee

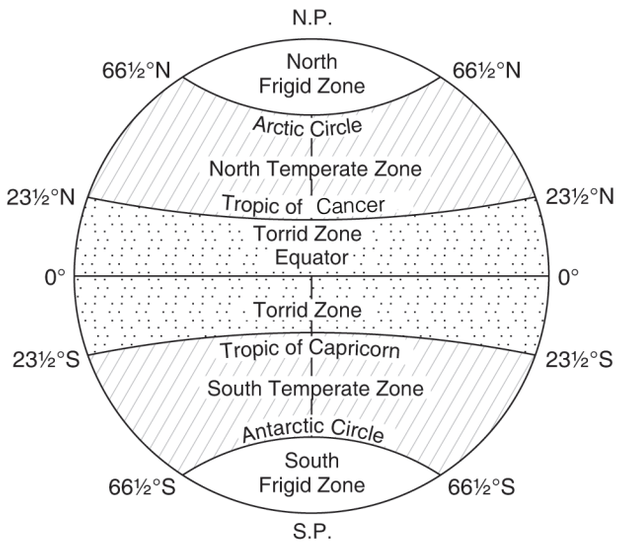
CHAPTER

2 GEOGRAPHY

General Aspects of Geography

Latitude

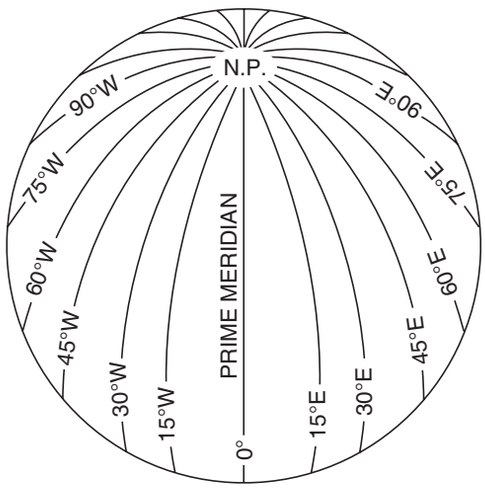
- It is the angular distance of a point on the earth's surface, measured in degrees from the centre of the earth. It varies from 0 to 90° North and 0 to 90° South.
- Latitudes are circular lines which are parallel to the equator, which lies midway between the poles. Hence, these lines are called **parallels of latitude**. The latitudes are also called as temperature coordinates because with the increase in latitudinal distance towards the poles, the temperature reduces.



- The most important lines of latitude are the Equator (0°), the Tropic of Cancer (23½°N), the Tropic of Capricorn (23½°S), the Arctic Circle (66½°N) and the Antarctic Circle (66½°S).
- The midday sun is exactly overhead at least once a year on all latitudes in between the Tropic of Cancer and the Tropic of Capricorn. This area, therefore receives the maximum heat and is called the **Torrid Zone** (or Tropical Zone).
- The areas bounded by the Tropic of Cancer and the Arctic Circle in the northern hemisphere, and the Tropic of Capricorn and the Antarctic Circle in the southern hemisphere, have moderate temperature, hence called **Temperate Zones** (or Mild Zone).
- Areas bounded by the Arctic Circle and North Pole, and the Antarctic Circle and South pole are called **Frigid Zones**. These zones are very cold as the sun does not rise above the horizon.

Longitude

- It is an angular distance measured in degrees along the equator east or west of the Prime Meridian (0°). It varies from 0 to 180° E and 0 to 180° W. It is also called as time coordinates.
- Longitudes are also known as **Great circles** because it divides earth into two equal parts. Each longitude cuts each latitude at 90°.
  1° = 4 minute i.e. 15° = 1 hour
- Meridians are a series of semicircles that run from pole to pole passing through the equator.



- The Prime Meridian is at 0° and is known as the **Greenwich line** as it passes through Greenwich near London, where the British Royal Observatory is located.
- Longitudes have one very important function i.e. they determine Local Time in relation to Greenwich Mean Time (GMT).
- Local Time is the time reckoned by the noon-sun at a given place and Standard Time is the Local Time of the Standard Meridian of a country.
- In India, the longitude of 82½° E is treated as the Standard Meridian. The Local Time at meridian is taken as the Standard Time for the whole country. It is known as the **Indian Standard Time** (IST).

International Date Line

- It is an imaginary line drawn at 180° longitude, avoiding the continuous land parts.
- International Date Line passes through Arctic Ocean, Bering Strait, Pacific Ocean, Antarctica, Fiji, Tonga and other islands.
- It is also the longitude where the date changes by exactly one day when it is crossed. If a traveller moves westward (from East to West), he gains a day, whereas form eastward (from West to East), he will loose a day.

Motions of Earth

- The earth is a planet of the solar system. It is not static but has two types of motions:
  (a) Rotational Motion
  (b) Revolutional (or Orbital) Motion

(a) Rotation of Earth

- The earth spins (or rotates) continuously on its own axis from west to east once in every 24 hours, causing day and night. This motion is called Rotation of the Earth (also called 'Daily Motion').
- **Day and Night:** When the earth rotates on its own axis, only one portion of the earth's surface comes into the rays of the sun and experiences day light whereas the other portion experiences darkness (or night).

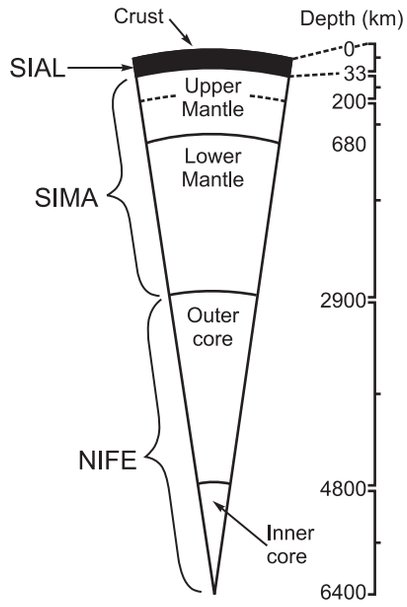
(b) Revolution of Earth

- The earth also revolves around the sun in an orbit once in about 365 days and 6 hours, causing formation of seasons and the year. This motion is called Revolution of earth (also called annual movement).

Varying Lengths of Day and Night

- The axis of the earth is inclined to the plane of earth's orbit at an angle of 66½° giving rise to different seasons and varying lengths of day & night.
- The earth's revolution round the sun with its axis inclined at 66½° to the plane of earth's orbit changes the apparent altitude of the midday sun.
- The sun is vertically overhead at the equator on 21 March and 23 September and these two days are termed as **Equinoxes** (equal length of day & night in both the hemisphere).
- On 21 June, the sun is vertically overhead at the Tropic of Cancer (23½° N). This is known as **summer solstice**, when the northern hemisphere will have its longest day and shortest night.
- On 22 December, the sun is vertically over head at the Tropic of Capricorn (23½° S). This is known as **winter solstice**, when the southern hemisphere will have its longest day and shortest night.
- Beyond the Arctic Circle (66½° N) and Antarctic Circle (66½° S) darkness lasts for 6 months and daylight is continuous for the remaining 6 months.

Structure of Earth



- The earth as a whole has been divided into three broad zones:

1. **Crust (SIAL) :** The earth is made up of several distinct layers but the outermost layer is called the crust. The crust is not a continuous layer of rocks, but consists of large masses called plates, which are free to drift slowly over a layer called **Asthenosphere**.

- The crust has a thickness of about 33 km in the continents (Continental crust) and 5-10 km thick in the ocean basins (Oceanic crust). **Silica** and **Aluminium** are the main constituent of the earth therefore it is also known as Sial.

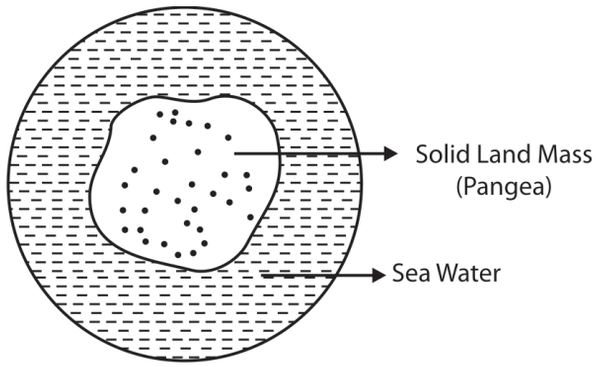
2. **Mantle (SIMA) :** The layer of rock below the crust is called the mantle. It is about 2900 km thick and is divided into the upper and lower mantle. This layer contains most of the mass of the earth, and is where most of the earth's heat is located. The mantle is composed mainly of **Ferro-magnesium silicates**.
   - **(a) Upper Mantle:** The upper mantle is about 650 km thick and has two distinct layers. The top layer of the upper mantle is solid. Combined with the crust, this layer forms the Lithosphere, which makes up the earth's plates. With in this layer is the **Asthenosphere**, where semi molten rock flows slowly.
   - **(b) Lower Mantle :** The lower mantle is solid and is about 2700 km thick. Though temperatures are higher here but the tremendous pressures keep the rock material from melting.
3. **Core :** It is the innermost part of the earth and it comprises of outer core and inner core.
   - **(a) Outer Core :** The outer core is liquid and is about 1900 km thick. It comprises of **molten iron** and **nickel**, formed as a result of the extremely high temperature. This liquid outer core controls the earth's magnetic field.
   - **(b) Inner Core:** The earth's innermost core is about 1600 km thick and is made up of **solid iron** and **nickel**. The inner core is incredibly hot, with temperature reaching about 5,500°C and is subjected to a pressure of about 4 million atmospheres. It is this extreme pressure that keeps the inner core in a solid state.

Formation of Continents

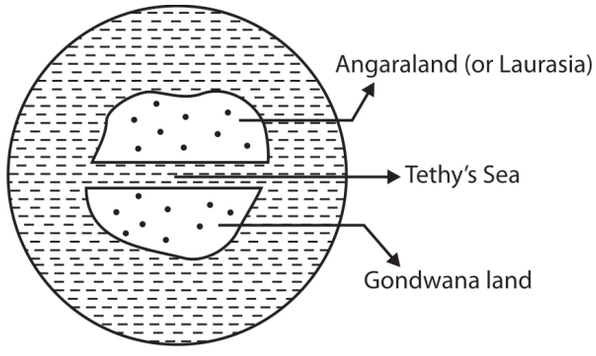
- The age of earth is about 4500 million years (4.5 billion) and about 70%, of the total surface area of the globe is represented by the oceans (Hydrosphere), whereas remaining, 29.2% is represented by the continents, (Lithosphere).
- More than 75% of the total land area of the globe is situated to the north of the equator, therefore the northern hemisphere is also known as the '**Land Hemisphere**' and the Southern hemisphere as the '**Water Hemisphere**'. It is believed that the continents are moving away from each other, Several theories have been propounded to explain this phenomenon:

Continental Drift Theory:

- This theory was proposed by famous German Geographer, Prof. **Alfred Wagner** in 1924. According to this theory, before 200 million years ago, there was a single land mass surrounded by water which was named as **Pangea**.



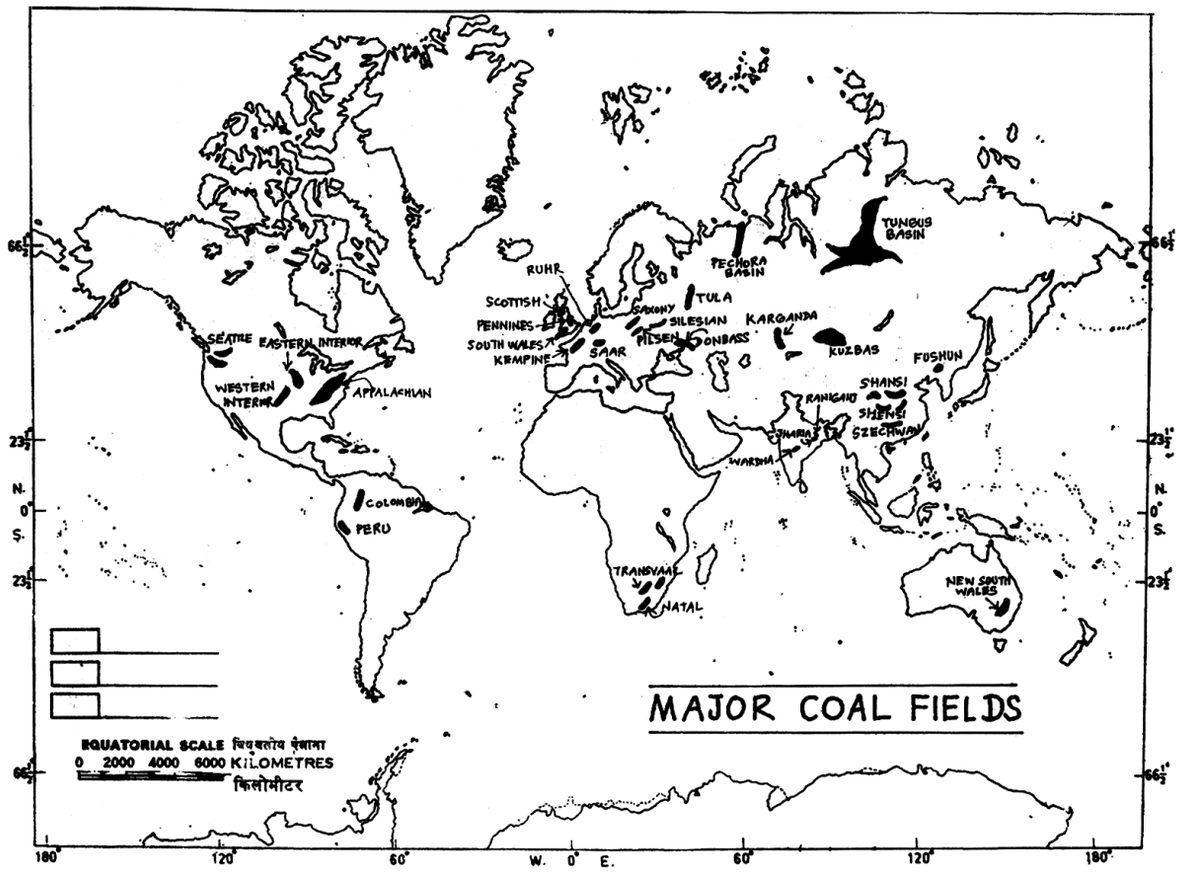
- About 200 million years ago, pangea got cracked into two parts i.e. (a) **Angaraland** (or Laurasia) (b) **Gondwana land**, and ocean water filled in it. As a result, a narrow sea was created, known as **Tethy's Sea**.



- During further course of time, Angaraland was cracked into:
  (i) North American Plate (ii) Eurasian Plate
  Whereas Gondwana land was cracked into 5 plates:
  (i) African Plate
  (ii) South American Plate
  (iii) Indian Plate
  (iv) Australian Plate
  (v) Antarctic Plate

Major mining centres:-

- **China :-** It is main producer of coal from inner Mongolia, Shansi, Anhui, Jiangsu & Hegei region.
- **USA :-** Appalachian region
- **CIS:-** Kuznetsk basin, Karganda and Donetz basin (Ukraine)
- **Europe :-** Franco-Belgian, Ruhr, Saar, Sileria, Pilsen and Saxony in Germany and Poland are main regions.
- **Australia:-** Newsouth Wales and Queensland



12 Mineral Oil

- It is made from tiny marine creatures, minute plants and animals which were buried under sediments around 100 to 200 million years ago. So, it is found in sedimentary rocks and continental shelves.

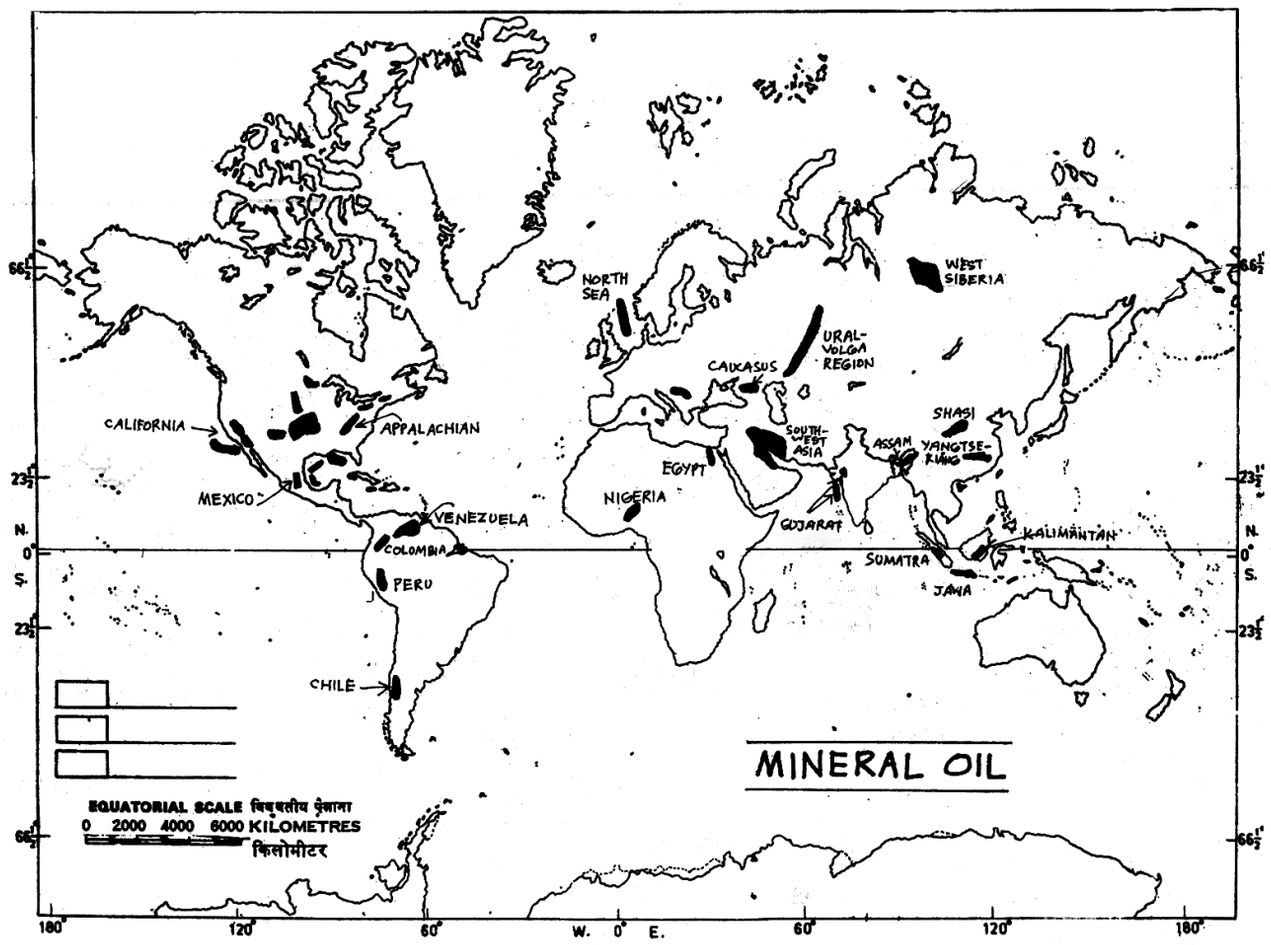
World's largest mineral oil producer countries:-

1. USA
2. Saudi Arabia
3. Russia

World's largest reserves:-

1. Venezuela
2. Saudi Arabia
3. Canada

- Saudi Arabia, Iraq, Kuwait, Iran, UAE, Bahrain and Oman are main oil producing countries in West Asia. In India, oil is found in Assam, Gujarat and Bombay High and in Myanmar Irrawaddy and Chindwin Valleys are the major oil producing areas.



13. Nuclear Energy

- It is produced using radioactive fuels, such as Uranium, Thorium, Plutonium or by fusion using heavy isotopes of Hydrogen. Uranium after use produces Plutonium.
- **Uranite** (65% to 80% purity) and **Pitchblende** (50% to 80% purity) are ores of Uranium.
- **Canada** is the largest producer of Uranium, whereas Kazakhstan has largest reserves. In Canada, Uranium is mined near Lake Athabasca and Port Radium near Lake Great Bear.
- In USA, Uranium is mined from Colorado Plateau, Marysville and Wyoming.
- South Africa, Zaire, Malagasy, Australia, Germany, Sweden, Spain, Czechoslovakia, CIS and Yugoslavia are other important producers of Uranium. In India, Uranium is mined in Gaya, Singhbhum, Udaipur, Jaipur, Nellore, Palghat and Shillong Plateau.
- The Uranium Corporation of India Ltd. (UCIL) which DAE set up in 1967, operates four mines namely Jadugoda, Bhatin, Narwapahar and Turamdih.
- **Monazite** is the major ore of thorium in the world. It is found in Brazil, Australia, Malaysia, Sri Lanka, Kerala coast of India & USA. India accounts for roughly 32% of world's Thorium deposits.
- **Allanite** is another ore of thorium found in Andhra Pradesh & Rajasthan in India.

Glossary of Geographical Terms

Anemometer: An instrument used for measuring wind velocity.

Anticline: The arch or crest of a fold in the rocks. Its opposite is a syncline, the bottom of a fold.

Apogee: The position of the moon or any other heavenly body, when it is at its greatest distance from the earth. At its shortest distance from the earth the moon is said to be in perigee.

Asteroids or planetoids: Minor planets revolving around the sun between the orbits of Mars and Jupiter.

Atmosphere: The envelope of air surrounding the earth. The most abundant among its constituents are nitrogen and oxygen.

Avalanche: A large mass of snow and ice at high altitude, sliding downslope on a mountain. Usually a large amount of rock material is also involved in an avalanche.

Beach: A gently sloping strip of land along the coast. This lies between the high and low tide levels and is formed by depositional action of waves.

Canyon : A narrow, deep, steep-sided river valley cut in the soft rocks.

Cape : A headland, a more or less pointed piece of land jutting out into the sea.

Cartography : The art of drawing maps and charts.

Climate : The average weather conditions of region throughout the seasons.

Climatology : The science studying climates and their influence on other components of the environment.

Cloud : A mass of tiny water droplets or ice crystals formed by condensation of water vapour in the atmosphere.

Condensation : The process by which a substance changes from vapour to liquid.

Convection : The uplift of air as a result of surface heating or instability due to other reasons. Generally this term refers to vertical movement of gases in contrast to advection.

Convection currents : Due to instability in air some vertical motions in the atmosphere are set up which are more or less in the form of currents.

Colour of the sky : Seems blue because of the selective scattering of light in the atmosphere by gases and dust particles.

Downs : Grasslands of Australia.

Estuary : Mouth of a river where tidal effects are evident and where fresh water and sea water mix. The term also refers to river valleys which have been flooded by sea due to coastal subsidence.

Fauna : The animal life of a region or a geological period.

Flora : The plant life of a region or geological period.

Geosyncline : A large depression or trough in the earth's crust, that is a syncline on a large scale.

Geyser : A thermal spring which throws up a jet of hot water and steam intermittently.

Glacier : A moving mass of ice.

Gorge : A narrow and deep valley of a river.

Great circle : A circle on the earth's surface whose plane passes through its centre and thus bisects it into two hemispheres.

Gulf : A large, deep bay.

Hinterland : Area from which a port gets most of its exports.

Humidity : State of the atmosphere with respect to the water vapour it contains.

Humus : Decomposed and partly decomposed organic matter in the soil.

Hydrology : The study of the water content on the earth.

Hygrometer : Instrument used for measuring humidity in the atmosphere.

Iceberg : A mass of land ice which has been broken off or carved from the end of a glacier and is afloat in the sea.

Insolation : Energy radiated from the sun received by the earth.

CHAPTER

4

INDIAN POLITY

Constitutional Developments

- It was in 1934 when the idea of Constituent Assembly for India was put forward for the first time by M. N. Roy (A pioneer of communist movement in India).
- In 1935, the Indian National Congress (INC) demanded a Constituent Assembly to frame the Constitution of India.
- In 1938, Jawaharlal Nehru, on behalf of INC declared that the Constitution of Free India must be framed without outside interference and by a Constituent Assembly elected on the basis of Adult Franchise. The demand was accepted by British Government during August Offer in 1940.
- In 1942, Sir Stafford Cripps, a member of the British Cabinet came to India with draft proposal of the British Government on the framing of an independent Constitution which to be adopted after the World War II.
- The Cripps Proposals were rejected by the Muslim League which wanted India to be divided into two autonomous States with two separate Constituent Assemblies.
- Finally, the Constituent Assembly was constituted in November,1946 under the scheme formulated by the Cabinet Mission Plan.

Important British Acts of Constitutional Significance

Regulating Act, 1773

- The Regulating Act, 1773 was the first step taken by the British Government to control and regulate the affairs of the East India Company in India.
- It designated the Governor of Bengal as the 'Governor-General of Bengal' and created an Executive Council consisting of four members to assist him. The first Governor-General of Bengal was Lord Warren Hastings.
- It made a provision of Supreme Court at Fort William in Calcutta, comprising one Chief Justice and three other judges.
- It strengthened the control of the British Government over the East India Company by requiring the Court of Directors which was a governing body of the Company to report on its revenue, civil and military affairs in India.

Pitt's India Act, 1784

- This Act created a new body called Board of Control to manage the political affairs while Court of Directors were allowed to manage the commercial affairs. Thus, Pitts's India Act made a provision of separation in company's political and commercial activities.
- It empowered the Board of Control to supervise and direct all operations of the civil and military affairs and revenues of the British possessions in India.
- The Company's territories in India were for the first time called **British Possessions in India.**

Charter Act, 1793

- This Act recognised the courts and redefined their jurisdictions. Accordingly, the revenue administration was separated from the judiciary functions. This provision led to disappearing of the Maal Adalats (Revenue courts).
- Salaries of the members of the Board of Control to be drawn from the Indian exchequer.

Charter Act, 1813

- The East India Company's monopoly over trade was abolished in India but its monopoly over trade with China and for trade in tea retained.
- This Act asked Company to spend one lakh rupees every year on the education of Indians.
- Christian missionaries were permitted to propagate their religion in India.

Charter Act, 1833

- This Act made the Governor-General of Bengal as the Governor-General of India and vested in him all civil and military powers. Lord William Bentinck was made the first Governor-General of India.
- The East India Company lost its monopoly over trade with China also and it was asked to close the commercial business. The Company became a purely administrative body.
- This Act asked government to abolish **slavery** in India.

Charter Act, 1853

- This Act had provisions of separation of executive and legislative functions of the Governor General's Council. It provided for addition of six new members called Legislative Councillors to the **Indian (Central) Legislative Council.**
- For the first time, the local representation in the Indian (Central) Legislative Council was allowed.
- An open competition system of selection and recruitment of civil servants was introduced. For the first time, Indians were allowed to take part in Civil Services recruitment process. Consequently, the Macaulay Committee (the Committee on the Indian Civil Service) was appointed in 1854.

Government of India Act,1858

- It brought an end to the Company's rule and transferred all powers to the British crown.
- The system of **Dual government** (Board of Control and Court of Directors) introduced by Pitt's India Act was abolished by this Act.
- A new office of **Secretary of State for India** was created and he was vested with complete authority and control over Indian administration. He was a member of the British Cabinet and was ultimately responsible to the British Parliament. Lord Stanley was the first Secretary of State for India.

Indian Councils Act, 1861

- The Viceroy was empowered to issue ordinances in case of emergency without the concurrence of the legislative council. The life span of such ordinances was six months.
- This Act also introduced the 'portfolio' system. Under this, a member of the Viceroy's council was made in-charge of one or more departments of the government.

Indian Councils Act, 1892

- This Act empowered the Universities, district boards, municipalities, zamindars and chambers of Commerce to recommend members to the Provincial Legislative Council which were to be nominated by governors.
- According to this Act, the members of the Legislatures were for the first time entitled to take part in debate over Annual Statement of Revenue and Expenditure i.e. Budget. They could also put questions within certain limitations.

Indian Councils Act, 1909 (Morley-Minto Reforms)

- This Act is also known as **Morley-Minto Reforms.** Morley was the then Secretary of State for India and Lord Minto was the then Viceroy of India.
- Muslims were given separate representation and hence Lord Minto came to be known as the **Father of Communal Electorate.**
- A provision was made for the association of Indians with the Executive Council of the Viceroy and Governors. **Satyendra Prasad Sinha** became the first Indian to join the Viceroy's Executive Council. He was appointed as Law Member.

Government of India Act, 1919 (Montague-Chelmsford Reforms)

- This Act is also known as **Montague-Chelmsford Reforms or Montford Reforms.** Montague was the then Secretary of State for India and Chelmsford was the then Viceroy of India.
- All administrative subjects were divided into two groups viz. central and provincial subjects. Provincial subjects were further divided into two parts- transferred and reserved. The **transferred subjects** were to be administered by the Governor with the aid of ministers responsible to the Legislative Council whereas Governor was not responsible towards Legislative Council in the discharge of **reserved subjects.**
- This dual scheme of governance was known as 'dyarchy', a term derived from the Greek word diarche, which means double rule.
- For the first time, Indian Central Legislature was made **bicameral** (two Houses).

Q.56 The Committee of Parliament on Official Language comprises

(a) 20 members from Lok Sabha and 10 members from Rajya Sabha

(b) 10 members from Lok Sabha and 20 members from Rajya Sabha

(c) 10 members from Lok Sabha and 10 members from Rajya Sabha

(d) 20 members from Lok Sabha and 20 members from Rajya Sabha

Q.57 Match **List-I** (Item in the Indian Constitution) with **List-II** (Country from which it was derived) and select the correct answer using the codes given below the lists:

List-I	**List-II**
A. Directive Principles of State Policy	**1.** Australia
B. Fundamental Rights	**2.** Canada
C. Concurrent List in Union-State Relations	**3.** Ireland
D. India as a Union of States with greater powers to the union	**4.** UK
	5. USA

Codes:

	A	**B**	**C**	**D**
(a)	5	4	1	2
(b)	3	5	2	1
(c)	5	4	2	1
(d)	3	5	1	2

Q.58 Match **List-I** with **List-II** and select the correct answer using the codes given below the lists:

List-I

A. Lord Mountbatten
B. Dr. Rajendra Prasad
C. Dr. B. R. Ambedkar
D. Pandit J. L. Nehru
E. Dr. K. M. Munshi

List-II

1. Chairman of the Drafting Committee
2. First Prime Minister of India
3. Member of the Constituent Assembly
4. Last British Governor-General
5. President of the Constituent Assembly
6. Legal Adviser to the Constituent Assembly

Codes:

	A	**B**	**C**	**D**	**E**
(a)	4	1	5	2	6
(b)	4	5	6	2	1
(c)	4	5	1	2	3
(d)	4	3	6	2	1

INDIAN POLITY

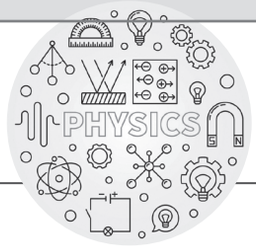
ANSWER KEY

1. (a)	**2.** (a)	**3.** (c)	**4.** (b)	**5.** (d)	**6.** (b)	**7.** (c)	**8.** (a)	**9.** (d)
10. (b)	**11.** (b)	**12.** (a)	**13.** (a)	**14.** (a)	**15.** (c)	**16.** (c)	**17.** (d)	**18.** (d)
19. (a)	**20.** (b)	**21.** (b)	**22.** (a)	**23.** (a)	**24.** (a)	**25.** (a)	**26.** (d)	**27.** (a)
28. (d)	**29.** (a)	**30.** (c)	**31.** (a)	**32.** (c)	**33.** (d)	**34.** (d)	**35.** (a)	**36.** (c)
37. (a)	**38.** (b)	**39.** (c)	**40.** (b)	**41.** (b)	**42.** (c)	**43.** (a)	**44.** (d)	**45.** (a)
46. (c)	**47.** (c)	**48.** (c)	**49.** (c)	**50.** (d)	**51.** (a)	**52.** (b)	**53.** (b)	**54.** (b)
55. (a)	**56.** (a)	**57.** (d)	**58.** (c)					

CHAPTER

5

GENERAL SCIENCE



PHYSICS

Physics is a branch of science which is concerned with all aspects of nature on both the microscopic and macroscopic level. Its scope of study encompasses not only the behavior of objects under the action of forces but also the nature of gravitational, electromagnetic, nuclear forces among others.
The ultimate objective of physics is to formulate comprehensive principles that bring together and explain all such phenomena.

UNITS & MEASUREMENT

- Unit is the chosen standard used for measuring a physical quantity.
- There are basically two types of unit:
  1. **Fundamental Unit:** These units are a set of measurements, defined arbitrarily and from which other units are derived. Examples: meter, kilogram, second, etc.
     The fundamental unit of some of the physical quantities are given below:

International System of Units (S.I.)		
Physical	**Fundamental**	**Symbol**
Mass	Kilogram	kg
Length	Metre	m
Time	Second	s
Temperature	Kelvin	K
Electric-current	Ampere	A
Luminous intensity	Candela	Cd
Quantity of matter	Mole	mol

Systems of units	Length	Mass	Time
C.G.S. System	Centimetre	Gram	Second
F.P.S. System	Foot	Pound	Second
M.K.S. System	Metre	Kilogram	Second

  2. **Derived Unit:** All the units which are expressed in terms of fundamental units are known as derived units. Examples: Newton, Joule, etc.
- Internationally, there are four types of unit systems. These are:
  1. **S.I. Units/System:** It is the modern form of the metric system, and is the most widely used system of measurement. It comprises a coherent system of units of measurement built on seven base units namely kilogram, meter, second, candela, ampere, kelvin and mol.
  2. **CGS System:** The centimeter-gram-second (CGS) system of units is a variant of the metric system based on centimetre as the unit of length, gram as unit of mass, and the second as the unit of time.
  3. **FPS System:** The foot-pound-second (FPS) system is a system of units built on three fundamental units: the foot for length, the pound for mass and the second for time.
  4. **MKS System:** The MKS system of units is a physical system of units that expresses any given measurement using base units of the metre, kilogram, and second.

Basics of Motion

A body is said to be in motion if it changes its position with respect to its surroundings as time goes on. A body is said to be at rest if it does not change its position with time, with respect to its surroundings.

Types of Motion

(i) When a particle or a body moves along a straight path, its motion is Rectilinear or translatory motion.

(ii) When a particle or a body moves in a circular path, its motion is circular motion. When a body spins about its own axis, it is said to be in rotational motion.

(iii) When a body moves to and fro or back and forth repeatedly about a fixed point in a definite interval of time, it is said to be in vibrational or oscillatory motion.

Speed

The time rate of change of position of an object in any direction i.e. the rate of change of distance of an object with respect to time is known as speed.

$$\text{Speed} = \frac{\text{displacement}}{\text{time taken}}$$

Velocity

The rate of change of displacement of an object with respect to time is known as velocity.

$$\text{Velocity} = \frac{\text{displacement}}{\text{time}}$$

Acceleration

The rate of change of velocity with respect to time is called acceleration.

$$\text{Acceleration} = \frac{\text{Change in velocity}}{\text{time taken}}$$

When a body completes equal displacement in equal interval of time, its velocity is constant and hence, it does not have an acceleration. When a body shows equal change in velocity in equal interval of time its velocity is not constant but it has a constant acceleration.

Equation of Motion

For a body moving with a uniform velocity

If a body completes a displacement 'S' in time 't' with a uniform velocity 'V', then,

$$\text{Displacement} = \text{velocity} \times \text{time}$$

or $$S = vt \qquad \text{...(i)}$$

For a body moving with a uniform acceleration

If a body starting with an initial velocity 'u' moves with a uniform acceleration 'a' for a time 't' and attains a final velocity 'v' after travelling a displacement 's' then,

$$S = ut + \frac{1}{2}at^2 \qquad \text{....(ii)}$$

$$v^2 = u^2 + 2as \qquad \text{...(iii)}$$

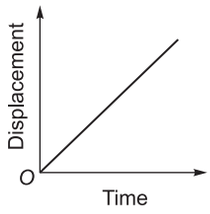
When the velocity of a body increases, it has a positive acceleration and when the velocity decreases, it has a negative acceleration.

This negative acceleration is called deceleration or retardation.

Position (Displacement)-Time Graphs

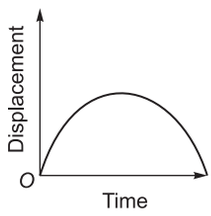
For a body moving with a uniform velocity

This graph comes as a straight line because in a uniform velocity the particle completes equal displacement in an equal interval of time.



For the motion of a body thrown vertically upwards

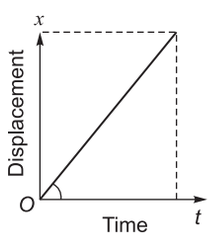
When the body moves up, its velocity continuously decreases due to gravity and finally becomes zero at the maximum height. Then, the body falls with an increasing velocity.



The slope of the position time graph is equal to the uniform velocity.

$$\text{Slope} = \frac{\text{Displacement}}{\text{Time}}$$

or $$V = \frac{x}{t}$$



Physical Quantities

Vectors

They have a definite magnitude and a definite direction, e.g. displacement, velocity, acceleration, force etc.

Scalars

They have definite magnitudes only and not direction. e.g. distance, speed, work, energy, power, electric charge etc.

Tensors

They have different magnitudes in different directions, e.g. Moment of interia, stress etc.

In a motion, a body can have a constant speed but variable velocity like the motion of a body along a circular path. A particle may have zero displacement and zero velocity but non-zero distance and speed. When a body completes one revolution along a circular path in a given time period, the net displacement and velocity of the body will be zero but the distance and speed of the body must be non-zero.

Linear-Momentum

It is the quantity of motion which a body possesses and is measured as the product of the mass and velocity of the body.

Linear momentum = mass × velocity

Impulse

The total change in momentum is called the impulse. If a very large force acts for a very small time, the product of force and the time is equal to the impulse.

Inertia

The inability of a body to change by itself its state of rest or state of uniform motion along a straight line is called inertia of the body.

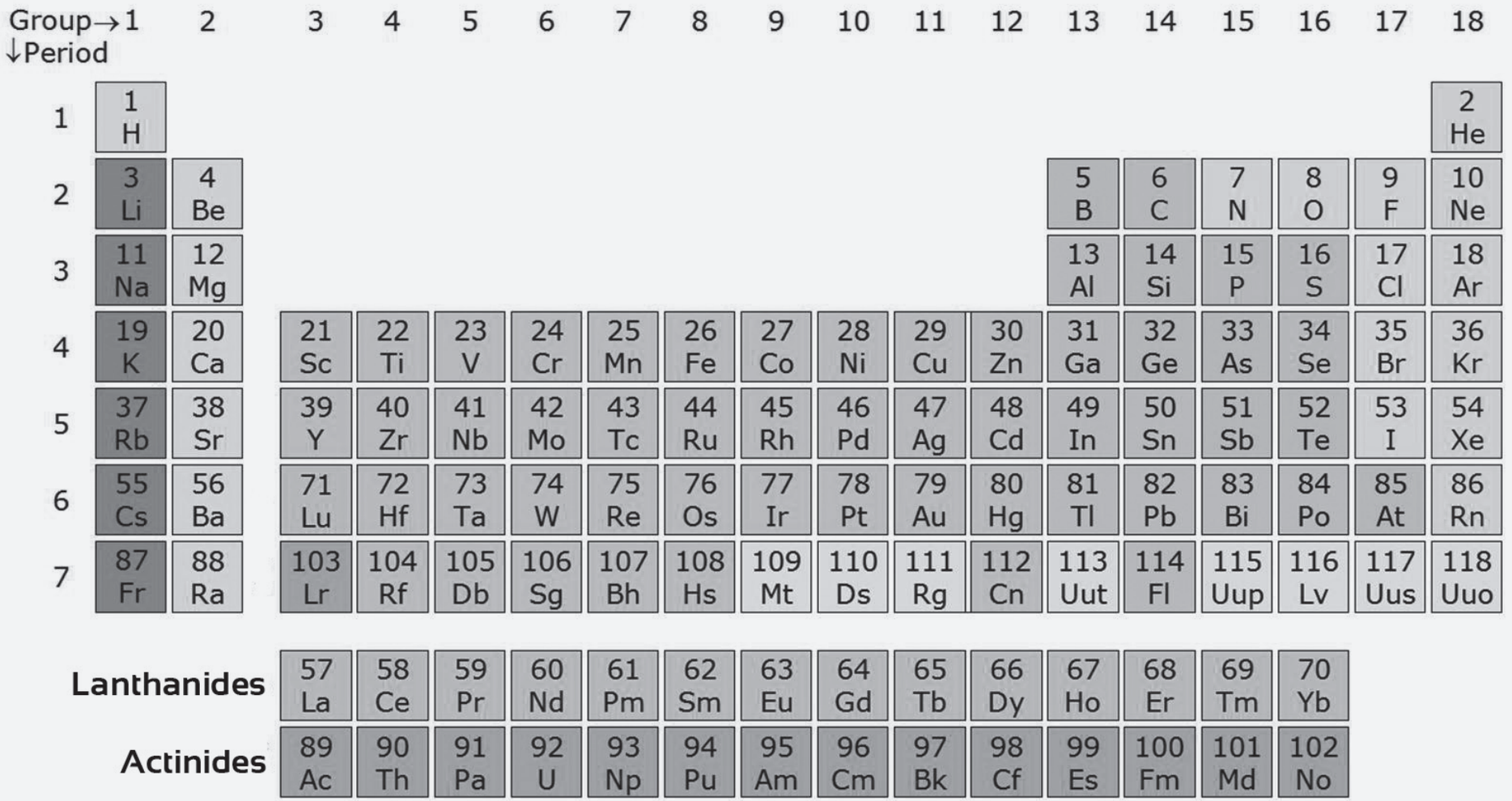
The inertia of a body is measured by its mass. Heavier the body, greater is the force required to change its state and hence greater is its inertia. Inertia of a body may be inertia of rest, inertia of motion or inertia of direction.

Newton's Laws of Motion

First Law of Motion

Every body continues to be in a state of rest or uniform motion in a straight line, except in so far as it may be compelled by force to change that state.' Newton's first law of motion defines inertia.

1. **Inertia of Rest :** The inability of a body to change by itself its state of rest.
   - When a branch of a fruit tree is shaken, the fruits fall down. This is because the branch comes in motion and the fruits tend to remain at rest. Hence, they get detached.
   - The dirt particles in a durree fall off if it is stricken by a stick. This is because the striking sets the durree in motion whereas the dirt-particles tend to remain at rest and hence fall.
   - When a train starts suddenly, the passenger sitting inside tends to fall backwards. This is so because the lower part of the passenger's body starts moving with the train but the upper part tends to remain at rest.
   - If a smooth paper having a coin on it placed on a table is suddenly drawn, the coin remains at the same place on the table due to inertia of rest.
   - When a horse starts suddenly, the rider tends to fall backwards due to inertia of rest
2. **Inertia of Motion :** The inability of a body to change by itself its state of uniform motion.
   - When a horse at full gallop stops suddenly, the rider on it falls forward because of inertia of motion of the upper part of the rider's body.
   - When an athelete takes a long jump, he runs first for a certain distance before the jump. This is because his feet come to rest on touching the ground and the remaining body continues to move owing to inertia of motion.
   - When train stops suddenly, a passenger sitting inside tends to fall forward. It happens because the lower part of the passenger's body comes to rest with the train but the upper part tends to continue its motion due to inertia of motion.
   - A person jumping out of a speeding train may fall forward due to inertia of motion of his body. Hence, he should run a few steps on the platform in the direction of motion of train.



Modern Periodic Table

CHAPTER

7

SCIENCE & TECHNOLOGY

INDIAN INSTITUTIONS IN SCIENCE & TECHNOLOGY

Ministry of Science and Technology

Department of Science and Technology (DST), Department of Scientific & Industrial Research (DSIR) and Department of Biotechnology (DBT) are the departments which work under the Ministry of Science & Technology.

Department of Science and Technology (DST)

- DST is primarily entrusted with the responsibility of formulation of S&T policies and their implementation, identification and promotion of thrust areas of research in different sectors of S&T; technology information, forecasting and assessment; international collaboration, promotion of science & society programmes and coordination of S&T activities in the country.
- The list of autonomous S&T institutions is
  1. Agharkar Research Institute, Pune.
  2. Aryabhatta Research Institute of Observational-Sciences, Nainital.
  3. Birbal Sahni Institute of Palaeobotany, Lucknow.
  4. Bose Institute, Kolkata.
  5. Centre for Liquid Crystal Research, Jalahalli, Bengaluru.
  6. Indian Association for the Cultivation of Science, Kolkata.
  7. International Advanced Research Centre for Powder Metallurgy and New Materials, Hyderabad.
  8. Indian Institute of Astrophysics, Bengaluru.
  9. Indian Institute of Geomagnetism, Mumbai.
  10. Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru.
  11. National Accreditation Board for Testing & Calibration Laboratories, New Delhi.
  12. Raman Research Institute, Bengaluru.
  13. S.N. Bose National Centre for Basic Sciences, Kolkata.
  14. Sreechitra Tirunal Institute for Medical Sciences & Technology, Thiruvananthapura.
  15. Technology Information, Forecasting & Assessment Council (TIFAC), New Delhi.
  16. Vigyan Prasar, New Delhi.
  17. Wadia Institute of Himalayan Geology, Dehradun.
  18. Institute of Advanced Studies in Science & Technology, Guwahati.

Department of Scientific and Industrial Research (DSIR)

- Council of Scientific and Industrial research (CSIR) and Consultancy Development Centre (CDC) are the two autonomous institutions which work under DSIR.
- The Council of Scientific and Industrial Research (CSIR), with its 39 laboratories dedicated to research and development in well-defined areas and around 50 field stations, is the major organization under DSIR.
- Among the other programmes of DSIR are: support to R&D by industry, programmes aimed at technological self-reliance, schemes to enhance efficacy of transfer of technology and a National Information System for Science and Technology (NISSAT).
- The list of CSIR Laboratories is as follows:
  1. Central Building Research Institute (CBRI), Roorkee
  2. Center for Cellular & Molecular Biology (CCMB), Hyderabad
  3. Central Drug Research Institute (CDRI), Lucknow
  4. Central Electrochemical Research Institute (CECRI), Karaikudi

CHAPTER

8 ENVIRONMENT

Introduction

The word 'environment' has been derived from French word "*Environner*" which means "*to encircle*" or "*to surround*", whereas "Nature" word is derived from Latin word "*Natura*" which refers to characteristics of plants, animals and other creatures.

Components of Environment	
Abiotic	**Biotic**
• Energy • Radiation • Temperature and heat flow • Water • Atmospheric gases and wind • Fire • Gravity • Topography • Soil • Geological substratum	• Green plants • Non-green plants • Decomposers • Parasites • Symbionts • Animals • Man

All organisms (from virus to man) are obligatorily dependent on the environment for food, energy, water, oxygen, shelter and for other needs.

Environment is total sum of all conditions which affect evolution and development of life on Earth's surface where organisms live including abiotic components (soil, water, air, etc.) and biotic components (plants, animals, microorganisms, etc.).

Biosphere

Biosphere is the part of the earth's crust, hydrosphere, and atmosphere that supports life. It is formed through the interaction of atmosphere, lithosphere and hydrosphere.

The area of contact and interaction between these three components are the basic requirement for the biosphere to exist.

Atmosphere

The atmosphere is the body of air which surrounds earth. Most of the atmosphere is located close to the earth's surface where it is most dense.

The atmosphere is divided into a series of concentric shells of sphere due to the variations in temperature and pressure at various altitude.

Air Composition

Nitrogen and oxygen are the most abundant gases in the Troposphere, constituting about 78% and 20.9% of total gaseous volume respectively. The remaining 1 % consists of argon, water vapour, CO_2 and ozone. These gases occur in minute quantities in the atmosphere, but are essential for maintaining life on the earth.

Carbon dioxide, water vapour and ozone play an important role in maintaining the heat balance of the earth.

Normal Composition of Gases in Air		
Constituents	**Chemical Symbol**	**Mole Percent**
1. Nitrogen	N_2	78.08%
2. Oxygen	O_2	20.95%
3. Argon	Ar	0.93%
4. Carbon dioxide	CO_2	0.04%
5. Neon	Ne	0.00%
6. Helium	He	0.00%
7. Methane	CH_4	0.00%
8. Krypton	Kr	0.00%

Lithosphere

The Lithosphere is the solid, rocky crust covering entire earth. This crust is inorganic and is composed of minerals.

Geologically, Lithosphere refers to the combination of earth's crust and outer mantle. It provides the platform and habitat to the biotic elements of the ecosystem. It covers the entire surface of the earth from the top of Mount Everest to the bottom of the Mariana Trench.

Hydrosphere

The Hydrosphere is composed of all of the water on or near the surface of earth. This includes the oceans, rivers, lakes, and even the moisture in the air. Water is considered to be the most important constituent of biotic elements.

97% of the earth's water is in the oceans, and remaining 3% is fresh water. The three-quarters of the fresh water is solid and exists in ice sheets.

DO YOU KNOW

Biosphere has also been divided in different Bio-geographical realms at sub-global levels. Bio-geographic realms are large spatial regions within which ecosystems share a broadly similar biological evolutionary history.

Ecosystem

An ecosystem is a complex set of relationship among the living resources, habitats, and residents of an area. It includes plants, trees, animals, fishes, birds, micro-organisms, water, soil, people, etc. Everything that lives in an ecosystem is dependent on the other species and elements that are also part of ecological community.

Ecosystems include living organisms, the dead organic matter produced by them, the abiotic environment within which the organisms live and exchange elements (soils, water, atmosphere), and the interactions between these components.

When an ecosystem is healthy (i.e., sustainable) it means that all the elements live in balance and are capable of reproducing themselves.

The term 'ecosystem' was first coined by A.G. Tansley in 1935.

The concept of ecosystem was initially given by E.P. Odum who is widely considered as "Father of ecosystem/ ecology".

Structure of Ecosystem

Ecosystem is a subset of Biosphere, wherein various species, their populations and communities interact with each other along with non-living things like land, sunlight, wind, humidity, etc., called as abiotic elements, whereas, the living things are called as biotic elements.

Abiotic Components

Abiotic components are the inorganic and non-living parts of an ecosystem. These consist of soil, water, air, light energy, etc. They also involve a large number of gases like oxygen, nitrogen, etc. and physical processes including volcanoes, earthquakes, floods, forest fires, climate and weather conditions.

Abiotic factors are the most important determinants of where and how well an organism exists in its environment.

Some of the important abiotic factors are:

(i) **Energy (Sunlight):** Sunlight is the primary source of energy in nearly all ecosystems.

(ii) **Water:** Water is essential for all living beings. It helps to regulate body temperature.

(iii) **Temperature:** Temperature is a critical factor of the environment which greatly influences survival of organisms.

(iv) **Atmospheric gases:** Atmospheric gases like oxygen, nitrogen and carbon dioxide are imperative for the survival of flora and fauna of this planet.

(v) **Soil (Edaphic factors):** These factors include soil texture, soil temperature, soil water, soil solution and pH, together with soil organisms and decaying matter.

(vi) **Climate:** Climate of a region includes the average rainfall, temperature and the patterns of winds that occur. Climate is one of the most important abiotic factors of an ecosystem.

Biotic Components

Biotic components are classified according to their functional attributes into producers and consumers.

(i) **Producers**

Producers are also known as autotrophs, or self-feeders. Producers manufacture the organic compounds that they use as sources of energy and nutrients. Most producers are green plants or algae that make organic compounds through photosynthesis.

(ii) **Consumer**

Consumers are incapable of producing their own food. These are also known as Heterotrophs or phagotrophs (other nourishing). Consumers depend on organic food derived from plants, animals or both.

(a) Macro Consumers

Herbivores (Primary Consumers)

The consumers or organisms that feed on autotrophs are called herbivores. Examples: Deer, rabbit, cow, goat, grasshopper, rat, etc.

All the herbivorous animals which directly consume the plants are called primary consumers.

Carnivores (Secondary Consumers)

Carnivores are further subdivided into First, Second and Third order. These animals predate on herbivorous animals.

Omnivores (Tertiary Consumers)

Omnivorous animals eat herbivorous animals as well as plants. Examples: Sparrow, crow, fox, wolves, cat, dogs, snakes etc. belong to this category. Human being is the best example of omnivores because they can take their food from any stage of food chain i.e. they are dependent on autotrophs as well as on heterotrophs.

(b) Micro Consumers

Micro consumers are popularly known as decomposers or detritus. They breakdown complex compound of dead remnants of flora and fauna. They also decompose tissues of plants and animals into micro-nutrients. These are also known as Saprotrophs.

DO YOU KNOW

There are regular change in the activities of plants and animals, caused by factors such as light and heat from the sun, the tides, season and phases of the moon and the rotation of the earth. These regular, rhythmic changes are called biorhythms.

Biotic Interactions

Biotic interactions are the effects the organisms in a community have on one another. These interactions can involve individuals of the same species (intraspecific interactions) or individuals of different species. The species may interact once in a generation (e.g. pollination) or live completely within another (e.g. endosymbiosis).

The types of biotic interaction can be classified further as follows:

(i) Competition: The competition is defined as the process in which the organism fights for the same resources.

(ii) Predation: This is an interaction between the members of different species, in which one member catches the prey and kills them.

(iii) Parasitism : The parasitism is defined as the process in which two organisms of different species are present and in which one of the organism acts as a parasite and the other organism acts as a host.

(iv) Mutualism: Mutualism is the associations between pairs of species that bring mutual benefit. The individuals in the populations of each mutualist species can grow, survive and reproduce at a higher rate.

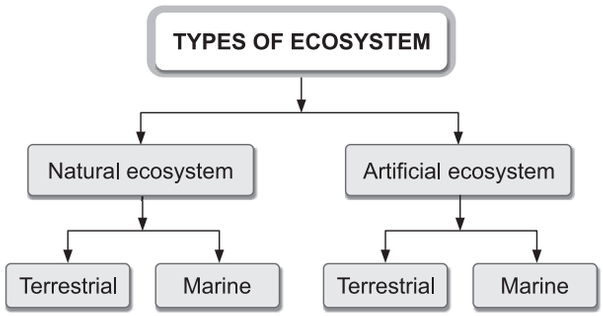
(v) Commensalism : The commensalism is a process in which two organisms of different species are present and in which one organism is benefitted while the other one acts as a neutral organism which is neither harmed and nor benefitted.

(vi) Amensalism : The amensalism is a process in which two organisms of different species are present and in which one organism do not allow, the other organism to survive.

(vii) Neutralism : Neutralism is a process in which neither population directly affects the other. It is the most common type of inter-specific interactions.

Types of Ecosystem

There are essentially two types of ecosystems: Natural and Artificial. These are further divided into terrestrial and marine ecosystems.



Terrestrial Ecosystems

Terrestrial Ecosystem is an ecosystem that exists on land, rather than on water. Such ecosystem is a community of organisms existing and living together on the land.

(iii) Mesotrophic: Many lakes fall somewhere between two extremes of nutrients enrichment and known as Mesotrophic lakes. They have moderate nutrient content and moderate amount of phytoplankton, reasonably productive.

Lakes and ponds are divided into following zones:

(i) Littoral zone: The topmost zone near the shore of a lake or pond is the Littoral zone. This zone is the warmest as it is shallow and can absorb more of the Sun's heat. This zone is rich in biodiversity which includes algae, rooted and floating aquatic plants, insects, fishes, and amphibians.

(ii) Limnetic zone: The near surface open water surrounded by the littoral zone is the limnetic zone. This zone is farther from the shore, extending to depth penetrated by light. This zone is occupied by phytoplankton, zooplankton, and produces food and oxygen that supports most of consumers in the lake.

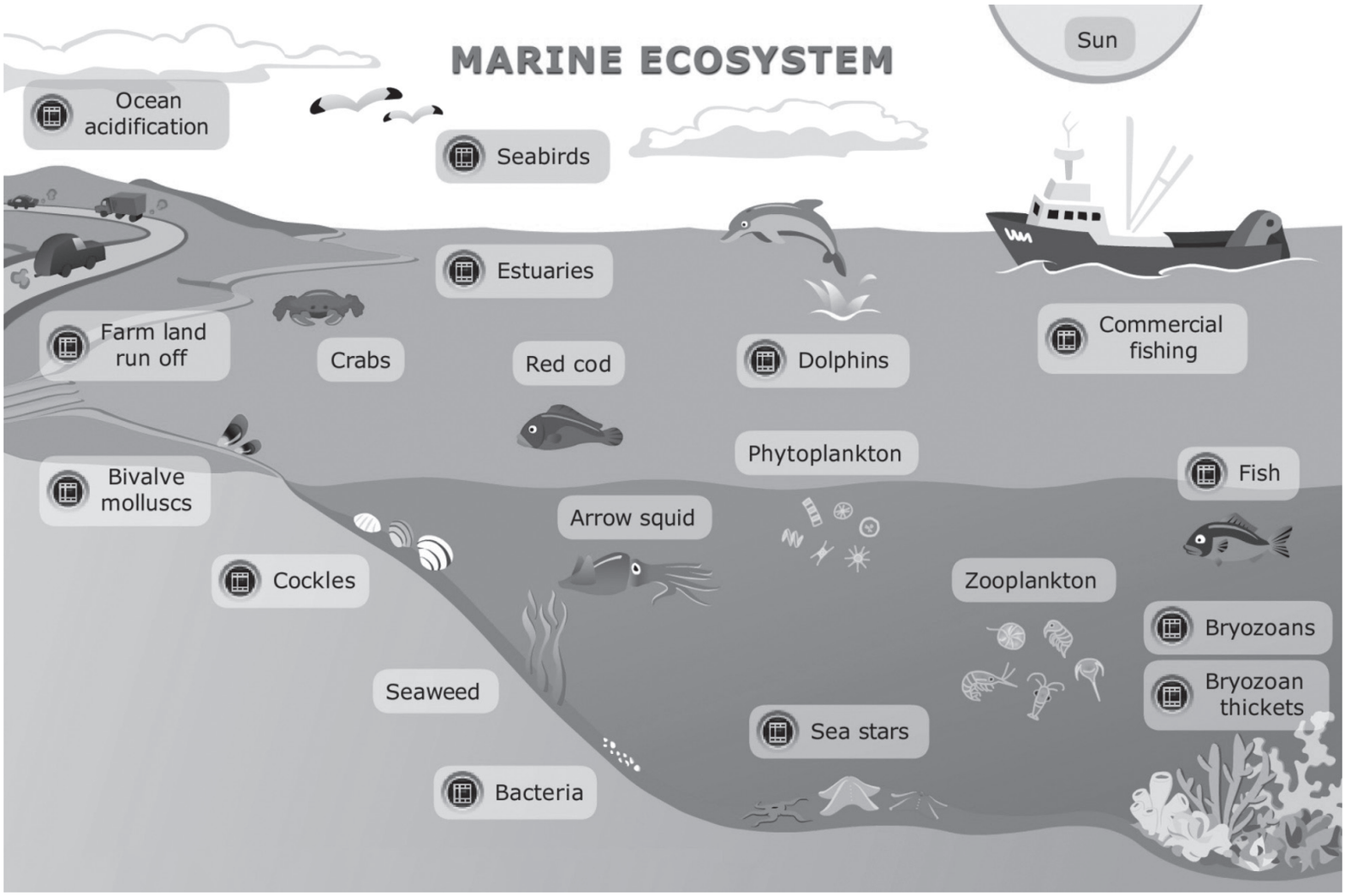
(iii) Profundal zone: The deepest zone of the lake is the profundal zone. It consists of deep, aphotic regions, lacking in oxygen and are too dark for photosynthesis.

(iv) Benthic zone: This zone is actually bottom of lake, inhabited by organisms that can tolerate cool temperatures and low oxygen levels. Mostly decomposers, detritus feeders and fish that swim from one zone to other inhabit this zone.

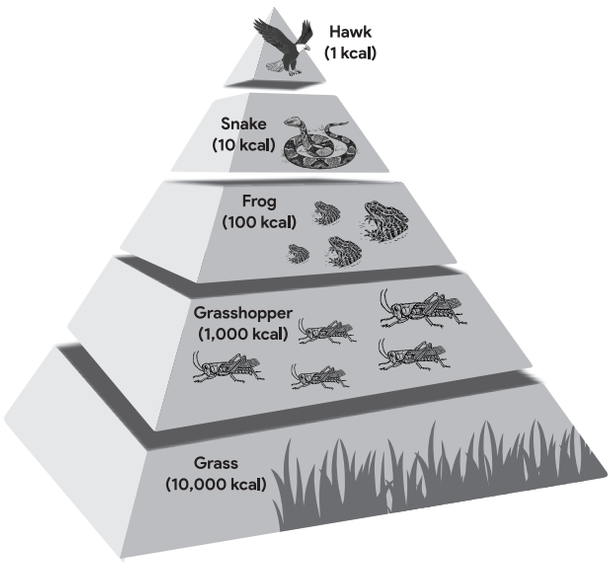
Nektons are the top predators in most marine food chains of the community ecology. The vast majority of nektons are verte brates (e.g., fishes, reptiles, and mammals), molluscs, and crustaceans.

Plankton are the numerous, primarily microscopic inhabitants of the pelagic environment. They provide nutrition for the nekton (e.g., crustaceans, fish, and squid) and benthos (e.g., sea squirts and sponges).

Benthos are abundant in surface sediments of the continental shelf and in deeper waters.



Pyramid of Energy



The pyramid of energy shows how the amount of energy entering each level varies across trophic levels. It shows that energy is maximum at producer level and minimum at the consumer level.

The consumers are at the top of a food pyramid, means they have much less energy available to support them than those closer to the bottom. Eventually, the amount of useful energy left cannot support another level. That's why energy flow is depicted in the shape of a pyramid.

At every successive trophic level, there is a loss of energy in the form of heat, respiration etc.

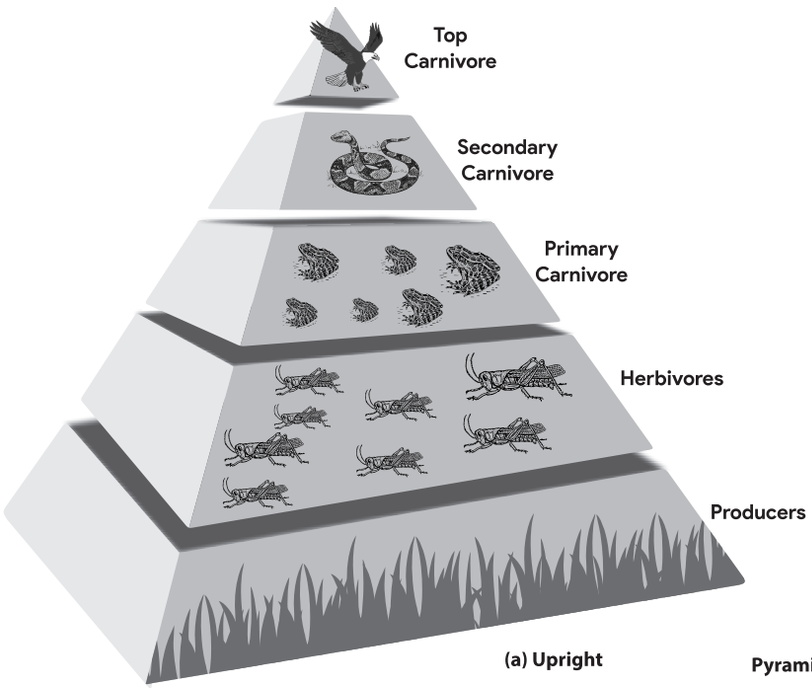
The pyramid of energy is always upright and erect.

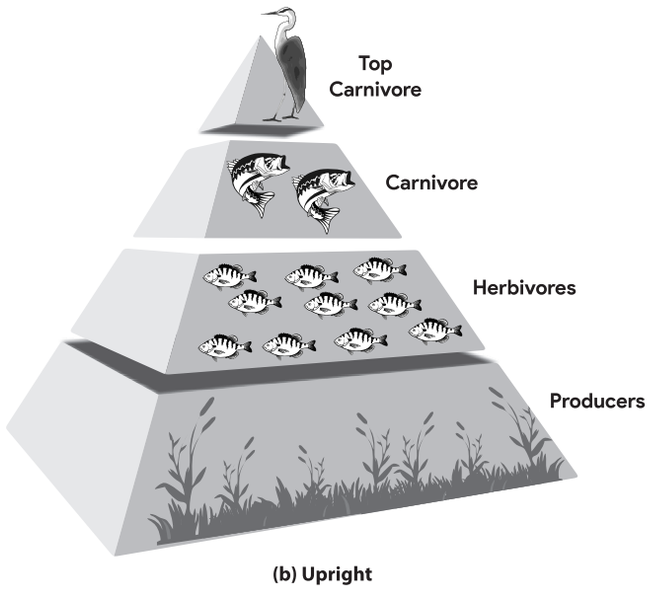
Lindeman's Law (10% Law)

- According to Raymond Lindeman, in an ecosystem when energy is transferred from one trophic level to another, then 90% energy is used in maintenance of metabolic processes and only 10% energy is transferred from one trophic level to another.
- A metabolic process means the energy used in digestion respiration and locomotion etc.

Ecological Efficiency

- Ecological Efficiency refers the percentage of energy transferred from one trophic level to another.
- Energy transfer from one trophic to another varies from 5% to 35%. In case of terrestrial ecosystem, rate of transfer is 10%, whereas in case of marine ecosystem, it is about 20%. In marine ecosystem, ecological efficiency is higher because of the rich biodiversity, that is why consumers don't move longer distance for their food intake. Therefore, in this ecosystem less energy is used by consumer to maintain their metabolic processes.





Pyramids of Numbers : (a) In a Grassland (b) In a pond

Pyramid of Numbers

Pyramid of numbers shows the relationship between producers, herbivores and carnivores at successive trophic levels in terms of their number.

In grassland ecosystem, the producers which are mainly grasses are always maximum in number. This number then shows a decrease towards apex as the primary consumers (like rabbits, mice etc.) are lesser in number than the grasses. Consequently the secondary consumers (like snakes and lizards) are lesser in number than the primary consumers. Finally, the top consumer (like hawks or other birds) are least in number. Thus, the pyramid becomes upright.

DO YOU KNOW

In a forest ecosystem, the producers, which are mainly large-sized trees, are lesser in number, and form the base of the pyramid. The herbivores, which are usually birds, elephants, deer etc. are more in number than the producers. Thereafter, there is a gradual decrease in number of successive carnivores, thus, making the pyramid again upright. Hence, in this case, Pyramid of Numbers is partly upright and partly inverted.

In a pond ecosystem, the pyramid is upright. Here, the producers which are mainly the phytoplankton (like algae, fungi etc.) are maximum in number. The herbivores (like smaller fishes) are lesser in number than producers and the secondary consumers (like bigger fishes), are lesser in number than the herbivores.

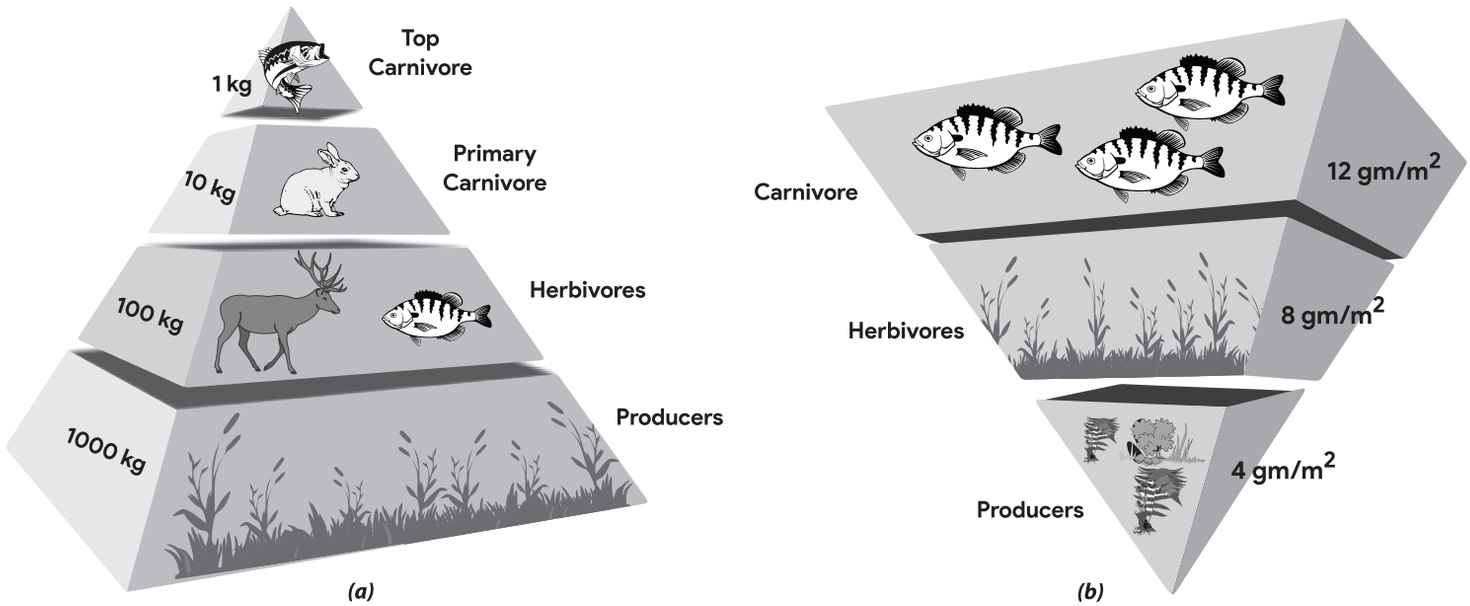
Finally, the top consumers. (like heron) are least in number.

In a parasitic food chain, the pyramids are always inverted. This is because a single plant may support the growth of many herbivores and each herbivore in turn may provide nutrition to several parasites which support many hyper-parasites. Thus, from the producer towards consumers, the number of organisms shows an increment, thus making the pyramid inverted in shape.

Pyramid of Biomass

The pyramid of biomass shows how the biomass of living organisms varies across trophic levels. This dry weight (biomass) represents the amount of organic matter.

In grassland and forest ecosystems, there are generally a gradual decrease in biomass of organisms at successive levels from the producers to the top carnivores, making the pyramid upright.



Pyramid of biomass: (a) In a Forest Ecosystem (b) In a Pond Ecosystem

In a pond ecosystem, as the producers are small organisms, their biomass is least, and this value gradually shows an increase towards the apex of the pyramid, thus making the pyramid inverted in shape.

Productivity

Productivity of ecosystem refers to the rate of formation of energy and matters which is stored in different species of different trophic levels.

There are two types of productivity:

(i) **Primary Productivity:** It refers to the rate at which chemical energy is produced from solar energy. It is measured in dry weight gm calories/unit area/unit time. e.g. for the whole earth, mean net primary productivity is 320 dry gm cal./m^2/year.

Primary Productivity for Different Ecosystem	
Ecosystem	**Primary Productivity**
Desert	Less than 2
Deep oceans	Less than 4
Grasslands	2 – 12
Deep lakes	2 – 12
Continental shelf	2 – 12
Mountain forest	2 – 12
Dry farming	2 – 12
Rainforests	12 – 40
Shallow lakes	12 – 40
Humid grassland	12 – 40
Wet cultivation	12 – 40
Estuaries	40 – 100
Springs	40 – 100
Coral reef	40 – 100
Alluvial plains	40 – 100
Annual crops like sugarcane	40 – 100

Gross Primary Productivity (GPP) is the total amount of organic matter that it produces through photosynthesis.

Net Primary Productivity (NPP) describes the amount of energy that remains available for plant growth after subtracting the fraction that plants use for respiration.

(ii) **Secondary Productivity:** It refers to the rate with which energy is stored at different levels in consumers.

Ecotone

Ecotone is a transition area between two biomes (vegetational communities), where two communities meet and integrate. It may be narrow or wide, or may be local zone between field and forest, or regional zone between forest and grassland.

An ecotone may appear on the ground as a gradual blending of two communities across a broad area, or it may manifest itself as a sharp boundary line.

It describes variation in species of flora and fauna.

Ecocline

Ecocline is a gradation from one ecosystem to another when there is not sharp boundary between the two. It is the joint expression of associated community and complex environmental gradients.

It refers variation in physio-chemical environment of ecotone i.e. an ecocline indicates thermocline (temperature gradient), chemocline/chemical gradient, halocline (salinity gradient) or pycnocline (variations in density of water).

It describes variation in forms of species based on genetic differences.

The term was coined by the English evolutionary biologist Julian Huxley in 1938.

Biological Spectrum

The biological spectrum consists of all living organisms divided into three domains which are co-existing across various levels of biological organization. The three domains are bacteria, archaea and eukaryota, which are further subdivided into kingdoms. All three domains exist on various levels of biological organization, from a cellular level to its biosphere.

Ecological Niche

Ecological niche refers to the web of relationship of a member of flora and fauna in a given environment. It is the way in which an organism fits into an ecological community or ecosystem.

CHAPTER

9 INDIAN ECONOMY

INTRODUCTION

- The independence-era Indian economy was initially inspired by the economy of the Soviet Union with socialist practices, large public sectors, high import duties and lesser private participation characterising it, leading to massive inefficiencies and widespread corruption. However, later on India adopted free market principles and liberalised its economy to international trade.
- India recorded the highest growth rates in the mid-2000s, and is one of the fastest-growing economies in the world. The economy of India is the third largest by purchasing power parity (PPP).
- The growth was led primarily due to a huge increase in the size of the middle class consumer, a large labour force and considerable foreign investments.

Types of Economy

There are three main types of economies:

(i) Free-Market Economies: In free-market economies, businesses and individuals have the freedom to pursue their own economic interests, buying and selling goods on a competitive market, which naturally determines a fair price for goods and services.

(ii) Command Economies: A command economy is also known as a centrally planned economy because the central, or national, government plans the economy.

(iii) Mixed Economies: A mixed economy combines elements of free-market and command economies

Sectors of Economy

(i) Primary Sector: When the economic activity depends mainly on exploitation of natural resources then that activity comes under the primary sector. Agriculture and agriculture related activities are the primary sectors of economy.

(ii) Secondary Sector: When the main activity involves manufacturing then it is the secondary sector. All industrial production where physical goods are produced come under the secondary sector.

(iii) Tertiary Sector: When the activity involves providing intangible goods like service then this is part of the tertiary sector. Financial services, management consultancy, telephony and IT are good examples of service sector.

NATIONAL INCOME

- In a layman's language, national income means the total value of goods and services produced annually in a country.
- A national income estimate measures the volume of commodities and services turned out during a given period, counting it without duplication.
- National Income measures the flow of goods and services in the economy i.e. it measures the production power of a economy whereas national wealth measures the stock of commodities held by the nationals of a country at a given instant of time.

National Income Estimation in India

- *Simon Kuznet* (winner of Nobel Prize in 1971) set the trend of using National Income Aggregates.
- National Income estimation in India was for the first time done by Dadabhai Nauroji in his book *Poverty and Unbritish rule in India* in 1867-68.
- First scientific estimation of National Income was done by V. R. V. Rao in 1931-32 in his book *National Income in British India.*

- In 1956, Government established Central Statistical Organization (CSO) which has been annually publishing National Income and related aggregates in a document titled National Accounts Statistics (NAS).

Concepts in the National Income

(i) Gross Domestic Product (GDP)

It is the sum total of the value of all final commodities and services produced within the geographical boundary of a country during a given period of time. The sum total is to be calculated by counting the values without duplication.

(ii) Gross National Product (GNP)

GNP = GDP + Net Factor Income Abroad (NFIA)
= GDP + Export – Import.

Note: *Since India has more imports than exports, its GNP figure is less than that of GDP.*

(iii) Net National Product (NNP)

NNP = GNP – Depreciation
= GNP – Capital Consumption Allowance
= GDP + NFIA – Depreciation
= NDP + NFIA

(iv) Net Domestic Product (NDP)

NDP = GDP – Depreciation.

Methods to estimate National Income

(i) **Production method:** Net value of final goods and services produced in country during a year is taken into consideration.

(ii) **Income method:** Total of net income earned by working people in different sectors and commercial enterprises.

Total income = total rent + total wages + total interest + total profit

(iii) **Consumption method:** Also called as expenditure method. It is the addition of total consumption and total savings.

Items not included in estimation of National Income

(i) Input (intermediate consumption)
(ii) Transfer payments (unilateral payments)
(iii) Old goods
(iv) Shares and bonds in stock exchange
(v) Black money
(vi) Wind fall games e.g. prizes, winnings from lotteries
(vii) Household services etc.

Sectoral Contribution to GDP in India

Year	% contribution of sectors		
	Primary	Secondary	Tertiary
1950-51 to 1959-60	56.0%	16.0%	28.2%
1990-91 to 2000-01	28.6%	27.1%	44.3%
2016-17	12.0%	28.0%	60.0%
2018-19	17.32%	29.02%	53.66%
2019-20	19.90%	25.33%	54.77%
2020-21	21.82%	24.29%	53.89%
2022-23	20.78%	25.89%	53.33%

Purchasing Power Parity

- It shows the parity (equality/co-mparison) on the basis of purchasing power of a currency and not the conventional exchange rate of a currency. This says how much quantity of goods/ commodities or services can be purchased by different currencies, had those products been at the neutral international market.
- As per April 2024, India is the 3rd largest economy of the World on account of GNP on the basis of PPP.

MONEY & BANKING

Money

- Money is that commodity which is generally acceptable (legally) as a means of payment in the settlement of all transactions including debt. Money performs following functions:
  (a) Medium of exchange
  (b) Unit of account
  (c) Standard of deferred payment
  (d) Store of value
  (e) Basis of credit creation
  (f) Basis of distribution of national income, etc.

Indian Currency

- Indian currency is also known as *Fiat Money* i.e. Money on the Fiat (order) of the government. It is also known as *Legal Tender Money.*
- Reserve Bank of India manages the *currency* of India while the responsibility of *coinage* vests with Government of India.