

SAMPLE STUDY MATERIAL

Postal Correspondence Course GENERAL STUDIES *for* IES & PSU's

1. HISTORY 2. INDIAN-POLITY 3. ECONOMICS
4. GEOGRAPHY 5. LIFE-SCIENCE



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UNIT-I ANCIENT HISTORY

- 'Herodotus', a Greek historian is known as 'Father of History'.

EARLY MAN

(a) Paleolithic Period (5,00,000 BC to 10000 BC)

- Hunters used stone equipments.
- Use of hand axes, cleavers and choppers is the characteristic feature of this period.
- **Sites:** Valley of river soan (Pakistan), Thar Desert, Belan valley of Mirzapur (UP), Narmada valley, Kashmir, Bhimbetka near Bhopal, Andhra Pradesh, Central Madhya Pradesh.

(b) Mesolithic Period (9000 BC – 4000 BC)

- Hunting, fishing, food gathering and in later period rearing of animals.
- **Sites:** Rajasthan, UP, South of river Krishna, Adamgarh in MP.
- Rock painting of many birds, animals and human being found in Bhimbetka near Bhopal.

(c) Neolithic Period (5000 BC – 1800 BC)

- Cultivation of plants and rearing of animals is characteristic feature of this period, nomadic herders transformed into sedentary farmers due to the advancement in agriculture.
- Village settlement started.
- **Tools:** axes, saws, chisels, celts, burins etc.
- **Crops:** Wheat, barley, plum, dates, pea.
- Animals reared – Goat, Sheep, Cattle and Buffalo.
- **Sites:** Mehargarh (Baluchistan), Kashmir valley on Jehlum River (Barzahom and Gufkral), Belan valley in Mirzapur (U.P.), Assam, Deccan plateau.
- Dog burial along with human grave is a cultural feature of Central Asian Neolithic culture.

(d) Chalcolithic Period (1800 BC – 1000 BC)

- Stone copper age.
- First metal used by man was copper.
- **Sites:** Banas and Berach Basin (Udaipur), Malwa, Western Maharashtra.
- Stage of settlement.

Indus Valley Civilization and Culture (2500 BC – 1750 BC)

- Older than the chalcolithic age.
- First site discovered – Harrappa (1921 by Daya Ram Sahni) hence also called Harrappan culture.
- Total area 1.5 million km² and about 1500 sites spread over Sindh, Baluchistan, Punjab, Haryana, Rajasthan, Gujarat, Northern Maharashtra, Western UP and Kashmir.

Northern Most Site: Manda (Jammu Kashmir) bank of river Chenab.

Southern Most Site: Daimabad (Maharashtra) Pravara river.

Eastern Most Site: Alamgirpur (Meerut (U.P.)) Hindon river.

Western Most Site: Sutkagendor (Makran Coast) Iran-Pakistan border.

Ports: Lothal, Sukta gender, Allahdino, Balakot.

Capital cities: Harappa, Mohanjodaro

Major Cities of Indus Culture

(a) Harappa:

- Unearthed by Dayaram Sahni in 1921.
- Situated on the bank of river (**Ravi**) in Montgomery district of Pakistan Punjab.
- Two rows of 6 granaries (Nearest to the river), labourer's quarters.
- Seal of virgin goddess, stone symbol of male and female sex organs, painted pottery, two type of cemetery (R-37, H), Dice, copper mirror, wheat and barley in wooden mortar, copper scale, clay figure of Mother goddess.

(b) Mohenjodaro:

- Second site of Indus culture excavated in 1922 by R.D. Bannarji.
- Largest site.
- Largest building of Harappan culture, the **great Granary** found here.
- Situated at the bank of river Indus in Larkana district of Sindh (Pakistan).
- Mohenjodaro means "Mound of Dead".
- Great bath, Great granary, Bronze image of nude female with right hand on hips, multipillar rectangular assembly hall, seals of Pashupati Mahadeva, 2 Mesopotamian seals, Steatite seal of bearded man, Painted seal of Demi god. Clay figure of Mother Goddess, 1398 seals (57% of total seal).
- First street located in Mohenjodaro.

(c) Chahundaro:

- Unearthed by Mackey (1925) and R.C. Majumdar (1931).
- Situated on the banks of river Indus in Nawabshah district of Sindh (Pakistan).
- Only Indus city with out Citadel.
- Bronze toy cart, Terracota model of Bullock cart, Inkpot, Lipsticks, Metal workers, Impression of dog's paw on bricks.

(d) Lothal:

- Excavated by S.R. Rao (1954).
- Situated on the banks of the river Bhagava in Kathiawar district of Gujarat (India).
- Only city having a artificial dockyard (world's first tidal port).
- Burial of male and female in same grave (Double burial), evidence of rice cultivation, terra cotta figurine of horse. Iranian, Persian and Baharainian seals, Bead makers seal.
- Game of chess evolved in Lothal.

(e) Kali Bangan:

- Excavated by A. Gosh and B.B. Lal in 1951.
- Situated on the banks of Ghaggar river in Hanuman garh district of Rajasthan (India).
- Kalibangan means "the bangles of black colour".
- Having both proto Harappan and Harappan culture phases.
- Evidence of mud bricks and mixed cropping from Kalibangan.
- Ploughed field, 7 fire altars, Mesopotamian cylindrical seal.

(f) Banwali:

- Excavated by R.S. Bist and located on banks of River Ghaggar in Hissar district of Haryana.
- Largest number of barley grain found from the Banwali.
- Lack of systematic drainage system, clay figure of Mother goddess.

(g) Sur Kotada:

- Located in Gujarat and Excavated by J.P. Joshi.
- Evidence of hoarse bone found from Surkotada.

- Only city to have stone wall fortification.
- Evidence of Pot burial.

(h) Dholavira:

- Excavated by J.P. Joshi in 1967-68 located in Kutchh distric of Gujarat on the River Luni.
- Largest Indus settlement, latest site discovered in India.
- Large stadium found.
- Entire city was divided into three parts instead of two as usual the citadel, the middle town and the lower town.
- Evidence of dams, embankments and irrigation from dholavira.
- A unique water harnessing system and storm water drainage system, gaint water reservoir.

(i) Daimabad:

- Excavated by Dhavalikar, located in Maharastra on the river Pravara.
- Largest number of bronze items found (charioteer with chariot, rhino, ox, elephant).

SOCIAL, ECONOMIC AND POLITICAL SYSTEM OF INDUS CIVILIZATION

Sample Continued for Polity

CONTENT

Indian Polity

67-108

13. CONSTITUTION
14. GROWTH OF INDIAN CONSTITUTION
15. SOURCES OF INDIAN CONSTITUTION
16. TYPES OF MAJORITIES
17. PREAMBLE
18. STATES & UNION
19. FUNDAMENTAL RIGHTS
20. NATURE OF WRITS
21. FUNDAMENTAL RIGHTS
22. THE UNION
23. PRESIDENT
24. COMPTROLLER AND AUDITOR
25. GENERAL OF INDIA
26. FINANCE COMMISSION
27. CHIEF INFORMATION COMMISSIONER
28. PARLIAMENT
29. JUDICIARY
30. UNION TERRITORIES
31. ELECTIONS
32. LIST OF IMPORTANT AMENDMENTS

33. PRESIDENTS OF INDIA
34. SPEAKER OF INDIA
35. HIGH COURTS SEATS IN INDIA
36. CHIEF ELECTION COMMISSIONER IN INDIA.
37. IMPORTANT JUDGEMENT IN INDIAN POLITY
38. PRACTICE-SET

CONSTITUTION (POLITY)

Constitution is the fundamental & organic law of the country establishing conception; character & organs of its government as well as prescribing the extent of its sovereign powers and manner of its exercise.

Indian Constitution Is Written Constitution. **Characteristics Of Written Constitution** Are

- It is Codified
- Constitution Is Supreme
- It is Enacted Constitution
- It is rigid
- It has dual polity

Making of Indian Constitution

- Constituent assembly is a body of members which is responsible for drafting constitution. Assembly at the time of India's independence consist of indirectly elected member of parliament. They were elected by elected member of provincial legislative assembly. Phases of constituent assembly and characteristics associated with it are given below :-

Phase 1 (9 Dec. 1946 – 14 Aug. 1947)

- Not sovereign body
- Merely drafting body
- Acted According to provision of Cabinet missions.

Phase 2 (15 Aug 1947-26 Nov 1949)

- Sovereign body
- Was drafting body as well as provisional parliament

Phase 3 (27 Nov 1949 – 22 Mar 1952)

- Acted as provisional parliament

1st Amendment Act 1951 was taken by provisional parliament. Inclusion of National Song, National Anthem and tricolour were done.

Original Constitution hadl	• 395 Articles
	• 22 Part
	• 8 schedules
Present Constitution have	• more than
	440 Articles
	• 22 Parts
	• 12 schedules

INFLUENCE OF OTHER CONSTITUTION ON INDIAN CONSTITUTION

(1) Government of India Act 1935

- 60% of constitution is based on it.
- Federal scheme
- Office of governor
- Ordinance making power of government and president

(2) British constitution

- Rule of law
- Single citizenship
- Civil services
- Parliamentary of government

(3) U.S. Constitution

- Fundamental right
- Independence of Judiciary
- Removal of Supreme Court and High Court judge
- Preamble Judicial Review

(4) Canadian constitution

- Residuary power

(5) Ireland irish constitution

- Directive principle of state policy
- Method of election of president

(6) Weimer constitution of Germany

- Emergency provision

(7) Australian constitution

- Concurrent list

- Freedom of trade and commerce

(8) South African constitution

- Procedure for amendment simple function by majority so it is called functional majority of constitution

(9) USSR constitution

- Fundamental duties

TYPES OF MAJORITIES DEFINED IN INDIAN CONSTITUTION

(1) Simple Majority

- More than 50% of members present and voting member of house
- Following provisions are included in it
- No confidence motion
- Confidence motion
- Vote of thanks to president
- Adjournment Bill
- Ratification of amendment by state legislature
- Money bill, financial bill
- Election of Chairman of Rajya Sabha, Speaker and deputy speakers of Lok Sabha and legislative assembly.

(2) Absolute Majority

- More than 50% of total strength of house
- Nowhere used in isolation. It is used in association with other majorities.

(3) Effective Majority

- More than Total strength of house excluding vacancy
- Provision included under it are
- **Article 67 (b)** – passing of resolution in Rajya Sabha for removal of vice president
- Removal of deputy chairman of Rajya Sabha and legislative council and; removal of speaker and deputy speaker of Lok Sabha and legislative assembly.

(4) Special Majority (SM). There are three types of special majorities.

(i) *Special Majority under article 249*

- More than or equal to 2/3 present and voting
- Example:– Rajya Sabha authorising parliament for creation of all India Service (Art 312)

(ii) *Special Majority under article 368*

- Relating to amendment of constitution
- > 2/3 present and voting plus majority of total membership of house
- Example
- Removal of Supreme Court and High Court Judge

(iii) *Special Majority under article 61*

- More than 2/3 of total member of house.

- Impeachment of president

PREAMBLE

- We the people of India, having solemnly resolved to constitute India into a sovereign, socialist, secular democratic, republic and to secure to all its citizens JUSTICE, social, economic & political; LIBERTY of thought, expression, belief, faith & worship; EQUALITY of status & opportunity; and to promote among them all FRATERNITY assuring the dignity of individual & unity and integrity of the Nation. In our constituent assembly this 26th day of November 1949, do hereby adopt, enact and give ourselves this constitution.
- According to decision by Supreme Court Preamble is a Part of Indian constitution. It can be amended but it is included under basic structure framework as defined by Supreme Court. So it can be amended but its basic features cannot be amended.
- Words secular socialist and integrity were added by 42 Amendments Act.

STATES AND UNION

Under article 3 union government can change name, area and boundary of state

Procedure defined under Article 3

- Recommendation of President needed
- President refer the bill for consent of state and sets time limit for it. Opinion of state is not binding on union.
- Bill introduced in either house of parliament.
- Bill is passed by simple majority by both house of parliament.

CITIZENSHIP

- Legal relationship between centre and states
- Constitution do not lay down comprehensive definition regarding citizenship. All matter are covered by Indian citizenship act 1955.
- Citizenship law are based on two principle
 - (i) Jus soli (law of soil)
 - (ii) Jus sanguine (law of blood relationship)

5 modes of obtaining citizenship

- (i) By birth (Jus soli) – Born on the soil of India and one or both parent of child were Indian.
- (ii) By descent (Jus sanguine)
 - Person born outside India but one or both of parents were Indian citizens

(iii) By registration

- Person not included under first two categories but included under following categories:
 - People of Indian origin
 - Citizen of common wealth country
 - Person married to Indian citizen
 - Minor children of Indian parents
- Person included under one of the above categories should live in India for continuous 5 years before applying for Indian citizenship.

(iv) By Naturalization

- Not included in above 3 categories
- Can apply only after living in Indian for atleast continuous 10 years

(v) By incorporation of Territory

- When territory is included then people belonging to that territory are eligible.
- *Example:* Sikkim was included by this method in 1975.

Loss of Indian Citizenship

(i) Termination

- Indian citizen voluntarily obtains citizenship of other country
- It is involuntary act. It means it acts from the state.
- Legal termination of citizenship by state.

(ii) By deprivation

- Person who has obtained citizenship by fraud, misrepresentation
- Applicable to registration and naturalization methods

(iii) By renunciation

- If citizen obtains citizenship of another country and voluntarily submits the citizenship

Overseas citizenship

Entitles them following right and restriction. Indian citizenship Act 1955 was amended in 2003 by overseas citizenship act 2003.

It provided dual citizenship for overseas citizen. Pakistan & Bangladesh citizens are excluded under this act.

A) Right

- VISA
- Passport of India
- Property Right
- Admission in educational institution

B) Restriction

- Public employment
- Right to vote
- Right to election
- Constitutional office

Fundamental Rights in India

Right to Equality	<ul style="list-style-type: none"> • Article 14 : Equality before law and equal protection of law • Article 15 : Prohibition of discrimination on grounds only of religion, race, caste, sex or place of birth. • Article 16 : Equality of opportunity in matters of public employment • Article 17 : End of untouchability • Article 18 : Abolition of titles, Military and academic distinctions are, however exempted
Right to Freedom	<ul style="list-style-type: none"> • Article 19 : It guarantees the citizens of India the following six fundamentals freedoms: <ol style="list-style-type: none"> 1. Freedom of Speech and Expression 2. Freedom of Assembly 3. Freedom of form Associations 4. Freedom of Movement 5. Freedom of Residence and Settlement 6. Freedom of Profession, Occupation, Trade and Bussiness • Article 20 : Protection in respect of conviction for offences • Article 21 : Protection of life and personal liberty • Article 22 : Protection against arrest and detention in certain cases
Right Against Exploitation	<ul style="list-style-type: none"> • Article 23 : Traffic in human beings prohibited • Article 24 : No child below the age of 14 can be employed
Right to freedom of Religion	<ul style="list-style-type: none"> • Article 25 : Freedom of conscience and free profession, practice and propagation of religion • Article 26 : Freedom to manage religious affairs • Article 27 : Prohibits taxes on religious grounds • Article 28 : Freedom as to attendance at religious ceremonies in certain educational institutions
Cultural and Educational Rights	<ul style="list-style-type: none"> • Article 29 : Protection of interests of minorities • Article 30 : Right of minorities to establish and administer educational institutions • Article 31 : Omitted by the 44th Amendment Act
Right to Constitutional Remedies	<ul style="list-style-type: none"> • Article 32 : The right to move the Supreme Court in case of their violation (called Soul and heart of the Constitution by BR Ambedkar) • Forms of Writ check

Nature of writs (Included under article 32)

1) Habeas corpus

- Means to have body
- To safeguard individual liberty
- It is issued when person is wrongly arrested or detained
- Can be issued against state or individual

2) Mandamus

Means we command

- Order from court to person holding public authority to do or not to do something in nature of illegal duty.
- Cannot be issued against private or individual organization & president, governor of state.

3) Prohibition

- Means to prohibit
- Issued against judicial or quasi judicial body so that they do not exceed their limits

4) Certiorari

- Means to certify
- Similar to prohibition but issued by supreme court after judgment by lower court. It is to certify that these bodies have crossed their limits.

5) Quo-Warranto

- Means what is your authority
- Issued only against person holding public authority to ensure that he is qualified to hold that office

Difference between writ jurisdiction of the High Court and Supreme Court

Supreme Court

- Under article 32
- Duty of Supreme Court to enforce Fundamental right.
- Jurisdiction extends all over India

High Court

- Under article 226
- Have duty to enforce fundamental right.
- Jurisdiction extend to its territorial limits.

Amendments

Changes to the fundamental rights require a constitutional amendment which has to be passed by a special majority of both houses of Parliament. This means that an amendment requires the approval of two-thirds of the members present and voting. However, the number of members voting should not be less than the simple

majority of the house — whether the Lok Sabha or Rajya Sabha.

The right to education at elementary level has been made one of the fundamental rights under the Eighty-Sixth Amendment of 2002.

Basic Structure

- Innovation of Judiciary to define amending power of legislature
- Introduces after Kehavananda Bharti v's State of Kerala case.

Rule of law

- Defined under article 14
- Government and all citizen are subjected to law is supreme (lex sepremus)

Procedure established by law includes under its perview following provisions.

- Prescribed procedure is followed while passing a law. This is to ensure.
- Legislative competence of house.

Due process of law includes under its perview following provisions.

- There is prescribed procedure followed while passing law.
- There is legislative competence of house.
- Princeples of natural justice is followed

Doctrine of eclipse

- Defined under article 13 (1) & 13 (2)
- All laws enforced in India immediately before and after commencement of constitution in for as they are inconsistent with all fundamental right shall be void to the extent of such inconsistency
- 13(1) – for pre-constitutional law
- 13(2) – for past constitutional law

DIRECTIVE PRINCIPLES OF A STATE POLICY (DPSP)

- Under part IV
- They are directive to state for ensuring welfare state
- They are not enforceable in court
- They are not private rights but are public rights.

Directive principles of state Policy (DPSP) are given below:

Art 38 : State secure social order for promotion of welfare of people

Art 39 : Certain principle to be followed by state to ensure adequate livelihood, prevention of concentration of resource & to ensure distribution of resources.

Art 39A : Equal justice and free legal aid.

Art 40 : Organization of village panchayat.

.....;Sample continue for Geography

CONTENT

GEOGRAPHY :165-280

PART-I

WORLD GEOGRAPHY

1. Universe
2. The solar system
3. Shape of earth
4. Structure of the earth
5. Geomorphic processes
6. Land forms
7. Atmosphere
8. Hydrosphere
9. To your knowledge



Part-II

GEOGRAPHY OF INDIA

1. Introduction of india
2. Physical features
3. Drainage
4. Climate
5. India annual rainfall
6. Agriculture
7. Tribes of india
8. Transport system (india)
9. Coastal states of india
10. Partices set

PART-I : WORLD GEOGRAPHY

CHAPTER-1 UNIVERSE

Geography term was coined by the Greek Scholar **Eratosthenes (276 – 194 B.C)**, also known as “**Father of Geography**”.

Physical Geography

Totality of all physical matters energy, the planets, stars, galaxies and the contents of the inter galactical space.

Galaxy: A Huge congregation of stars held together by the forces of gravity.

- Our own galaxy is **Milky way** or **Akash Ganga**
- **Andromeda** nearest galaxy, spiral in shape
- **Dwarf galaxy** latest known galaxy.
- **NGC 4486 (M87)** and **NGC 4472(M49)** largest and brightest galaxies.

Theories of Universe Origin

(a) Big Bang Theory:

Proposed by Belgian astronomer – priest **Abbe Georges Lamaitre**. It is also known as **expanding universe hypothesis**. According to this theory.

(i) In the beginning, all matter forming the universe existed in one place in the form of a “tiny ball” (singular atom) with an unimaginably small volume. Infinite temperate and infinite density.

(ii) At the Big Bang the “tiny ball” exploded violently. This led to huge expansion. Big Bang took place 13.7 billion years before the present. The expansion continues even to the present day. As it grew, some energy was converted into matter. There was particular rapid expansion with in fraction of second after the bang. There after the expansion has slowed down. With in the first three minutes from the Big Bang event, the first atom began to form.

(iii) Within 300,000 years from the Big Bang, temperature dropped to 4500 K (Kelvin) and gave rise to atomic matter. The universe became transparent.

(iv) The expansion of the universe means increase in space between the galaxies.

(b) Steady State Theory:

Proposed by **Hermann Boudi** and **Thomas Gold**. According to this theory:

The universe everywhere remained relatively uniform, unchanged without beginning or end.

(c) Pulsating (Oscillating) Universe Theory:

Proposed by Dr. Alan Sandage, According to this theory— The universe expands and contracts alternately between periods running into tens of billion years.

This is the latest theory of the evolution of the universe.

Light Year:

The distance the light travel in one year is called light year.

$$\text{One light year} = 9.461 \times 10^{12} \text{ km}$$

- Speed of light = 300,000 km/s
- Light year is the measure of distance in space.

Astronomical Unit (A.U.):

- Evolved by radar astronomy
- A light year is equal to 60,000 Astronomical unit (A.U.)
- One Astronomical unit is equal to 93 million miles or 150 million km.

Black Holes:

A black hole is the smallest and the densest object in universe. Its gravitational power is incredible. It can swallow up every thing near it and nothing that gets into it can never escape it. It can neither crack nor split and do not decrease in size. Black holes are the stars which have contracted so much that they developed super density 10^{16} gm per cubic centimeter. CYGNUS X – 1 is recently identified black hole.

CHAPTER-2

THE SOLAR SYSTEM

Origin of Earth and Solar System:

Many theories have been advanced with regard to the origin of solar system and Earth as follows.

A. Early Theories:

(i) Geocentric Theory: By **CLAUDIUS PTOLEMY (140 A.D)**

According to him:

- Earth was the unmoving centre of the universe, around which the sun and other heavenly bodies revolved.

(ii) **Heliocentric Theory:** First advanced by **Copernicus (1473 – 154)**, a Polish astronomer later supported by Italian astronomer **Galileo Galilei (1564 – 1642)**, According to this theory.

- The sun was the centre of the universe and the earth and other planets revolve round it.

B. Modern Theories:

(i) **Buffon's Hypothesis:**

Proposed by French naturalist **comet de Buffon (1749)**

- “Planetary system originated as the result of a collision between the sun and a huge comet, due to this collision lot of matter freed from the sun on condensation this matter formed planets and sub planets.”

(ii) **The Gaseous Mass Theory:**

In 1775 German Philosopher **IMMNUEL KANT** suggested this theory. According to this theory “Scattered primordial matter of small shape and low temperature were pulled towards one another due to gravitational force. This result into collision which increased the temperature of matter and produced “angular velocity”. High increase in temperature and speed changed the mass of particles in gaseous state and began to emit light. Due to the angular velocity. “Centrifugal force” increased so much that rings began to separate from the gaseous mass, on cooling these rings became planets and sub planets and remaining gaseous mass became the sun.”

(iii) **Tidal Hypothesis:**

Proposed by **James Jeans and Jaffreys H.** Also known as **Hit and Run Theory** or **CATASTROPHIC**

Theory or Tidal action theory

According to this hypothesis. A wandering star approached the sun. As a result, a cigar shaped extension of material was separated from the solar surface. As the passing star moved away. The material separated from the solar surface continued to revolve around the sun and slowly condensed into planets.

Some other theories with the regard of origin of solar system are as follows.

- **Nebular theory** proposed by **Marquis de Laplace** in 1799.
- **Planetesimal theory** proposed by **T.C. Chamberlain** and **F.R. Moulton** in 1904.
- **Meteorite theory** proposed by British scientist **Lockyer**.
- **Inter staller hypothesis** proposed by **OTTO Schmidst**
- **Binnary star theory** proposed by Russel and Lyttleton in 1936.
- **The Nova theory** by **Hoyle and Lyttleton**.

The Sun

- Centre of solar system, ultimate source of energy for life on earth.
- Diameter 1400000 kms.
- Surface temperature 6000° C, temperature of centre around 15,000,000° C.
- Composed of 71% Hydrogen, 26.5% Helium and 2.5% other elements.
- Hydrogen is converted into Helium by nuclear fusion.
- Shining surface of sun is called photosphere.
- Outer layer of sun is called corona visible only during the total eclipse of sun or with special telescope called **coronagraph**.
- About 150 million kms away from earth.
- Light of sun take 8.5 minutes to reach the earth.

The Planets

Opaque bodies which continuously revolving around the sun and lighted by the sun. There are eight planets namely mercury, Venus, Earth Mass, Jupiter, Saturn, Uranus Neptune.

Classification of Planets : Eight planets are divided in two groups.

(i) **Inner Planets:** Mercury, Venus, Earth and Mars are called inner planets because they lie between the sun and belt of asteroids. These four planets are called **Terrestrial planets** or **Earth like planets** as they are made up of rock and metals and have relatively high densities.

(ii) **Outer Planets:** Other four planets Jupiter, Saturn, Uranus, Neptune are called outer planets as they lie beyond the asteroid belt. These planets also called Jovian (Jupiter like) or gas gaint planets. Most of them are much larger than terrestrial planets and have thick atmosphere, mostly of Helium and Hydrogen.

– Mercury and Venus are called **inferior planets** and rest of planets are called **superior planets**.

Jupiter > Saturn > Uranus > Neptune > Earth >
Venus > Mars > Mercury

Figure Sequence of planets according to their size (descending order)

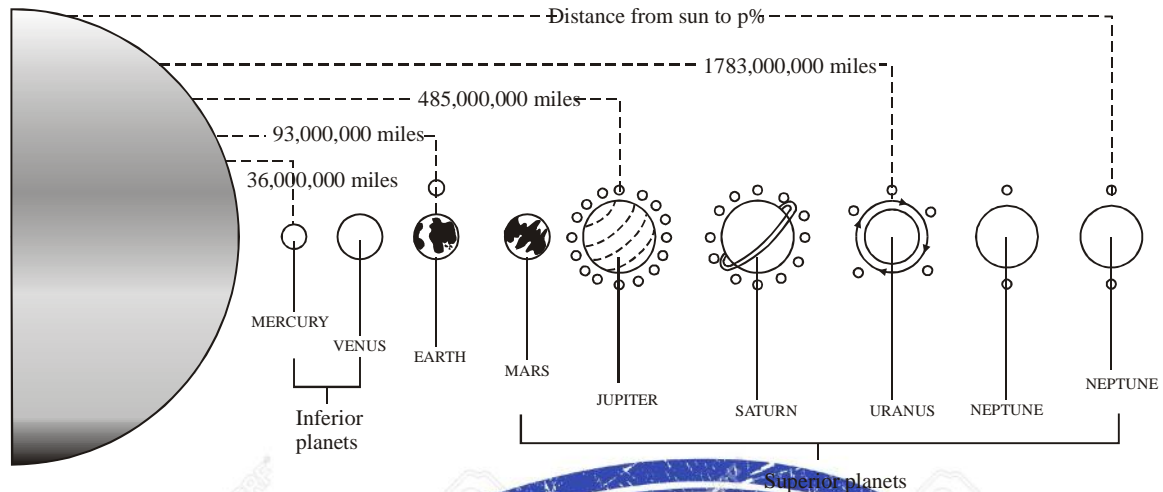


Figure: Sun and eight planets

Mercury

- Nearest to the sun and smallest planet takes 88 days to complete one revolution round the sun.
- Take 58.65 days to rotate on its own axis.
- Extremely hot, no water, no gases like CO_2 , N_2 , H_2 , O_2 present.
- No atmosphere
- Seen as evening star just after sun set and morning star just before dawn.
- Have no moon
- 57.6 million km from sun.
- Diameter 4849.6 km

Venus

- Second planet in distance from the sun.
- Nearest to earth and **Brightest** planet of our solar system.
- Popularly known as **Evening star** and **Morning star**.
- Called Earth's twin because similarity in size mass, density.
- Also called **Veiled planet** as surrounded by thick cloud cover.
- Very hot planet (500°C approximately)
- No moon
- Take 225 days to revolve round the sun.
- Take 117 days to rotate on its axis.

General Studies (IES, PSUs)

- Rotates in opposite direction to that of other planets *i.e.*, east to west direction.
- Space probe sent to Venus – Venera 4, 5, 6, 11 and 12, Mariner 2, 5.
- Diameter 12032 km
- 107.52 million km from the sun.

Mars

- Also called **Red planet** because of Iron rich soil and pink sky fourth planet from the sun, Have dark patches on surface.
- Two natural satellites namely probes and demos.
- Diameter 6755.2 km.
- 225.6 million km from the sun.
- Take 687 days to revolve around the sun.
- Take 24 hours and 40 minutes to rotate on its axis.
- Space mission on Mars – Mariner 7, 9, Viking – 1, 2.

Jupiter

- Largest planet of our solar system, also known as **winter planet** (average temperature – 148° C)
- Made of gases like hydrogen, helium and Methane.
- Have circular light and dark bands.
- Diameter 141968 km.
- 772.8 million km from the sun.
- Take 11.9 years to revolve round the sun.
- Take 9 hours 50 minutes to rotate on its axis.
- 16 natural satellites – Io, Europe, Ganymede callisto are important satellites of Jupiter.
- Space mission – Pioneer – 10, 11.

Saturn

- Second largest planet
- Diameter 119296 km
- 1417.6 million km from the sun.
- 18 natural satellites. **Titan** (largest satellite of solar system, only satellite to have atmosphere), phobes.
- Take 29.5 year to revolve round the sun.
- Unique feature of Saturn is to have ring system around it made up of ice and ice covered dust particles.
- Space mission on Saturn – Voyager 1, 2, Cassini.

Uranus

- Appears faint bluish green disc because of Methane present in its atmosphere.
- Diameter 52096 km

- 2852.8 million km from the sun.
- 84 years are taken to orbit the sun.
- Rotation time on its axis is 10 hours 50 minutes.
- Third biggest planet of solar system.
- Extremely cold (-190°C).
- Rotates from east to west (opposite to other planets) on its axis.
- Surrounded by the five rings namely alpha, beta, gamma, delta, epsilon.
- Space mission on Uranus – Voyager- 2
- Uranus is tilted 98° from its axis.
- 5 moons (ariel, umbriel, titania, Oberon and Miranda).

Neptune

- Very similar to Uranus considered as twin of Uranus.
- Diameter 49000 km.
- 4497 million km from the sun.
- Take 165 years to revolve around the sun.
- Atmosphere appears blue in colour.
- 2 Natural satellites (Triton and Nereid).
- Take 16 hours to rotate on its axis.
- Temperature -180°C .

Pluto

- Pluto is dwarf planet now with new name Asteroid No. 134340.
- Pluto was removed by IAU from the planet list on 24 August 2006
 - Pluto's orbit is not circular but elliptical.

Asteroids: Known as minor planets and revolve around the sun mostly found between the mars and Jupiter. They also rotate on their axis, every 5 to 20 hours.

Example: Trojan, Pallas, Vesta, Juno, Hebe etc.

The Earth

Earth is known as watery or blue planet due to the presence of water, only planet provides life on it. It has **Goldilock Zone** (a zone where all conditions are available for life to sustain).

Earth is the largest planet of the inner planets. Diameter 12,754 km and radius 6,377 km. Earth is tilted by $23\frac{1}{2}^{\circ}\text{C}$ on its axis and thus makes $66\frac{1}{2}^{\circ}\text{C}$ angle. It take 365 days 5 hours and 48 minutes to revolve the sun. So a year on earth is of 365 days at the speed of 29.72 km/sec. As it is not possible to show a quarter of a days in calender, a normal year taken to be 365 days and extra day is added in every fourth year, called **Leap year** in the month of February.

Leap Year has 29 days in the Month of February.

Earth takes 23 hours 56 minutes and 4.09 second to complete its rotation on its axis. Earth has enough oxygen gas in its atmosphere for survival of the living beings and has a blanket of ozone that protect us from the harmful ultra violet radiation coming from the sun.

The Moon: Moon is the only natural satellite of our earth. Has no atmosphere. It takes 27 days 7 hours 43 minutes to rotate on its axis and some period of time to revolve around the earth. Diameter 3475 km and 384,335 km from the earth. Study of moon is called **Selenology**. Day time temperature 100°C and during night it is -180°C . It revolves eastward side. Light from the moon takes 1.3 second to reach the earth. We see only one side of moon always because the rotation and revolution period of moon is approximately same.

EXERCISE

- The study of universe on grand scale is called?
(a) Exbiology (b) Astronomy (c) Astrology (d) Casmology
- Which is the theory that explains the origin of universe from a primordial explosion which broke the condensed matter and scattered its fragments into space at enormous velocities?
(a) Steady state theory (b) Big bang theory
(c) Infinite time theory (d) Oscillating universe theory
- The pulsating universe theory says that.
(a) The universe expands and contracts alternately between periods of tens of billion of years.
(b) The universe illuminates and darkens alternately between periods of million of years.
(c) The universe enlarge and shrinks alternately.
(d) All of above
- Galaxies are best described as
(a) Congregation of stars that are held by molecular attraction of the particles. (b) Congregation of primordial dust particles.
(c) Congregation of constellations rotating around the nucleus.
(d) Congregation of dust particles and stars that are held together by force of gravity.
- What form does the milky way Galaxy has
(a) Spiral (b) Elliptical
(c) Irregular (d) Barbed
- Match the following theories of origin of the earth and their proponents.
A. Nebular hypothesis 1. Kant

- B. Proto planet 2. Von wizensacker
C. Planetesimal theory 3. Chamberlin
D. Binary star theory 4. Russel and little ton

- | | A | B | C | D |
|-----|---|---|---|-----|
| (a) | 1 | 2 | 3 | 4 |
| (b) | | 3 | 4 | 1 4 |
| (c) | 4 | 3 | 2 | 1 |
| (d) | 4 | 1 | 2 | 3 |

.....;Sample continued for LIFE SCIENCE



UNIT-1: BIOLOGY: Page : 283-298

1. Important Branches of Biology.
2. Father of Various Branches.
3. Biological Institutes.
4. Characteristics of Living Organisms.
5. Classification.

UNIT-2 CELL BIOLOGY Page : 299-307

UNIT-3: PLANT BIOLOGY Page : 308-320

1. Plant Morphology.
2. Root System.
3. Shoot system.
4. Leaf.
5. Flower.
6. Fruit.
7. Seed.
8. Edible part of fruits.
9. Plant growth regulator.
10. Essential Elements required by plants.
11. Photo synthesis.
12. Plant diseases.

UNIT-4: HUMAN BIOLOGY Page : 321-366

1. Movement and locomotion.
2. Breathing and exchange of gasses.
3. Body fluid and circulation.
4. Excretory product and their elimination.
5. Neural control and coordination.
6. Chemical co-ordination and Integration.
7. Human reproduction.
8. Digestion and Nutrition.
9. Human Diseases.

Unit Question Set-1, 2, 3 Page : 367-366 Life
Science Practics Set Page : 367-378

UNIT-1 BIOLOGY

Biology:

- Study of living beings and various aspects related to them.
- Greek origin – Bios – Life, Logos – Study
- Two main branches of biology are
 - **Zoology** – Study of animals
 - **Botany** – Study of plants.

1. SOME IMPORTANT BRANCHES OF BIOLOGY

- **Agrostology:** Study of grasses
- **Anthology:** Study of flowers
- **Anatomy:** Study of Internal structure of organism.
- **Angiology:** Study of blood vascular system.
- **Anthropology:** Study of behaviour of human.
- **Araneology:** Study of spiders.
- **Apiculture:** Rearing of honey bee for honey.
- **Biotechnology:** It is the scientific manipulation of living organism's, especially at the molecular end genetic level to produce useful product for the benefit of mankind is called Biotechnology.
- **Biochemistry:** Study of chemical reactions related to life activities and chemicals constituting the body.
- **Batracology:** Study of Frogs.

General Studies (IES, PSUs)

- **Bacteriology:** It is the study of bacteria—the smallest, simplest, prokaryotic, single celled microorganism.
- **Bryology:** Study of bryophytes.
- **Cytology:** Study of cell.
- **Cardiology:** Study of heart.
- **Dendrology:** Study of shrubs and trees.
- **Dermatology:** Study of skin related problems.
- **Ecology:** Study of interaction between organism and their environment.
- **Evolution:** Study of origin of life, variation and development of living organism.
- **Endocrinology:** Study of duct less glands and their hormones.
- **Ethology:** Study of animal behaviour.
- **Ethnology:** Study of mankind.
- **Embryology:** Study of embryo till the birth of young ones.
- **Etiology:** Study of diseases and causative agents.
- **Entomology:** Study of insects.
- **Enzymology:** Study of enzymes and their activities.
- **Exobiology:** Outer space biology.
- **Eugenics:** Connected with the improvement of human race by applying the laws of heredity, applied before birth, this branch is related to the future generation.
- **Euthenics:** Related with the improvement in the environment to improve the human race, related with the present generation, applied after the birth.
- **Euphenics:** Study of improvement of human race through the genetic engineering.
- **Floriculture:** Study of cultivation of plant for flowers.
- **Gynecology:** Study of female reproductive organs.
- **Genetics:** Study of heredity and transmission of heredity characters from one generation to next generation.
- **Histology:** Study of tissue *i.e.*, microscopic anatomy.
- **Haematology:** Study of blood and its disease.
- **Hypnology:** Study of sleep and related problems.
- **Hepatology:** Study of liver.
- **Herpatology:** Study of lizards and reptiles.
- **Hotriculture:** Study of fruit and flowering plants.
- **Ichthyology:** Study of fishes.
- **Immunology:** Study of immune system and resistance power against the disease of organism.
- **Kalology:** Study of human beauty.
- **Kinesiology:** Study of muscle movements.
- **Limnology:** Study of snails.
- **Lepidopterology:** Study of moths and butterflies.
- **Morphology:** Study of external structure and appearance.

General Studies (IES, PSUs)

- **Myology:** Study of muscles.
- **Microbiology:** It is a science dealing with the structure, function and use of microscopic organism, such as viruses, bacteria, fungi, algae, protozoa and helminthes.
- **Molecular biology:** Study of chemicals found in living organism at molecular level.
- **Mammography:** Science which deals test of breast cancer.
- **Mycology:** Study of Fungi
- **Mammalogy:** Study of mammals.
- **Myrmecology:** Study of ants.
- **Melanology:** Study of pigments.
- **Neurology:** Study of nervous system.
- **Nephrology:** Study of kidneys
- **Neonatology:** Study of new born.
- **Nosology:** Classification of diseases.
- **Osteology:** Study of bones.
- **Oncology:** Study of tumours and cancer.
- **Ornithology:** Study of birds.
- **Odontology:** Study of teeth and gums.
- **Oology:** Study of eggs of birds.
- **Olericulture:** Study of vegetables.
- **Oneirology:** Study of dreams
- **Ophthalmology:** Study of eyes and related disorders.
- **Ophiology:** Study of snakes.
- **Ontogeny:** Study of various life cycles.
- **Physiology:** Study of functions of various organ system with in the organism.
- **Pomology:** Study of fruits.
- **Palaeontology:** Study of fossils.
- **Pedology:** Study of various type of soil.
- **Psychiatry:** Treatment of mental disease.
- **Psychology:** Study of human mind and behaviour.
- **Phylogeny:** Evolutionary history of an organism.
- **Pisciculture:** Rearing of fishes.
- **Parasitology:** It is the study of parasitism and parasites-that include pathogenic protozoa, helminth worm and certain insects.
- **Phycology:** Study of algae.
- **Pathology:** Study of disease, causative agents, transmission of pathogens.
- **Poultry:** Rearing of fowl.
- **Radiology:** Study dealing with the effect of radiation on living organisms.
- **Rhinology:** Study of olfactory organs and nose.
- **Sericulture:** Rearing of silk worm to obtain the silk.

General Studies (IES, PSUs)

- **Serpentology:** Study of snakes.
- **Serology:** Study of blood-serum.
- **Saurology:** Study of lizards.
- **Silviculture:** Cultivation of timber-yielding plants.
- **Spermology:** Study of seeds.
- **Synecology:** Study of body joints and ligaments.
- **Trophology:** Study of nutrition science.
- **Taxonomy:** Nomenclature and classification of living organisms.
- **Toxicology:** Study of poisons and fatal substances their effects and treatment.
- **Trichology:** Study of hair.
- **Urology:** Study of urine and its related issues.
- **Virology:** It is concerned with the study of viruses (minute noncellular particles that parasitize living things) and virus diseases.
- **Veterinary science:** Study of health care and treatment of cattle's, domestic animals.
- **Gerontology:** Study of aging.

2. FATHER OF VARIOUS BRANCHES

- Father of Biology and Zoology – **Aristotle**
- Father of Botany – **Theophrastus**
- Father of Endocrinology – **Thomas Addison**
- Father of Taxonomy – **Carolus Linnaeus**
- Father of Bacteriology – **Leeuwen hock**
- Father of Genetics – **G. J. Mendel**
- Father of Modern Genetics – **T.H. Morgan**
- Father of Micro biology – **Louis Pasteur**
- Father of Cytology – **Robert Hooke**
- Father of Indian Surgery – **Susruta**
- Father of Indian Medicine – **Charka**
- Father of Medicine – **Hippocrates**
- Father of Mutation – **Hugo de vries**
- Father of blood groups – **Karl land steiner**
- Father of blood circulation – **William Harvey**
- Father of Microscopy – **Marcello Malpighi**
- Father of Indian Paleobotany – **Birbal Sahni**
- Father of Indian Ecology – **R. Mishra**

3. BIOLOGICAL INSTITUTES

- Central Institute for cotton research – Nagpur
- Indian Agriculture research institute – New Delhi
- Central rice research institute – Cuttock

- Central zoo authority – New Delhi
- Forest research institute – Dehradun
- Himalayan Forest research institute – Shimla
- Indian council of forestry research and education – Dehradun.
- The botanical survey of India – Kolkata
- The forest survey of India – Dehradun.
- National Biodiversity authority – Chennai
- Rain forest research institute – Jorhat
- The zoological survey of India – Kolkata
- Wild life institute of India – Dehradun.
- Central drug research institute – Lucknow
- Centre for cellular and molecular biology – Hyderabad
- Central for DNA finger printing and diagnostics – Hyderabad
- Indian cancer research center – Mumbai
- Indian Lac research institute – Ranchi
- Indian science congress association – Kolkata
- National brain research center – Gurgaon
- National dairy research institute – Karnal
- National institute of immunology – New Delhi
- Central potato research institute – Shimla
- Indian veterinary research institute – Izzat nagar
- National institute of virology – Pune
- Genetic research center – Mumbai
- Council of scientific and Industrial research – New Delhi
- Indian institute of Pulses research – Kanpur.

4. CHARACTERISTICS OF LIVING ORGANISM

- Ñ **Growth:** Increase in number of cells or mass by the means of reproduction.
- Ñ **Reproduction:** To produce off springs by various methods of reproduction.
- Ñ **Metabolism:** Chemical reaction with in the cell called metabolism causing chemical and physical changes with in the cell constantly, Metabolism may be anabolic (constructive process) or catabolic (destructive process)
- Ñ **Sensitivity:** Living organisms responds to stimuli caused by the surrounding environment.
- Ñ **Protoplasm:** Protoplasm is the physical basis of life. It is the unique feature of living beings.
- Ñ **Evolution:** Living organism changes themselves according to environmental condition mode of reproduction, diet to survive called evolution.
- Ñ **Respiration:** Living organisms respire constantly in-taking oxygen and exhaling CO_2 , by the respiration carbohydrates, fats and proteins oxidized to give energy to survive.
- Ñ **Nutrition:** All living organisms need nutrients to synthesize their protoplasm.

- Ñ **Life-Cycle:** Every living organism possess a certain life cycle, it is definite *i.e.*, they born, develop grow, reproduce and then die.

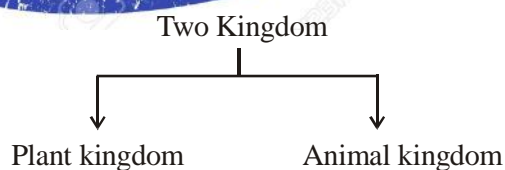
5. CLASSIFICATION

- The art of identifying distinctions among organisms and placing them into groups that reflect their most significant features and relationship is called **biological classification**.
- Study of classification known as **systematics** or **taxonomy**.
- Carolus linneus who introduced binomial nomenclature system, known as father of taxonomy.
- John ray coined the term **species**.
- A.P. de candole coined the term **taxonomy**
- Cuvier coined the term **phylum**
- In Binomial nomenclature system organism has a scientific name which consists two parts first part represents **genus** and second part represents individual **species**.
- Classification based on few superficial similarities called **Artificial Classification**.

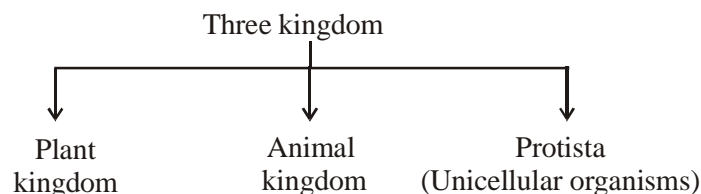
Example: Animals are divided into two groups : (i) Can fly (ii) Cannot fly

Plants are divided into three : (i) Herbs (ii) Shrubs (iii) Trees

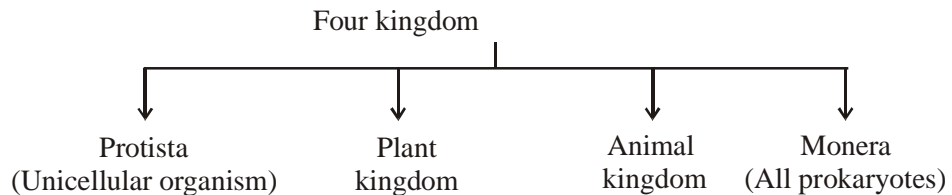
- Natural classification** system proposed by **George Bentham** and **Joseph Dalton Hooker**, based on natural affinities and considered many characters to determine the similarities.
- Phylogenetic classification** system advanced by **Adolf Engler** and **Karl Prantl**, considers morphological characters and evolutionary history and genetic relationship among the organism.
- Classification of Organisms**
- Plants were classified into **Herbs, Shrubs** and **trees** by **Theophrastus**
- Two kingdom** system was advanced by **Carolus linnaeus**



- Three kingdom** system was advanced by **E.H.Hackel**.



Four kingdom system was proposed by Cope land



Five kingdom system

- Most acceptable classification today, proposed by **R.H. Whittakar**.
- It considers the similarities in body organization, life style, phylogenetic relationship, mode of nutrition and cell structure.

Five Kingdom System

- Monera (All prokaryotes)
- Protista (Unicellular Eukaryotes)
- Fungi (Eukaryotes, Heterotrophic)
- Plantae (Photosynthetic organisms)
- Animalia (Metazoans)

(A) Kingdom Monera:

- Prokaryotes and Microscopic single cell organisms.
- Form colonies or trichomes.
- Consists of rigid cell wall made up of peptidoglycan (mureic acid)
- Cell organelles without enclosing membrane
- Some are photosynthetic **Example:** Cyanobacteria or blue green algae.
- Monerans are divided into four groups: Archae bacteria, Eubacteria, Cyanobacteria and Mycoplasmas.
- **Archae bacteria** are oldest anaerobic bacteria found in marshy places (**Methanogens** – produce methane gas), extremely saline an aerobic conditions (Halophiles), in hot sulphur springs (Thermo acidophiles).
- **Eubacteria:** are omnipresent single celled animals, they may be **Coccus** (spherical), **Bacillus** (Elongated rod like), **Spirillum** (Spiral) **Vibrio** (Comma like), Mycelial (filamentous body) shaped.

- Nutrition may be photo auto trophs (an oxygenic photo synthesis) **Example: Chlorobium, Rhodospirillum**, Chemo auto trophs (oxidation of inorganic compounds) **Example: Nitrobacter, Nitrosomonas**, saprotrophs (decomposer) **Example: Pseudomonas**, parasitic type.
- Reproduce by binary fission.
- Bacteria are useful in dairy and alcohol industry.
- Bacteria cause many diseases in plants and animals like leprosy, pneumonia, cholera, blight of rice, citrus canker etc.
- **Cyanobacteria:** Unicellular, forms colonies or trichomes surrounded by gelatinous sheath.
- Prokaryotes, peptidoglycan cell wall.
- Mode of nutrition autotrophic by oxygenic photo synthesis.
- Reproduction by binary fission and fragmentation.
- Also called blue-green algae.
- Nitrogen fixing cyanobacteria – **Nostoc, Anabarna Aulosira**.
- **Spirulina:** A cyanobacteria, rich in protein used as human food and cattle feed.
- **Mycoplasma:** Discovered by **Nocard** and **Roux**, smallest prokaryotes, without cell wall.
- Highly pleomorphic **Example:** vary in shape.
- Cause **pneumonia** and **urethritis** in animals.
- Cause witches broom of legumes, little leaf of brinjal, bunchy top of banana, in plants
- **Example:** PPLO.
- Nitrogen fixing bacteria – **Azotobacter clostridium**.

(B) Kingdom Protista:

- Unicellular eukaryotes, found mostly in aquatic habitats.
- Cell consists of membrane bound organelles like Mitochondria, ER, Golgi apparatus, lysosomes, chloroplasts.
- Kingdom Protista is connecting link between Monera and other three kingdoms.
- Locomotion by flagellum, cilia or pseudopodia.
- Mode of Nutrition: Photo auto trophs like plants saprotrophs or decomposer like fungi and heterotrophs or Holozoic like animals.
- Reproduce sexually or asexually, sexual reproduction by fusion or Meiosis.
- Protists are divided into four phylums.

(a) Protozoa

- May be free living (**Paramoecium, Amoeba**), Parasitic (**Plasmodium**) or symbiont (**Trichonympha** in gut of cockroach or termites).
- Reproduce sexually by conjugation in and by gamete formation in **plasmodium Paramoecium**.
- Cause many diseases in human beings like
 - Kala azar – **Leishmania donovani**
 - Sleeping sickness – **Trypanosoma**

Malaria – **Plasmodium**

Amoebic dysentery – **Entamoeba**

- Locomotion takes place by flagella in **Giardia**, **Trichomonas**, by pseudopodia in **Amoeba**, **Entamoeba**, by cilia **paramecium**.

(b) Myxomycota

- Shows features like plants (production of spores which have cell wall) and animals (mode of nutrition and somatic organization)
- Called slime Moulds

Example: Dictyostellium, Stemonites

(c) Dinoflagellata

- Unicellular protists, have a cellulose cell wall
- No sexual reproduction.
- **Example: Noctiluca, Ceratium, Gonyaulax**
- **Gonyaulax** secretes toxins which cause fish mortality and cause red tides in ocean.

(d) Chrysophyta

- Also called as diatoms (golden brown algae) and desmids.
- Found both in fresh water and marine water constitute the major phyto planktons
- Cell wall is impregnated with silica.
- Reproduce a sexually by binary fission and sexually by formation of gametes.
- Diatoms are indicator of sewage pollution
- Diatomaceous earth are used as insulator in boilers and blast furnace, for filtering the liquids in sugar industries, as absorbant for liquid nitroglycerine to make explosives.

(C) Kingdom Fungi:

- Mostly multi cellular except yeast (single celled)
- All cell organelles are membrane bound.
- A fungal cell do not contain plastids.
- Grow on decaying organic matter in moist and warm conditions.
- Body consists of complex filamentous structures called **mycelia** which is made up of long slender thread like structure called **hyphae**.

- Talus body, do not contain stem, leaves and roots.
- A nitrogenous carbohydrate **Chitin** is the main constituent of cell wall of hyphae.
- Fungi are hetero trophs *i.e.*, saprotrophs or parasites or living as symbionts in the roots of higher plants.
- Lack chlorophyll, non-photosynthetic
- Reproduced vegetatively by fragmentation, fission or budding.
- A sexual reproduction by formation of **Zoo spores** as in **Sapro legnia**, by **aplanospores/sporangiospores** as in **Rhizopus** and **Mucor** or by **Conidia** as in **Penicillium** and **Aspergillus**.
- Sexual reproduction take place by gamete fusion.
- Fungi are grouped into five classes.

(a) Mycorrhizae:

- Member of myxomycetes found at wet, damp shady places.
- Mostly parasites.
- Zoospores and aplanospores help in Asexual reproduction.
- Sexual reproduction by fusion of gametes.
- Fragmentation helps in multiplication.

Example: Pythium, Albugo, Synchytrium, Phytophthora

- Cause diseases in plants

Late blight of Potato – Phytophthora infestans, Damping off disease in crucifers – Pythium white rust of crucifers – Albugo Candida

(b) Phycomycetes

- Consists of aseptate (lacking septa) and coenocytic (multinucleated) mycelium.
- Found in damp place and on decaying leaves in water.
- Asexual reproduction takes place with in sporangia with the help of zoo spores or aplanospores.
- Fusion of gametes helps in sexual reproduction.

Example: Mucor, Rhizopus.

(c) Ascomycetes

- May be unicellular (**Yeast**) or multi-cellular
- Also called **Sac fungi**
- Saprotrophic or parasite organisms.
- Asexual spores are formed in chain and called **Conidia**, formed exogenously and by detaching from parents and form new mycelia.
- Sexual reproduction by **ascospores**
- **Yeast** used in breweries to form alcohol and in bakeries.
- **Morels**(Morchella) and buffles are edible fungi.
- **Penicillin** an antibiotic production takes place by **employing Penicillium notatum** and **P. Chrysogenum**. Example: *Morchella*, *P. Chrysogenum*, *Yeast Neurospora*, *Piziza*.

(d) Basidio Mycetes

Example: Ustilago, puccinia, Agaricus, Polyporus

- Also know as **gill fungi** or bracket fungi or club fungi.
- No Asexual reproduction.
- Sexual reproduction by mating of + and – strain cells of hyphal by fusion.
- **Agaricus** (Mushroom) is edible fungi.
- **Puccinia** cause rust of wheat.
- Wood decomposed by **Polyporus**

(e) Deuteromycetes

- Imperfect fungi as they lack sexual mode of reproduction.
- Only asexual reproduction takes place by the spores called Conidia.
- Branched and septate any mycelium.
- Parasites cause many diseases in plants such as early blight of potato by **Alternaria solani**, red rot of sugar cane by **colletotrichum falcatum**
- Saprotrophs and decomposers helps in mineral cycle.
- **Arthobotrys**, a predatory fungus is nematophagus as it feeds upon **nematodes**.

Example: Agricus, alternaria, calletotrichum

Lichens

- Composite organisms composed of symbiotic association of algae and fungi.
- **Phycobiont** is algal part which prepares food and **Mycobiont** is fungal part which provides protection and helps in absorption of Nutrients and water. Example: Usnea, Cladonea, Evernia,

Peltigera.

Mycorrhizal

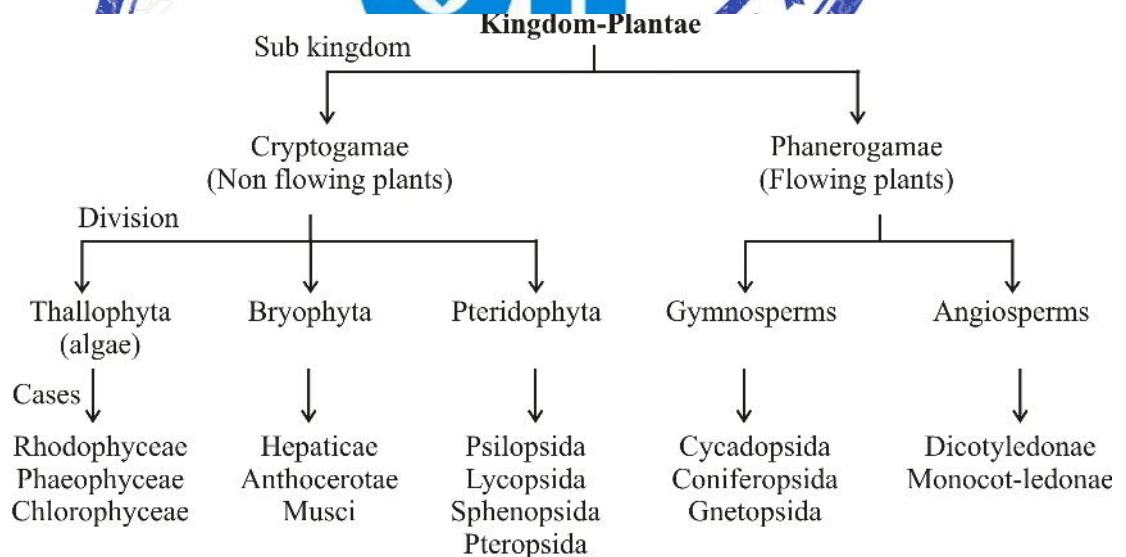
- A symbiotic association between the ratio of some higher plants and certain fungi call Mycorrhizal.
- Study which deals with fungi called **Myology**.

(D) Kingdom Plantae:

• Kingdom plantae consists of mostly autotrophic multicellur plants with few exception a few algae like **chlorella**, **chlamydomonas** (unicellular), **Cuscuta**, **Viscum**, **Loranthus** (Parasites), Monatrapa (Saprophyte), Nepenthes, Drosera (Insectivores).

- Plant cells consists rigid cell wall made up of cellulose and pectin.
- Cell wall is the characteristic of plant cell as it lacks in animal cell.
- Plant cell consists peroxysomes which are not found in animal cell.
- Plant kingdom is divided into five divisions as follows.

- (a) Thallophyta (Algae) (b) Bryophyta (c) Pteridophyta
(d) Gymnosperms (e) Angiosperms



(a) Thallophyta (Algae)

- Multi cellular with few exceptions and autotrophs *i.e.*, capable in making their own food.
- Occurs in various habitates as in water, land or well as on plants or animals and marine water (see weeds).
- Body of multi cellular algae called thalus which may be colonial, filamentous, anchored to the substratum by hold fast or free floating

- No vascular tissue.
- Algae reproduce vegetatively by fragmentation.
- Asexual reproduction by zoo spores.
- Antheridia are male sex organs and oogonia are female sex organs.
- Algae reproduce sexually isogamously, anisogamously or oogamously.
- Sex organs are mostly unicellular and non-jacketed.
- Based on the presence of pigments algae are classified into following classes.
 - (i) Rhodophyceae (Red algae)
 - (ii) Phaeophyceae (Brown algae)
 - (iii) Chlorophyceae (Green algae)

(i) Rhodophyceae (Red algae)

- Mostly marine with few exceptions like **Batrachospermum** which is fresh water form.
- Red colour due to the presence of red pigment *r*-phycoerythrin.
- Other pigments are chlorophyll *a* and *d*, β -carotene.
- **Floridean** starch which resembles glycogen is reserve material. **Example:** Corallina, Gelidium, Polysiphonia, Asterocystis

(ii) Phaeophyceae (Brown algae)

- Occur in cold marine water.
- Most of them are lithophytes but few are epiphytes.
- Brown colour due to the presence of brown pigment **Fucoxanthin** and other pigments are carotene, chlorophyll *a* and *c*, xanthophylls.
- Laminarin starch and mannitol are reserve food. **Example:** Sargassum, Laminaria, Macrocystis, Fucus.

(iii) Chlorophyceae (Green algae)

- Green colour due to the presence of chlorophyll *a* and *b*, xanthophylls and carotene.
- A compound molecule of starch and protein **Pyrenoids** and some oil drops are reserve foods.
- Fresh water forms, some living on moist soil, bark, logs and some are marine.

Example: Spirogyra, Ulothrix, Pongorina, Eudorina, Chlorella, Chlamydomonas.

(b) Bryophyta

- First group of plants that colonized the earth.
- They need water for fertilization so they are also called '**amphibian of plant kingdom**'
- Humid, cool, shady and damp places are habitats of Bryophytes.
- Bryophytes do not grow tall as they lack true vascular tissue system (Xylem and phloem)
- Plant body dorsoventral thallus, prostrate or erect, or anchored to the substratum with the help of rhizoids (unicellular or multicellular)
- Sex organs possess sterile jacket layer of cells, antheridia (male) and archegonia (female)

(c) Pteridophyta

- First land plants to develop vascular tissue system found in shady, cool, humid and damp places also called **snake of plant kingdom**.
 - Plant body have true stem called rhizome and true leaves (fronds) and rhizoids (adventitious roots)
 - When plant get matured leaves turned into sporophylls and bear sporangia.
 - Male sex organs – Antheridia
 - Female sex organs – Archigonia
- Example:** Hycopodium, saleginella, equisetum, pteris Azolla, Marsilea.

(d) Gymnosperms

- Seed bearing plants (Naked seeds) occurs in cold hilly areas or plains.
 - Body can be divided into stem, leaves and roots.
 - No fruit formation.
 - Well developed vascular system, woody and tall plants.
 - Tap roots but sometimes they can associated with other organisms like in **Pinus** roots harbour Fungi and in **Cycus** roots harbouring cyanobacteria like **Nostoc** and **Anabaena**
 - Xylum has tracheids and phloem has sieve cells.
 - Modified leaves called sporophylls possess sporangia which produces spores.
 - Pollination takes place through air.
- Example:** Cycus (Sago palm), Zamia (Sago tree), Cedrus (Deodar), Sequoia (red wood)

(e) Angiospermae

- Flowering plants, occurring in wide range of habitats and the largest group of the plants with enclosed seed in the fruit.
- Based on the cotyledons in the seeds angiosperms are divided into two groups.
- Having one cotyledons in the seed called monocotyledons.
- Having two cotyledons in the seed called dicotyledons.
- Well developed vascular tissue system.
- Stamens or microsporophylls are male sex organs consist of a filament and an anther.

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