CHENNAI

RACE

COACHING INSTITUTE PVT LTD

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GENERAL STUDIES

SAMRAT

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HISTORY

Rig Vedic Age (1500-1000 B.C.)

The source of information of this period includes the archaeological evidences as well as the literary source i.e. Rig Ved. Unlike the Indus Valley Civilization, whose script has so far not been deciphered Rig Ved is an important source of information for this period.

Concepts about Rig Vedic Age

1) Although the main source of information of this period is Rig Ved, the people of this age did not know how to read or write. Rig Ved was compiled and written during the later period.

2) Rig Vedic society was much simple as compared to that of the Indus Valley. The main occupation of Rig Vedic people was cattle rearing. It was only in the later Vedic Age that they adhered to the sedentary agriculture

3) The houses of this period were made up of wattle and daub and the life of people was nomadic.

4) There is no sign of urbanization during this period

5) The trade use to take place but was in a very rudimentary stage, unlike the case of Indus Valley Civilization.

6) The impact of trade on the economy was negligible

7) It was altogether a rural-tribal economy

8) Horse and cow were the two most important animals during this period

9) There has been no evidence of horse in the Indus Valley Civilization, however the horse was the important animal of this age

10) Indira, Agni and Som were the important gods which were worshipped. There is no evidence of worship of mother goddess or proto-Shiva as in the case of Indus Valley Civilization

11) Red ware was the most popular pottery of this period while, Painted Grey Ware was the most distinctive

12) In the Rig Veda, the most mentioned river is Sindhu and the most pious river is Saraswati. Ganga and Yamuna were the lesser known rivers during this period

13) The system of taxation was not developed during this period and there was no concept of property rights since the life was nomadic

14) Rig Vedic Aryans had the knowledge about the sea

15) The iron and copper was not used by the Rig Vedic Aryans. It was only during the later Vedic period that the usage of iron started

16) Tribal institutions like Sabha, Samiti, Vidhata and Gana were important assemblies

17) The first evidence of Varna division comes from the Purushsuktasloka in the tenth Mandal of the Rig Ved.

18) The Varna system was present, but it was mobile. The members from the same household can adopt any occupation. In a hymn mentioned in the Rig Ved the narrator says: 'I am a bard; my father is a physician, my mother is a grinder of corn.'

19) The cow was considered as a precious asset

20) From the names of rivers, mountains (Himvant i.e. Himalaya, Munjavant i.e. Hindukush) & ocean in Rig Veda we have a clear idea of the geographical area in which Rig Vedic people lived.

21) Rig Veda mentions 40 rivers. The Nadisukta hymn of the Rig Veda mentions 21 rivers which include the Ganges in the east and the Kubha (Kabul) in the west.

22) SaptaSindhu comprises Sindhu& its five tributaries – Vitasta, Asikani, Vipas, Parushni&Sutuadri and Saraswati.

Original home of Aryans

The location of the original home of the Aryans still remains a controversial point. Some scholars believe that the Aryans were native to the soil of India and some other scholars believe that the Aryans were migrated from outside. The following are the views of different scholars regarding the original home of Aryans:

Scholar	**Views about home of Aryans**
Max Muller	Central Asia
DayanadSaraswati	Tibet
Prof.Penka	German Plains
Mayor	Pamir range
Mach	W. Baltic
B.G Tilak	Arctic region

Rivers in Rig Ved and their modern names

Old name	Modern name
Asikani	Chenab
Drishadvati	Ghaggar
Gomati	Gomal
Krumu	Kurram
Kubha	Kabul
Parushni	Ravi
Saraswati	Sarsuti
Sindhu	Indus
Sutudri	Sutlej
Suvastu	Swati
Vipas	Beas
Vitasta	Jhelum

Economy

1) The Aryans were in the nomadic stage of life, the cattle rearing were the primary occupation and a great importance was attached to herds of cattle.

2) There was no sign of urbanization

3) The items like leather and wool were the items of trade, but the impact of trade on the economy was negligible.

4) Cows and gold ornaments of fixed value were the media of exchange. No other coins were known.

5) Various professions like carpenters, smiths, tanners, weavers, potters and grinders of corn were mentioned in Rig Ved

6) Medical knowledge was developed during this period. The art of healing wounds and curing disease and surgery were in existence

Society

1) The Rigvedic society comprised four varnas, namely Brahmana, Kshatriya, Vaisya and Shudra. However the Varna system was mobile and not rigid.

2) The teacher and priests were called Brahamanas; rulers and administrators Rajanya; farmers, merchants and bankers Vaishyas; and artisan and labourers as Shudras.

3) The members from the same household can adopt any occupation. In a hymn mentioned in the Rig Ved the narrator says: 'I am a bard; my father is a physician, my mother is a grinder of corn.'

4) The unit of society was family, primarily monogamous and patriarchal.

5) The age of marriage was 16-17 years and child marriage was not in vogue.

6) A widow could marry the younger brother of her deceased husband (Niyoga) .

7) The women were allowed to study and they participated in wars.

8) The women were allowed to wear the sacred thread

9) Monogamy was the established practice, however there were cases of polygamy as well which were common

10) The cases of polyandry were exceptional, however the practice existed

11) There is no evidence of practices like sati or purdah

12) Right to property was known in moveable things like cattle, horse, gold and ornaments and so also in immoveable property like land and house.

13) Milk and its products – curd, butter and ghee-formed an important part of the diet. The meat of fish, birds and animals was eaten.

14) The cow was deemed *Aghanya* i.e. not to be killed.

15) Alcoholic drinks, *Sura* and *Soma* were consumed.

Theory of Kingship and Polity

16) The role of king was to lead his tribe in the war and the protection of his tribe

17) Taxation system was not developed during this period. There was no land tax during this period as people were semi-nomadic

18) Bali was the earliest known tax but it too was voluntary

19) There was no officer associated with the taxation

20) The kingship was generally hereditary

21) The government was monarchial. Monarchy was normal but non-monarchical polities were present.

22) The election of king is mentioned in the Rig Ved, but it was a formality only

23) The Dasrajan War (The Battle of Ten Kings): According to Rig Veda, the famous Dasrajan war was mutual struggle of Aryans. The Dasrajan war given names of ten kings who participated in a war against Suda who was Bharata king of Tritsus family. The battle was fought on the bank of Parushani (Ravi) and Sudas emerged victorious.

24) Tribal institutions like Sabha, Samiti, Vidhata and Gana exercised the control over the king

25) Women were not allowed to take part in Samiti

Religion

1) Rig Vedic period witnessed the worship of male gods unlike Mother Goddess in the case of Indus Valley.

2) The animals and trees were not worshipped during this period.

3) The Rig Vedic people don't believe in life after death.

4) The mode of worship of gods was through sacrifice.

5) The Rig Vedic people worshiped god for the material gain and protection from the fury of nature. The concepts like salvation and life after death were not developed.

6) During this period the gods worshipped were generally the personified powers of nature.

7) Fire was sacred as it was regarded as the intermediary between man and God. The fire cult is the only similarity in the religious belief of Indus Valley people and the people of this age

8) There were nearly 33 gods.

9) These gods were divided into three categories i.e. terrestrial, aerial and celestial.

10) Indra, Agni, Som and Varuna were the most popular deities of Rigvedic Aryans.

11) Indra or Purandara (destroyer of fort) – the most important god (250 Rigvedic hymns are devoted to him) ; played the role of warlord and considered to be rain god.

12) Agni – The second most important god (200 Rigvedic hymns are devoted to him) ; fire god considered to be the intermediary between the gods and the people.

13) Varuna – Personified water; supposed to uphold 'Rita' or the natural order ('Ritasyagopa') .

14) Surya (Sun) was worshiped in 5 forms : Surya, Savitri, Mitra, Pushan& Vishnu.

15) Surya (Sun) – God who used to drive daily across the sky in his seven horses chariot.

16) Savitri (the god of light) - The famous Gayatri Mantra is addressed to her.

17) Mitra was a solar god.

18) Pushan was the god of marriage; main function – guarding of roads, herdsmen & straying cattle.

19) Vishnu – a god who covered earth in three steps.

20) Soma – Originally a plant producing a potent drink during courses of Agnishtoma sacrifice could be hemp/bhang, called king of plant; identified with the moon later. The 9th mandala of Rig Veda, which contains 114 hymns, is attributed to the Soma. That's why it is called 'the Soma Mandala'.

21) Other Gods/Goddesses: Rudra (the god of animals) ,Dyaus (the oldest god & the father of the world), Yama (the god of the dead) . Ashwin/ Nastya (the god of health, youth & immortality); Aditi (the great mother of gods), Sindhu (river goddess) .

22) The nature of Rig Vedic religion was Henotheism i.e. a belief in many gods but each god in turns standing out as the highest.

Vedic Literature

Vedic Literature can be categorized into four sections:

I.Vedas

II. The Brahamans

III.TheAranyakas

IV. The Upanishads.

1) Vedas are called "Apaurashey" and "Nitya" i.e. not created by man but God-gifted and existing in all eternity.

2) There are four Vedas-Rig Veda, Sama Veda, Yajur Veda &Atharva Veda.

3) Of the four Vedas, the Rig Veda is one of the oldest texts in the world.

4) The Rig veda (written in verse) contains 1028 hymns, is divided into 10 mandalas

5) The hymns of Rig Veda were recited by Hotri.

6) The Sama Veda (written in verse) contains 1549 hymns. All hymns (excluding 75) were taken from the Rig Veda. This Ved is important for music; however it is relatively insignificant as a source of history.

7) The hymns of the Sama Veda were recited by Udgatri.

8) The Yajur Veda is a ritual veda. Its hymns were recited by Adhvaryus.

9) YajurVed is divided into two parts-Krishna Yajur Veda &ShuklaYajur Veda. It is written in both verse & prose.

10) The Atharva Veda the fourth and the last one, it also contains charms and spells to ward off evils and diseases.

11) Atharva Veda is the most important source to construct the history of the Aryans.

12) Atharva Veda also contain the evidence of some non- Aryan practices

13) The Brahmans explain the hymns of the Vedas. They are written in prose and ritualistic in nature. Brahma means sacrifice.

14) Various sacrifices and rituals have been discussed in great detail in Brahamanas. Every Veda has several Brahmans attached to it:

Ved	**Associated Bharaman**
Rig Veda	Aitareya and Kaushitiki
Sam Veda	Jaiminaya and TandyaMaha
Yajur Veda	Shatapatha and Taittariya
AtharvVed	Gopatha

15) The word Aranya means the forst. The Aranyaka are called forest books, because they were written mainly for the hermits and the students living in the jungles.

16) The Aranyaka are the concluding portions of the Brahamanas.

17) The Upanishadas are the texts with high philosophical connotations.

18) Upanishads are also called Vedanta i.e. end of Vedas

19) Brihadaranyaka is the oldest Upanishada. The concept of life after death, for the first time appears here.

20) The latest Upanishada was written during the reign of Akbar

Later Vedic Literature

1) Literature of the later Vedic period can be categorized into six heads:

1.Vedangas 2.Smritis 3.Mahakavyas 4.Puranas 5.Upvedas 6.Dharshanas

2) Vedang means part of Vedas. They are six in number:

1.Shiksha- Phonetics 2.Kalpa- Rituals 3.Vyakrana- Grammar 4.Nirukta- Etymology 5.Chhanda- Metrics 6.Jyotish-Astrology

3) The three texts associated with different kind of rituals are:

a. Shrauta Sutras/Shulva Sutras – deal with the sacrifices

b. Grihya Sutras – deal with family ceremonies

c. Dharma Sutras – deal with Varnas, Ashramas& other.

4) Smiritis are related to the social conduct, laws and norms in the society. There are six famous smritis:

(i)Manu Smriti (Post Mauryan Age)

(ii)YajnvalkyaSmriti (Post Mauryan Age)

(iii)NaradSmiriti (Gupta period)

(iv)ParasharaSmriti (Gupta period)

(v)BrihaspatiSmriti (Gupta period)

(vi)KatyayanaSmriti (Gupta period)

5) There are mainly two Epics:

I. The Ramayana written by Valmiki, it is known as 'AdiKavya'. At present, it consists of 24,000 shlokas i.e. verses.

II. The Mahabharata composed by VedVyasa is the oldest epics of the world. At present, it consists of 1,00,000shlokas i.e. verses. Bhagavad Gita is extracted from BihshmaParvan of Mahabharata and Shanti Parvan is the largest parvan of the Mahabharata.

· The Purana means the old. These texts describe genealogies of various royal dynasties.

· The Upavedasi.e the auxiliary Vedas were traditionally associated with the Vedas :

Upveda	Associated with
Ayurveda	Rig Veda

Gandharveda	Sam Veda
Dhanurveda	Yajur Veda
Shilpveda	AtharvVed

Age of Buddha

The archeological sources of this period consist of punch mark coins, North Black Polish Ware (NBPW) pottery. The indigenous literary sources of this period consist of Brahamanic literature, Buddhist literature and Jaina literature. The foreign literary sources of this period consist of Historica by Herodotous etc.

Concepts about age of Buddha

a) A clear cut demarcation between the place of work and living dwelling took place during this period.

b) Dowry system came into existence for the first time

c) Village became the lowest unit of administration (this has continued till the present day)

d) Scripts and laws came into existence for the first time

e) The tradition of royal document started during this period

f) The caste laws replaced the tribal laws

g) The standing army was formed for the first time during this period

h) Slaves were given work in the agriculture for the first time. Prior to this period slaves were employed only in the household tasks

i) Use of iron implements for agriculture started for the time, prior to this iron was used only in weapons

j) Taxation system became more elaborate, about six officers were associated with the collection of taxes

k) The evidence of untouchabilty comes from the Buddhist literature belonging to this period

GEOGRAPHY

Structure of earth's interior

The interior of earth is divided into three parts: 1. Crust 2. Mantle 3. Core

The crust

1. The crust is the outermost and the thinnest layer of the earth. This layer has the least density and its thickness varies about 8 to 40 km. **Mohorovicic discontinuity** or Moho, marks the lower limit of the crust and this discontinuity is identified on the basis of rock density.

2. Thickness of the crust is more in the continents and lesser in the oceans while density of continental crust is lower than oceans.

The rocks forming the crust of the earth are rich in lighter minerals like silica and aluminium. hence, this layer is also called as **Sial** (silica and aluminium). The average density of this layer is 2.7 gm/cm^3.

The mantle

1. This layer is the intermediate layer of the earth in terms of both its location and density.
2. It is about 2900 km in thickness, composed of minerals in a semisolid state.
3. It is divided into further two layer upper mantle and lower mantle. The upper part of the mantle is called the **Asthenosphere**, which is about 250 km thick.
4. Due to presence of minerals like silica and magnesium in the rocks forming this layer of the earth, the mantle layer is also known as **Sima**(silica and magnesium).
5. The average density of this layer is about 5.68 gm/cm^3.
6. The transitional zone separating the mantle from the core is called the Gutenberg discontinuity.

The Core

1. The core is the innermost layer of the earth and occupies its center. It is about 3500 km in radius.
2. The core is further divided into two layers: outer core and inner core.3. The outer part of the core is believed to have the properties of a liquid and the innermost part of the core (about 1255 km in radius) may be called solid or crystalline.4. This layer is also known as **Nife** (nickel and iron), because this layer contain large concentration of iron and nickel.5. Temperature of the core is between 2200^{0}c and 2750^{0}c.Density of this part of the earth is 17.2 gm/cm^3 and is many times greater than the average density of the earth(5.53 gm/cm^3).

Discontinuities

The various layers are separated by discontinuities, which are evident in seismic data.

1. **Connard** discontinuity lies between upper crust and lower crust
2. **Mohorovic** discontinuity between crust and mantle
3. **Repetti** discontinuity lies between upper mantle.
4. **Gutenberg** discontinuity between core and mantle. Here, the earth's density as well as velocity of 'p' waves increases.
5. **Lehman** discontinuity divides upper core and lower core.

Composition of whole earth

Elements	Percentage (%)	Elements	Percentage (%)
Iron	35	Magnesium	13

Oxygen	30	Nickel	2.4
Silicon	15	Sulphur	1.9

Composition of earth's crust

Elements	Percentage (%)	Elements	Percentage (%)
Oxygen	46	Magnesium	4
Silicon	28	Calcium	2.4
Aluminium	8	Potassium	2.3
Iron	6	Sodium	2.1

Continental drift theory

1. This theory is given by Alfred **Wagener**, in 1915, to explain the origin and evolution of the continents and the oceans.

2. According to this theory, about 250 million years ago, there was only one continent named Pangaea means all earth and it was surrounded by one mass of water body, named **Panthalassa**.

3. the present shape of continents and oceans is due to the break up of Pangaea.

4. This breaking process started about 200 Millon years ago.

5. The northern rift cuts Pangaea form east to west creating Laurasia in the North and **Gondwanaland** in south. A shallow sea called **Tethys** was situated between the Laurasia and the Gondwanaland.

Sea floor spreading theory

1. The concept of sea floor spreading was first formulated by harry hess in the year of 1960.

2. According to this theory, the mid oceanic ridges were situated on the rising thermal convective current coming from mantle.

3. The oceanic crust moves in opposite direction from mid oceanic ridges and thus there is continuous upwelling of n3ew molten materials along the mid oceanic ridges. These molten masses cool down and solidify to form new crust.

Plate tectonics

1. Plate tectonic is a scientific theory that describes the large-scale motions of earth's lithosphere.
2. The word tectonics comes from the Greek word meaning builder
3. The theory of plate tectonics states that the lithosphere is divided into several rigid segments, which include both oceanic and continental crusts. These segments are called plates and they are moving on the asthenosphere, which is not a liquid, but a solid which flows under stress.
4. About 20 such plates have been identified. There are seven major plates such as Eurasia, Antarctica, north America, south America pacific African and Indian plate.
5. There are various intermediate sizes plates such as china Philippine, Arabian, Iran Nazca, Cocos, Caribbean and Scotia plates.
6. Most of the earth's seismic activity volcanism and mountain building occur along with these dynamic boundaries.

Depending upon the type of movement, plate margins are ;of three types

1. Divergent plate martin (constructive margins)
2. Convergent plate margin (destructive margins)
3. Parallel plates margin (conservative margin or transform boundary)

Forces and processes affecting the earth's crust

1. Appearance of the surface of the earth keeps changing
2. These changes are produced under the influence of two type of forces.

These are given below

Exogenetic or external forces

1. The forces affecting the surface of the earth from outside are called the external or exogenetic forces.
2. Weathering and erosion are the examples of external forces.

Endogenetic of internal forces

1. The forces originating in the interior of the earth are called the interior or the endogenetic forces.
2. Volcanoes. Earthquakes and landside are the examples of internal forces.

Sudden endogenetic forces

1. Sudden endogenetic forces are the result of long period preparation deep within the earth.
2. But their cumulative effects on the earth's are quick and sudden.
3. Collision can occur between two oceanic plates, one oceanic and one continental plate or two continental plates.

Diastrophic forces

1. Diastrophic forces include both vertical and horizontal movements which are caused due to forces deep within the earth. These diastrophic forces operate very slowly and there effects become discernible after thousands and millions of years.
2. These forces termed as constructive forces effect larger areas of the globe and produce meso-level reliefs e.g., **mountains, plateaus, plains, lakes, big faults** etc. These diastrophic forces are further subdivided into two groups namely epirogenetic force and orogenetic force.

I. **Epirogenetic force** it causes upliftment and subsidence of continental masses through upward movements and areinfact, vertical movements. These forces and resultant movements affect larger parts of the continents. These are further divided into two type: upward movement and downward movement.

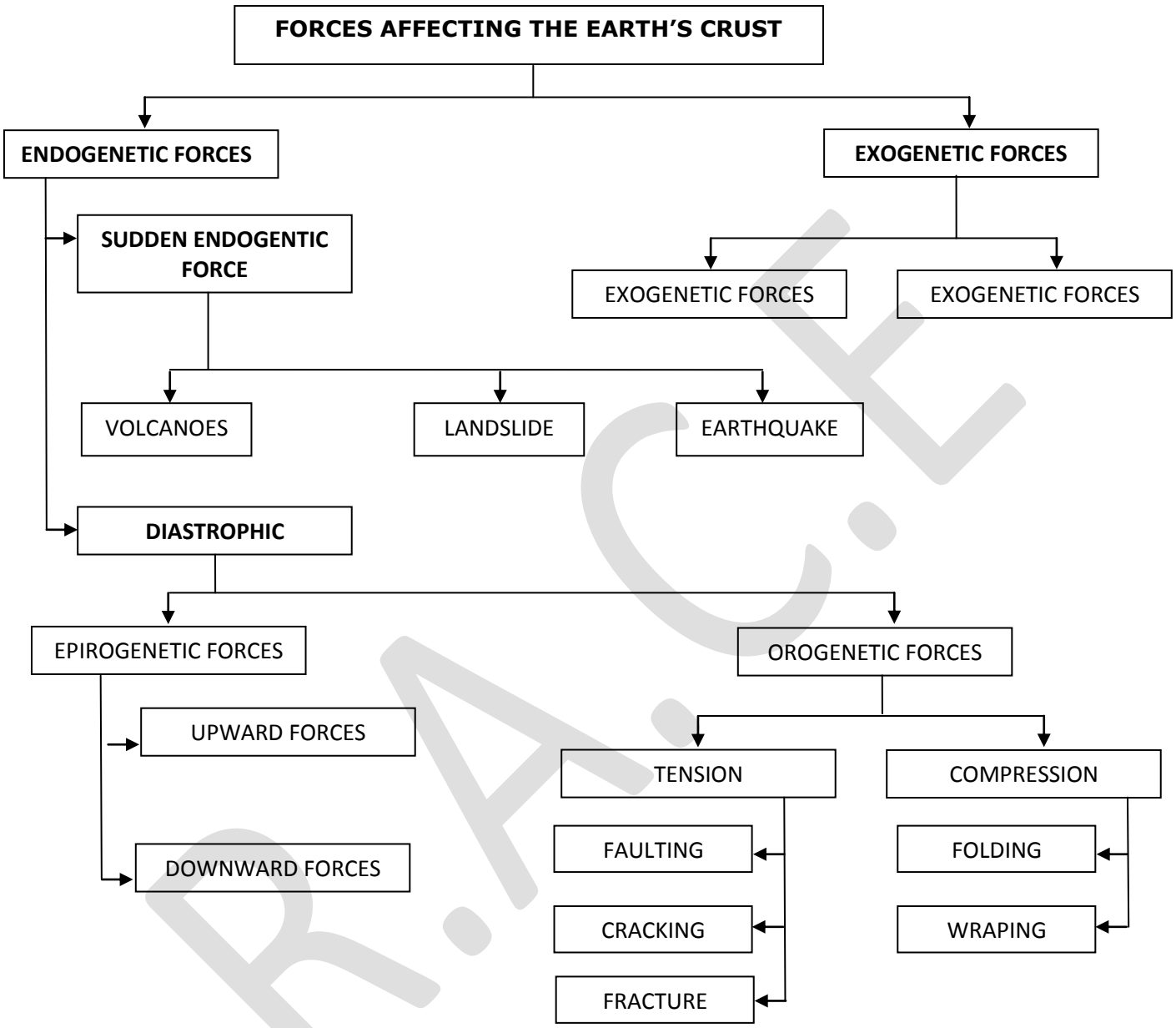
II. **Orogenetic forces**Orogenetic movement is caused due to endogenetic forces working in horizontal movement. Horizontal forces and movements are also called as tangential forces.

Orogenetic of horizontal forces work in two ways, namely

(i) in opposite direction and

(ii) towards each other.

When it operates i opposite direction, called tensional force. Tension force create faulting dracking and fracture. Tensional forces are also called as divergent forces. The force, when operates face to face, is called compression force or convergent force. Compression force create folding and warping.


FORCES AFFECTING THE EARTH'S CRUST
ENDOGENETIC FORCES
EXOGENETIC FORCES
SUDDEN ENDOGENTIC FORCE
EXOGENETIC FORCES
EXOGENETIC FORCES
VOLCANOES
LANDSLIDE
EARTHQUAKE
DIASTROPHIC
EPIROGENETIC FORCES
OROGENETIC FORCES
UPWARD FORCES
DOWNWARD FORCES
TENSION
COMPRESSION
FAULTING
FOLDING
CRACKING
WRAPING
FRACTURE

Received Education Excellence Award, 2017 – *from Blindwink.in, Bengaluru*

POLITY

- SALIENT FEATURES OF INDIAN CONSTITUTION

- **Sovereign** means absolutely independent, it is not under the control of any other state.
- **Socialist** involves a system which will endeavour to avoid concentration of wealth in a few hands and will assure its equitable distribution. It also implies that India is against exploitation in all forms and believes in economic justice to all its citizens.
- **Secular** means there is no state religion in India. Every citizen is free to follow and practice the religion of his/her own choice. The state cannot discriminate among its citizens on the basis of the religion.
- **Democratic** means that the power of the government is vested in the hands of the people, people exercise this power through their elected representatives who are responsible to them. All citizens enjoy equal political rights.
- **Republic** means that the head of the state is not a hereditary monarch.

- **Federal Government:** The constitution provides for a federal form of government. In a federation, there are two governments- at the central level and at the state level. The powers of the government are divided between the central government and the state government.
- **Fundamental Rights & Fundamental Duties:** Fundamental Rights and Fundamental Duties are most important characteristics of the Constitution. Fundamental Rights are considered to be essential for the proper moral and material uplift of people. These rights are fundamental in the sense that any law passed by the legislature in the country would be declared as null and void if it is derogatory to the rights guaranteed by the constitution.
- **Parliamentary Government:** Indian Constitution provides a parliamentary form of government. President is nominal head of the state. The government is run by the Prime Minister and other members of the council of Minister. The council of Ministers is collectively responsible to the Parliament.
- **Partly rigid and partly flexible:** The Constitution of India is neither wholly rigid nor wholly flexible. It is partly rigid and partly flexible.
- Certain provisions of the constitution can be amended by a simple majority in the Parliament.
- Certain provisions can be amended by two-third majority of the Parliament and its ratification by at least fifty percent states.
- The remaining provisions can be amended by the Parliament by two-third majority.
- **Single Citizenship:** In federation, normally we have double citizenship. In U.S.A every citizen of United States of America, is also a citizen of the state in which he or she resides. But the constitution of India provides single citizenship to every Indian.
- **Independent Judiciary:** The Indian Constitution provides for an independent judiciary. The judiciary has been made independent of the Executive as well as the Legislature. The judges give impartial justice

**TYPES OF MAJORITY*

SIMPLE MAJORITY	◉ Simple majority or working majority refers to majority of more than 50% of the members present and voting
ABSOLUTE MAJORITY	◉ Absolute majority refers to the majority of more than 50% of the total strength of the house.
EFFECTIVE MAJORITY	◉ Effective Majority of house means more than 50% of the effective strength of the house. This implies that out of the total strength, we deduct the absent and vacant seats
SPECIAL MAJORITY	◉ Any Majority other than simple, absolute and effective majority is called special majority. ◉ These include Majority by two-third strength of the house {example impeachment of president under article

PREAMBLE OF THE CONSTITUTION

The preamble emphasizes a few fundamental values and guiding principles on which the Constitution of India is based. It serves as a beacon for both, the Constitution and judges who interpret the Constitution in his light. The opening few words of the preamble - "we the people" means that power is concentrated in the hands of the people of India. The preamble is as follows:

***WE, THE PEOPLE OF INDIA,** having solemnly resolved to constitute India into a **SOVEREIGN SOCIALIST SECULARDEMOCRATIC REPUBLIC** and to secure to all its citizens:
JUSTICE, social, economic and political;
LIBERTY of thought, expression, belief, faith and worship; **EQUALITY** of status and of opportunity; and to promote among them all
FRATERNITY assuring the dignity of the individual and the unityand integrity of the Nation;
IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949, do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION***

First, the preamble was not part of the Constitution of India, but the Supreme Court, in the case of KesavanandaBharatiVs. State of Kerala found it a part of the Constitution and can be used in the interpretation of ambiguous areas of the Constitution. The words "socialist" and "secular" were introduced in the 42nd amendment.

	61} ◉ Majority by two-third of present and voting members {Example: Power of Parliament to legislate with respect to a matter in the State List in the national interest, under article 249}; Certain constitution amendment bills etc.
	◉ Absolute majority + majority of two-third present and voting {Example: Removal of Supreme Court Judge, CAG etc.}

- FUNDAMENTAL RIGHTS AND DUTIES UNDER INDIAN CONSTITUTION

FUNDAMENTAL RIGHTS

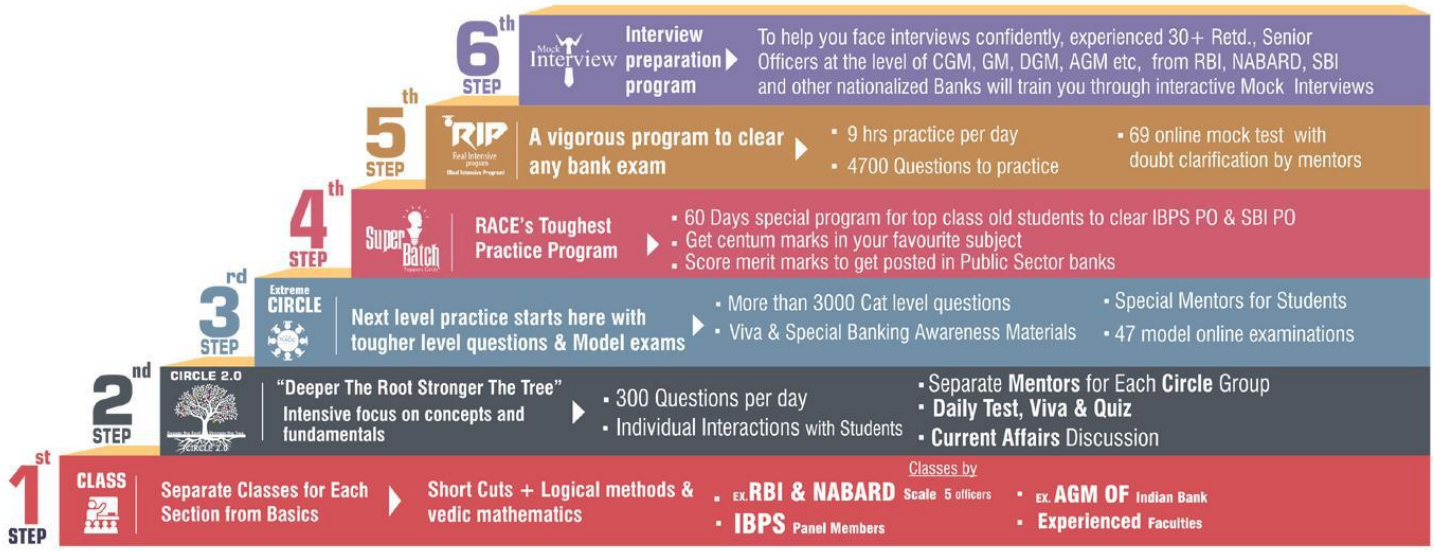
*These rights are fundamental in the sense that any law passed by the legislature in the country would be declared as null and void if it is derogatory to the rights guaranteed by the constitution. If any of these rights is violated, the individual affected is entitled to move the Supreme Court or High Court for the protection and enforcement of his rights. The rights are not absolute and can be curtailed during an emergency. (except articles 17, 21, 22)

Right to Equality

- 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.

6 Level Practice Programs



- 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

- Article 19 :- It guarantees the citizens of India the following six fundamentals freedoms:-

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

- Article 23 :- Traffic in human beings prohibited
- Article 24 :- No child below the age of 14 can be employed

Practice Village

Right to Freedom of Religion

- 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

- Article 29 :- Protection of interests of minorities

Rights

- Article 30 :- Right of minorities to establish and administer educational institutions
- Article 31 :- Omitted by the 44th Amendment Act

Right to Constitutional remedies

- Article 32 :- The right to move the Supreme Court in case of their violation

(It is called Soul and heart of the Constitution by BR Ambedkar)

THE WRITS

- **Habeas corpus** implies equality before law and equal protection of law.
- **Mandamus** is the form of command to either take a particular form of action or refrain from doing it.
- **Prohibition** is a writ issued by the high court or the Supreme Court to the local courts to prevent people from proceeding with a case which does not fall under its jurisdiction.
- **Certiorari** is a writ issued to lower courts, when these courts have gone beyong the scope of their jurisdictions.
- **Quo Warranto** writ is issued to a person who has been wrongly appointed in the office of authority.

- FUNDAMENTAL DUTIES

Initially, the Fundamental Duties were not provided in the Constitution. On the basis of the recommendations of Swaran Singh Committee, these ten duties were included in the Constitution under Article 51A of part IV by the 42nd Constitutional Amendment Act, 1976 and the 11th duty was adopted by 86th Constitutional Amendment Act, 2002. Under these provisions, a citizen of India is expected to faithfully observe the following fundamental Duties.

1. To abide by the Constitution and respect its ideas and institutions, the National Flag and the National Anthem;
2. To cherish and follow the noble ideals which inspired our national struggle for freedom;
3. To uphold and protect the sovereignty, unity and integrity of India;
4. To defend the country and render national service when called upon to do so;
5. To promote harmony and spirit of common brotherhood among all the people of India, transcending religious, linguistic, regional or sectional diversities, to renounce practices derogatory to the dignity of women;
6. To value and preserve the rich heritage of our composite culture;
7. To protect and improve the natural environment including forests, lakes, river, and wildlife and to have compassion for living creatures;
8. To develop the scientific temper, humanism and spirit of inquiry and reform;
9. To safeguard public property and to abjure violence;
10. To strive towards excellence in all spheres of individual and collective activities so that the nation constantly rises to higher levels of endeavor and achievement;
11. To provide opportunities for education to his child or, as the case may be, ward between age of 6 and 14 years;

- DIRECTIVE PRINCIPLES OF STATE POLICY

The Directive Principles may be classified into three broad categories—

1. Socialistic

2. Gandhian
3. Liberal-intellectual

Socialistic Directives

- **Article 38-** Securing welfare of the people
- **Article 39-** Securing proper distribution of material resources of the community as to best sub serve the common-good, equal pay for equal work, protection of childhood and youth against exploitation etc
- **Article 41-** Securing right to work, education etc
- **Article 42-** Securing humane conditions of work and maternity relief etc

Gandhian Directives

- **Article 40-** To organize village Panchayats
- **Article 43-** To secure living wage, decent standard of life, and to promote cottage industries
- **Article 45-** To provide free and compulsory education to all children up to 14 years of age
- **Article 46 to 48-** To promote economic and educational interests of the weaker sections of the people, particularly, the scheduled castes and scheduled tribes, to enforce prohibition of intoxicating drinks and cow-slaughter and to organize agriculture and animal husbandry on scientific lines.

Liberal Intellectual Directives

- **Article 49-** To secure uniform civil code throughout the country
- **Article 50-** To separate the judiciary from the executive
- **Article 51-** To protect monuments of historic and national importance and to promote international peace and security.

Miscellaneous : The Directive Principles in this category call upon the state : -

- To secure for all Indians a uniform civil code. (Article 44)
- To protect historical monuments.
- To save environment from pollution and protect wild life.
- To make arrangements for disbursement of free legal justice through suitable legislation.

** These all directives are non-justiciable in character i.e., The courts cannot compel the governments to enforce the directives.*

ECONOMY

NATIONAL INCOME OF INDIA

According to the National Income Committee (1949), "A national income estimate measures the volume of commodities and services turned out during a given period counted without duplication".

Thus, national income measures the net value of goods and services produced in a country during a year and it also includes net earned foreign income.

In other words, a total of national income measures the flow of goods and services in an economy. National income is a flow not a stock.

As contrasted with national wealth, which measures the stock of commodities held by the nationals of a country at a point of time, national income measures the productive power of an economy in a given period to turn out goods and services for final consumption.

In India, National income estimates are related with the financial year (April 1 to March 31).

CONCEPTS OF NATIONAL INCOME

Gross National Product (GNP)

Our Computer Lab at Chandigarh Branch

Gross National Product refers to the money value of total output or production of final goods and services produced by the nationals of a country during a given period of time, generally a year.

As we include all final goods and services produced by nationals of a country during a year in the calculation of GNP, we include the money value of goods and services produced by nationals outside the country.

Hence, income produced and received by nationals of a country within the boundaries of foreign countries should be added in Gross Domestic Product (GDP) of the country. Similarly, income received by foreign nationals within the boundary of the country should be excluded from GDE.

In Gross National Product Equation Form :

GNP = GDP + X – M,

where,

X = Income earned and received by nationals within the boundaries of foreign countries

M = Income received by foreign nationals from within the country.

If X = M, then GNP = GDP.

Similarly, in a closed economy X = M = 0, then also GNP = GDP.

Gross Domestic Product (GDP) is the total money value of all final goods and services produced within the geographical boundaries of the country during a given period of time.

As a conclusion, it must be understood while domestic product emphasizes the total output which is raised within the geographical boundaries of the country; national product focuses attention not only on the domestic product, but also on goods and services produced outside the boundaries of a nation. Besides, any part of GDP which is produced by nationals of a country, should be included in GNP.

NET NATIONAL PRODUCT (NNP)

NNP is obtained by subtracting depreciation value (i.e., capital stock consumption) from GNP.

In Net National Product Equation Form :

NNP = GNP – Depreciation

NATIONAL INCOME

GNP, explained above, is based on market prices of produced goods which includes indirect taxes and subsidies.

NNP can be calculated in two ways:

1. at market prices of goods and services.
2. at factor cost.

When NNP is obtained at factor cost, it is known as National Income. National Income is calculated by subtracting net indirect taxes (i.e., total indirect tax-subsidy) from NNP at market prices. The obtained value is known as NNP at factor cost or National income.

In NNP Equation Form :

NNP at factor cost or National Income = NNP at Market price – (Indirect Taxes – Subsidy = NNPMP – Indirect Tax + Subsidy.

PERSONAL INCOME

Personal Income: Personal income is that income which is actually obtained by nationals. Personal income is obtained by subtracting corporate taxes and payments made for social securities provisions from national income and adding to it government transfer payments, business transfer payments and net interest paid by the government

In Personal Income Equation Form :

Personal Income = National income – undistributed profits of Corporations – payments for social security provisions – corporate taxes + government transfer payments + Business transfer payments + Net interest paid by government.

RACE Institute Classroom

It should always be kept in mind that personal income is a flow concept.

Disposable Personal Income : When personal direct taxes are subtracted from personal income the obtained value is called disposable personal income (DPI).

In Disposable Personal Income Equation Form :

[Disposal Personal Income] = [Personal Income] – [Direct Texes].

METHODS OF MEASURING NATIONAL INCOME

According to Simon Kuznets, national income of a country is calculated by following mentioned three methods:

Product Method

S. Kuznets gave a new name to this method, i.e., product service method. In this method, net value of final goods and services produced in a country during a year is obtained, which is called

total final product. This represents Gross Domestic Product (GDP). Net income earned in foreign boundaries by nationals is added and depreciation is subtracted from GDP.

Income Method

In this method, a total of net incomes earned by working people in different sectors and commercial enterprises are obtained. Incomes of both categories of people – paying taxes and not paying taxes are added to obtain national income.

For adopting this method, sometimes a group of people from various income groups is selected and on the basis of their income national income of the country is estimated. In a broad sense, by income method national income is obtained by adding receipts as total rent, total wages, total interest and total profit.

Symbolically:

National Income = Total Rent + Total Wages + Total Interest + Total Profit.

Consumption Method

It is also called expenditure method. Income is either spent on consumption or saved. Hence, national income is the addition of total consumption and total savings. For using this method, we need data related to income and savings of the consumers.

Generally reliable data of saving and consumption are not easily available. Therefore, expenditure method is generally not used for estimating national income.

In India, a combination of production method and income method is used for estimating national income.

ESTIMATES OF NATIONAL INCOME IN INDIA

No specific attempts were made for estimating national income in India during pre-independence era. In 1868, the first attempt was made by DadabhaiNaoroji.

He, in his book 'Poverty and Un-British Rule in India', estimated Indian per capita annual income at a level of Rs.20. Some other economists followed it and gave various estimates of Indian national income.

Soon after independence, the Government of India appointed the National Income Committee in Aug 1949 under the chairmanship of Prof. PC Mahalanobis, to compile authoritative estimates of national income. The committee submitted its first report in 1951 and the final report 1954. According to this report, the total national income of the country was estimated at a level of Rs.8,650crore and per capita income at a level of Rs.246.90. The final report appeared in 1954 gave estimates of national income during the period 1950-1954. For further estimation of national income, the government established Central Statistical Organization (CSO) which now regularly publishes income national data.

Recently CSO has introduced a new series on National Income with 1999-2000 as base year. National income includes the contribution of three sectors of the economy primary Sector (Agriculture, Forest, Fisheries, Mining), Secondary Sector (Industries – Manufacturing and Construction) and Tertiary Sector (Trade, Transport, Communications, Banking, Insurance, Real Estate, Community and Personal Services).

GENERAL SCIENCE

PHYSICS

General Properties of Matter

Matter is the substance that occupies definite space and mass which is perceptible to sense.

ELASTICITY

The property of a body by virtue of which it regains its original shape & size after the removal of deforming force is called elasticity.

- Quartz, phosphor bronze are elastic bodies.
- If the body completely gains its original shape after removal of deforming force, the body is called perfectly elastic body.

- If the body remains in deforming shape even after removal of deforming force, is called perfectly in elastic (or) plastic body.

Stress:

The restoring force acting on the unit surface of an object is called stress. Its unit is N/m2

Stress = Restoring force
Area

Normal stress / Longitudinal stress

Stress produced normal to the axis of the body is called normal stress.

Types of stress:

(I) **Compressive stress:** Stress produced in the body, which is responsible for compression in the body is called compressive stress.

(ii) **Tensile stress:** Stress produced in the body which is responsible for the elongation in the body is called tensile stress.

Strain:

The external force acting on a body causes a relative displacement. Change in length and volume or shape takes place and it has no unit.

Types of strain:

There are three types of strain

(I) Longitudinal strain – It is the ratio of change in length to that of initial length of the body.

Longitudinal strain = ΔL/L

(ii) Shearing strain: The angle between the displaced state and initial state of the body is called shearing strain.

(iii) Volumetric strain: Ratio of change in volume of the body to its initial volume,

Volume strain = ΔV/V

Hooke's Law: Within the elastic limits of the body, stress produced is directly proportional to the strain produced.

Stress = E x Strain (or)

E is a constant called as modulus of Elasticity

Young's modulus of Elasticity (Y)

It is the ratio of longitudinal stress to the longitudinal strain within the elastic limit.

S.I. unit of Young's modulus of elasticity is Nm^{-2}(or) pascal

Bulk Modulus of Elasticity (B)

The ratio of normal stress to the volumetric strain within the elastic limit

S.I unit of bulk modulus of elasticity is Nm^{-2} (or) pascal

Rigidity Modulus (h)

The ratio of shearing stress to shearing strain within the elastic limit. It is also called shear modulus .

$$h = \frac{\text{shearing stress}}{\text{shearing strain}}$$

S.I unit of **h** is Nm^{-2} or pascal

PLASTICITY

The property of a body by virtue, of which it does not regain its original configuration after the removal of deforming force is called plasticity.

Putty, paraffin wax is nearly perfectly plastic bodies.

DENSITY

The density of a substance (d) is defined as the ratio of its mass (M) to its volume(V).

Density = $\frac{Mass}{Volume}$

Its unit is kg/m3 .

Density of water is maximum at 4℃ .

Relative density

The relative density is defined as the ratio of the density of the substance to the density of water at 4℃

Relative density = $\frac{Densityofsubstance}{Densityofwaterat\ \ 4℃}$

Relative density has no unit.

Relative density is measured by hydrometer.

Phenomena of density

Ice floats on water surface as its density (0.092 g/cm3) is lesser than the density of water.

Therefore, during swimming a person displaces the liquid with hands and legs and thus total weight of displaced liquid becomes equal to the weight of the body.

PRESSURE

It is defined as force acting normally on unit area of the surface.

Pressure = $\frac{Normlaforce}{Area}$

Its unit is N/m2 also called Pascal. It is a scalar quantity.

Pressure in a liquid is given by $p = hdg$

Where, h is the height

$d$is density of the liquid

$g$is acceleration due to gravity.

In a static liquid at same horizontal level, pressure is same at all points.

Pressure at a point in a static liquid has some value in all directions.

Pressure at a point in a liquid is proportional to the depth of the point from the free surface.

Pressure at a point in a liquid is proportional to the density of the liquid.

Atmospheric pressure

Atmospheric pressure is that pressure which is exerted by a mercury column of 76 cm length at 0° c at 45° latitude at the sea level. It is equal to weight of 76 cm column of mercury of cross sectional area 1 cm2.

Generally it is measured in bar. 1 bar = 105 N/m2

Atmospheric pressure of 1 atm = 1.01× 105 N/m2 = 760 torr.

Atmospheric pressure decreases with altitude. This is why it is difficult to cook on the mountain and the fountain pen of a passenger leaks in aeroplane of height.

Atmospheric pressure is measured by barometer. The slow rise in the barometric reading is the indication of clear weather.

Sudden fall in barometric reading is the indication of storm.

Slow fall in barometric reading is the indication of rain.

PASCAL'S LAW

The pressure exerted anywhere at a point of confined fluid is transmitted equally and undiminished in all directions throughout the liquid.

Hydraulic lift, hydraulic press and hydraulic brake work on the basis of Pascal law.

Effect of pressure on Melting point and Boiling pointThe M.P of substances which expands on fusion increases with the increase in pressure; for example: Wax

Buoyant Force

When a body is immersed partly or wholly in a liquid, a force acts on the body by the liquid in the upward direction. This force is called Buoyant force or force of buoyancy or upthrust.

It is equal to the weight of liquid displaced by the body and acts at the centre of gravity of displaced liquid. Its study was first made by Archimedes.

Buoyant force depends on the density of the fluid and not on the density of body and acts on centre of gravity of displaced fluid.

Centre of Buoyancy

The upthrust acts at the centre of gravity of the liquid displaced by the submerged part of the body that is called the centre of buoyancy.

ARCHIMEDES PRINCIPLE

When a solid body is immersed wholly or partially in a liquid, then there is some apparent loss in its weight. This loss in weight is equal to the weight of the liquid displaced by the body.

Law of Floatation

A body floats in a liquid if

Density of material of body is less than or equal to the density of liquid.

If density of material of body is equal to density of liquid, the body floats fully submerged in liquid in neutral equilibrium.

If density of material of body is equal to density of liquid, the body floats fully submerged in liquid in neutral equilibrium.

When body floats in neutral equilibrium, the weight of the body is equal to the weight of displaced liquid.

SURFACE TENSION:

Surface tension is a phenomenon in which the surface of a liquid, where the liquid is in contact with gas, acts like a thin elastic sheet due to various intermolecular forces,such as Van der Waals forces, draw the liquid particles together. Example, Insects walking on water. Several insects are able to walk on water , such as the water strider. Needle (or paper clip) floating on water.

Its SI unit is **N/m**.

VISCOSITY:

Viscosity is a property of the fluid which opposes the relative motion between the two surfaces of the fluid in a fluid that are moving at different velocities. The property of a fluid that resists the force tending to cause the fluid to flow. Its SI unit is **Pascal-Second.**

CAPILLARYACTION:

Capillary action (sometimes capillarity, **capillary** motion, or wicking) is the ability of a liquid to flow in narrow spaces without the assistance of, or even in opposition to, external forces like gravity.

In a glass tube, the level of water in the meniscus scale seems to be risen whereas the mercury level seems to be lowered due to capillarity.

Capillary action draws ink to the tips of fountain pen nibs from a reservoir or cartridge inside the pen.

SIMPLE PENDULUM

It is a heavy point mass suspended from a rigid support by means of an elastic inexhaustible string.

Time period of simple pendulum

$$T = 2\pi\sqrt{\frac{length\ of\ pendulum}{acceleration\ due\ to\ gravity}}$$

Where l is the length of simple pendulum and g is the acceleration due to gravity.

The maximum time period of a simple pendulum is 84.6 min.

A pendulum clock goes slow in summer and fast in winter.

If a simple pendulum is suspended in a lift descending down with acceleration, then time period of pendulum will increase. If life is ascending, then time period of pendulum will decrease.

WAVES

Introduction

Sound is a mechanical wave that is an oscillation of pressure transmitted through a solid, liquid or gas, composed of frequencies within the range of hearing and of a level sufficiency strong to be heard, or the sensation stimulated in organs of hearing by such vibrations.

Sound waves are longitudinal mechanical waves.

Sound waves are longitudinal waves :

When a sound wave passes through air, the particles of air vibrate back and forth parallel to the direction of sound wave.

Thus, when a sound wave travels in the horizontal direction, then the particles of the medium also vibrate back and forth in the horizontal direction but parallel to the direction of sound.

WAVES

Wave motion is a kind of disturbance which travels through a medium on account of repeated periodic vibrations of the medium particles about their mean position without any net transport

of the medium.All our communications depend on the transmission of signals through waves. All radiations are waves.

Different Types of Waves

Waves can be classified into three types:

- Mechanical waves
- Electromagnetic waves
- Matter waves.
- Surface waves.

A **Mechanical wave** is a **wave** that is an oscillation of matter, and therefore transfers energy through a medium. Mechanical wave is of two types Transverse waves and longitudinal waves.

Transverse waves	Longitudinal Waves
Particles of the medium vibrate in a direction which is perpendicular to the direction of propagation. Crests and troughs are formed	Particles of the medium vibrate in a direction which is parallel to the direction of propagation. Compressions and rarefactions are formed.
Can travel through solids and surfaces of Liquids	Can travel through solids, liquids and gases
Eg: Water waves,vibration of string.	Eg.Sound waves, tsunami waves, earthquake ,etc.

Electromagnetic Waves are the disturbance, which does not require any material medium for its propagation and can travel even through vacuum. They are caused due to varying electric and magnetic fields

Properties:

1. In vacuum E.M waves travel with light velocity.
2. E.M waves can be polarized.

3. E.M waves are transverse in nature.
4. Medium is not required for propagating the E.M waves.
5. E.M waves have momentum.

Example : Radio waves, light waves, thermal radiation, X ray etc.

Matter Waves are the waves produced in electrons and particles.Theseare also called **De Broglie waves**. They show or depict the wave nature or wave like nature of all matter, everything that makes up our body, the atoms etc.

Surface waves particles travel in a circular motion. These waves occur at interfaces.Example is a ground wave propagating close to the earth's surface. It can propagate between two fluids with different densities.

CHEMISTRY

Mendeleef's Periodic Law

It states, 'the physical and chemical properties of elements are the periodic function of their atomic masses. s and p-block elements are collectively called **representative** elements.

Atomic Size

- It decreases along a period from left to right. Thus, size of alkali metal is largest and that of halogens is smallest in a period.
- Smallest atom is hydrogen and largest atom is cesium.
- Most poisonous metal is plutonium.

Metallic Character

- Metal with lowest density is lithium.
- Tungsten is the metal having highest melting point.
- Reactivity of metals increases while that of non-metals decreases on moving down the group.

Ionisation Energy

- It is the energy required to remove an electron from the outermost shell of an isolated gaseous atom.

Electron Affinity (EA)

- It is defined as the energy liberated when an extra electron is added to an atom.

- It is highest for chlorine.

Electronegativity

It is the tendency of an atom in a molecule to attract the shared electrons towards itself. It increases regularly along a period from left to right and decreases on moving down a group. It is highest for fluorine.

Metals and their Properties

- These are the elements which are hard, lustrous, ductile, malleable, sonorous and conductor of heat and electricity in their solid as well as molten state.
- These form oxide with air. These oxides are generally basic, but oxides of zinc and aluminium are amphoteric, i.e., have acidic as well as basic properties.
- These evolve hydrogen gas when reacts with water and acids.
- Mercury (metal) is liquid at room temperature.
- Sodium and potassium are soft and highly reactive metals. These react with air and water. That's why these are kept in kerosene oil. Silver, gold and platinum do not react with air even on strong heating.
- Sodium and potassium burn in water while calcium floats over it.
- Copper (Cu) is the first metal used by man.
- Pb (lead) is a bad conductor of electricity.
- Ti is called strategic metal.

Non-Metals and their Properties

- These may be solid, liquid or gas (bromine is the only liquid non-metal).
- These are soft, non-lustrous, brittle, non-sonorous and non-conductor of heat and electricity.
- These have low melting and boiling points
- These form oxides with oxygen which are generally acidic.
- Their examples include noble gases (i.e., helium (He), neon-(Ne), argon (Ar), krypton (Kr), xenon (Xe) and some other p-block elements.
- Diamond is the hardest substance known. Iodine is lustrous. Melting point is very high for diamond and graphite.

- The order of hardness of some substances is diamond > corundum > topaz > quartz

Helium

- It is a noble gas (discovered by Lockyear and Janssen).
- It is used for filling balloons and other lighter aircraft. He, when mixed with O_2, is used by deep-sea divers for breathing and for respiratory patients.
- It is used as a heat transfer agent in gas cooled nuclear reactions.
- A mixture of mercury vapours and argon gas is filled in tube lights.

Neon

It was discovered by Ramsay and Travers. It is used in neon signs.

Argon

It was discovered by Rayleigh and Ramsay. It is used to generate inert atmosphere for welding and to fill incandescent light bulbs.

Xenon

It is called stranger gas. Xe, when mixed with Kr, used in high intensity, short exposure photographic flash tubes.

Uses of Some Important Metals and Non-Metals

- **Ferrous Oxide** (FeO) is used to prepare ferrous salts and green glass.
- **Ferric Oxide** (Fe_2O_3) is used in jeweller rough.
- **Silver Nitrate** ($AgNO_3$) is called lunar caustic and is used to prepare the ink used during voting.
- **Silver Iodide** (AgI) is used for artificial rain.
- **Mercuric Chloride** ($HgCl_2$) is used to prepare calomel and as a poision.
- **Hydrogen Peroxide** (H_2O_2) is used as an oxidising agent, bleaching agent, as an insecticide and for washing old oil paintings

Metalloids

These have properties of metals as well as non-metals. They are present only in p-block. e.g., arsenic, antimony, germanium etc.

Minerals

These are the substances in the form of which metal is found in nature.

- The main **constituent of pearl** is calcium carbonate ($CaCO_3$).
- **Ruby and sapphire** are chemically aluminium oxide, Al2O3.
- In haemoglobin and myoglobin, **iron** is present as Fe^{2+}.

Ores

- These are the minerals from which metal can be obtained conveniently and beneficially.
- All ores are minerals but all minerals are not ores.

Gangue of Matrix

- These are the impurities associated with the ore.

Ores of Some Important Metals

Metal	Ores
Sodium (Na)	Chilli salt petre ($NaNO_3$) Common salt or brine (NaCl)
Aluminium (Al)	Bauxite ($Al_2O_3 . 2H_2O$) Corundum (Al_2O_3) Cryolite ($Na_3 AIF_6$) Feldspar ($KAISi_3 O_8$)
Potassium (K)	Nitre (KNO_3) Carnalite ($KCI .MgCI_2 . 6H_2O$)
Magnesium (Mg)	Magnesite ($MgCO_3$) Dolomite ($MgCO_3 . CaCO_3$) Epsom salt ($MgSO_4 . 7H_2O$)
Calcium (Ca)	Calcite ($CaCO_3$) Flurospar (CaF_2)
Copper (Cu)	Cuprite (Cu_2O) Copper glance (Cu_2S) Copper pyrites ($CuFeS_2$)
Silver (Ag)	Ruby silver ($3Ag_2S . Sb_2S_3$) Horn silver (AgCI)
Zinc (Zn)	Zinc blende (ZnS) Calamine ($ZnCO_3$) Zincite (ZnO)
Mercury (Hg)	Cinnabar (HgS)
Tin (Sn)	Cassiterite (SnO_2)
Lead (Pb)	Galena (PbS) Cerrusite ($PbCO_3$)
Iron (Fe)	Haematite (Fe_2O_3) Magnetite (Fe_3O_4)

	Siderite ($FeCO_3$)
Uranium (U)	Pitch blende (kernatite) (U_3O_8)
Thorium (Th)	Monazite

Metallurgy

It is the process of extraction of metal from its ores.

Alloys and their Uses

Alloy	Composition	Uses
Brass	Copper (70%) + Zinc (30%)	In making utensils
Bronze	Copper (90%) + Tin (10%)	In making coins, bell, utensil
Gun metal	Copper (88%) + (10%) Sn + Zinc	In making gun, barrels, gears and bearings
German silver	Copper (60%) + Zinc (20%) + Nickel (20%)	In making utensils
Solder	Lead (50%) + Tin (50%)	For soldering
Bell metal	Copper (80%) + Tin (20%)	For casting bells, statues
Munz metal	Copper (60%) + Zinc (40%)	In making coins
Magnalium	Aluminium (95%) + Magnesium and manganese	For frame of aeroplane
Duralumin	Aluminium (94%) + Copper + Magnesium and manganese	For making utensils
Type metal	Lead (80%) + Antimony (15%) + Tin (5%)	In printing industry
Stainless steel	Iron (75%) + Chromium (15%), Nickel (10%) + Carbon (0.5%)	For making utensils and surgical cutlery

Babbit metal	Tin (89%) + Antimony (9%) + Cu (2%) Nickel + Chromium	In making heater coil

Calcination

- It is the process of heating the concentrate ore in absence or in limited supply of air, below its melting point. It is done for hydroxide or carbonate ore.
- It is done in reverberatory furnace.

Roasting

- It is the process of heating the concentrated ore in excess of air.
- It is used for sulphide ores.
- It is done in reverberatory furnace
-
- .

Smelting

- It is the process of heating the oxides of elements with cock and flux above their melting point.

Flux and Slag

- These are the substance which converts infusible impurities into fusible substances, called slag.
- These are of two types: Acidic flux such as SiO_2 (used to remove basic impurities) and basic flux, such as CaO, MgO (used to remove acidic impurities).

Electrolytic Refining

In electrolytic refining anode is made up of impure metal and cathode is made by thin strip of pure metal.

Alloys

These are mixtures of two metals or a metal and a non-metal. They have properties different from the main metal. Alloys of mercury are called amalgam.

BIOLOGY

HUMAN NERVOUS SYSTEM

Thin thread like nerves are spread throughout the body.

Nervous system of human is divided into three parts:

Central Nervous System:

Nervous system which keeps control on the whole body and itself.Two parts of central nervous system

Brain

Brain is covered by membrane called meninges. Situated in a bony box called **cranium** which protect it from external injury.

Forebrain: (weight – 1350 grams)

Function of cerebrum

Most developed part of the brain.Centre of wisdom, memory, movements, will power, knowledge and thinking.

Function of Thalamus:

Centre of pain, cold and heat.

Function of Hypothalamus:

Controls the hormone secretion of endocrine gland.Centre of hunger, thirst, temperature control, love, hate etc.Blood pressure, metabolism of water, sweat, anger, joy etc are controlled by it.

Mid – Brain: Also Called Corpora quadrigemina.

Centre of control on vision and hearing power.

Hind – Brain

Cerebellum: Large reflex centre for co ordination muscular body movements and maintenance of posture.

Pons: It acts as bridge carrying ascending and descending tracts between brain and spinal cord.

Medulla: Posterior part of brain and continue to the spinal card.

Connects and communicates the brain with spinal cord.Contains the cardiac respiratory and vasomotor centres that control complex activity like heart action,respiration, coughing, sneezing etc.

Spinal Cord:

Posterior region of the medulla oblongata forms the spinal cord.

Main function

Co ordination and control of reflex action.

Carries the impulses coming out of the brain.

Peripheral Nervous System

Made up of the nerves arising from brain (cranial – 12 pairs) and spinal cord (spinal - 31).

Unit of nervous tissue is called **Neuron /nerve cell.**

Automatic Nervous System

Automatic Nervous System is made up of some brain nerves and spinal cord nerves.

Supplies nerves to all the internal organs and blood vessel of the body.

There are two parts of Automatic Nervous System:

Sympathetic Nervous System Functions:

Helps in clotting of blood.Increases the Blood Pressure, Sugar level in the blood and Number of RBC in the blood.Increases the secretion of sweet glands, heartbeat, rate of respiration. Stretches the pupils of the eye ball.Reduces the secretion of salivary glands etc.

Parasympathetic Nervous System Functions:

Increases the secretion of saliva and other digestive juices.Contraction of pupil is caused by this. Widens the lumen of blood vessels but except the coronary blood vessels.Creates contraction and motion in intestinal walls.

HUMAN DIGESTIVE SYSTEM

Process where less soluble food is changed into soluable and diffusable substance by the action of enzymes. Process of nutrition is divided into five stages

INGESTION (Taking the food in the mouth)

Eating food in the solid form – holozoic nutrition. With the help of teeth, the food is chewed.Hardest part in the body is tooth enamel.

Teeth are of four types. 1) Incisors (for cutting)

2) Canines (for tearing)

3) Premolars (for chewing)

4) Molars (for chewing and grinding)

In elephants - tusks are the incisors of upper jaw. Maximum number of teeth - horse and pig.

DIGESTION

Digestive Glands	Secretion	Enzymes	Substrate	Products
Salivary glands	Saliva or Salivary juice	Ptyalin	Starch	Maltose

Gastric glands	Gastric juice	a)Pepsin b)Lipase	Protiens Lipids	Peptones Glycerides
Liver	Bile juice	No enzyme	Fat	Fatty acids
Pancreas	Pancreatic juice	a)Amylase b)Tripsin c)Lipase	Starch Protiens Fat	Maltose Peptides Fatty acids
Intestinal glands	Intestinal juice or Succusentericus	a)Enzyme for protein digestion b)Enzyme for sugar digestion c)Lipase	Peptones Sugars Fat	Amino acids Glucose Fatty acids and glycerol

ABSORPTION (Digested foods reaching blood)

The absorption of digested foods take place through small intestinal villi.

ASSIMILATION (Usage of digested food in the body)

DEFECATION

Undigested food reaches into large intestine where bacteria turns it into feces, which is excreted through anus.

HUMAN RESPIRATORY SYSTEM

Respiration is a complex process which involves exchange of oxygen and carbon di oxide gases along wtih the oxidation of digested food to release energy for various biological functions. The released energy is stored in ATP molecules.

Upper Respiratory Tract

Mouth, nose & nasal cavity: Function is to warm, filter and moisten the incoming air.

Pharynx: Throat divides into i) trachea (wind pipe)

ii) esophagus (food pipe).

Epiglottis(small flap of cartilage)**:** Prevents food from entering the trechea.

Larynx (voice box)**:**protect the trachea by producing a strong cough reflex if any solid objects pass the epiglottis.

Lower Respiratory Tract

Trachea (wind pipe): Carries air from the throat into the lungs.

Inner membrane of the trachea is covered in tiny hairs called cilia (traps dust particles).

Bronchi: Left bronchi is narrower, longer and more horizontal than the right.

Inside the lung the bronchi split several ways, forming tertiary bronchi.

Bronchioles: Tertiary bronchi divide into bronchioles (very narrow tubes less than 1 mm in dia).

No cartilage within the bronchioles. They lead to alveolar sacs.

Alveoli: Have very thin walls which permit the exchange of gases Oxygen and Carbon Dioxide.

There are approximately 3 million alveoli within an average adult lung.

Diaphragm: Lies below the lungs. Forms the base of thoracic cavity.

Process of respiration:

Process of respiration can be divided into four parts

a) **External respiration**

Breathing i) Inspiration (ii) Expiration

Breathing rate in human is 18 – 20 /min.Everyday approximately 400 ml water is excreted through breathing.

Exchange of gases

b)**Transportation of gases**

Reaching of gases (oxygen and carbon dioxide) from lungs to the cells and back to lungs.

Transportation of oxygen takes place by hemoglobin present in blood.

c) **Internal respiration**

Gaseous exchange takes place between blood and tissue fluid.

Food is broken down to release energy.

d) **Cellular respiration**

Glucose is oxidized by oxygen reached into the cell.

Respiratory organ	**Animal**
Lungs	Reptiles like lizards Mammals like man, camel, cattle, etc
Skin	Frog, earthworm and leeches
Gills	Fishes, tadpoles and prawns
Tracheae	Insects, centipedes and millipedes
Body surface	Amoeba, Euglena, chlamydomonas, spirogyra, Hydra, etc
Book lungs	Spider, Scorpion, ticks and mites
Book gills	King-crab, prawn, Cray fish and Daphnia
Air bladder	Lung fish and bony fishes (e.g., Labeo)
Air sacs/lungs	Birds

ENDOCRINE SYSTEM

Ductless glands, secreting the chemical substances called **hormones(**chemical constitution **- protiens**or **amino acids** or **steroids).**

Thomas Edison is called **Father of Endocrinology.**

Head – a) Pituitary Gland

Master gland which controls the activity of other endocrine glands.Produces many hormones like growth hormone, thyroid stimulating hormone, antiduretic hormone etc. Located inferior to hypothalamus.Over secretion of growth hormones causes gigantism.

Acromegaly : Extra growth of bones in face (large nose and thick lips).

b) Pineal Gland

Lies under **corpus callosum** in the brain.Produces**melatonin**, causing concentration of pigments.

Neck -a) Thyroid Gland

Largest endocrine gland, on each side of larynx.Ventral side of thyroid gland contains **parathyroid gland.**

Secrete **thyroxine-** Increases rate of metabolism and maintains body temperature.Regulates iodine and sugar level in the blood. Also called Personality Hormone.Provides growth and differentiation of tissues.

b) Parathyroid Gland

Produces hormone **parathormone and calcitonin.**Used in **mineral metabolism.** Thorax – Thymus Gland. They are **Lymphoid mass** present above the heart. Secrete thymosin which stimulates and differentiates **T–lymphocytes.**

Abdomen - a) Pancreas – **Islets of Langerhans.**

Pancreas plays both **endocrine and exocrine function.** It is called **mixed gland.**Exocrine parts produce **pancreatic juice** and endocrine part is **islets of Langerhans.**Islets of Longerhans has two types of cells called **Alpha cells** producing **glucagon** and **Beta cells** producing **insulin.**Insulin – Promotes the intake of glucose. Conversion of glucose into glucogen and storing it in liver and muscle.Prevents formation of glucose from fat and protien.Maintains normal blood glucose level at **80 – 120mg/100ml** of blood.Glucagon - Secreted when glucose level is low in blood.

Influences conversion of glycogen into glucose and raising blood glucose level.Adrenal Glands – Adrenal cortex and Adrenal medulla. Gonads – Testes (male) and Ovaries (Female).

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