* Astronomy and Cosmology *

⇒ **Astronomy**:- According to NASA, astronomy is the study of stars, planets and space, their composition, structure and makeup.

It is a science which investigates all the matter – energy in the universe : its distribution, composition, physical states, movements and evolution. Astronomy includes observation and theories about the solar system, the stars, the galaxies and the general structure of the space. It also includes cosmology that is the study of universe and its past and future. People who study astronomy are called astronomers.

⇒ **Cosmology**:- It is the branch of science that deals with study of universe is called cosmology Cosmology seeks a scientific explanation of how universe began and how it might end. Cosmologists study the universe observationally and theoretically.

All matter and energy including earth, the galaxies and the contents of space. (Nasa)

⇒ **Universe**:- The universe is sum ~~total~~ of all matter and energy that exists ~~and~~ or has existed both in space and time. It further can be described as the totality of everything that exists including all matter, energy, the planet, stars, galaxies and contents of intergalacti

Space. The universe is infinite in space but astronomers believe it does have finite age.

Astronomers accept theory that about 14 b years ago, the universe began after an explosive event which resulted in hot, dense and expanding sea of matter and energy.

* Theory that explain the origin of universe.

→ Big Bang Theory: cosmic Egg exploding / exploded at the moment of creation (Report published in 'Nature' Journal) (multidisciplinary scientific)

In 1927, Georges lemaitre proposed the Big Bang theory of universe. He is considered father of Big Bang theory. This theory states that there was an infinitely small, infinitely dense matter/ point (object) that contained everything that is in universe. This was incredibly dense and hot. The bigbang ~~theory~~ ~~have~~ has believed to have occur between 10–15 ~~years~~ billion years ago, approx 13.7 b years. Some scientists believe that entire universe came from small atom. All matters and spaces were created from single pure matter.

This theory states that the universe sprang into existence from a singularity. Once singularity was created, it began to expand through a process of inflation. The universe went from very small, very dense and very hot to the cool expanse that we see today. This term was coined by Sir Fred Hoyle in 1950.

Interestingly, there wasn't any ~~explosion~~ sort of explosion as the name suggest but rather it was a rapid expansion of space and time.

* The moments after the Big Bang:-

The early universe was not bound by the laws of physics as we know them today. Scientists believed that universe was intially so hot and so dense that even elementry particles like protons and neutrons could not exist. Then slowly over time, these protons, neutrons and electrons came together to form Hydrogen and small amounts of Helium.

* End of Universe :-

⇒ Steady - state Theory :- It states that the universe has always been the same as it is today and and it will continue that way forever. In the view of this theory, (1) universe is always expanding but (2) maintaining constant average density. It further adds that (3) matter is being continuously created to form new stars and galaxies at the same rate that old ones become unobservable as the consequence of their increasing distance and velocity of recession. A steady state universe has (4) no beginning ~~and~~ or end in time. On the grandscale, it states that the (5) average density and arrangements of galaxies is the same.

(4)

This theory was first put forward by Sir James Jeans in 1920 and again in revised form in 1948 by Austrian astronomers, Hermann Bondi and Thomas Gold, and further developed by Fred Hoyle. It is cosmological theory.

* Redshift Theory :- It states that (1) stars are moving away from eachother and their light becomes dimmer. This theory gives the evidence that (2) universe is expanding. As (3) light comes from other galaxies. As the distance between the earth and galaxy increases, the wavelength of light increases. longer wavelengths of visible lights are red, and that is why it is called the red-shift theory.

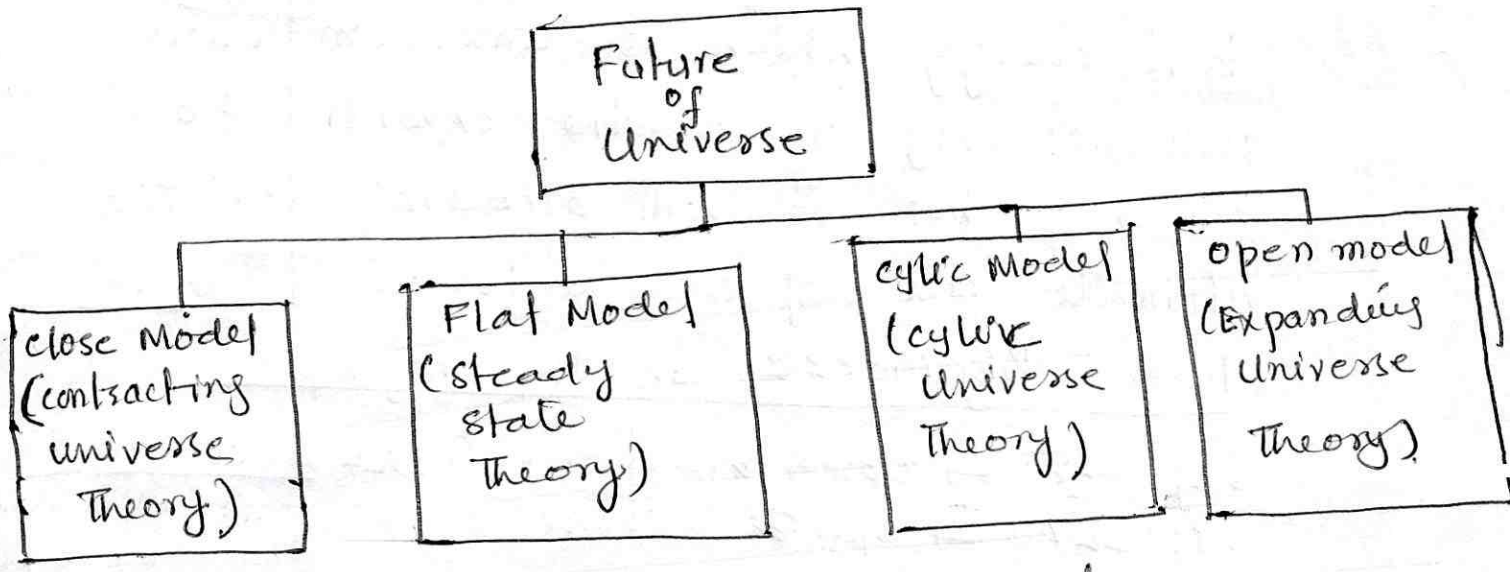
The redshift of light gives scientists information on the basis of speed and direction that star is moving. This in turn states that stars are not only moving away from us, but they are also moving away from each other.

- Example Doppler effect.
- support big-bang theory.
- universe was small.

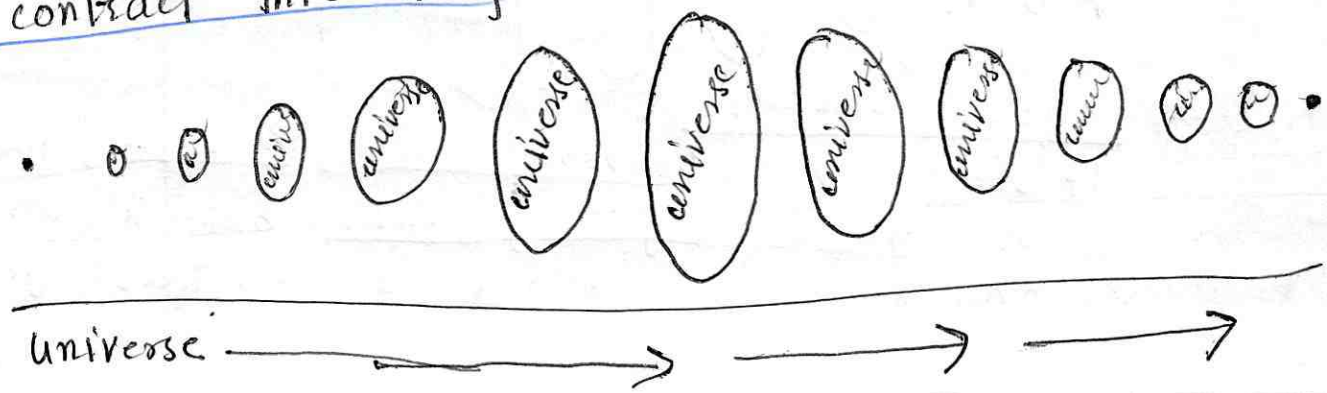
(5) * Blue shift Theory:- This theory states that stars (1) are moving towards each other in the universe. In this (2) wavelength is decreased and frequency is increased. For example, the (3) Andromeda galaxy is moving towards our own Milley way galaxy with the local group. Thus, (4) when observed from earth its light is undergoing blue shift.

Red ⟶ Blue.

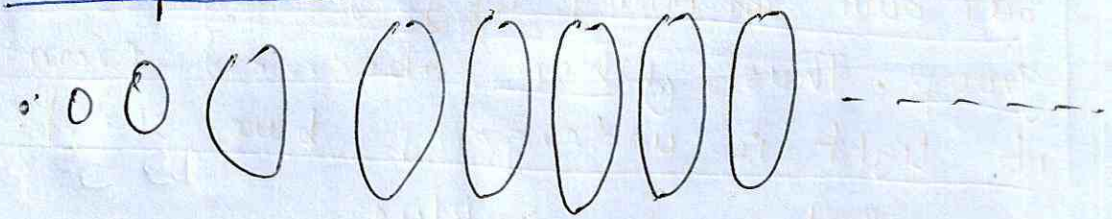
* Future of the Universe



→ close Model:- According to this model, many billions of years from now, universe will stop expanding at certain point and it will begin to contract into itself.



* Flat model :- In the flat model, there will be no any collapse of universe, but expansion will slow and the universe will approach a stable size. It will stop its expansion and maintain itself forever.



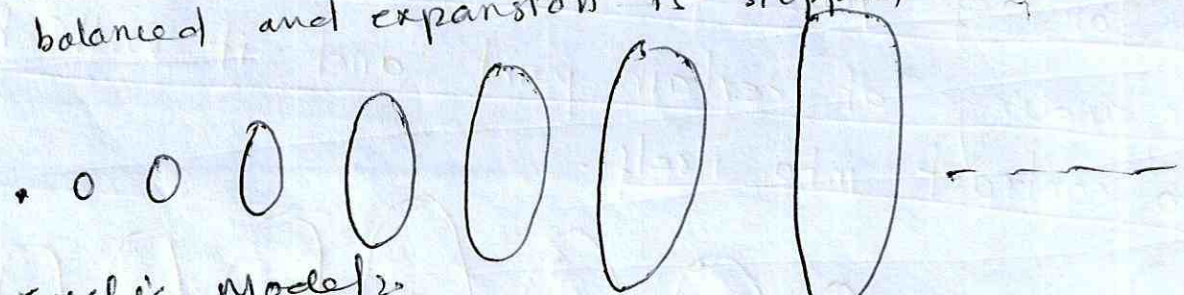
* Open Model :-

According to the open model, the universe will continue to expand forever. In this dark energy which is unknown form of energy will not only cause the expansion to continue but it will accelerate it. The ultimate fate of open universe is heat death, Big freeze or the Big Rip.

- If $\Omega > 1$ → closed universe
- If $\Omega < 1$ → open universe
- If $\Omega = 1$ → flat universe

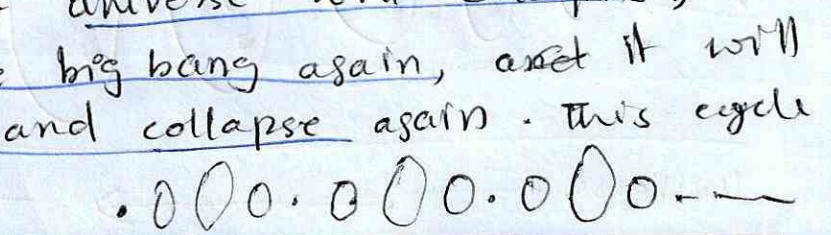
Ω = actual density / critical density

critical density :- It is the value at universe is at balanced and expansion is stopped. ($1-3 \times 10^{-26}$ kg/m^3)



* Cyclic Model :-

It states that universe will collapse, then there will be big bang again, after it will expand first and collapse again. This cycle will go on.



fundamental unit of universe.

Largest Galaxy = 10^{14} stars
Smallest Galaxy = 10^{3} stars

* Galaxy :- It is the grouping of millions and billions of stars kept together by gravitational force. Astronomers estimate that there are about 125 billion galaxies in the universe. Milky way and Andromeda are the examples of galaxy.

* Main types of galaxies :-

→ Spiral Galaxies → It is shaped like a disk, (1) usually with a bulge in the centre and with (3) arms that spiral outwards as galaxy moves. It contain more (4) middle-age stars along with the clouds of (5) gas and dust. (Milky way is spiral) (2)

→ Elliptical galaxies :- It contain older stars and very little gas and dust. Three dimensional and stars are somewhat in random orbit.

→ Irregular Galaxies :- It has an undefined shape and lots of young stars, dust and gas.

* Milky Way (Spiral) :- It is a (1) large, disk shaped galaxy that (2) includes our solar system. Milkyway contains (3) 200–400 billion other stars and almost (4) 100 billion other planets. (5) Most of the stars that (6) we see are in the Milky way Galaxy. The main plane ~~band~~ of Milky looks like a faint band of white in night sky

→ ~~Spiral~~ Its main features.

✓. Spiral Galaxy
✓. It is about 100,000 light year in diameter.
✓. It is formed about 14b years ago.
✓. Sun roughly takes 250m years to orbit around Milky way

(5)

Galactic Region
Milky way galaxy region

- Our solar system is 30,000 light years away from the centre of Milky way.
- Nearest galaxy to milky way is Andromeda (M31).
- Our Milky way is the part of cluster of 3 dozens of galaxies called 'local group'.

Extra

Solar system is in minor arm called orion spur/arm. major. perseus arm, . Sagittarius arm, . Centaurs . Cygnus

* Astronomical System of Units :-

. It is the (1) system of measurement developed for used in Astronomy. It was adopted by (2) International Astronomical Union (IAU) in 1976 and significantly (3) updated in 1994 and 2009. This system was ~~adopted~~ developed because of (4) difficulties in measuring and expressing astronomical data in 'International System of Units' (SI units). The astronomical system of units is tridimensional in that it defines units of length, mass and time.

* length :-

. Light year :- The distance between celestial bodies is measured by unit light year. According to IAU, light year is a distance that light travels in vacuum in one julian year.

- one julian year = 365.25 days
- one light year = 9.4607×10^{12} km ✓

* **Unit of Time:-** The astronomical unit of time is the 'Day', defined as 86400 seconds. 365.25 Days make up one julian year. The symbol 'D' is used in astronomy to refer this unit.

* **Unit of Mass:-**
The astronomical unit of mass is solar mass. The symbol $M_\odot$ is often used to refer this unit. It is used to describe the masses of stars and galaxies. One solar mass is equal to the mass of the sun and about 333,000 times the mass of earth and 1048 times the mass of jupitar.

$333000 \approx 332950$

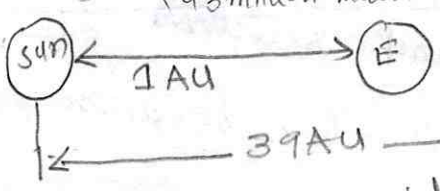
one solar mass $= 1.98892 \times 10^{30}$ kg.

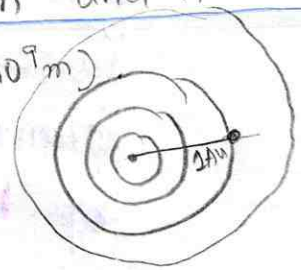
M_J = one jupita mass $= 1.898 \times 10^{27}$ kg.

$M_\oplus$ = one earth mass $= 5.9742 \times 10^{24}$ kg.

continue... units of length.

⇒ **Astronomical Unit (AU):-** It is defined as the average distance between the earth and the sun and it is approximately 150 million kilometers (150×10^9 m)
(93 million miles)





⇒ **Parsec:-** It is also a unit of distance that is equal to 3.26 Light years or 3.086×10^{13} kilometers. It is a distance at which star would have parallax of 1sec of arc.

1 minute arc = $\frac{1}{60}$ of one degree

1 second arc = $\frac{1}{3600}$ of one degree

(2)

* The Planets and Their characteristics.

The 'Planet' is a term used for body in orbit around the Sun. The word comes from Greek 'planetes' which means 'wanderers'. Our solar system has eight planet: Mercury, Venus, Earth, Mars, Jupitar, Saturn, Uranus and Nepture. Pluto was considered as planet some years back but now classified as dwarf planet.

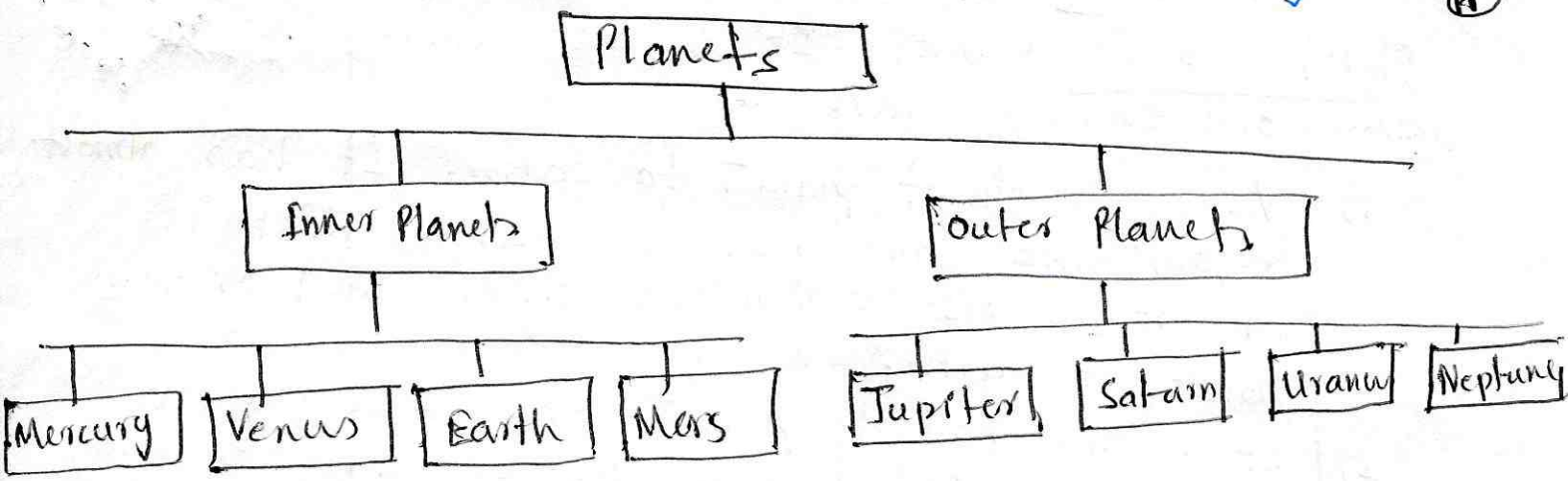
→ Inner / Rocky / Inferior planets.

Mercury, Venus, Mars and Earth are the planets closest to the Sun. They are called the inner planets. They are made up mostly of rock. Therefore, they are called rocky or terrestrial planets. They are very small as compared to outer planets, so that is why they are also called inferior planets.

→ Outer / Graseous / Superior / Jovian Planets.

Jupitar, Saturn, Uranus and Neptune are called jovian (Jupiter like) planets because these are large in size. They are also called gaseous planets because they have an atmosphere of hydrogen and helium and they have rings. They are also called outer because they are after Asteroids.

Solar system → 4.5 b years



• Mnemonic Device for planet.

My Very Energetic Mother Just Served Us Noodles.

Mercury Venus Earth Mars Jupiter Saturn Uranus Neptune

* Mercury :- It is smallest and fastest revolving planet.

1- It is smallest planet in solar system and it has diameter of 4900km. It is about the same size as our moon.

2- Mercury travels around the sun faster than any other planet. That is why it was named after Mercury, the swift messenger of gods in Roman mythology.

3- Mercury has no atmosphere i.e no air, no water and no moon, therefore, human would not be able to live there.

4- It is consist of rock and iron like surface, therefore has very high density.

5- It revolves around the sun in 88 days and 58m km away from the sun. Its temperature is -170 to 450°C.

6- 1 rotation completes in 59 days.

⇒ Size, Speed, Livelihood, Structure, Characteristics.
- Rotation
- Revolution.

Venus :— It is the hottest, brightest, slowest slowest rotating planet. It is also known as morning morning and evening star.

1) Venus is closet planet to earth. It has almost equal size and mass to earth. That is why it is also known as sister planet or twin planet to earth.
2) It is the hottest planet and temperature rises to 460 — 480 celsius on the side facing the sun.
2) Venus is yielded with the ~~clo~~ spinning clouds of CO_2 which cover its surface. These clouds hold the heat in it that is why it is so hot.
4) It is brightest because these clouds of CO_2 reflects the light. So it appears bright here on earth.
5) All the planets rotates anti-clockwise ~~(west to east)~~ but venus rotates clock-wise ~~(east to west)~~.
6) It spin very slowly. Its one day is equal to the almost 244 (≈243) days on earth.
7) It completes its revolution around the sun in 225 days.
8) It has no rings and moons. NO

* **Earth →** It is colourful ~~planet~~ and most dense planet. Its greek name is Gaea. The earth is the biggest of all terrestrial planets. It is 3rd in position and 5th largest in solar system.

- Its diameter is 7926 miles and circumference measured around the equator is 24901 miles or 40,075 km.

1. Its 30% surface is covered with land and 70% surface is covered with ocean.
2. It has an atmosphere which is consist of many different gases mainly nitrogen and oxygen.
3. It is the only planet in solar system that support life.
4. It has one moon, named as 'luna'.
5. It completes its revolution around sun in 365.25 days. Due to its ~~rotation~~ revolution, different seasons comes and go.
6. It rotates around its own axis and complete one rotation in 23 hours, 56 minutes and 4 seconds. Due to this day and night happen.
7. Earth is dense planet and its density is 5.52 g/cm³
8. It is also known as blue planet.

→ Gaea
→ Densest planet → Earth

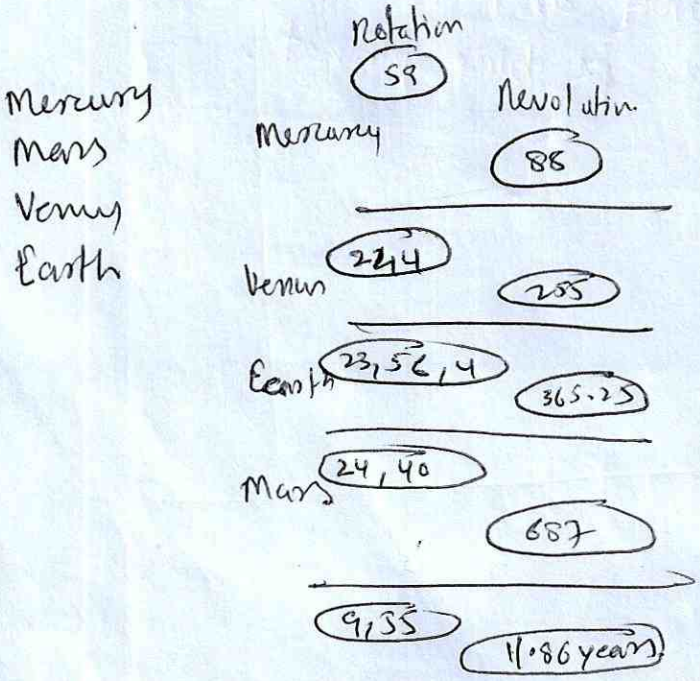
(19)

* **Mars :-** It is red planet and second smallest planet.

1. It has very cold temperature, average around -30°C.
2. Mars has two moons, phobos and Deimos which have unusual shape. And Deimos is the smallest natural satellite of our solar system.
3. It is called red planet because of the presence of red dust.
4. Its atmosphere is composed of CO_2.
5. Its diameter is 6780km
6. Mars is 228 m km away from sun.
7. Its rotation period is 24 hrs and 40 minutes and revolution period is 687 days.

* ~~Jupiter is biggest and fastest rotating~~

8) Gravity and diameter - half of the earth.
Due to low gravity, you can jump 3 times higher.



Jupiter :- It is the biggest and fast rotating planet.

1) It is a large gaseous planet whose clouds changes colour daily and made of H and He.
2) Huge storm of swirling gases can be found in Jupiter's atmosphere. The largest storm of gas is called Great Red spot.
3) large bolts of lightning have found in Jupiter's atmosphere
4) Jupiter has 67 moon, of 50 moons are confirmed and 17 moon still waiting for confirmation by IAU. Ganymede is the largest moon of Jupiter and is the largest in solar system.
5) Its is fast rotating and its one day is equal to 9 hrs and 55 minutes of earth.
6) Its revolution period is 11.86 years.
7) It 1350 times bigger than earth and 318 times massive than earth.
8) Jupiter's four largest moon: Io, Europa, Ganymede and Callisto were discovered by ~~Gallilo~~ Galileo and called Galileo moons.
9) Its average temperature is -150 and it has rings that are not visible.
10) It is also known as vacuum cleaner of solar system because it suck all the dust.
11) Its gravity is higher than earth. - i.e 100pound = 240pound on earth on Jupiter

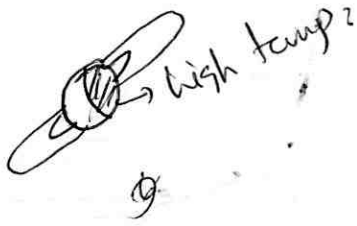
(10)

* Saturn :- It is also known as ring planet and it is the second largest planet. It is also the most beautiful planet in the solar system due to its ~~beauti~~ beautiful rings. Its rings are of pure ice crystals.

1) It is very large gaseous planet and rotates very fast. Its rotation period is 10hrs and 15 minutes.
2) Its atmosphere has winds that can blow at over 1800 km/hour.
3) It is surrounded by over 1000 rings made of ice and dust. Some of rings are very thin and some very thick. Because of these rings, it is named as ring planet.
4) It has atleast 62 moons.
5) It has the atmosphere of H and He.
6) It is lightest planet and its density is equal to 0.7g/cc.
7) Its diameter is 120,800 km.
8) Its distance from sun is 1430m km.
9) Its average temperature is $-180^{\circ}C$.
10) Titan (saturn's moon) → and largest moon in solar system and has atmosphere of nitrogen.
11) It can float in water like rubber ball due to its low density.
12) If storms start on it, it may continue for months and years.
13) No body can stand on it, because it is full of gases like He.
14) It is named after Roman God of Farming.

* Uranus :-

1) It look like falling on one side (Tilted). Its season remained for 20 years due to its tilt.
2) Its atmosphere is made up of H, He, CH_4.
3) Temperature in upper atmosphere is very high.
4) CH_4 gas gives it blue-green colour.
5) Its rapid rotation cause wind up to 600km/hour to blow.
6) It has 27 named moon.
7) Its rotation period is 17 hrs, and revolution period is 84 ~~days~~. Earth years.
8) Its mean distance from sun is 2870m km.
9) Its diameter is 51810 km.
10) It is named after the Roman god of sky.



(8)

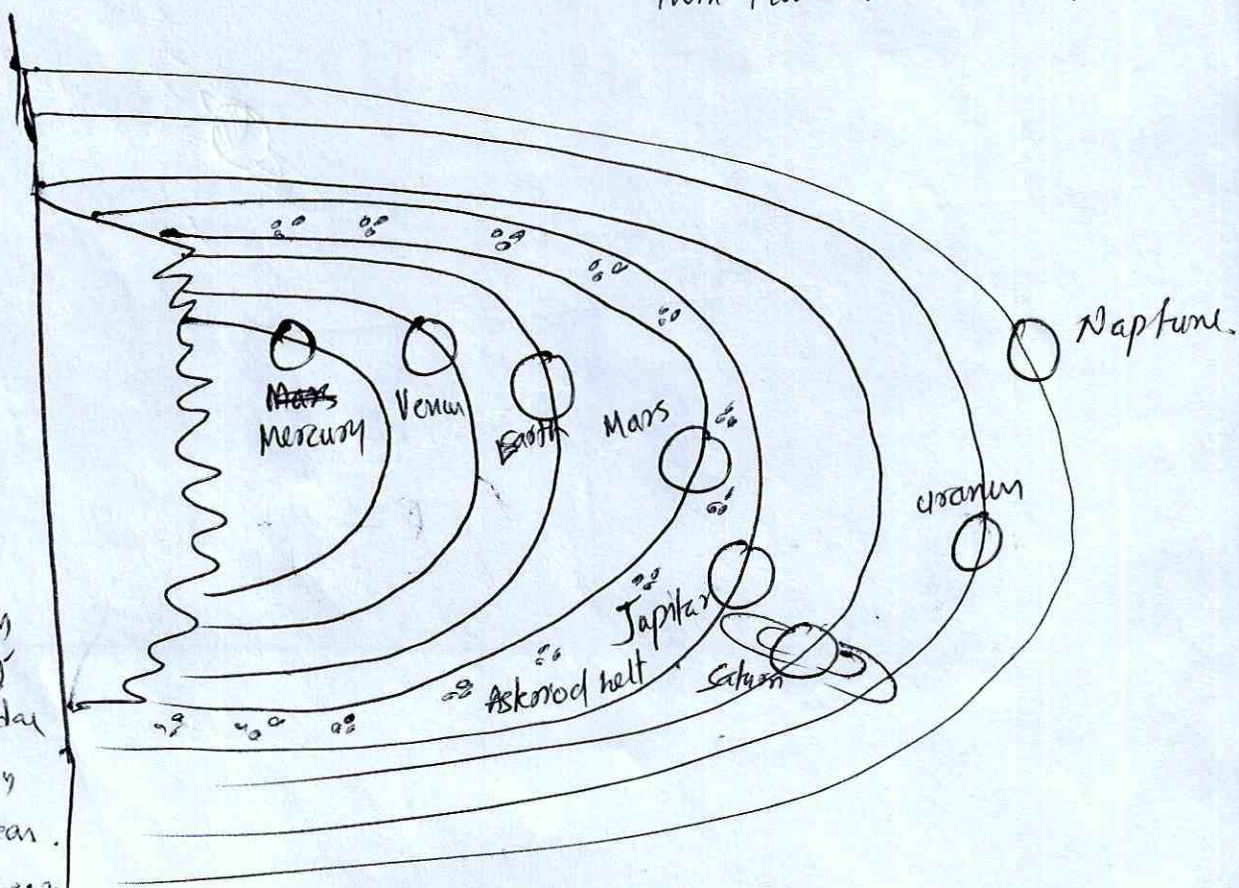
* **Neptune :-** It is the coldest and slowest revolving planet. Neptune and Uranus are very much alike. They are both large gaseous planets that looks like blue-green balls in the sky. Therefore, these are called twin planets.

1) Its winds blow up over 2000 km/hr.
2) It has two thick and two thin rings around it.
3) It has 13 known moons.
4) It is farthest planet from sun.
5) Its rotation period is 16 hours and revolution period is 165 years
6) Its diameter is 49400 km.
7) It is 4500 m km away from sun.
8) Its biggest moon Triton is the 6th largest moon of our solar system.

Sister planets → Earth & Venus
Twin Planets → Uranus & Neptune

Fast Rotating.
Jupiter - 9.55
Saturn → 10.15
Neptune → 16hrs
Uranus → 17hrs
Earth → 23.56.4
Mars → 24.40
Mercury → 59
Venus → 244

Farthest Revolving
Mercury → 88 day
Venus → 225 day
Earth → 365.25 day
Mars → 687 day
Jupiter → 11.86 year.
Saturn → 29.4 year.
Uranus → 84 years
Neptune → 165 years



ENERGY

* **Energy :-**

Energy is the ability of matter to perform work as a result of its motion or its position in relation to the forces acting on it. Energy exists in various forms including mechanical, thermal, chemical, electrical, radiant and nuclear energy. All forms of energy are interconvertible by appropriate process. The unit of energy is joule.

unit of energy ⇒ Joule.

* **Forms of Energy:-**

Energy is founds in various forms including light, heat, motion, etc. But all they are put into two catagories: potential and kinetic.

* **Potential Energy:-**

Energy by virtue of its position or configuration is called potential energy.

$$P.E = mgh$$

where "m" is the mass of object, "g" is the gravitational acceleration of earth and "h" is the height of object.

For example: Water stored in reservoirs is capable of rotating turbines which are kept at lower level, water stored in reservoirs possesses energy (Potential energy).

A toy car be driven by key: when we turn the key spring that gets wounds and if we leave the toy car on the floor, it starts moving on the floor due to the unwinding of the spring. This means wound spring possesses energy. This energy is P.E which is due to positio

Kinetic Energy:-

Energy possessed by an object by the virtue of its motion. The magnitude of kinective energy depends on both mass and velocity of a moving object.

Formula: $K.E = \frac{1}{2} mv^2$.

Where m is the mass and v is the velocity of an object.

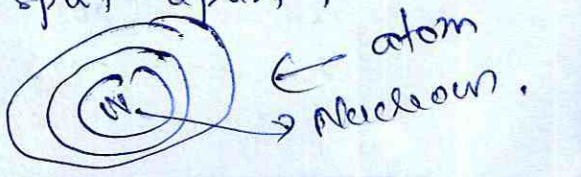
EXL:- It is a matter of comon exprience that fast moving stone can break windowpane, falling water can rotate turbine, moving wind can rotate ~~windows~~ windmills. In all example moving body possesses energy and work is done due to motion. This type of energy possessed by an object is called kinectic energy.

P.E => Chemical, Nuclear, Gravitational and mechanical.
K.E => Redrant/Light, Thermal, Sound and Electrical.

Chemical Energy:- It is the energy stored in the ~~forms~~ bonds of atoms or molecules. Batteries, Biomass, petroleum, natural gas and coal are exaple of stored chemical energy. It can be converted into thermal energy when we burn wood in a fireplace or burn gasoline in a cars engines

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

Nuclear Energy:- It is the energy stored in the nucleous of an atom. ~~It's~~ This energy holds nuclei together. Very large amount of heat can be released when the nuclei are combined or split apart.



Gravitational Energy :-

It is the form of energy that is stored in an objects height. The higher and heavier the object, the more gravitational energy is stored. Hydropower is an example of gravitational energy where the dam piles up water from a river into a reservior.

$P = mgh$ $P \propto m$; $P \propto h$

Mechanical Energy :-

It is the energy stored in objects by tension. Compressed springs and stretched rubber bands are example of stored mechanical energy.

Radiant / Light Energy :-

It is electromagnetic energy that travels in transverse waves. Radiant energy includes visible light, x-rays, gamma rays and radio waves. Sunshine is a radiant energy which provides the fuel and warmth that makes life on earth possible.

Thermal Energy :- (Heat Energy)

It is the vibration and movement of atoms and molecules within substances. As the object is heated up, its atoms and molecules move and collide faster. Geo-thermal energy is the energy in the earth.

Sound Energy :- It is the movement of energy through substances in longitudinal (compression/refraction) waves. Sound is produced when force cause an object or substance to vibrate. Typically, the energy in sound is far less than other forms of energy.

* **Electrical Energy:**

It is the energy that is delivered by tiny charged particles called electrons, typically moving through a wire. Lightening is an exaple of electrical energy in nature, so powerful that it is not confined to a wire.

* **Energy Resources:**

The energy resources have been split into two main catagories: ~~Ren~~ renewable and non-renewable resources.

The renewable energy sources are:

- Solar
- Wind
- Hydroelectric
- Biomass
- Geothermal power

~~The~~ On the other hand non-renewable is a blanket term for sources of energy which rely on consumable materials namely:

- Nuclear energy and its waste.
- Fossil ~~fuels~~ fuels
  - Coal
  - Petroleum
  - Natural gas.

* **Renewable Energy:**

The most common definition is that renewable energy is form of an energy resource which is continuously replenished by ~~thermal~~ natural process at a rate that is equal to or faster than the rate at which the resource is being consumed. Renewable energy is a subset of sustainable energy.

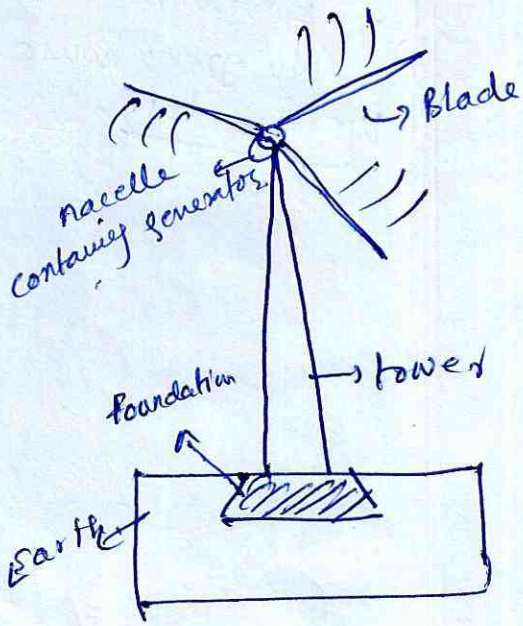
Most renewable forms of energy other than geothermal and tidal power, ultimately derive from solar energy. Energy from biomass ~~derives~~ derives from plant ~~mater~~ material by photosynthesis using the power of Sun. Wind energy drives from wind, which are generated by the Sun's uneven heating of the atmosphere. Hydropower depends upon rain which again depend upon sunlight power to evaporate water. About 16% of global final energy consumption comes from renewable sources, with 10% of fuel energy from traditional biomass, 3.4% from hydroelectricity and 3% from other new renewable sources. The share of renewable energy in electricity generation is around 19%, with 16% of electricity coming from hydroelectricity and 3% from new renewable resources.

Advantage.
- can't depleted
- Environmental friendly
- No greenhouse effect

Disadvantage.

Wind Power :-

As the sun heats up the earth unevenly, winds are formed. The kinectic energy in the winds can be used to run turbines. Modern ~~utility~~ utility-scale wind turbines range from 600kw to 5MW. The power ~~also~~ available from the wind is a function of the cube of the wind speed, so the wind increases, the power output would increase dramatically. Such turbines generally require a wind in the range 5.5m/sec (20km/hour). Areas where winds are stronger and more constant such as offshore and high altitude sites are preferred locations for wind farms. Wind strength vary and thus cannot guarantee continuous power. Some estimates suggest that 1000MW of wind generation capacity ~~can~~ can be relied on for just 333MW of continuous power. This could require wind turbines to be installed over large areas, particularly in areas of higher wind sources.



Advantages.

Environmental friendly
can not depleted.
No Greenhouse effect
No global warming.

Disadvantage.

- location specific.
- No continuous power
- Not as much efficient.

Hydropower :-

Energy in water can be harnessed and used in the form of motive energy and temperature difference. Since water is about 800 times denser than air, even a slow streaming of water can produce considerable amount of energy. There are many form of water energy.

- Hydroelectric energy is term usually reserved for large-scale hydroelectric dams. Examples are the Tarbela dam and Mangla dam.
- Micro hydro systems are hydroelectric power installations that typically produce upto 100kw of power
- Tidal power, also called tidal energy, is a form of hydropower that converts the energy of tides into useful forms of power — mainly electricity.
- Blue energy is the reverse of desalination. A difference in salt concentration exists between sea water and river water. The gradient can be utilized to generate electricity by separating +ve and -ve ions by ion specific membrane. Brackish water is produced. This form of energy is in research. At this moment it is predicted that if every thing works out, $\frac{1}{3}$ of the ~~capacity~~ electricity needs in the Netherlands can be covered with this system (roos).

Solar Energy :-

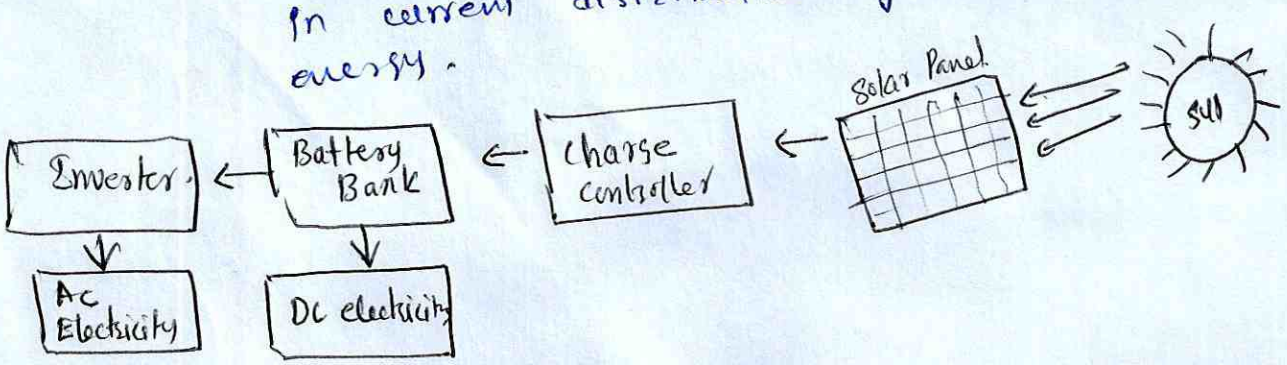
Solar energy applies energy from the sun in the form of solar radiation for heat or to generate electricity. Solar powered electricity generation uses either photovoltaics or heat engines (concentrated solar power). Solar technologies are broadly characterized as either passive or active solar depending on the way they capture, convert and distribute energy. Active solar techniques include the use of photo-voltaic panels and solar thermal collectors to harness electricity. Passive solar techniques include orienting building to sun, selecting material with favourable thermal mass or light dispersing properties.

Advantages :-

- Pollution free
- Production end wastes and emission are manageable.
- Very little maintance.
- Economically competitive alternation.

Disadvantages :-

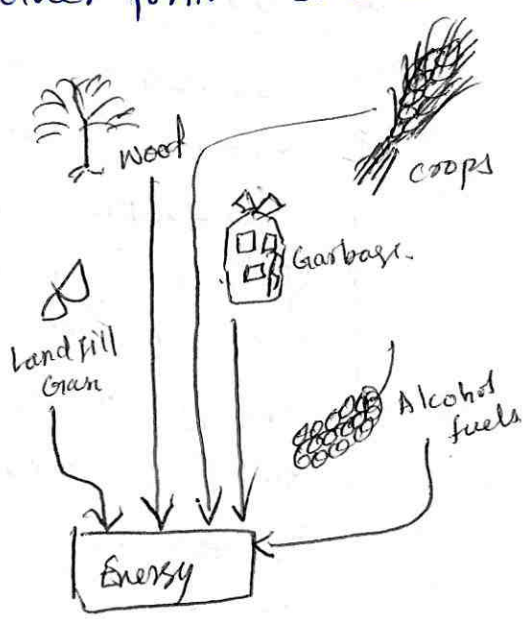
- Intermittency : It is not available at night and reduced when there is cloud cover.
- location at high altitudes.
- Solar cell technologies produces DC power which must be converted to AC power when used in current distribution grids which reduce 5-10% energy.



* Biomass :-

Biomass is a biological material derived from living organisms. In the context of ~~energy~~ biomass for energy this is ~~often~~ used to mean plant based material, and animal and vegetable derived material.

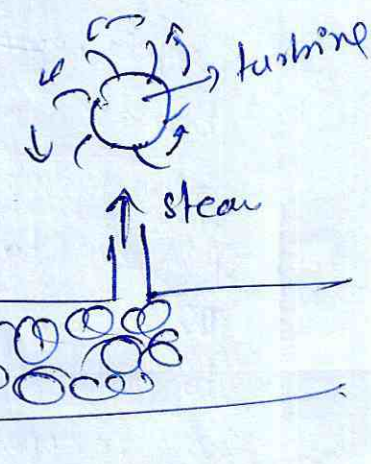
Biomass is a matter usually thought of as grabage like dead trees, left over crops, sawdust, used tires and livestock manure. Using Biomass can help to reduce global warming. Plants use and store CO_2 when they grow. They emit CO_2 when they are burnt. By replanting, new plants can use CO_2 of burned plants. So using biomass along with replanting can ~~reduce~~ help to close CO_2 cycle. ~~and~~ However if crops are not planted then biomass will emit CO_2 that will contribute towards global warming. It is renewable resource because plants to make biomass can be grown again & again. There are many conversion technologies available to make use of wide variety of Biomass types as renewable energy source. Conversion technologies may release energy directly into heat and electricity or may convert it into another form such as biofuel or combustible biogas.



Geo-thermal Energy:

It is a form of energy which uses energy (heat) that is inherited in earth. Hot water and steams from deep grounds can be used to derive turbines, this is called geo-thermal energy.

Several types of rock contain radioactive material such as uranium. Radioactive decay of these substance releases heat energy which warms up the rocks. In volcanic areas, the rocks may heat water so it rises to surface as steam and steam will derive turbines and electricity generators.



- Advantages:
  - clean source, No air pollution
- Disadvantages
  - location specific
  - Prone to volcanic & earth quake
  - Huge installation cost.

Sustaintable Energy.

Sustainable energy is the sustainable provision of energy that meets the needs of present generation without compromising the ability of future generations to meet their needs. Technologies that promote sustainable energy include renewable energy source such as hydroelectricity, solar energy, wind energy, wave power, geothermal, tidal power, etc. These technologies are designed to improve efficiency.

✱ Non-Renewable Resources ✱

The Atom :-

The atom consist of small massive positively charged core known as nucleous that is surrounded by electrons. The nucleous, containing the most of mass of an atom, is itself composed of neutrons and protons that are bound together by very strong nuclear force, much greater than the ~~forces~~ electrical forces require to bind electrons with nucleous. The mass number 'A' is the ~~mass~~ total mass of an atom and atomic number 'z' is the number of protons or informally we can say may be the number of electrons because in neutral atom, the number of electrons and protons are always equal.

$_{Z}X = {}^{235}_{92}U$; ${}^{1}_{1}H$; ${}^{12}_{6}Na$

— Binding Energy :-

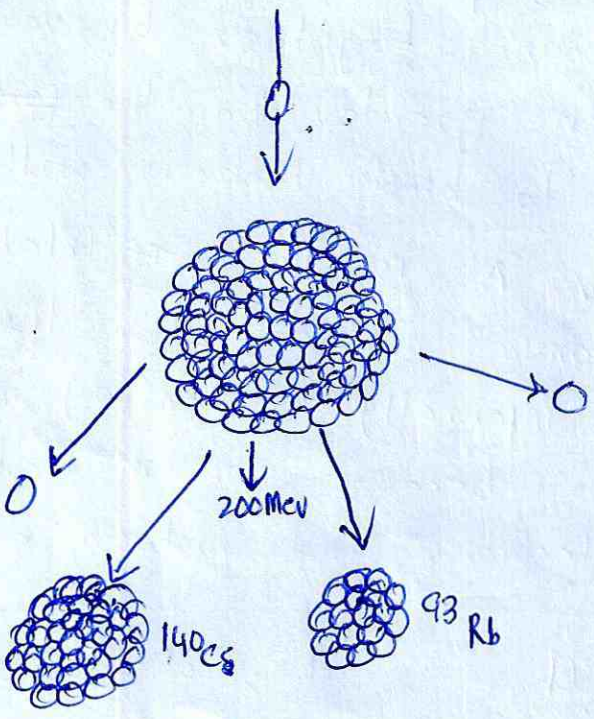
The binding energy of a nucleous is a measure of how tightly its protons and neutrons are held together by nuclear forces.

- **Binding Energy per nucleon :-**

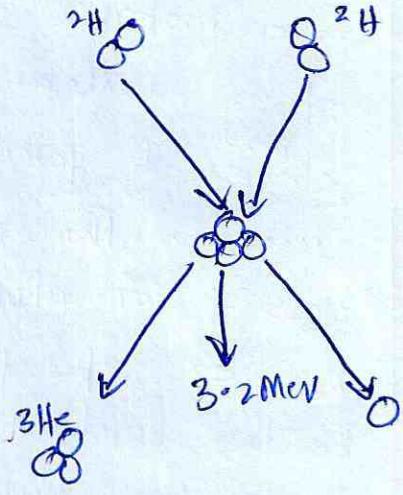
It is the energy required to remove one neutron or proton from a nucleous, is a function of mass number A.

Ex:- If two lighter nuclei coalesce to form a heavier nucleus or if a heavy nucleous is splited into two lighter ones, the more energy will be released for the more tightly bound nuclei. When two light nuclei like two heay hydrogen, nuclear deuteron (${}^{2}_{1}H$) combine in reaction producing a helium-3 atom, a free nucleon and 3.2MeV or 5.4×10^{-13} J or 1.2×10^{-13} cal is released. Nuclear energy measured in million electron volt (MeV).

When fission of heavy nucleous as $^{235}_{92}U$ is Induced by the absorption of neutron as in producing cesium-140 and rubidium 93, three neutron and 200 Mev or 3.2×10^{-11} J or 7.7×10^{-12} cal.



Fission



~~Fussion~~

Fusion

* Note :- A nuclear fission reaction releases 10 million times as much energy as released in a typical chemical reaction.

* Nuclear energy from Fission :-

- Two key characteristics are given below.
- First, the energy per fission is very large. In practical units, the fission of 1kg (2.2lb) of uranium-235 ($^{235}_{92}U$) releases 18.7mKW hours as heat.
- Second, the fission process initiated by the absorption of one neutron in uranium-235 releases about 2.5 neutrons on ~~every~~ average from the split nuclei. The neutron released in this manner quickly cause the fission of two more atoms, thereby releasing ~~four~~ or more additional neutrons and initiating self-sustaining series of

nuclear fissions or chain reactions which result in continuous release of nuclear energy.

* **Nuclear Fusion Energy:**

The release of energy can occur at low end of the binding energy curve through the fusion of two light nuclei into a heavier one. This type of energy is released by stars like sun. At enormous temperature above 15m °C (27m°F) and pressure existing their, Hydron nuclei combine and release huge amount of energy.

If fusion becomes practical it offers following advantages:

1- a limitless source of fuel, deuterium from ocean.
2- No possibility of reactor accident (amount of energy is small)
3- Waste products are much less radioactive and simpler to handle than those of fission system

* Fossil Fuels :-

The term fossil fuel is used to describe hydrocarbons and it is believed (theory) that the hydrocarbons are the ramnants of deads plants and animals. The theory was first introduced by Michael lomonosov in 1757. Fossil fuel also known as mineral fuel is used symonymously with other hydrocarbons containing natural sources such as coal, oil and natural gas. The utilization of fossil fuels has enabled large scale industrial development. and

Georg Agricola in 1556 also

Fossil fuel is a general term for buried combustible deposits of organic material formed from decayed plants and animals that have converted to crude oil, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust over the hundreds of millions of years.

The burning of fossil fuels by human is the largest source of CO_2, which is one of the greenhouse gases and contributes to global warming

* Coal :-

About 300 million years ago, enormous ferns and other pre-historic plants were comon on the swamp-like earth. When those plants died and ~~covered with water~~ fell to the ground, they were ~~con~~ covered with water and they slowly decomped. As the decomposition took place in the absence of oxygen, the much of hydrogen content was eroded away, leaving a material rich in carbon. The material was compressed over years by sand and dirt, leaving the form of carbon known as a coal.

- world's largest reserves → N. America
- world's largest user → china

=> Types of coal :-

There are various types of carbon. The nature of coal is that the higher the carbon content, the more cleanly and brilliantly the coal burns. The slates of coal from lowest carbon content to highest are peat, Lignite, bituminous and anthracite coal. If the anthracite is heated and compressed even more, the result is graphite almost completely pure carbon.

. Peat is used for burning in furnaces.
. Bituminous is used for generation of electricity.
. 'coke' is very pure form of coal used in steal industry.

* Petroleum :-

Petroleum or 'crude oil' is a liquid fuel that is present in various location throughout the world. The American Petroleum Institute in its Manual of Petroleum Measurement standards (MPMS) defines it as " a substance generally liquid occurring naturally in the earth and composed mainly of the mixtures of chemical compounds of carbon and hydrogen with or without other non-metalic elements such as sulphur, oxygen and nitrogen. "

Uses:- It has many uses, from the generation of electricity to the manufacture of medicines, plastics, and other chemical items.

Formation:- Much like coal, petroleum is formed from the remains of biograded organic material. When animals lived in the sea millions of years

ago ~~dec~~ ~~ocean floor~~ died underwater, their remains were covered by layers of very fine dirt known as silt on the ocean floor. Then as years passed, pressure from the layers build up and compressed the organic material, forming the oil.

Types:- Petroleum has three main forms: paraffin, asphaltic and mixed-base. These forms are based upon the chemical makeup of the hydrocarbon based oil.

- world's largest reserves of Petrol → Venzeuela (S. America)
- world's largest ~~user~~ supplier → Saudi Arabia.

* Natural gas :-

Natural gas is consisting primarily of methane. It is almost found in deposits of petroleum. When the petroleum is drilled, natural gas is also recovered. Once the natural gas is recovered, other fuels are extracted by the process of condensation or absorption. The gas is usually transported by pipelines. Compared to petroleum and coal, natural gas is clean burning because it contain only trace portion of sulphur and oxygen. The western-hemisphere, Europe and parts of Africa contain the largest deposits of natural gas.

- Russia → world's largest reserves of natural gas
  ↳→ world's largest supplier of natural gas

(3) (1)

Sun

~~Structure of Sun~~

Sun:- It is a star (1) that is (2) huge ball of gases mostly (3) hydrogen and helium. It is so huge that it could fit (4) 109 earths side-by-side across its diameter. It is shinning under its own power. It has enough volume to hold ~~to~~ 1.3 million earth (5). It doesnot have solid surface like earth. Nuclear fission reactions inside the star releases enormous amount of heat energy.

Sun is divided into three main regions:

1) the sun's interior
2) the solar atmosphere
3) the visible surface of sun.

1) The Sun's interior There are also three main parts of ~~earths~~ sun's interior.

i- Core ii- Radiative zone iii) Convection zone.

Core:- The core is the centre of the sun. It is the hottest region where the nuclear fusion occurs. It extends to 25% of sun's radius. Its density is 150 times ~~dense~~ that of the water. It is the only portion of sun that produces heat through fusion. The temperature is 15 million celsius.

ii- Radiative (Radiation) Zone:-

Its name is derived from the way the energy is carried out from this layer. The energy emits in the forms of photons as thermal radiation. The radiative material is hot enough that it ~~radiates the energy of~~ transfers the heat of core outward.

iii) Convective Zone:- The third part is the convection zone. It is also named after the mode of energy this layer transfer. The convection plasma is not dense or hot enough to transfer interior energy outward in the form of radiations. Once the material cools off at the surface then it plunges downwards in the convection zone to absorb more heat energy from the top of radiative zone and then repeats cycle.

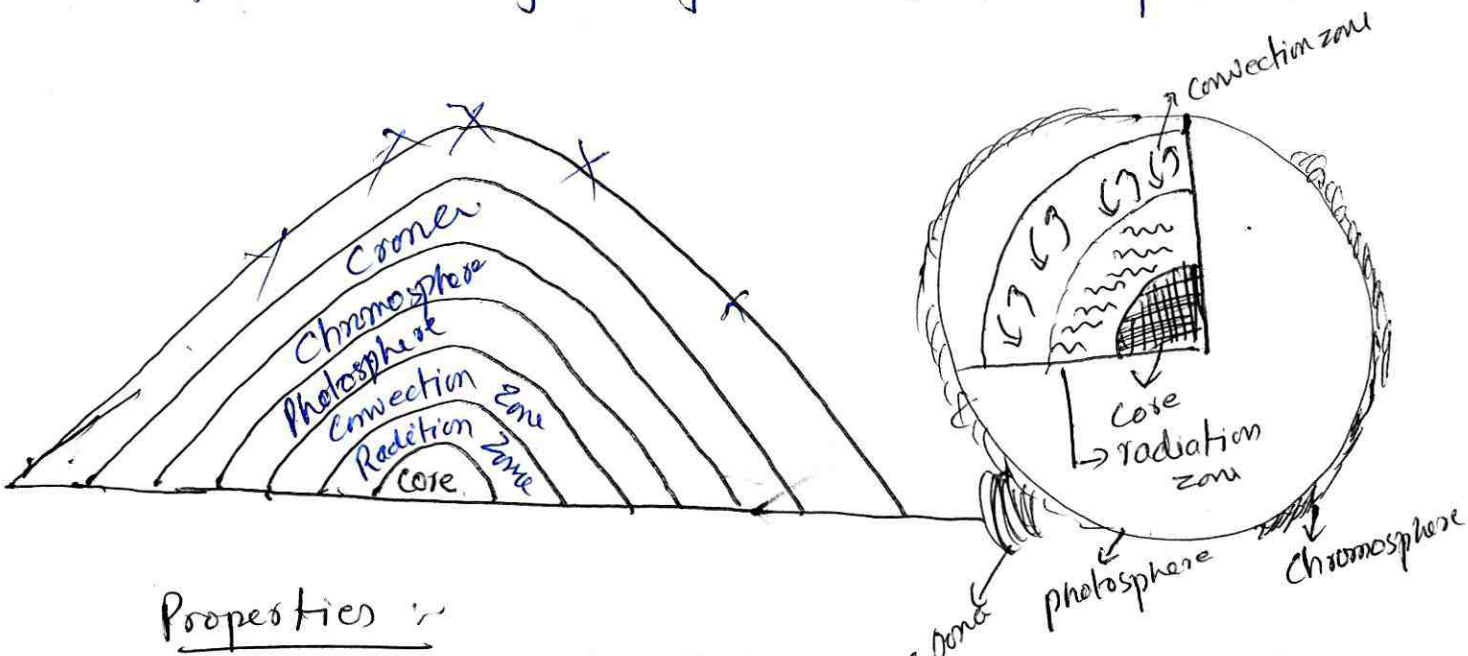
3⇒ The visible surface of the sun:-

1. Photosphere:- It is a boundary between the interior surface of the sun and the atmosphere of sun. It is a visible surface we usually see normally, ~~as well as during solar Eclipse.~~ Light emits from this surface.

2- Atmosphere of the sun:- Sun also has an atmosphere. The lower region of sun's atmosphere is called chromosphere and uppermost portion of sun's atmosphere is called corona.

i- Chromosphere:- This word is derived from greek word chroma which means colour. It appears bright red when viewed during solar eclipse.

ii- Corona:- It is a thin transition region, where temperature rises sharply. It seperates the chromosphere from the vast corona atmosphere. It is surprisingly much hotter than the surface of sun that is photosphere.

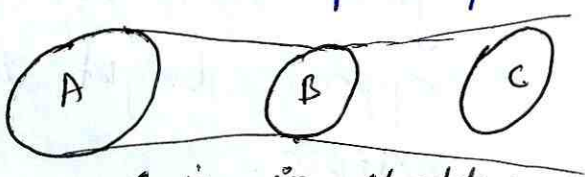


Properties :-

- composed of 74% H_2, 24% He and 2% heavy metals.
- Density is 1.41 g/cm³
- Sun has large and active magnetic field.
- Revolves at the speed of 220km/sec and revolution time is 250 million years
- Sun's rays reaches on earth in 8minutes and 20seconds

Solar And Lunar Eclipse

The Eclipse takes place when one heavenly body such as moon or any other planet comes in the shadow of another heavenly body. There are two types of eclipses on earth: an eclipse of moon (lunar eclipse) and an eclipse of sun (solar eclipse).



C is in shaddow of B. Then it eclipse of C.

- Lunar Eclipse:-

The moon moves in an orbit around earth and at the same time earth moves around the sun. When earth comes in between then sun and moon, the earth blocks the sunlight that is usually reflected by moon. Instead of light hitting the surface of moon, the shadow falls on the surface of moon. The lunar eclipse can occur when the moon is full. It can be viewed from earth at night. The earths casts a long and conical shadow in space. When the light in area it completely ~~occurs~~ obscurred is called Umbra. The area of partial shadow is called Penumbra.

Three types.

i- ~~Partial Lunar~~

i- Penumbra lunar eclipse:- The moon passes through the penumbra of earth shadow. It is rarely visible

from earth and there is slight change of the colour of the moon.

ii- Partial Lunar Eclipse:- When part of the moon passes through the umbra of earth shadow then it is termed as partial lunar eclipse.

iii- Total Lunar eclipse:- When the entire moon passes through the umbra of earth's shadow and the moon is totally obscurred.

- occurs when moon is full
- viewed from earth at night
- partial occurs every year
- safe to look at lunar eclipse

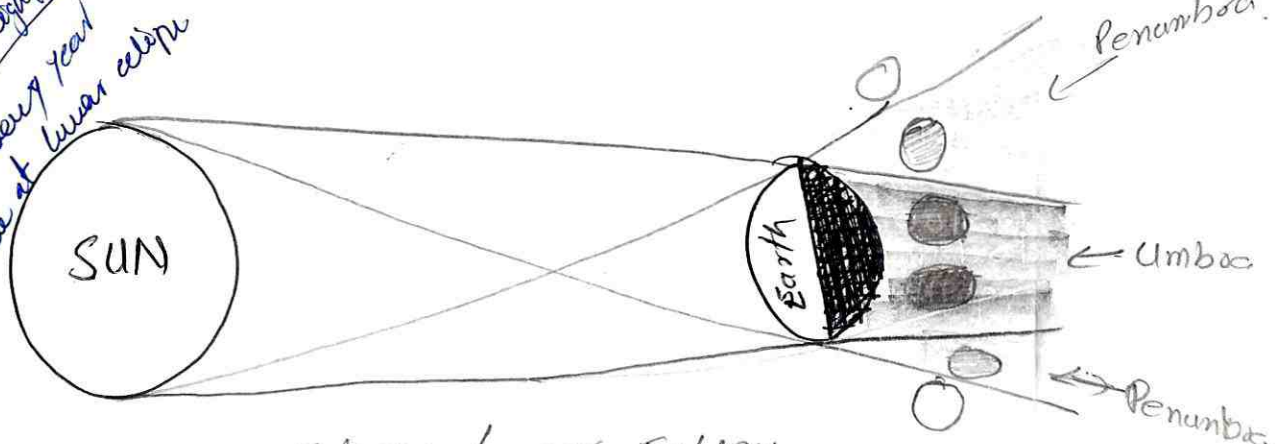


Figure: Lunar Eclipse

Properties:- Last for few hours. Partial eclipse happens every year but total lunar eclipses are rare. It is safe to look at lunar eclipse.

⇒ Solar Eclipse :-

In this type of eclipse, moon comes in between the sun and earth. When this happens moon blocks the light of sun on some portion of earth. This causes an eclipse of sun or solar eclipse. This shadow on earth consist of two regions: the umbra and the Penumbra. It happens once in 18 months. Unlike lunar eclipse it last for few minutes. It always occurs at the time of new moon.

Types of Solar eclipse:

1. **Total Solar eclipse:-** It occurs when moon completely covers the sun, as seen from ~~small~~ Earth. Totality of eclipse can be viewed from small area of earth. The area is usually about 100 miles wide and 10,000 miles long. looking at solar eclipse without any protective device can severly harms one's eyes.

2. Partial Solar Eclipse:- It is viewed from that part of earth where moon and sun doesnot ~~lies~~ in straight line, and the moon only ~~covers~~ partially covers the disc of sun.

3. **Annual Solar eclipse:-** It occurs when ~~moon~~ the moon appears smaller than the sun and passes centrally accross the solar disk and bright ~~ring~~ ring of ~~sun~~ sun remains visible during eclipse.

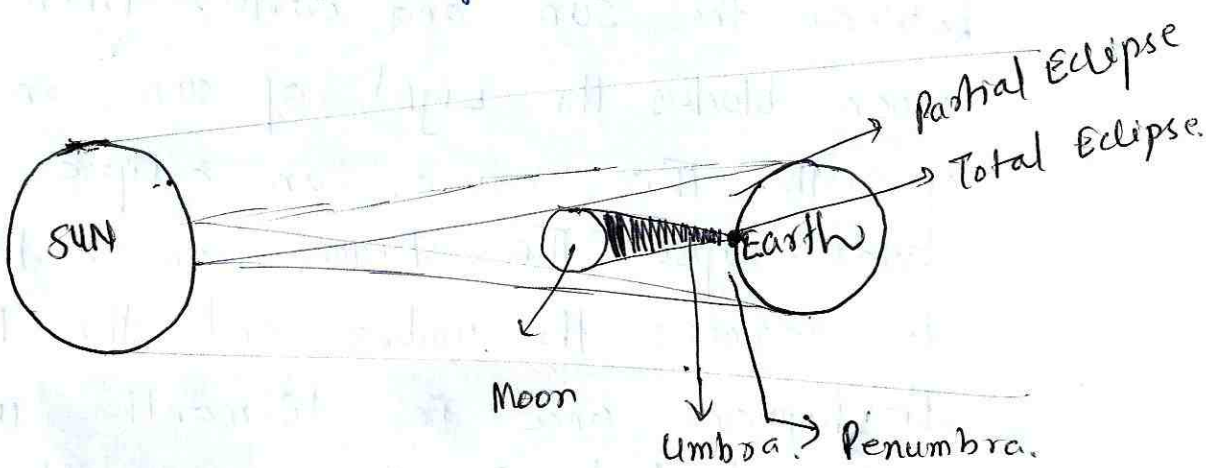
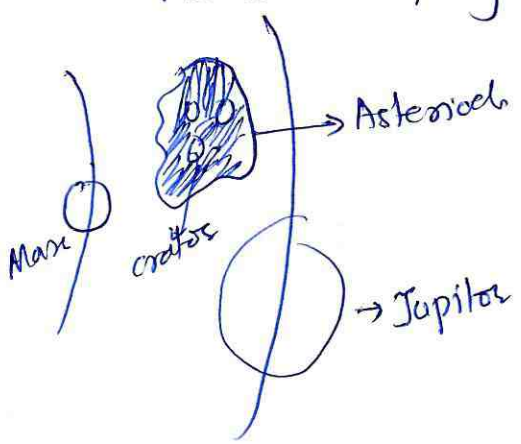


Figure:- Solar Eclipse.

ASTEROIDS AND METEROIDS

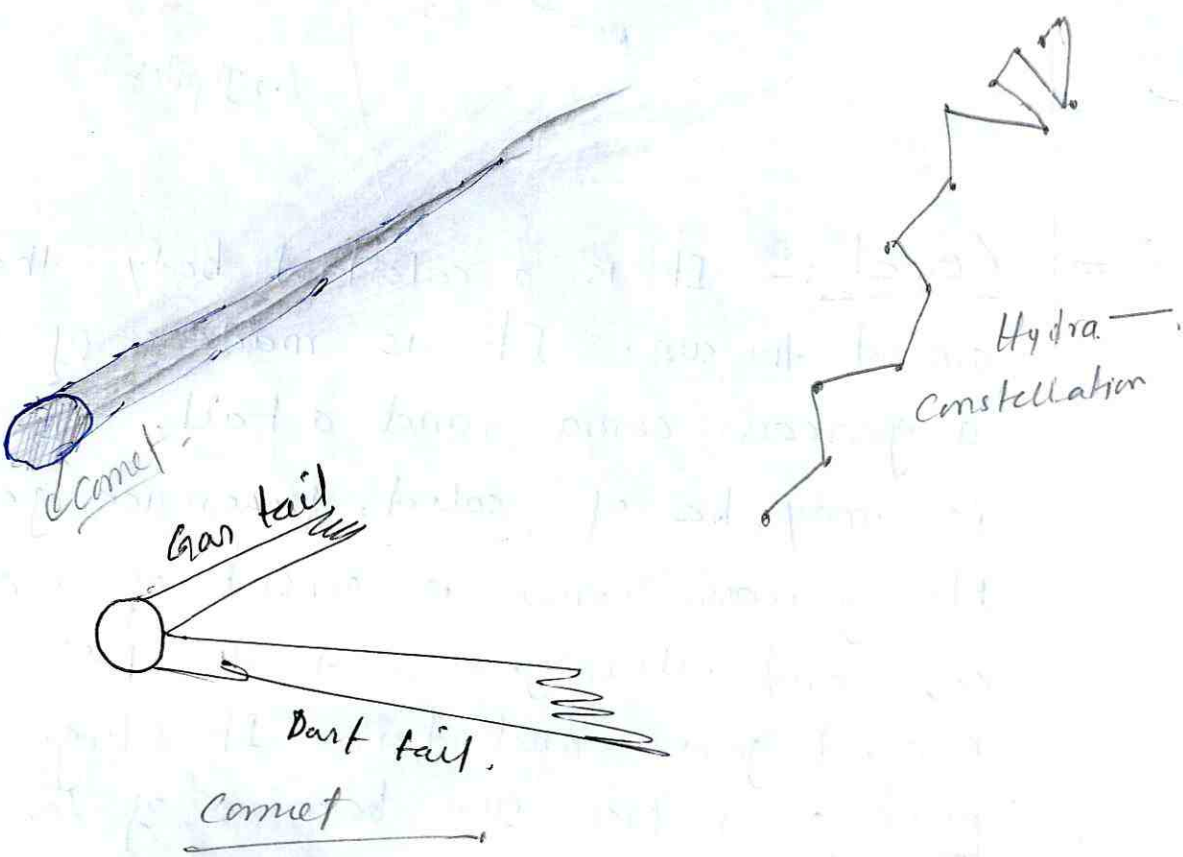
Asteriods :— These are the largest non-planetary and non-Lunar objects in the solar system. These objects are bigger than 100m ~~and~~ in diameter and less than 1000 km in diameter. The Largest steriod is Ceres that is 950km. They are irregular in shape and often have surfaces covered with craters (hollows). These are also known as minor planets or planetoids. Most of them orbit between Mars and jupiter.



⇒ Comet :— It is a celestial body that orbits around the sun. It is made of nucleous, a gaseous coma and a tail. Its nucleous is may be of solid, frozen ice, gas, dust, etc. Its gaseous coma is consist of water vapour, CO_2 and other gases and its tail made up of ionized gases and dust. Its long tail always point away from sun because of force of solar wind. The tail can be of 250 million Km long.

(8) Halley's comet is a periodic comet that orbit around the sun. Edmund Halley was the first to recognize that it is periodic. It was last seen in 1986 and will be next seen in in 2061 year. Its period is 75 years.

Constellation:- These are the groups of stars visible within the particular region of night sky forming various shapes and patterns. Constellation are named after the names of aminals, tools, objects, etc. Some of them are named after religious personalities and scientists. Constellations can be view after sunset and before sunrise. There are totally 88 named constellations. The largest one is Hydra.



(5)

1. Ceramics
2. General properties
3. How ceramics are produced.
4. Application
5. Classification of ceramics

Included ...
- → Ceramics
- → Plastics
- → Fertilizers

* Ceramics:-

A ceramic is an inorganic non-metallic solid made up of clay, ~~that~~ it has been shaped and hardened by heating at high temperature.

Cramics is sanskirt word which mean to burn

* General Properties :-

Most ceramics have the following properties:

- Ceramics are hard, extremely strong, showing considerable stiffness.
- Refractory material
- High melting point.
- Corrosion resistant.
- ~~Inert~~ Inert material and donot react with gases, liquids, etc
- Thermal and electrical insulators.
- These are primary oxides, nitrides, borides, silicates, etc
- Brittle having little elasticity.
- Oxidation resistant.

⇒ How ceramics are produced:-

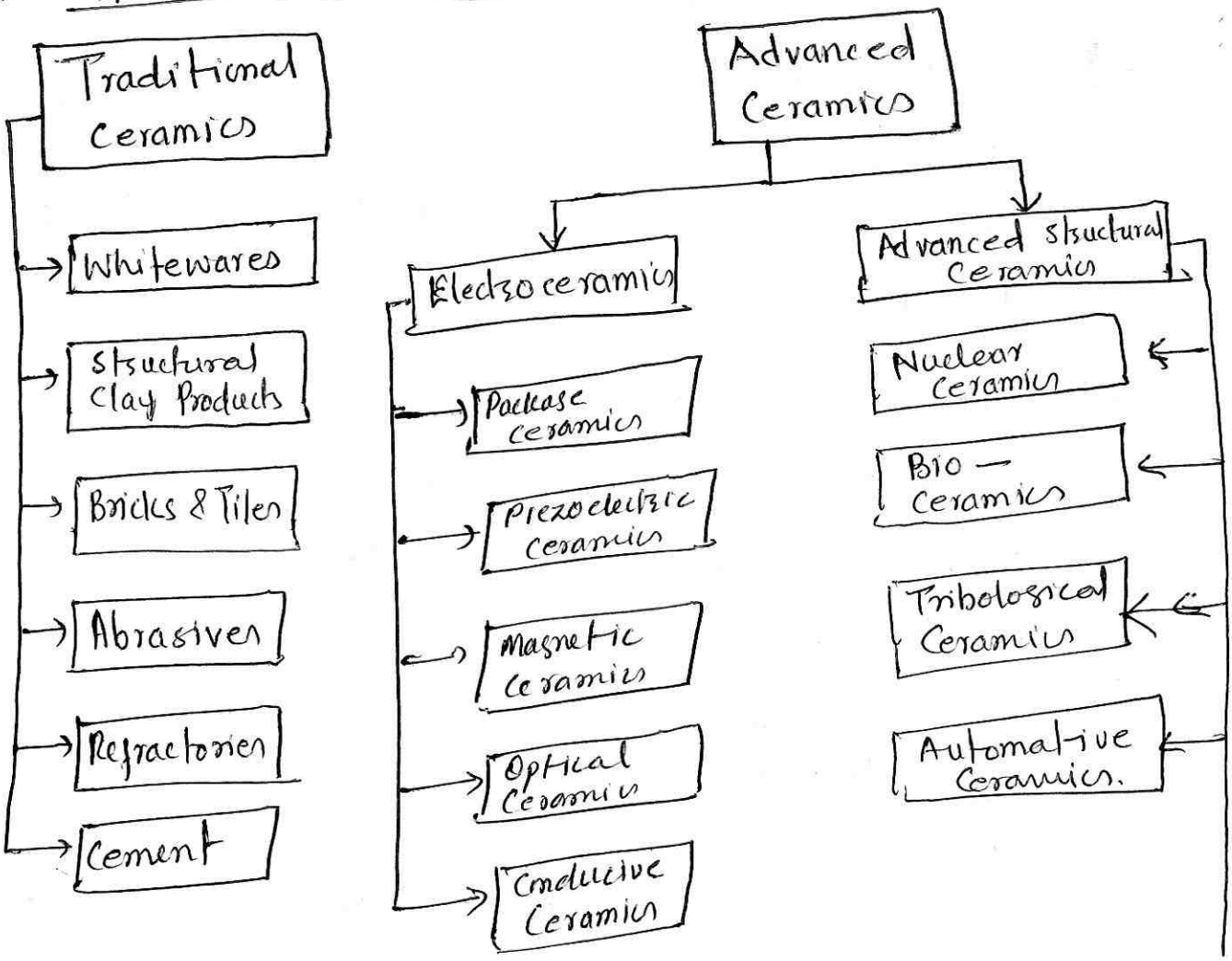
~~The word ceramics~~
~~Ceramics are formed by traditionally by firing.~~
Kav.

- Ceramics have traditionally been formed by firing.
  - Bricks and certain type of glasses are still made by this process.
- Today ceramics are made in industries by chemical reactions

⇒ Application:-

- Aerospace ⟶ formation of rockets, space station, etc
- Automative industry → Filters, rotors, spark plugs.
- Medical (Bio-ceramics) → Dental bone fillings
- Military equipment
- Computer and Electronics → Computer parts like insulators, resistors, capacitors, etc.
- Abraisive → Grinding, cutting, polishing of material
- Building and construction → ~~Building~~ Bricks, tiles, piping
- Coatings
- Nuclear Ceramics
- Optical Ceramics
- Tribological Ceramics → tip of ball point.
- Refractories → One that retains its strength at high temperature.

⇒ Application based on classification 1.



⇒ Classification on basis of composition:-

Oxides :- Aluminia, iron oxide, etc.

Non – oxides : Carbides, borides, Nitrides, Silicides.

Composites :- Combination of oxides and non-oxides.

Plastics :—

Word plastic is derived from latin word "Plasticus" which means "capable of being moulded" and Plastikos (Greek, "to mould" or "fit for moulding").

⇒ Plastic is a material consisting of any of wide range of synthetic or non-synthetic organic compounds that are malleable and so can be malleable in solid objects.

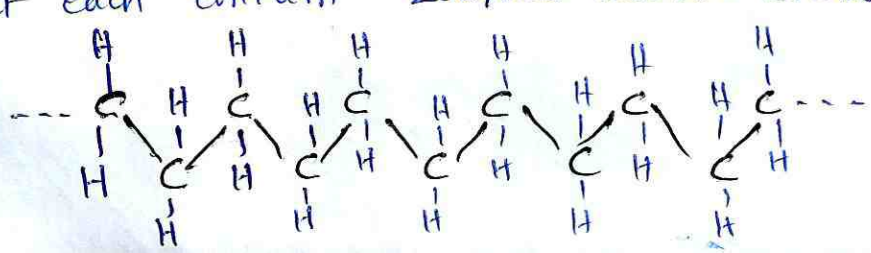
⇒ General Properties:

- Lighter in weight.
- Corrosion resistant and oxidation resistant
- Produced in various colours, transparent and translucent (emitting small amount of light).
- Electrical insulators
- Chemically stable or somewhat inert.
- Plastics are not-brittle.

⇒ Chemistry of plastics:

Composed of carbon atoms linked into a chain called polymers.

- like polyethylene composed of long molecules that each contain 200,000 carbon atoms.



⇒ Two types of plastics:-

(1) Thermoplastics -
(2) Thermosetting plastics -

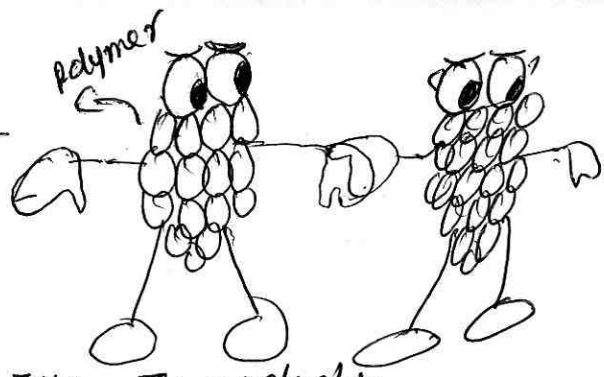
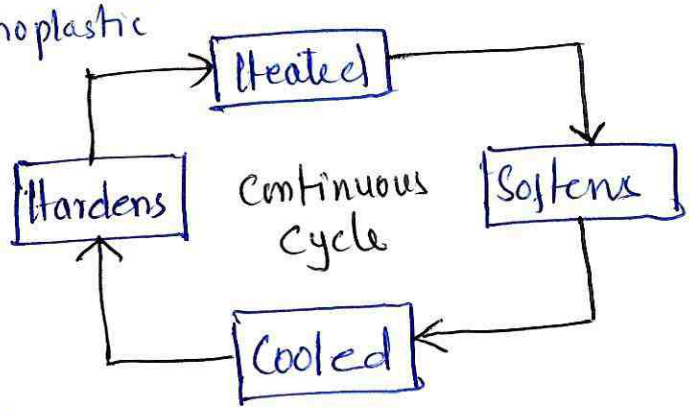


Fig: Thermoplastic

(1) Thermoplastics:-

1- . Thermoplastics can be heated and cooled, and consequently softened and hardened, repeatedly like candle wax.

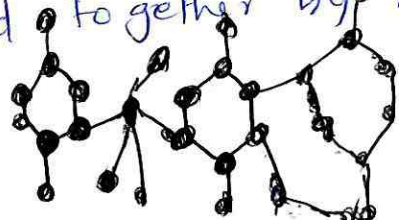
2- . For this reason, thermoplastic can be reused again and again.



Thermoplastics.

3- . Thermoplastics are linear or slightly branched and donot chemically make bonds with each other when heated.

. The thermoplastic chain are held together by weak Vander Waal forces (weak bonds).


Thermoplastic molecules

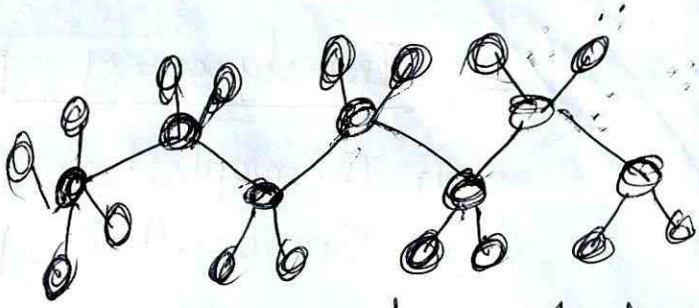
⇒ Properties of thermoplastic material:-

- It may melt before passing to a gaseous state.
- Allow plastic deformation when heated.
- Soluble in certain solvents.
- Good resistance to creep. (cold flow/creep: Viscous flow of solid at ordinary temperature)

⇒ Application:-

- low pressure polyethylene ~~plastic elastic plastic used~~ for insulation
- Applied for electric insulation used for making bells.
- PVC, etc. used for insulation purpose, pipes, containers,

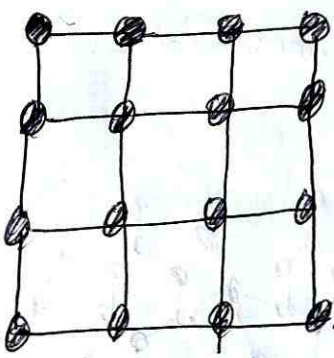
- Plastic shopper bags
- toys
- Bodies of metals.



Thermoplastic molecules

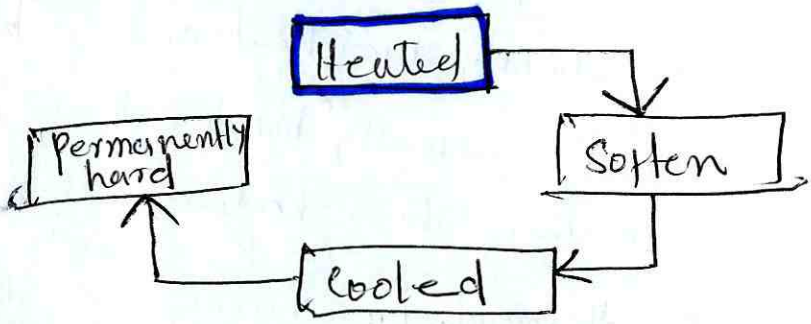
⇒ Thermosetting Plastics:-

They are hardened permanently after being heated once. These consist of chain of molecules that chemically bond or cross link with eachother when heated. When thermosetting plastics cross links, the molecules create a permanent and three dimensional network.



← monomer.

3-dimension network.



Thermoset-Plastic

~~Advantages~~ Pros.

Resistant to high temp.

Highly flexible design

high level of dimensional stability.

cost-effect

Cons

- cannot be ~~recycled~~ recycled
- Cannot be remolded & reshaped.

Thermoplastic

Pros

Highly recyclable

heat resistant

Reshaping/remolding capability

Eco-friendly

Cons

More expensive

can melt if heated

Advantages of Plastics

- Light in weight
- Possess very good strength
- Possess good shock absorption capacity.
- Corrosion resistant and chemically inert.
- Good thermal and electrical insulating property.
- Very good water resistant and possess good adhesiveness
- Recyclable material and doesnot decompose.

Hazard

- Plastic debris is hazardous for marine life when thrown in seas, oceans, etc.
- chemicals used in their formation are also dangerous for human bodies causes hormones disorders.
- Cannot easily decomposed.

* Fertilizer:-

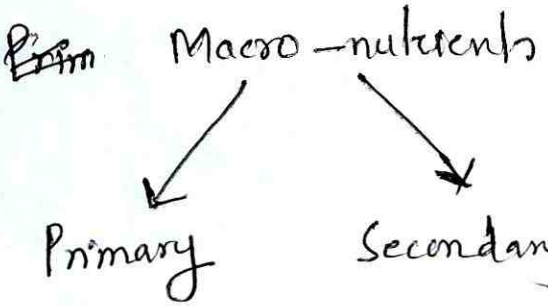
Fertilizer is any organic or inorganic material of any natural or synthetic origin that is added to a soil to supply one or more nutrients essential for growth of plants.

➡ Why fertilizers are needed?

There are 16 essential elements needed by plants to grow. The most important of these are: nitrogen, phosphorous or potassium (NPK). Without these plant can not grow because it cannot make the food it needs. If any of these is ~~are~~ missing or hard to obtain from the soil, this will arrest the growth rate for the plant. In this case we use fertilizer to maintain its growth.

⇒ Macro - nutrients:-

Macro-nutrients are elements that require in large number. They are further divided into two catagories: primary and secondary.



Primary: Nitrogen, phosphorus and potassium (NPK).

Secondary: Calcium (Ca), magnesium (Mg) and ~~Sulphur~~ Sulphur (S). [(CMS) or (CaMgS)

Note: • Lime contain Ca + Mg

⇒ Micro-nutrients:

They are essential for plant growth and which are needed in small (micro) quantities. These elements are sometimes called minor elements or trace-elements.

Micro nutrients: Boron (B), Copper (Cu), Iron (Fe), chloride (Cl), Maganese (Mn), Molybdenum (Mo), Zinc (Zn)
(Group: 6, ATOMIC No: 42)

⇒ Classification:

⇒ Classification based provision of nutrients).

(i) Straight fertilizers: They provide single nutrient like N, P, K.

(ii) Multinutrient fertilizers (complex fertilizers):
They provide two or more nutrients together like N and P.

⇒ Classification based on mode of operation.

(1) Direct fertilizer: Fertilizers which are directly assimilated by the plants. Ex:- Superphosphate, nitrate, amonium, etc. They are in the form of mineral salts.

(2) Endirect:- These are introduced in the soil to improve its mechanical, chemical and biological properties. Ground dolomite ($CaMg(CO_3)_2$), limestone $CaCO_3$.

(3) Complete:- They contain all primary ingredients (NPK), So additional fertilizer is not needed.
Ex: ZorAawar, Zarkhaiz by Engro Fertilizer.

4 Incomplete :- The fertilizer contain one or two needed component elements (NPK) such as ammonium nitrate, potassium chloride.

5 Mixed :- Fertilizers obtained by mechanical mixing of various fertilizers are known as mixed fertilizers.
For ex: urea mixed with single super phosphate and potash.

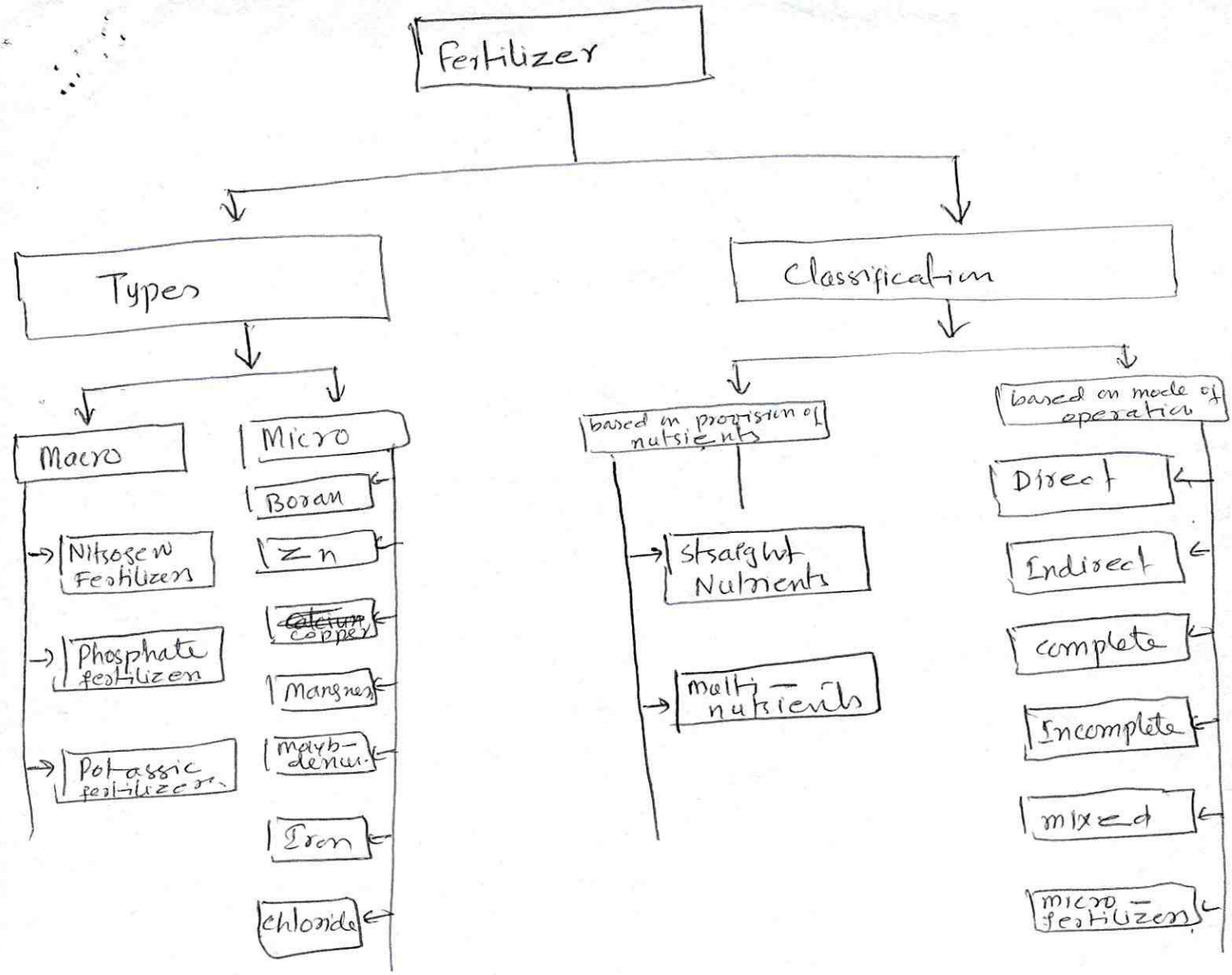
6 Microfertilizers:- These contain the element boron, maganese, zinc, copper

⇒ Types of Fertilizers :-

- Nitrogen fertilizers.
  - Urea, ammonium sulphate, calcium ammonium nitrate
- Phosphate fertilizers :-
  - Single superphosphate
  - Triple superphosphate,
  - Dimmonium phosphate
  - Monoammonium phosphate.
- Potassic fertilizer :-
  - Sulphate of potash
  - Muriate (Chloride) of potash.

⇒ Environmental Hazards of fertiliser :-

- Nutrient pollution :- Fertilizer, animal manure.
- Eutrophication :
- Groand Water pollution
- Soil Acidity
- Health Hazards


Fertilizer
Types
Classification
Macro
Micro
Boran
Zn
Calcium
copper
Mangnes
mayb-denum
Iron
chloride
Nitrogen Fertilizers
Phosphate fertilizer
Potassic fertilizer
based on provision of nutsients
based on mode of operation
straight Nutrients
multi-nutrients
Direct
Indirect
complete
Incomplete
mixed
micro-fertilizers

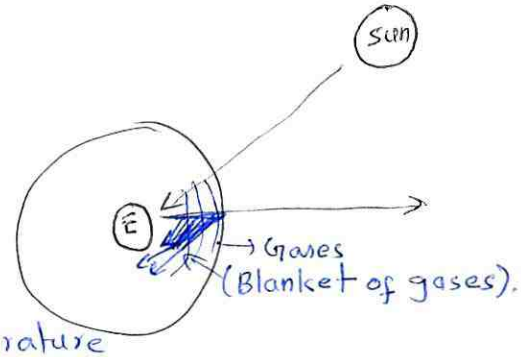
(6) Climate change

UNFCCC → UN Framework Convention on Climate Change.
~~UNCFEC~~ Definition :

A change of climate which is attributed directly or indirectly to human ~~activity~~ activities that alters the composition of global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Factors (Natural factors)

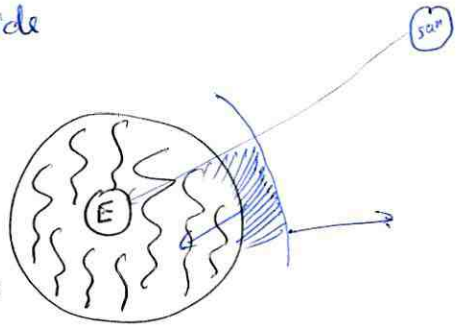
- change in sun energy
- change in earth's ability to absorb or reflect heat.
- Volcanic activity (emit carbon, sulphuric acid).
- Plate tectonics



Green house gases

- These gases form* blanket in our atmosphere. They donot allow sun rays to reflect in same amount. In that way, they ~~maintain~~ increase the temperature on earth

Gases
- Carbon mono-oxide
- carbon dioxide
- Sulphur dioxide
- Nitrogen dioxide
- CFC, HCFC → From cooling apparatuses



- Green house effect.

Causes.

- Fossil fuels
- Emission from factories
- Detergents.
- Fertilizers and pesticides
- Deforestation
- Agriculture residuals combustion.

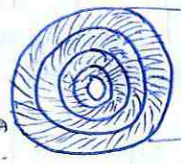
CFC or HCFC + O3 (Ozone) = Ozone depletion

Atmosphere

Is Climate change a reality?

Yes -
→ Arctic sea ice loss.
→ Deforestation.
→ Dendro climatology.

→ Pak contribution to climate change → 0.6%



Tree rings.
Each ring describe
- age
- Living condition

* Climate change is human kind's greatest threat in modern world. It is likely to have profound effect on human health, food production, energy consumption and natural resource management.

- Crop ~~feeled~~ yield growth rate are declining.
- climate change induces diseases.
- There is also evidence on accelerated recession of most glaciers on earth and changes in marine ecosystem.

Pak's contribution:

- Pak contributes 0.6% in global change policies.
- Pak is top 10 affectes of global warming. 3rd

5th affected country.
Global climate Risk Index

1- Glacier melting in Hamalyas
2- Depletion in water resources
3- coastal areas at greater risk of Tsunamis
4- Karachi's two year heat wave (heat stroke)
5- Spread of diseases.

→ Kyoto Protocol:

Policy spectrum
Article-17 - Emission Trading (carbon Trading)
Article-12 - clean development mechanism
Article 6 - Joint implementation (Emission reduction units)

Failure
1 - Exclusion of developing countries.
2 - cost and economical implementation.
3 - Not-ratification by US.

Developed → conflict → Developing
US, UK, France — Pak, china, India

Doha - agreement (2012)

- It gives vision of 2013-2020, regarding climate policies.

Under this Project, Developed country simplement project in developing country. As a result, earn a certified Emission Reduction (CER) which is sellable.

one CER is = one ton of CO_2.

Criticism

(1) The Bush Administration has criticised the Kyoto Protol on the basis that 80 per cent of the world is exempt from emission reduction standards as well as the potential of economic harm to the US.

(2) It excluded developing countries from emission reduction obligations including China.

---

(1) **Emission Trading.**

According to article 17 of Kyoto Protocol, the countries which have extra units of Emission Reduction, and of no use to them, they can sell their units to other countries.

- one unit is equal to one ton of CO_2.

(2) **Clean Development Mechanism.** (Article – 12)

In this mechanism, a signatory developed country (Anexture B) would instal a project ensuring limitation of Carbon Emission in developing country would earn a certified Emission Reduction (CER) unit.

(3) **Joint Implementation.** (Article – 6)

In this strategy, the country in Anexture-B would invest in a country belonging to Anexture – B with fulfilment of requirements recommended by kyoto Protocol & UNFCCC. The host country will issue ERUs to investing country from its quota as per genuine assessment.

⇒ Motreal Protocol (successful Protocol)

ozone depletion effects

- skin cancer (due to UV).
- Land depletion.
- climate change.
- Plant diseases

⇒ Proposed in 1987 and enforced in 1989.

- Ozone-depleting substances were removed from industries, like CFC, HCFC, methane.
- Use three Rs: Reduce, Reuse, Recyle.
- shifting to energy consevative products.
- Gray water policy
- create awareness about the importance of ozone.
- law & strategies for implementation.

⇒ Acid Rain :- → coined by Robert Angus Smith

Elements
Sulpher dioxide → SO_2
Nitrogen dioxide → NO_2

Definition Acid rain or acid deposition is a broad term that includes any form of percipitation with acidic components, such as sulfuric or nitric acid that fall to the ground from atmosphere in wet or dry form - rain, snow, fog, etc.

$2SO_2 + H_2 \rightarrow H_2SO_4 \rightarrow$ Sulphuric acid → Rain → acid rain

$NO_2 + H_2 \rightarrow HNO_3 \rightarrow$ Nitrogen acid → Rain → acid rain

Effects of acid rain

- Dissolve the nutrients from soil
- Dissolve toxic material in soil.
- Damage the waxing coat of leaves in plant.
- Damage the wildlife.
- Corrosion of metals, buildings and monuments
- Skin diseases

⅔ of SO_2 & ¼ of NO_2 released into the air by ~~fossil fuel~~ by electric power generation

Environment Protection Agency → Regulate the emission comings from vehicles
- Restricting fossil fuels.
- Focusing on more sustainable energy sources such as solar wind power
- Respecting Pan's agreement 1922.
- using public transportation
- car-Pooling

* Smog

Fog + smoke ⇒ Smog

word first used by A.A. Des Voeux

Fog + {Sulphuric acid / Nitrogen acid} ⇒ Smog

effect
- Lesser efficiency of vitamin D, thus leading to Rickets
- Bronchial diseases
- Lung issues
- Dangerous for people with Asthma

Prevention:-

- Plantation.
- Dispersing of condensed population.
- Shifting of industry from urban areas.
- Use of ecofriendly vehicles.

Environment
Climate change → 1 Question

★ Physical sciences ✓

★ Environmental science – 15

★ C. climate change

★ IT

Topics 10–15

Biology

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* Food Science:-

- We require food to produce and maintain good health. It helps us to stay warm, build and repair tissues, and ~~to~~ maintain a heart beat.

Balanced diet: It is a diet which includes right amount of all the nutrients such as proteins, vitamins, minerals, fats, carbohydrates, etc for proper growth, development and environmental function of body.

- Proten · Vitamin · Carbohydrates · Fats · Minerals · Water

Carbohydrates → Main source of energy ex: Glucose

⇒ Carbohydrates :- (Main source of energy)

- 3.9 c/g

Types:- ~~Saccrides~~ Sachrides.

- Mono-sachrides, Disachrides/oligo sachrides, polysachrides.
  - Glucose
  - Galactose
  - Fractose
  - Sachrose (Gulcose - Fractose)
  - lactose (Gulocose - Galactose)
  - Maltose (Gulocose - Gulacose)
  - Glycogen
  - starch
  - cellulose

Molecule: carbon – hydrogen – oxygen

Source :- Milk, roti (Wheat), Maisins, ~~Meat~~, starch, honey.

of Carbohydrates

⇒ Proteins :-

- Made of amino acid.
- chief builders of body.
- Complex molecules: carbon – hydrogen – oxygen – Nitrogen.
- They made enzymes (~~as~~ enzymes are catalyst).
- Develope carrier proteins → haemoglobin
- 20 types → 11 are non-essential and 9 are essential proteins.

Classification

- through enzymes production
- structural classification.
  - caratin protein for hair and nails
  - Enzymes
  - carrier proteins
  - structural proteins
  - storage proteins.

Enzyme → H.W

Source :- Fish, chicken, Mutton, Egg, Beans

Carbohydrates — Source of energy
Proteins — Builders of body
Fats — storage of energy
Vitamin
Mineral
Water

⇒ Fats :- 9.1 c/g (Lipids)

- Naturally occuring compounds, commonly known as oil.
- They help in cell structure
- & storage houses of energy

Types :-

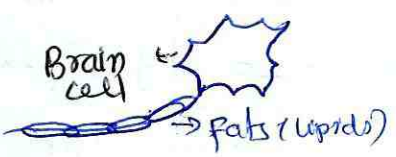
Saturated fats :- solid at room temperature. Ex:- Coconut oil.
- It may increase cholestrol.
- Increase low density lipids.

Trans fats :- improved form of saturated fats.

unsaturated :- It is liquid at room temperature.
- All the oils from plants are unsaturated.

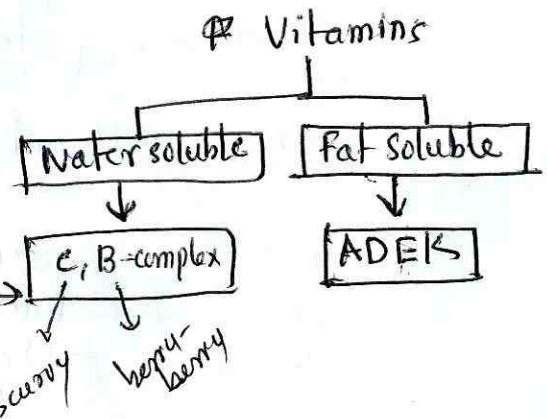
Function :-

- They are the storage compounds of energy.
- Main component of cell memberance.
- Fat solluble vitams are disolved by fats. (A, D, K)
- Found in nerve cells (Insulate them)



⇒ Vitamins :-

- They are not part of basic diet. They work as co-effers.
- They require in less number and trigger out several chemical reactions in body
- Vitamin are soluble in water and (B, C) they goout of body through urine



Fat solubles

- Vitamin A → protect from nigh blindness
- Vitamin D → protect from soft bones
  - Rickets disease
- Vitamin E → anemia, Cancer
- Vitamin K → Blood clotting

Water soluble.

Vitamin-B → B1, B2, B3, B5, B6, B7, B9, B12

B1 → Berry Berry

B2 → eye and skin infection

B3 → Diahorrea

B5 → Fatigue

B6 → Kidney stones

B7 → Depression and Fatigue (neuron's fatigue)

B9 → (It is folic acid) Protect from abnormal behaviour

B12 → Protect from neurological diseases.

Diseases

BED - PK - DAN

Vitamin c :-

Protect from scurvy (skin diseases)

Minerals :- (Ca, K, Cl, Mg, P, Zn, I, Cu)

Ca → Bones

Cl → acid

Mg → Growth failure

P → Weakness

K → Saves from cramps

Zn → Iron, anemia

I → Thyroides

Cu → B

⇒ Water (H_2O) :-

- Essential for body.
- Life of body.
- Important part of balance diet.

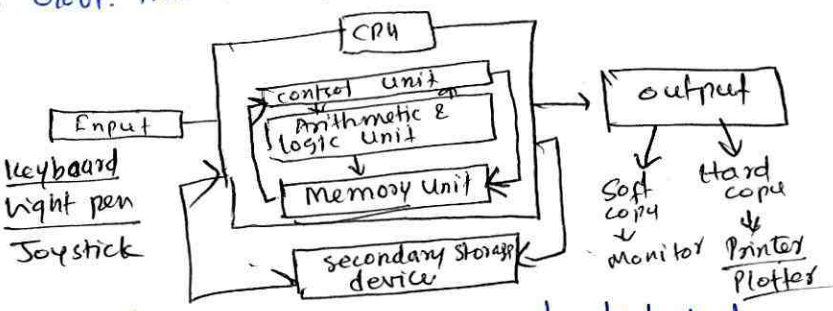
Food Preservation :-

Name — 3 bullets.

freezing
Syrups of sugar & salt
Pasturization

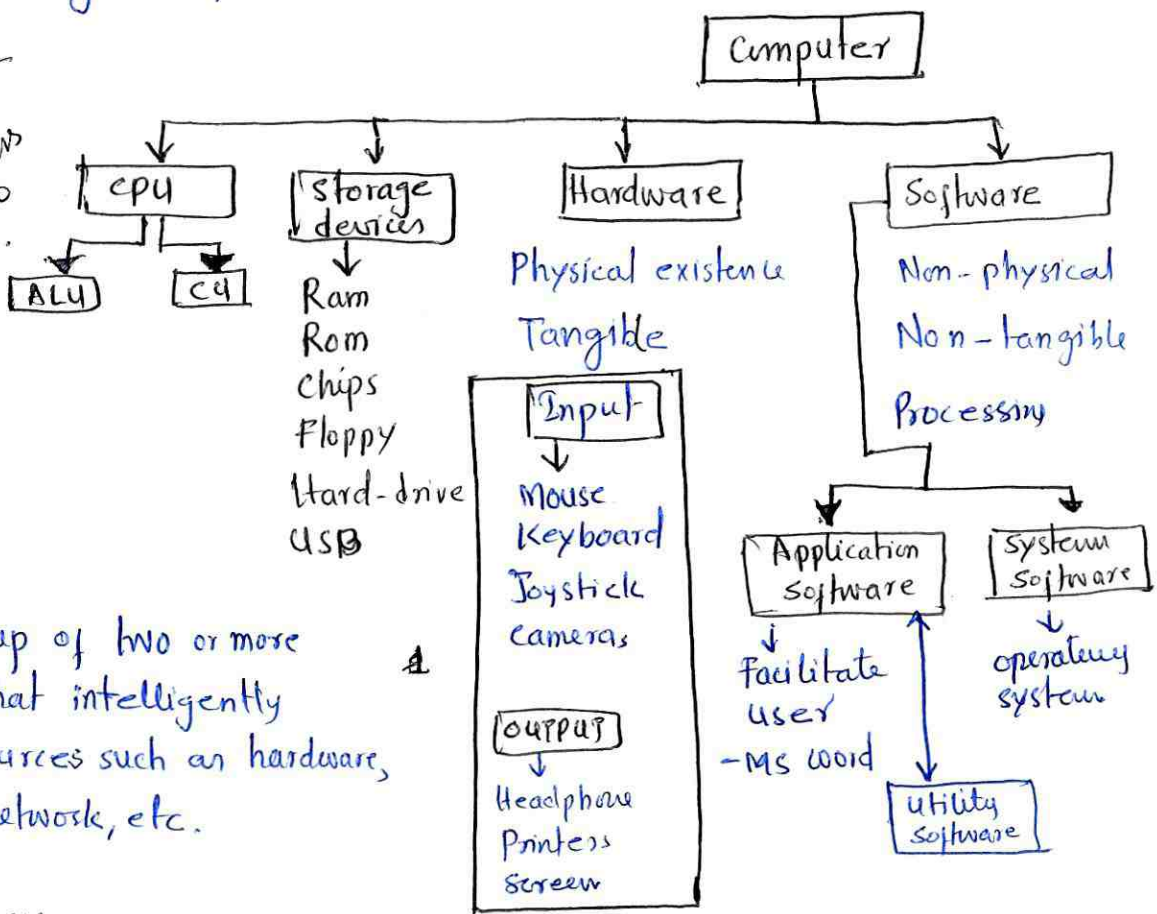
Information Technology

- Computer (Education, Engineering, Medical, Banking, Industry, science, Trade, etc)
- Networks (accounts, Govt. institution, etc
- cell phones
- Fiber optics
- Information system
- GIS



Information technology is defined as processing and distributing of data using computer hardware and digital electronics.

According to Information Technology Trends in 2019 — Information technology refers to anything related to computing technology.



Network :-

It is a group of two or more computers that intelligently share resources such as hardware, software, network, etc.

Pattern topology :-

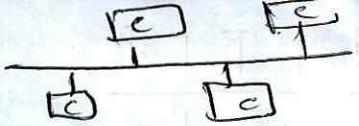
Network :-

LAN → local area network [single building almost]

MAN → Metropolitan area network [University, city, some campuses]

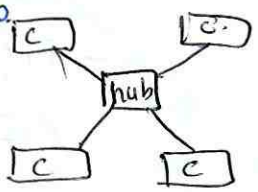
WAN → Wide area network [very broad like countries, subcontinents]

1- Bus Topology:-

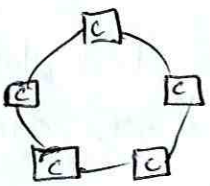


It is a comon medium that connects many computers to gether.
- Ex:- Ethernet system

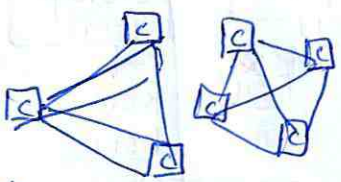
2- STAR Topology :-
- It has all the computers (devices) are connected to comon hub.
- Data between two computer will be shered through hub.

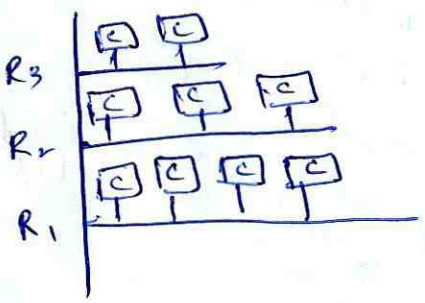


3- Ring Topology :-
- All the devices are connected in Ring.
- It is slow in processing



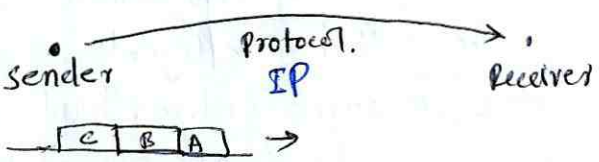
4- Tree Topology :-
In this; group of computers are connected are connected to gether.





5- Mesh Topology
In which each and every device is connected to eachother.

Internet :-
All information is transmitted accross the internet in small units of data called packets.



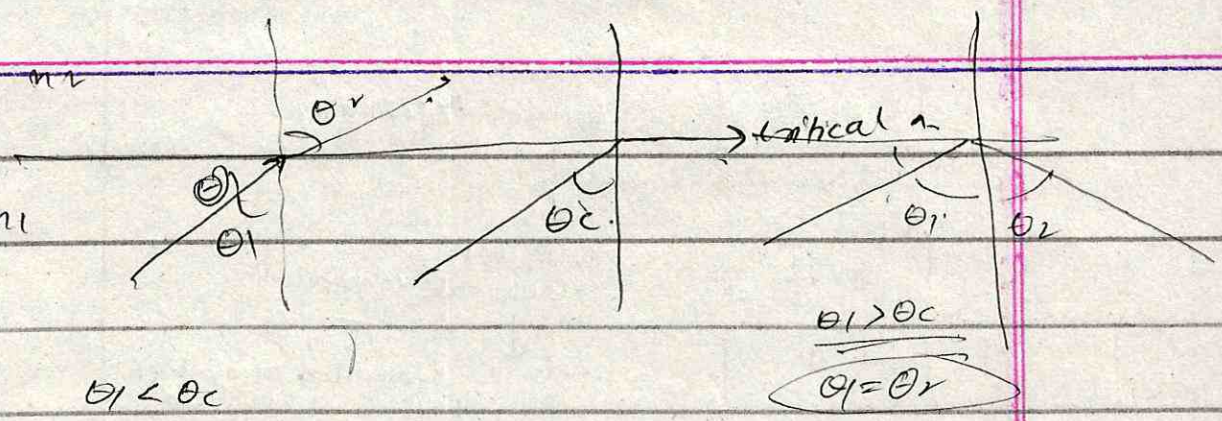
— Social Networking :-
It is the grouping of individuals and organizations through medium in order to share thoughts, interests and activities.

Ex:- Facebook, Twitter, Watsapp, Linkedin, Youtube, etc.

• Gout. Application, e-commerce, e-paper, e-channels, education, bussiness app, etc.

Advantages :-
- Facilitate open communication
- Exchange information
- Reduce Time & space
- Bring together like-minded people.
- Traget a wide audience.

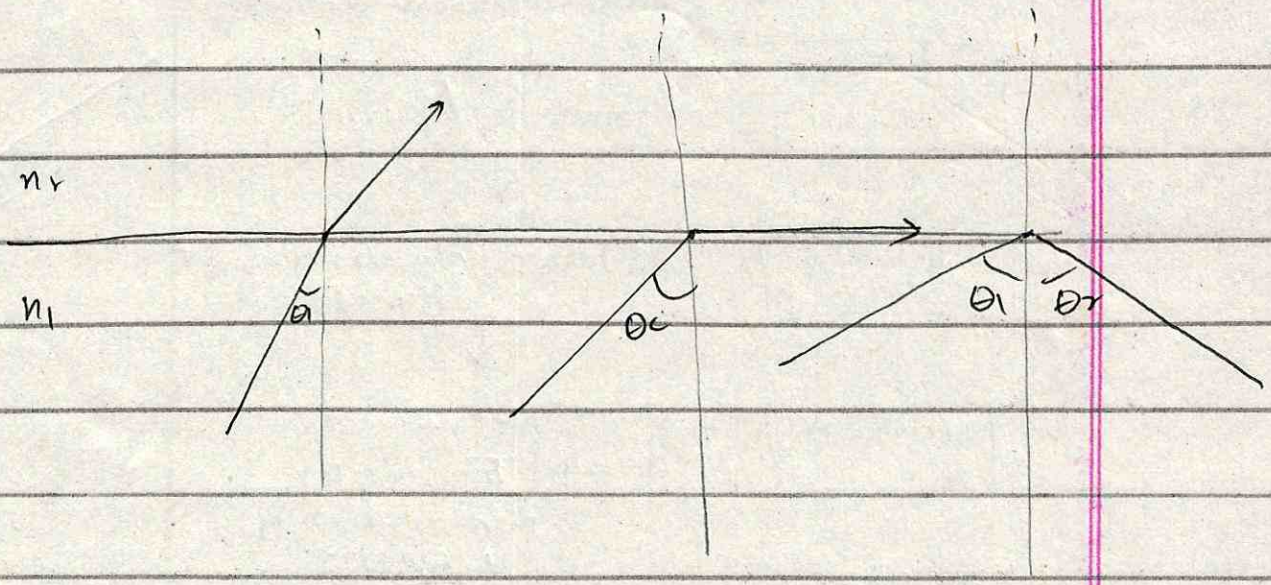
Disadvantage :-
- damage privacy, Invade privacy.
- chances of misuing of your info throug hacking
- Time waste.
- Social harrasment.
- Bring Pessimism



θ1 < θc

θ1 > θc

θ1 = θr



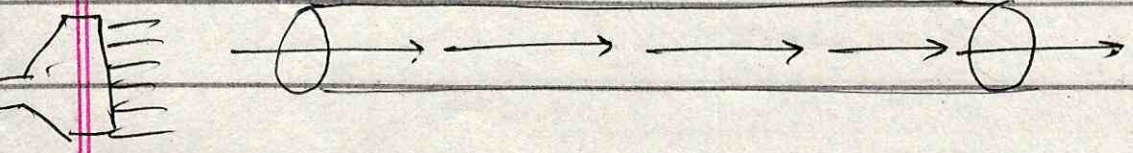
θ1 < θc θ1 = θc θ1 > θr & θ1 = θr.

Q) Data rate upto 10 Gbps. with bandwidth of 2 GHz.

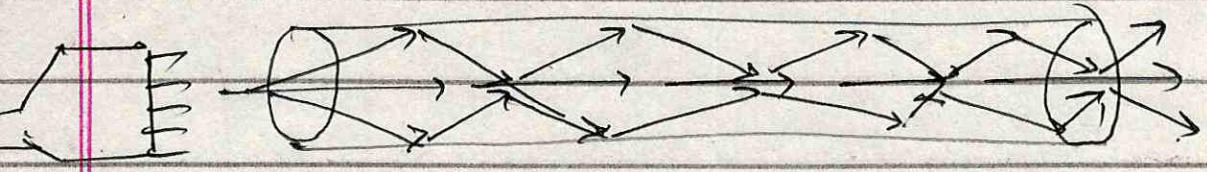
→ Support Data rate upto 100 km without repealers.

small core — one beam of light

* Single-mode Fibre



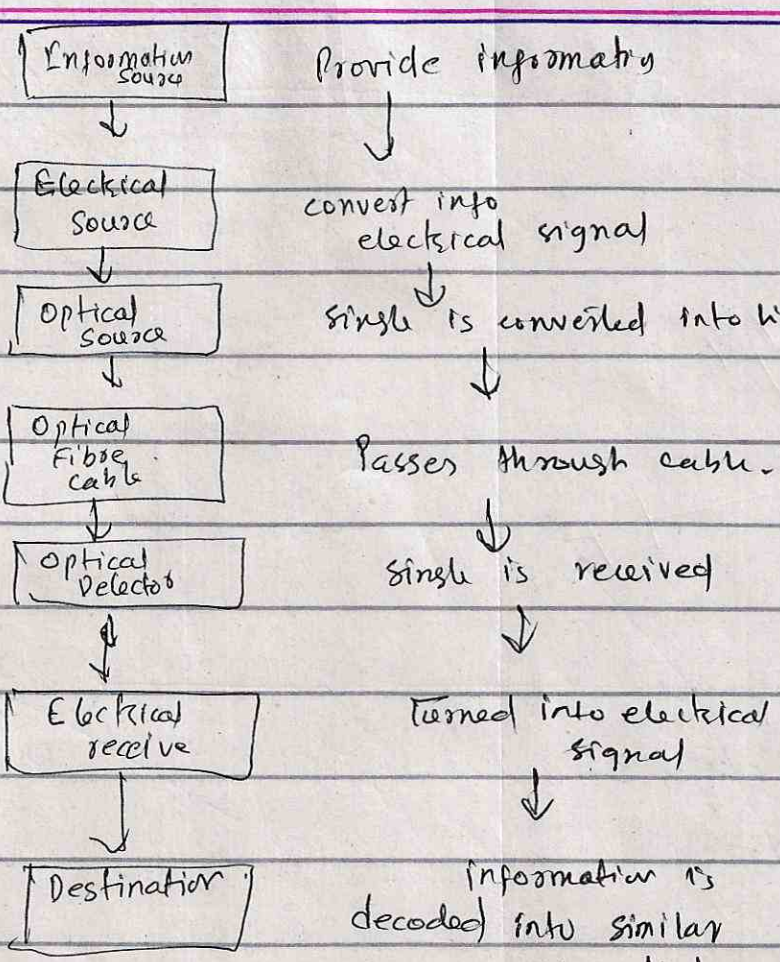
* Single Mode Fibre



* Multi Mode Fiber

∴ Multimode Fibre.

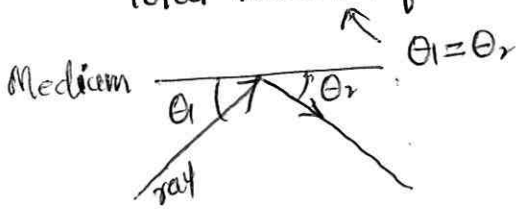
- Data rate 1 Gbps
- Many pulses of light generated by LE.
- can support less bandwidth than single mode.

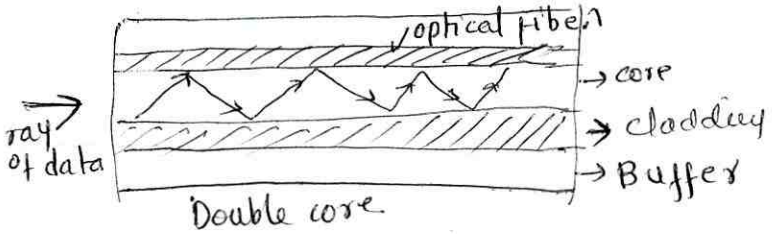

Information source
Provide information
Electrical Source
convert into electrical signal
Optical source
single is converted into light
Optical Fibre cable
Passes through cable.
Optical Detector
single is received
Electrical receive
Turned into electrical signal
Destination
information is decoded into similar medium that of information

Optical Fibre

Optical fiber refers to the medium and technology associated with the transmission of information is like passes along a hollow glass tube or fibre. Fibre optics is branch of sciena that deals with the Optical fibers.

Total internal Reflection

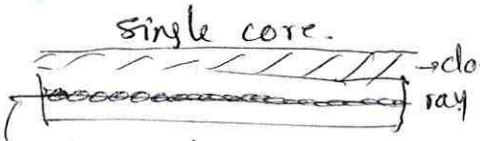




FO → It uses the principle of total internal reflection.

Parts-
core → made of glass, info pass through it in the form of rays
cladding → made of metal, that works of an insulator.
Buffer. → outer protection.

Double core
Amount of data (↑)
cost (↓)
speed (↓)
Repair cost (↓)
Coverage (↑)

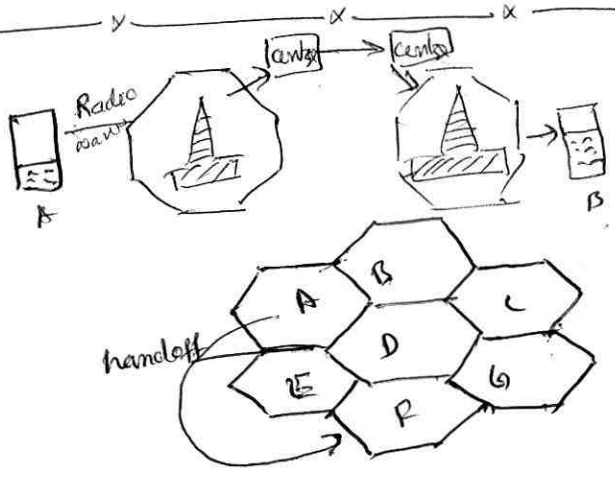


> Narrow glass
- Almost no - reflection
- less amount of data.
- Speed high
- Repair cost (↑)
- cost (↑)
- Coverage (↓)

(Nov 6) Rawalpindi — Khashkhar → FO

Copper	Fiber optic
- Prone to magnetic and electric field	- No prone to any field.
- chances of burning (fire)	- No any chance of fire
- have much weight	- less in weight.
- less cost	- high cost.

Cell phone:-
Parts
Ram, Rom, core, CPU, microphone, vibrators
system :- Android, macintosh, etc.



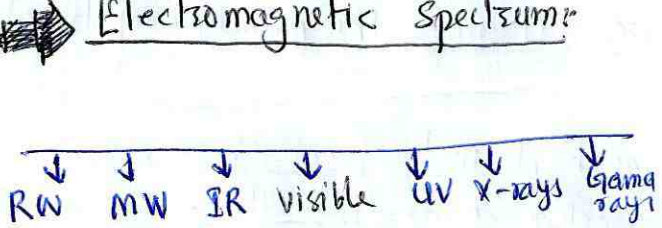
* Reading comprehension :-

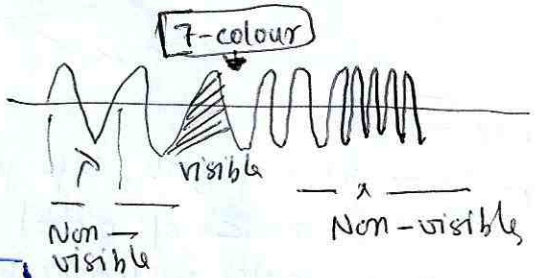
Types of comprehension questions.

(1) Factual questions.
(2) Inferential questions. (How, why)

⇒ Why the writer thinks so ?

Electromagnetic Spectrum :-





Descending wavelength order
(Assending frequency order)

AM meter	Radio
Aircraft	MW
MW	IR
TV remote	visible
Night vision	UV
visible	X-ray
UV	G-rays
Airplane (medicine)	
Scanning (X-rays)	

long

short

---

* Artificial Intelligence :-

It can think & decide, have ~~ability~~ cognitive ability, rationality, ~~emotion~~, etc.

Cognitive science :-

Robots :- Physical object implemented with AI.

- Natural interference APP.
- Speech recognition
- sensory ability.

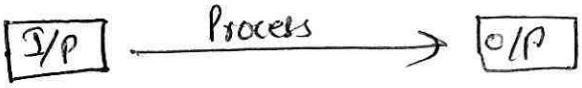
Application :-

Daily life :-
- communication
- Time management
- Education
- Goals and information needs
- Games
- reaction
- leisure
- Augmentation of cognition

Science
- automated discovery
- interpretation of data
- Problem solving
- designing of experiments
- Solve complex issues.
- Transportation
- commerce decision making
- agriculture.
- ~~Info~~

Information Systems

It is defined as software that capture, transmit, store, manipulate and display information



computer
People
~~dentist~~ Data
procedures
~~hardware~~
~~Data~~
software
Hardware

- Transaction Processing system
- Business information system
- Management information system
- Executive information system

* Surveillance :-

(8)

* Natural, Hazards, And Disasters *

Disaster :- It is sudden and calamitous event that seriously disrupts the functioning of community. It causes human, material, ~~and~~ economic losses or environmental losses.

- Disaster caused by three factors :-

$$\text{Disaster} = \frac{\text{Hazard} + \text{Vulnerability}}{\text{Capacity}}$$

The combination of hazards, vulnerabilities and inability to reduce the potential negative consequences of risk results in disaster.

2

- Hazard :- It is threatening event and probality of occurance of disastrous event in given time and area.

Hazard

- Natural Hazard
  - geophysical: Earth quakes, landslides, Tsunamis, Volcanos
  - Hydrological: Avalanches and ~~storms~~ flood
  - Climatological: Extreme temperatures, droughts, wildfires.
  - Meteorological: Cyclone, storms
  - Biological: diseases, insects/animal plagues. [swine Flu, Bird's Flu] ↑
    - COVID-19
    - Spanish Flue
    - Plant Diseases → Potato Blight.
- Man-made Hazard
  - Technological
    - Industrial accidents
    - Reactor explosions
    - Transport accidents
    - Famine
    - Conflicts / Wars
    - displaced population

- **Vulnerability**:- Diminished capacity of individual or group to cope with or recover from hazard either manmade or natural.

- **Capacity**:- Amount and quality of sources available to people, groups and countries to cope with hazards.

⇒ **Scale of disaster**

1- lead time available
2- Duration
3- Density of population
4- Spatial extent
5- Intensity
6- Time of occurance

⇒ **Elements at risk**

1- People, livestock and wildlife
2- Personal and public properties
3- Crops, forests
4- Telephone, electric poles
5- Irrigation infrastructure

Effects of disasters

All disasters have three types of effects.

- Primary:- Occurs because of process itself.
  Ex: Water damage during flood, collapse of building, landslides, hurricane.

- Secondary:- Occurs because of primary effect.
  Ex: Fire ignition, reactor explosion, disruption of electric power

- Tertiary:- long term effects and also caused by primary effects.
- Crops failure due to volcano eruption, permanent position change of river caused by flood.

1 Disaster Management System :-

— Disaster Management :- It is an organization whose responsibility is to cope with emergencies and safeguard the properties and lives of peoples as well.

— Disaster management cycle :-

The disaster management work in the following cycle :

- Prevention (Mitigation)
- Preparedness
- Response
- Recovery.

4 Rs
1. Reduction
2. Readiness
3. Response
4. Recovery

⇒ Prevention :- [Pre-disaster mitigation efforts].

Prevention or mitigation reduces or eliminates the probability of disaster occurence,

Ex. building codes, preventive health care, public awarness education, etc.

⇒ Preparedness :- During preparedness organizations and governments made plans to deal or cope with disaster.

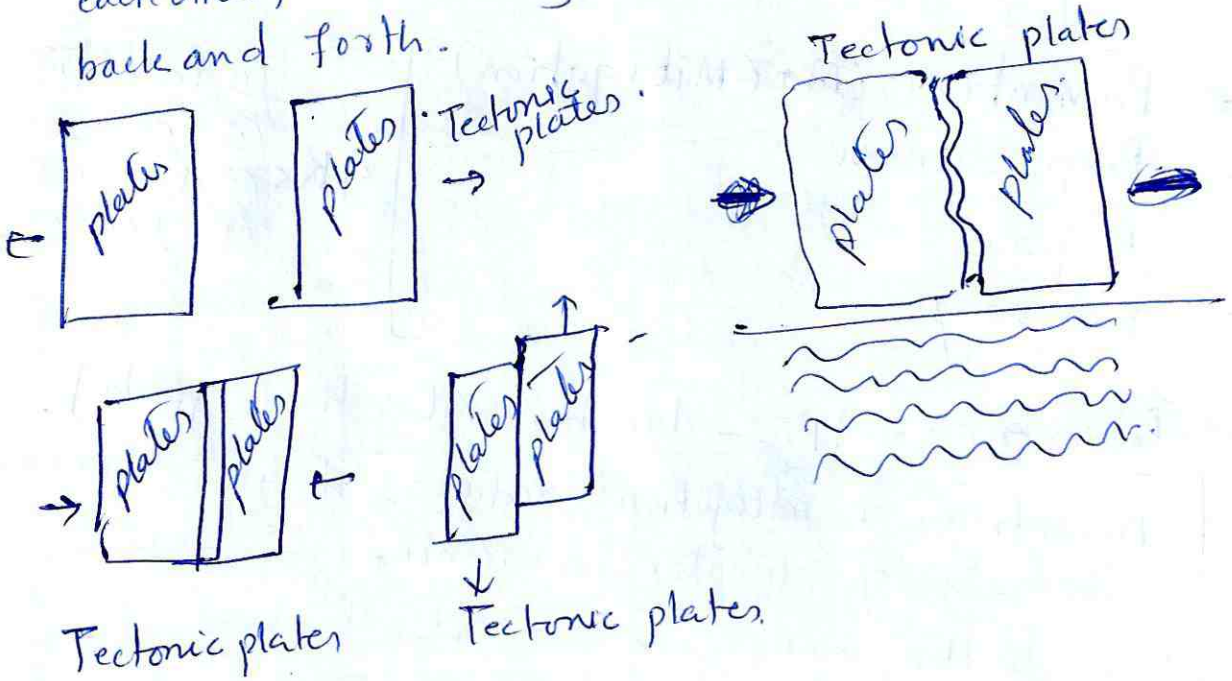
Ex:- emergency exercise, warning systems, rescuers, etc.

⇒ Response :- The aim of emergency response is to provide assistance to maintain life, improve health and support the morale of affected population. Many humanitarian organization are always present in this phase.

⇒ Recovery:- It involves the ~~restoring~~ restoration and rehabilitation of people. Recovery ~~system~~ activities continue until the all system returns to normal or better.

Ex:- NGOs & foreign aid providers established temporary rehabilitation centres for displaced peoples as in flood of 2010.

⇒ Earthquake:- Earthquake is a sudden release of energy in the form of seismic wave that creates vibration in earth crust and imbalances the tectonic plane. Tectonic planes either move towards each other, or away from eachother or move back and forth.



• Seismic waves:- It is an elastic wave generated by an impluse such as earthquake or explosion. It travel either along or near the earth surface or through the earth interior.

• Measurment of earthquake:-

A seismograph detects the vibration caused by an earthquake. It plots these vibration on a paper. The strength or magnitude is measured ~~these~~ using Richter scale". This scale is numbered between 0 and 10.

It is a logarithmic scale. 6.0 is 10 times more powerful than 5.0

⇒ Effects of earthquakes:

1 Damage to structure (Infrastructure):
- Partial or total collapse, damage to rails, roads and transports.

2 Sea level :- Sea level could rise suddenly, causing high waves which can cause flood in coastal areas.

3 landslide and Avalanche:- huge chunks can fall on lower region, causes change topography.

4 Socio-economic losses:-
Various psychological and socio-economic losses.
~~Build~~ huge burden on economy unpredictably.

Ex:- ~~US~~ loss ~~of~~ of 5198 USD in 2005 Kashmir Earth Quake accordig to World Bank

⇒ Management of Earthquakes:-

1- Risk assessment:- Evaluate and document risk associate with buildings, infrastructure, etc.

2- Risk Zoning:- Carryout county wide microzonation to minimize disaster damage.
Ex:- Red where no construction is allowed,
yellow where single story is allowed, etc.

3- Planning:- Maintaining of a better planning, construction and mitigation practices before earth quake.

4- Research & development:- Advance technology for prediction.

5- Public awareness:- Educate people about emergency measures and first aid procers, etc.

6- Legislation:- National and local effective policies

7- **Building codes:-** Development of national building code. Adopting and enforcing building code can reduce damage risk.

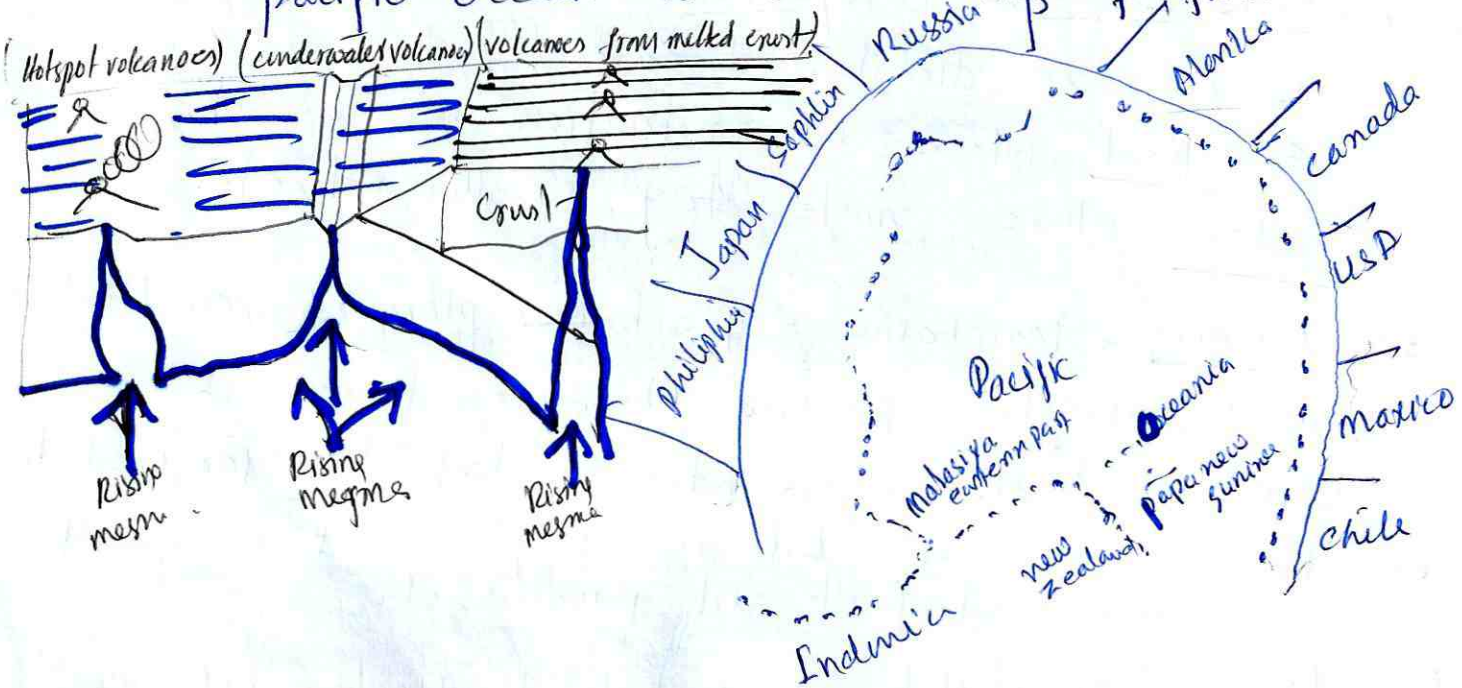
8- Emergency measurement :- Advanced emergency drills, preparedness of procedures to cope with calamity.

> A Volcano is an opening on the surface of planet or moon that allows material warmer than its surroundings to escape from its interior. (NASA).

* **Volcanoes :-** It is an opening on the surface of earth through which molten magma (gases, hot vapors) comes out and damages the nearby areas.

— The word volcano was taken from the name of "Roman god of small island of ~~sisily~~ in the mediterranean sea of sisly (Italy's part) called Volcan."

— The area around the pacific is full of active volcanoes. This entire rim alnd pacific ocean is called rings of fire.

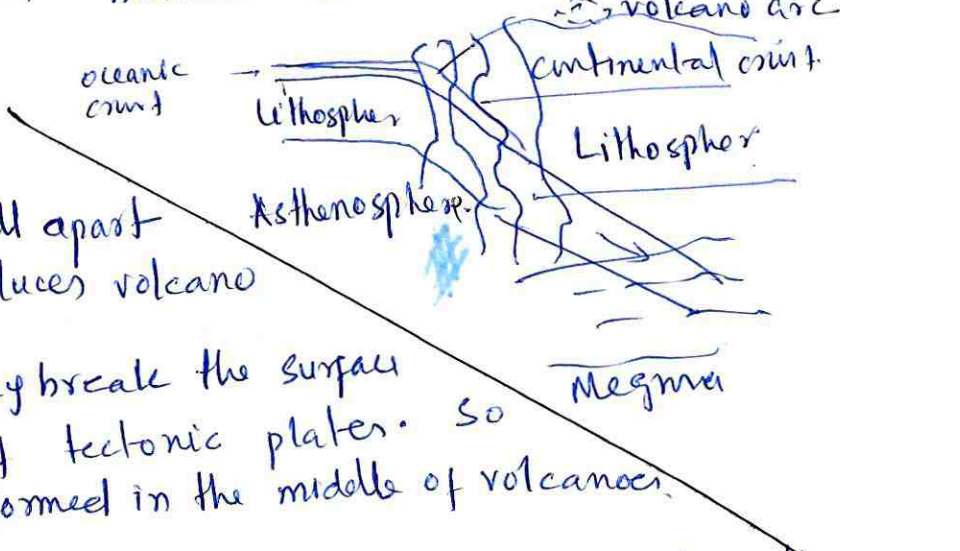


* Formation of volcanoes :-

Volcanoes can be formed into three ways.

— **Via subduction :-**

• Subduction :- It is geological process in which one plate move under another and is forced ~~to~~ sinks due to the gravity in mantle. This process occurs in subduction zones. The plate reaches depth at 50 to 100 ~~The~~ miles and become so hot that crust release fluid.



— **Via rifting :-**

When two plates pull apart magma rises, produces volcano eruption.

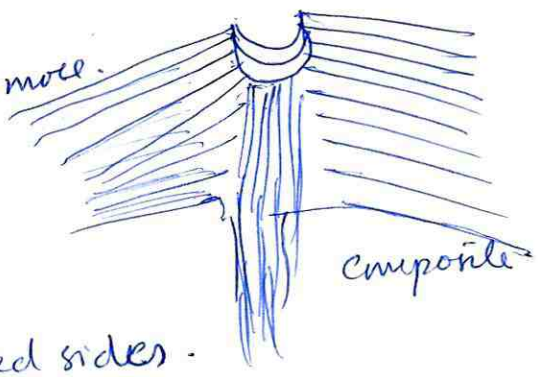
— At Hotspots :- They break the surface In the middle of tectonic plates. So hotspots can be formed in the middle of volcanoes.

Types of Volcanoes :- Volcanoes are described by their shape, ~~and type~~ size and composite style.

— **Composite cone volcanoes :-** (Stratovolcanoes)

• Cone shaped volcanoes composed of lava, ash and rock debris.

• Grown to 8000 feet or more.



— **Shield volcanoes :-**

Broad and domed-shape volcanoes with long sloped sides.

— (Cinder cone) **Cinder cone volcano :-** Can be found on the flank (side) of shield or composite volcanoes. These are hill sized volcanoes of few hundred meters. Lava erupt from small vent in the crust.

Effects of volcanic eruption:

1- Volcanoes can be accompanied by earthquakes.
2- Volcano activity ~~can~~ in sea can trigger tsunamis
3- Discharge of toxic gas ~~poston~~ poison the water
4- Discharge of these gases affect breathing.
5- Causes displacement of population.
6- lava at such a high temperature causes structural damage.

* Tsunami :—

- It is a Japanese word meaning "harbour wave"
- It causes catastrophic damage when it hits coastline.
- It is a series of waves caused by rapid displacement of body of water.
- Almost 80% of the tsunamis occur within the Pacific ocean's 'Ring of Fire'.

⇒ Causes of Tsunami:-

Can be generated by:
undersea earthquake (Frequent cause) (86% of tsunamis)
undersea landslides
undersea volcano disruption
asteriod crashing into ocean.

⇒ Formation:-

(1). Earthquake must be atleast 7.0 on richter scale.
(2). Centre of earthquake must be near to coastal areas.
(3). Plates must move upward or downward. Sidward movement donot cause Tsunami.

⇒ Characteristics :-

- can travel upto 1000 km/h
- maximum one ~~height~~ meter high in sea.

Eg: 2011 Tohoku Tsunami
2010 Chile Tsunami
2010 Sumatra Tsunami.

⇒ Effects :-

— Destruction to the lives of animals.
— leaves crops damaged
— Create pollution.
— Effect economic condition of people.

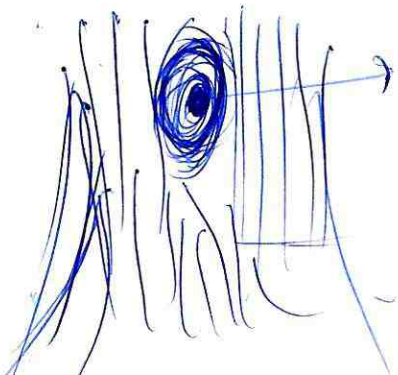
* Avalanche :- It is a sudden and often rapid mass movement of ~~snow~~ snow and ice down a mountainside due to gravity.

Avalanche → descent (French word)

Types of Avalanche :-

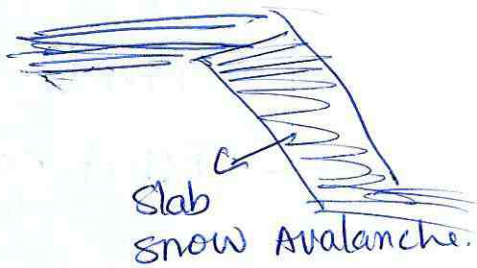
(1) loose snow avalanche :- (sluff or slough avalanche)
It originates at a single point on a slope and gathers ~~so~~ cohesionless snow on the surface of the pack as it descends.

- Cohesionless snow is not well bonded.



⇒ Slab avalanche :- When stronger snow overlies weaker snow we call it a slab.

- It consists of very well bonded and consolidated snow crystals throughout entire layer.
- They are formed from new snow and wind slope ; they are also refferred as wind slopes.
- It occurs when cohesive layer of snow slides down a slope.



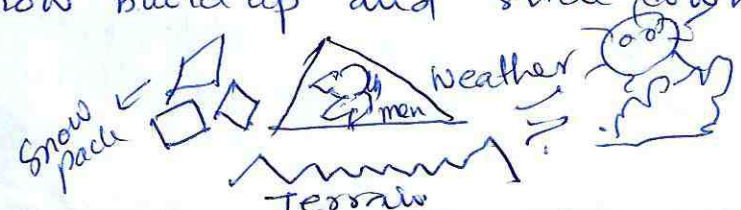
Causes of Avalanche :

→ Terrain related factor :—
slope size, slope shape, slope angle.

→ Weather related factors :
- Heavy snowfall deposits more snow in unstable areas.
- Heavy snowstorms (24 hour continuous)

→ Man - related factors.
- use of vehicles and snow mobiles creates vibration within snow.
- Construction work done with explosives tends to weaken entire surrounding.
- Heavy deforestation and erosion of soil give little stability in winter months.

→ Snow pack related :-
- Layers of snow build up and slide down.



Effects of Avalanches
- loss of life (like in Siachan with Pak army)
- loss of property
- Blockade of traffic and road damage
- Impact on tourism.
- loss of flaura and fauna.

Management of avalanche:-
- Afforestation (for stability)
- land use planing (Red, yellow, green, orange area)
- Public awareness
- Avalanche hazard, vulnerability & risk management.

Flood :-
- It is a high water stage.
- Water overflows its natural and artificial boundaries.

Causes :-

— Meteorological :-
- Prolonged and intense rainfall -
- cyclones
- Typhoons, storms, tidal surges
(tropical mature cycles)

— hydrological causes :-
- Ice and snow melt.
- Saturated land
- Land erosion

Anthropogenic causes.
- Human plays negative role in causing flood.

→ Deforestation, intensive agriculture
→ Urbanization, climate change
→ Global warming.
→ Industrialization

Effects of floods:

1. Primary :-
   - Physical damages
   - collapses of building
   - Casualities
   - Damages of crops
   - loss of resources.

2. Secondary :-

These effects caused due to primary.

- Imminent threat of Landslides
- Soil erosion and land degradation
- Effect on health
- Disturb communication infrastructure.
- Water pollution.

3. Tertiary (long term) :-

- It takes years to rebuilt and rehabilitation process.
- Economic ~~updown in~~ damage in country's wealth
- Food shortages
- Poverty.

Management of floods:-

(1) Structural measures:- (i) construction of dams.

(ii) River engineering :- Rivers must be widened and deepend to carry more water.

(2) Non-structural :-

- Afforestation
- Urban planning
- Public awareness.

* **Drought** :- It is the deficiency of rain ~~fall~~ fall over extended period. This prolonged shortages can retain for ~~for~~ few months, a year or several year.

⇒ **Causes of drought**

- Lack of rainfall. Where agriculture is dependant on this source.
- Dry season :- It cause drought due to low humidity, river drying up, etc.
- Deforestation
- Global warming and climate change.
- Mismanagement of resources.

— Effects :-

- Diminish crops growth
- Food shortage and famine due to lack of water for irrigation
- Habitat damage, affecting both terrestrial & acquatic life.
- Mass migration, internal displacement and international refugee crisis.
- Social unrest and conflict over natural resources.
- Death of people and animals.
- Loss of economy.

— Management of droughts :-

- Building of dams
- desalination of sea water for irrigation & consumption
- Drought monitoring → continuous ~~monitor~~ observation of rainfall.
- land use planning → less water dependent crops.
- Recycled water
- Cloud seeding

Tropical cyclone :-

Tropical storms, cyclones, hurricanes, and typhoons, although name differently, describe same disaster type.

- A tropical cyclone is a type of low pressure system.
- Tropical cyclone is a general name for a kind of storm, while typhoon and hurricanes are the ~~name~~ names applied in particular locations.

South asia → cyclone
~~Northern~~ Western areas → Hurricane (In east and west of USA)
North pacific near Japan → Typhoon.

Formation :

All ~~storms~~ have two things in comon.

i— low atmospheric pressure.

ii- Winds that are created ~~from~~ by the flow ~~of~~ of air from higher pressure outside the storm towards the low pressure at the centre. In other words, wind is being pushed by high pressure to Low pressure. ⇒ Developement stages Tropical

⇒ Saffir — Simpson wind ~~state~~ scale :-

It is based on 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Catagory 3 are major hurricane can cause huge loss of life.

1	2	3	4	5

Saffir-Simpson Scale.

Development stages:

- Tropical disturbance → Winds are weaker and unorganized
- Tropical depression → Winds speed less than 39 mph.
- Tropical storm → Winds 39 to 74 mph
- Tropical cyclone and hurricane → Winds greater than 74 mph.

Who gives hurricane name:

Regional specialized ~~metrological~~ meteorological centres (RSMC) works under the world ~~metrological~~ meteorological organization (WMO) selects hurricane names.

Environmental Impacts:

- Storm surges.
- Floods
- Winds
- Tornadoes.

* Tornado (Twister):

It is a spiral of violently fast moving air that extends between the earth's surface and cloud.

Duration

- Most tornadoes last for less than 10 minutes.
- large tornadoes last around 30 minutes.

Speed:

- Comon tornadoes have wind speed of less than 110 miles (176 km) per hour.
- Poweful tornadoes crosses wind speed more than 300 miles (483 km) per hour.

Width:

- comen tornadoes are 250 ft (76meters) accross.
- Poweful tornadoes can be more than 3.2 miles wide

Travelling distance:

- Comen tornadoes travel few miles.
- Powerful tornadoes can travel dozen miles.

Destruction:

- Powerful tornadoes can rip building off their foundation
- Torandoes kill 60 people an averge in US every year.

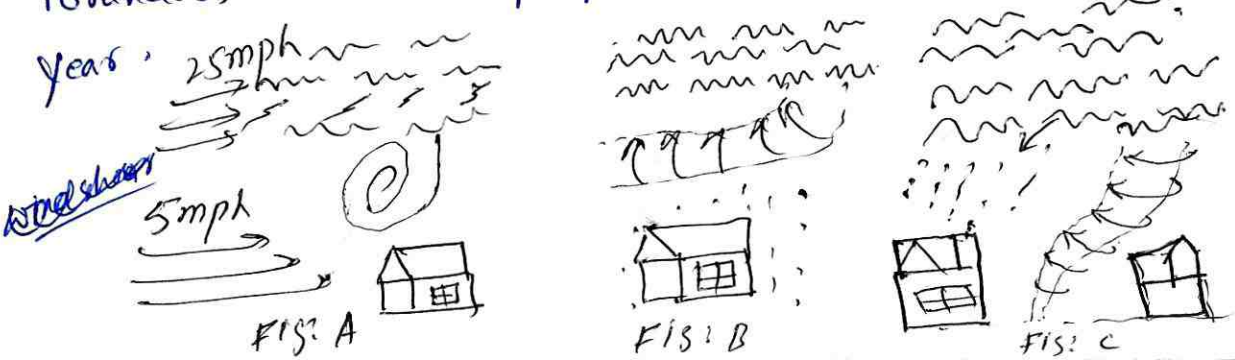


Fig: A Fig: B Fig: C

⇒ Tornado formation:

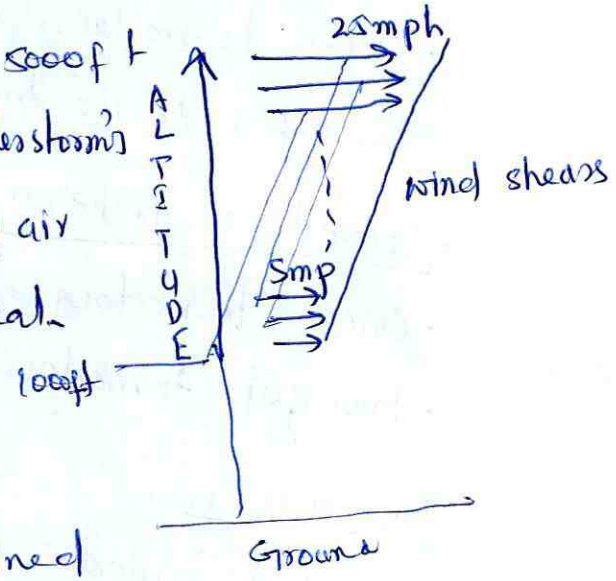
- Tornadoes are borne out of supercell storms.
- Super cell storms are thunderstorms characterized by updraft (upward air).

— Three steps

(1) Change in wind direction and increase in wind speed.

• This change occurs in increasing altitude and creates an invisible horizental spinning effect in lower atmosphere. (Atmosphere where we live)

• Winds at different altitudes blow at different speeds, creating a wind sheer

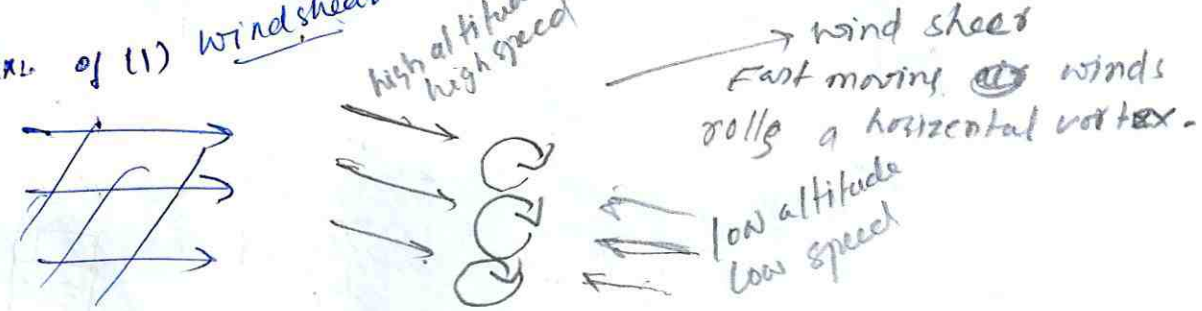


(2) Rising air within the thunderstorm's updraft tilts the rotating air from horizental to vertical.

(3) Area of rotation

Ex: 3–10 km wide contained within the storm, more possibility of tornadoes formation is.

Ex. of (1) Windshear



Ex1 of 2.

- Updraft
Ground air begins to up lift a section of horizental vorter.

storm 2. Stronger of the two vortices become the heart of thunderstorm

* Fujita Tornado Damage scale :- (F-scale)
(Fajita pearson scale) :- (FPPP scale)

- It is used to determine the intensity of rotating tornado. It is based primarily on damage that tornadoes inflict on human-built structures and vegetation.

Fujita scale.

F0	F1	F2	F3	F4	F5	

*. F0 → Light damage.
*. F1 → Moderate damage.
*. F2 → Significant damage.
*. F3 → Severe damage.
*. F4 → Devastating damage.
*. F5 → Incredible damage.

~~* Effects of tornadoes~~ 2.

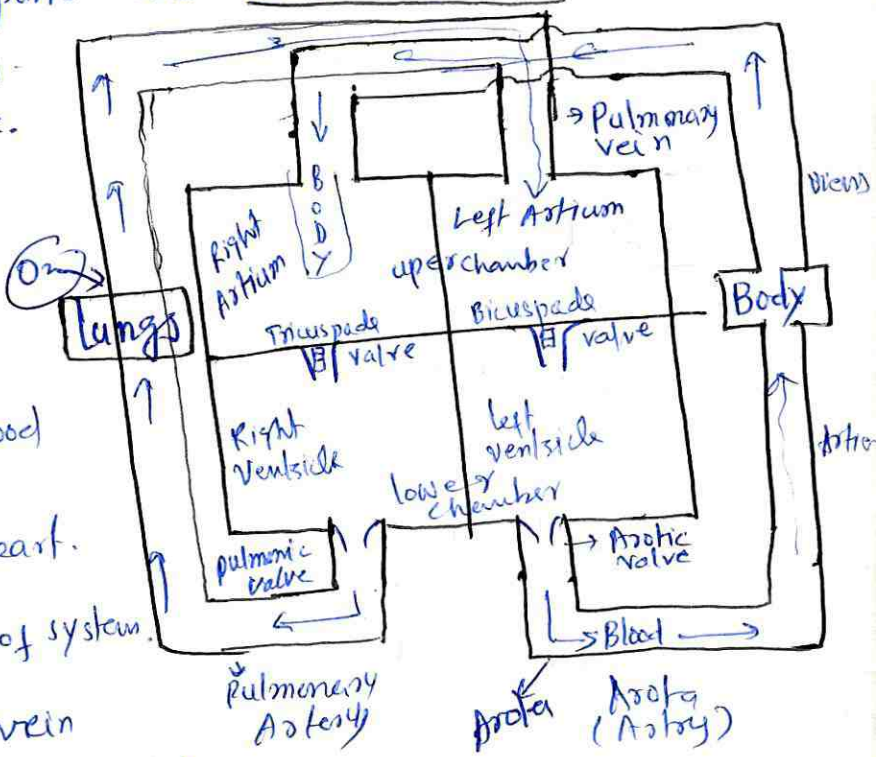
* Effects of tornadoes.
- Primary effects
- Secondary effects
- Tertiary effects.
- F-scale damages.

(2)

1. Circulatory System
2. Respiratory system
3. Digestive system

Circulatory System

⇒ It is made up of vessels and muscles that help and control the flow of blood around the body, the process is called circulation. Its main parts are heart and blood vessels.



- Arties → Oxygenated blood is present there.
- Simple vein → Blood return through this vein to heart.
- Arteries → spread or carry blood from heart
- Veins → Return blood to heart.
- Aorta → larger artery of system.
- Pulmonary Vein → It is only vein that contain oxygenated blood.

↓↓ → Veins
Heart
↓↓ → Arteries

Heart (Human Heart)

- It is a fist size organ that pumps blood through the body
- Everyday heart pumps 2000 gallons blood/day → 2000 gallon = 7600 liter
- It has 4 chamber heart, two upper chambers called Atrias and two lower chambers are called Ventricles.
- Heart collect blood from veins.
- Ventricles pumps blood into arteries.
- Valves in heart are like semi-lunar shape

- Four valves within the heart stop blood from flowing backward -
- valves :→ Tricuspade, Bicuspade, Pulmonic valve, Aortic valve.

System circulation

- Blood circulate around ~~through~~ body is a system circulation.
- Blood goes to body through simple arteries and return to heart through simple veins.

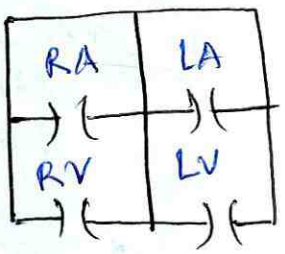
Plumonary circulation :-

- Blood needs O_2. It goes to lungs through pulmonary artery.
- Blood is oxygenated in lungs. Then oxygenated blood goes to heart through pulmonary veins.

✱ Blood Pressure

- Upper blood pressure (systol) [Lub (noise)]
  - due to contraction
  - Range 120 almost. (120 mmHg)

lower blood pressure (Dystol) [Dub]
- due to expanding or closing of value 2, Relaxation.
- Range 80 mmHg almost.



mmHg → milimeter mercury.

- Heart Beat → normal 72 Beats/mint.

~~Pressure~~ Beat greater than 72 → Trachychardia

Beat less than 50 → Brad chardia.

~~Arties :-~~

Arteries :-

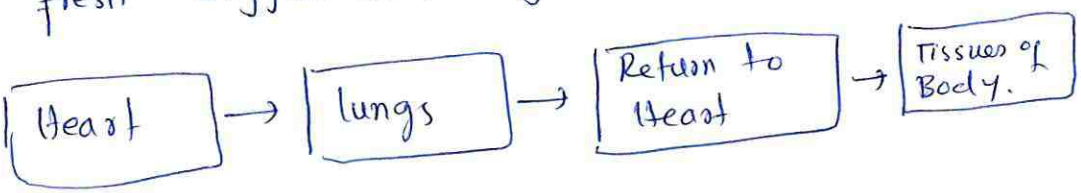
Arteries carry blood away from the heart into two distinct pathways :

. The System Circuit :-

In this pathway, oxygen-rich blood is carried away from the heart and towards the tissues of body.

. ~~Pto~~ Pulmonary Circuit

In pulmonary circuit, oxygen-depleted blood is carried away from the heart into the lungs where it can acquire fresh oxygen and get rid of carbon Dioxide.



D. Anglare.

Digestive System:

Stomach:

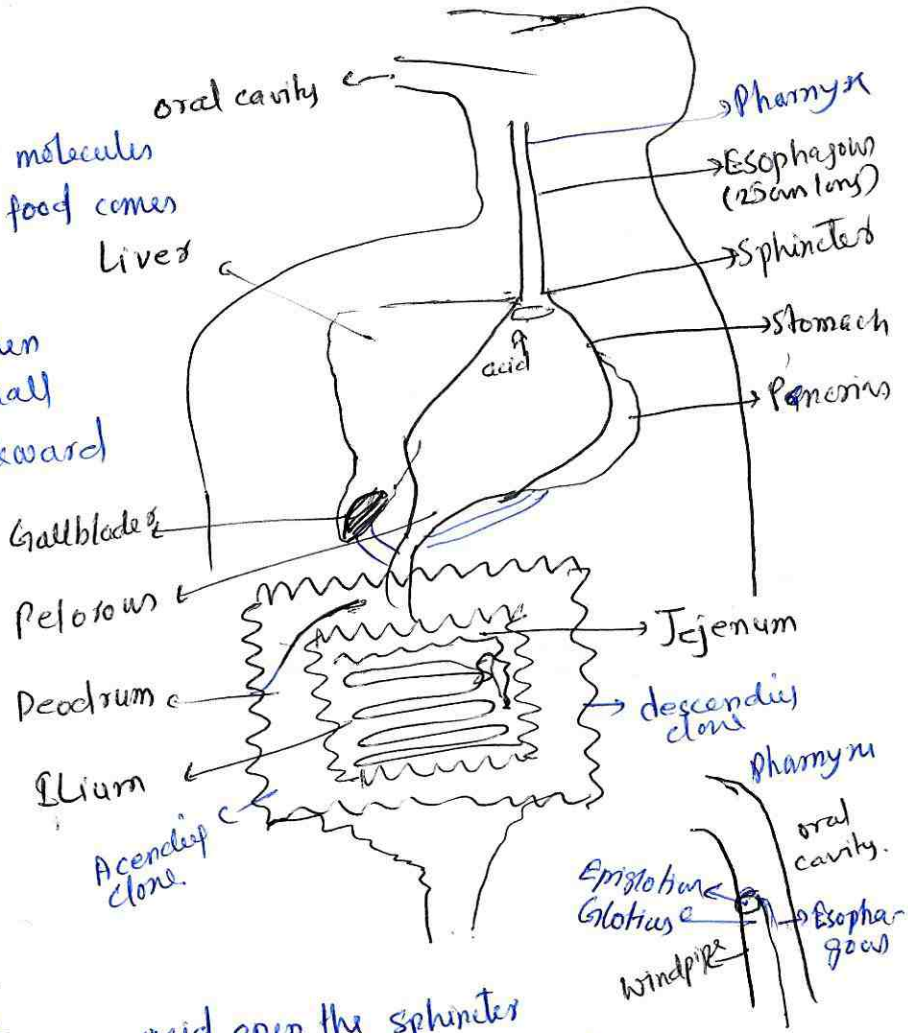
It has HCl which break molecules
After stomach, digested food comes into small intestine.

Pelorous ~~Phalorous~~ :- It is closed when food is transfered to small intestine and stop backward ~~prevention~~ flow.

Bile Juice → Produced by Gallbladder

Pancria Juice → produced by panchrias.

Villo → consumes amino acid and fats.



Small Intestine

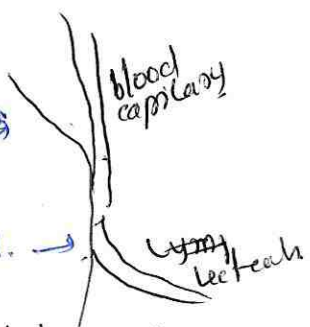
Duodenum → ~~Deodrum~~ → starting part — acid open the sphincter cause acidity in stomach.

Two enzyme – bile Juice
↓ Liver (Produces)
↓ Gall bladder (comes to gallbladder)
→ Pancreatic Juice

These enzymes rapidly digest the..

→ Then Jenjum comes after ~~Deodrum~~ Duodenum
→ Ilium comes after ~~Jen~~ ~~Deodrum~~ Jejunum

Lymph system



Sphincter → Restrict food's reverse direction from stomach to foodpipe

~~Phalorous~~ Pelorous → It is closed when food is transferred to small intestine and stop backward flow.

large Intestine :- Further water is and vitamins are added to the food and perform bacterial reaction -

Note :- Blood is produced in bonemarrow

Digestive system :-

Definition The process of breaking down of food by mechanical and enzymetic (chemical) action in the stomach and in the intestine in the substances that can be absorbed by blood.

Parts

Digestive track

- oral cavity
- ~~Pharynx~~ Pharynx
- Esophagous
- ~~De~~ stomach
- ~~Deodenum~~ Duodenum
- Jejnum
- ~~Ilium~~ Ilium
- large intestine
- Anus.

Respiratory System :-

Two system operate parallely and continuously : Blood Circulation

- It is process to deliver O_2 to the cells of body through blood streams.
- Lungs perform the function to enrich deoxygenated blood with O_2 through ~~exhaling~~ exhaling ~~and exhalation~~ of CO_2 ~~from through~~ body. ~~other~~

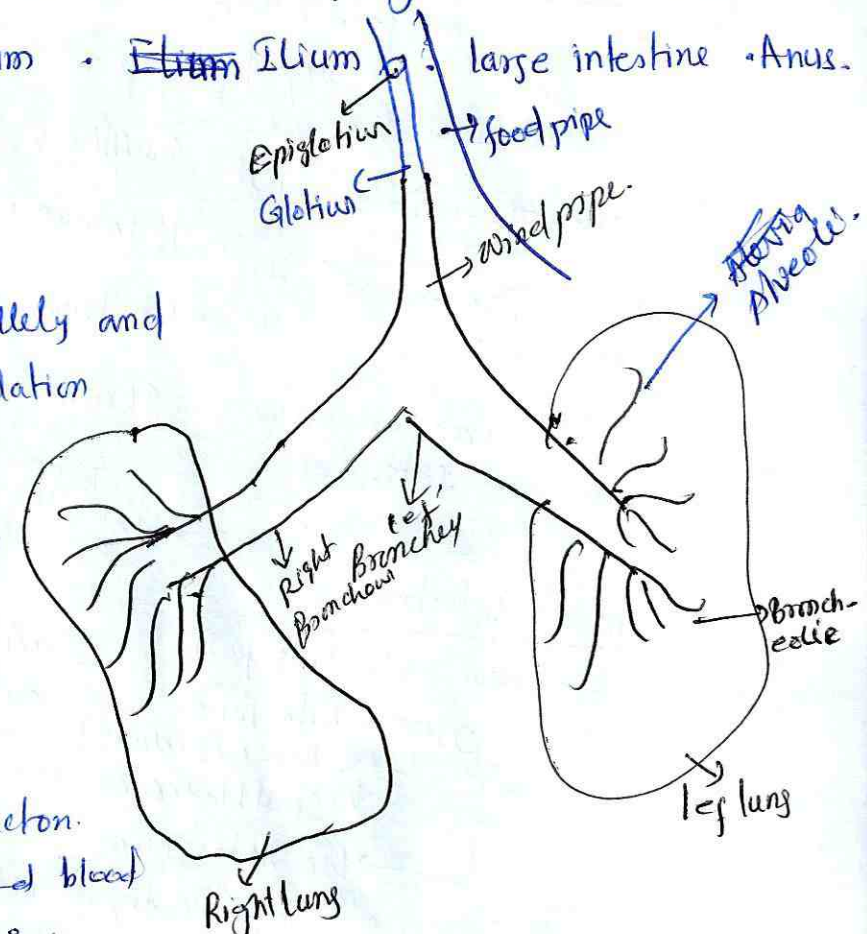


Fig: Lungs.

- Respiratory system is consisit of two lungs. The right lung is relatively larger than left lung. It has three lobes and left has two lobs.
- O_2 comes through windpipe (Trachea) to lungs which moves into Bronchues and further into bronchey and eventually reach Alveoli to become a part blood through assmilation.

Human Digestive System - (HDS)

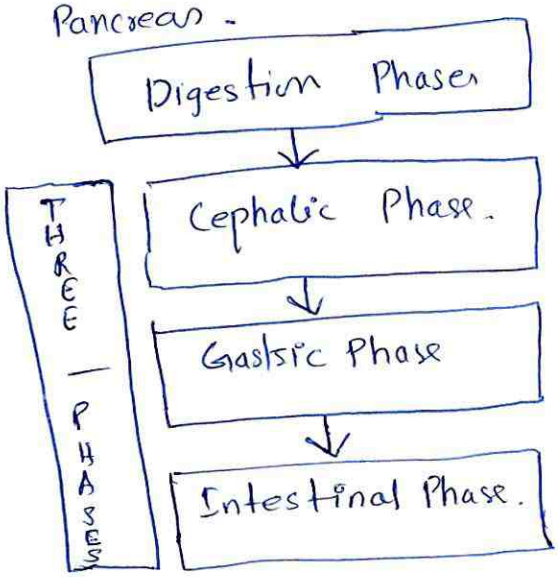
- HDS involves the breakdown of food into smaller and smaller components, until they can be absorbed and assimilated into the body.

Phases of Digestive system. Three stages

(1) **Cephalic Phase :-**
This stage includes the mechanical ~~backgr~~ breakdown of food by chewing and chemical breakdown by digestic enzymes that takes place ~~int~~ in the mouth.

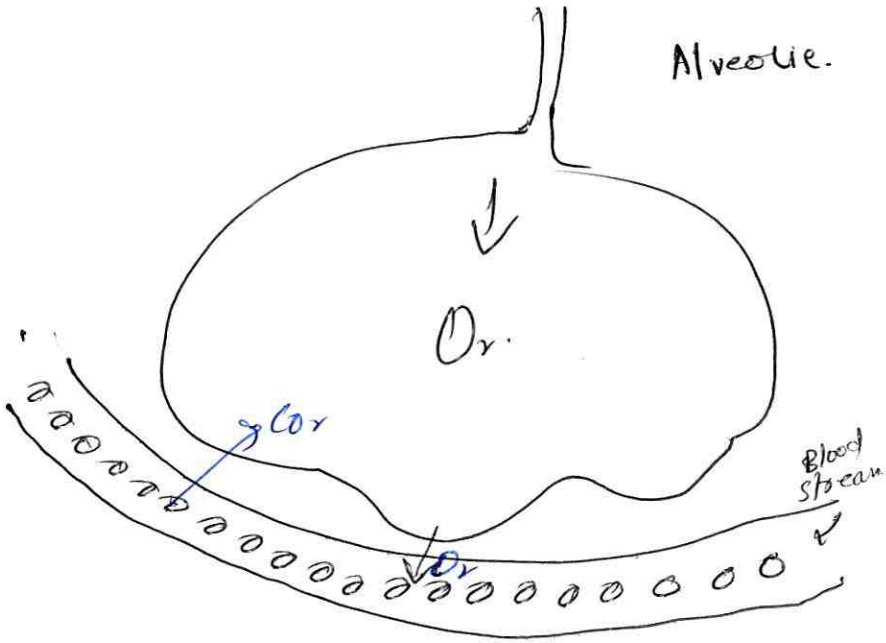
(2) **Gastsic Phase :-**
This phase of digestion takes place in stomach - The food is further breakdown by mixing with gastric acid until it passes to duodenum.

(3) **Intestinal phase. :-**
. Here, food is mixed with number of enzymes produced by Pancreas.



Function of HDS

- Ingest food.
- Breakdown food into nutrient molecules
- Absorb molecules into blood ~~steam~~ -steam
- Rid the body of indigestible remains.

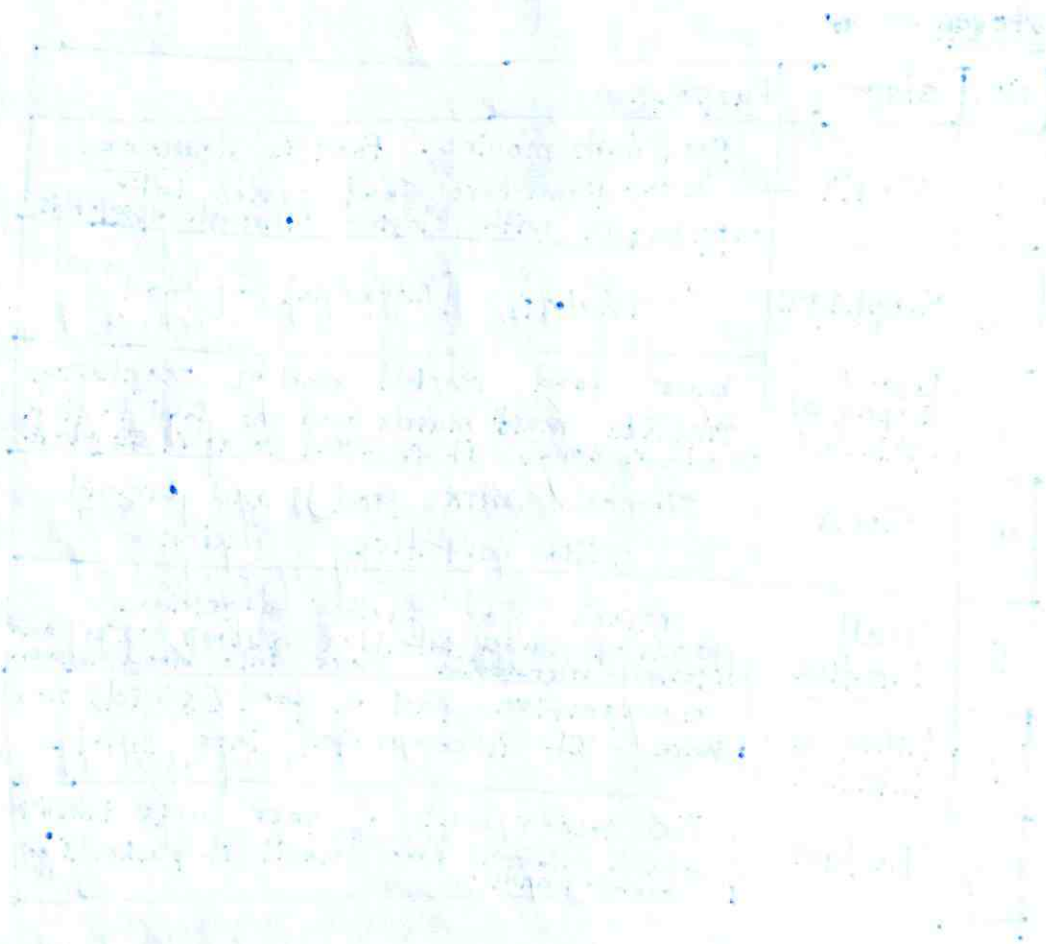


Digestive.

~~Mouth~~

~~stages~~ .

No.	stages	Purpose.
1	Mouth	Food starts moving. Food is swallowed here. From here food passes into esophagus with closing through epiglottis
2	Esophagus	Peristalsis [Movement of food]
3	Lower Esophageal Sphincter	when food reaches end of esophagus ring like muscle muscle and let food to flow. once it is done, it is closed to avoid flow back.
4	Stomach	Stomach mix food and liquid with digestive juices.
5	Small intestine	Mixes for further digestion. walls of small intestine absorb water and digested nutrients move into blood stream.
6	large intestine	undigestive part of food & fluid flows here. It is converted into stool.
7	Rectum	The lower end of ~~your~~ large intestine which stores stool until it pushes stool out of anus.



* CERAMICS

A ceramic material is an inorganic, non-metallic, often crystalline oxide carbide, nitride and oxide material. Ceramic materials are hard, brittle, strong in compression and weak in shearing. The word comes from the Greek which means potters' clay. The pieces of pottery we handle everyday like cups, saucers, plates ~~and other kinds of pottery are~~ has been made of ceramics. Ceramic products about, from sparking plug bodies and abraise to synthatic diamonds and rubies.

Types of clay.

Clay is of various types that is found beneath the top soil practically every where in the world. It is cheap and plentiful. It is formed when rock is break down under the ~~chemical~~ action of chemical process and weather. There are wide variety of different clays, but they all have a greater or lesser extent, two basic properties that make them useful to us. First they become plastic when they mixed with water. This means that they can be shaped or moulded without falling apart. ~~They~~ Secondly, they become extremely hard and strong wh they are exposed to fire.

Clay to be baked into bricks is used more or less as it is taken from the ground. But few natural clays are suitable for making pottery. They are often blended with different material to give them suitable properties called clay body. Three different clay bodies are used to make main kinds of pottery which are earthenware, stoneware and porcelain.

* Types of pottery:

⇒ Earthenware:

- It is one of the cheapest and commonest kind of pottery. Everyone is familiar with them. It is easy to work relatively at lower temperature especially at 1000°C. It is dull, porus and absorbent. We use pottery of earthenware in our daily life. The cheap, so called china used for everyday table ware is white glazed earthenware. On the surface it looks like proper china, when it cracks we can see dull, porous body showing through it.

⇒ Stoneware:

It is extremely hard and strong kind of pottery that is used for jugs, heavy dishes and storage jars. Unlike earthenware it is semi-vitreous and store liquid without having to be glazed. But in many uses it is glazed with salt. Sewer and drainage pipes are familiar examples of

salt glazed stoneware. It requires higher temperature as compared to earthenware.

⇒ Procelain :-

It is ultimate in pottery. It is brilliantly white not only on the surface like others but the whole way through. It is also translucent which means that if you hold it upto to a strong light, the light will shine through. It is also called china or chinaware because the secret of procelain making was discovered long ago by the chinese. The material from which procelain is made is called paste. It requires higher temperature as compared to others. The high temperatures make it completely vitreous.

An artificial kind of proclain, called soft past procelain is a mixture of white clay and powdered mass of glass, sand and broken china.

Ex: of artificial china → Bone china, → main ingredient is bone ash which act as flux.

⇒ Shaping Pottery :-

The shaping of piece of clay into a beautiful piece of pottery is the most fascinating part of potter's craft. For the simple shapes, he may use his hands alone. To make rounded symmetrical shapes, the potter generally make use of wheel. This is simple device for rotating the piece of clay while the potter shapes it with his hands.

The act of shaping a wet clay on wheel is called throwing. The method of hand throwing would not be quick enough to produce large quantity. For the comercial purpose, machines are wed to peform mechanical throwing process. Jigger is wed to make flat ware such as saucers and plates while jolley is wed to make hollow ware such as cups, etc.

⇒ Firing Potteries :-

The whole object firing pottery in furnace or kiln is to change one of constituent in the clay (usually silica) into a kind of glass. When the glass is cools, it binds other materials in clay into a rigid mass. The forming of this glassy or vitreous ~~bod~~ bond is called vitrification. The amount of vitrification varies from product to product, according to the composition of clay and temperature of firing.

Earthen ware ⟶ 1000°C
stone ware ⟶ 1100°C
Procelain ⟶ 1200°C

⇒ Glazing Pottery :-

Glazing ~~pottery~~ a piece of pottery involves coating a surface with thin layer of claylike liquid mixture called glaze. It forms glassy coating over the surface. A variety of different glazes can be made by adding metal oxides. Adding tin oxide or zinc oxide makes the glaze opaque white. ~~Eg~~.

*** Note Ceramic work is typically fired twice: it is bisque fired and then glaze fired. The purpose of bisque firing is to convert greenware to durable, ~~semiconductor~~ semi-vitrified porous stage where it can safely handled during the glazing and decorating process.

* Decorating pottery:-

Painting is the most popular means of painting pottery. It may be done on clayware before it has been glazed and is then called underglaze. Special pigments must, of course, be used in such paints to withstand with heat~~ing~~ of fire. Overglaze decoration is applied after the piece has been glazed.

(9)

Classification And Texonomy:-

* **Classification:-** The scientific ~~identifying~~ practice of identifying, naming, and grouping of living organism is known as classification.

* **Taxonomy:-** The branch of biology that deals with the classification is called taxonomy.

Taxis (arrangement) — Greek
Nomia (Distribution) — Greek
→ arrangement by doing proper distribution.

* ~~Carl~~ Linnean classification.

This classification was given by swedish scientist (botanist) Carl Linnaeus, is regarded as father of taxonomy. He gave two contributions:

(1) A hierarchical classification system
(2) A system of binomial nomenclature (scientific name)

(1) Hierarchical Classification:-

Ascending order:

	Human
i- Species	Sapiens
ii- Genus	Homo
iii- Family	Hominidae
iv- Order	Primates
v- Class	Mammalia
vi- Phylum	Chordata
vii- Kingdom	Animalia
viii- Domain	Eukarya

Mnemonic for taxonomy

Special German Family
Ordered classical Potterby
from Kingdom of Denmarke.

In descendiy order
Eh. All Cool Men Prefer
Having Heavy Sidebarns.

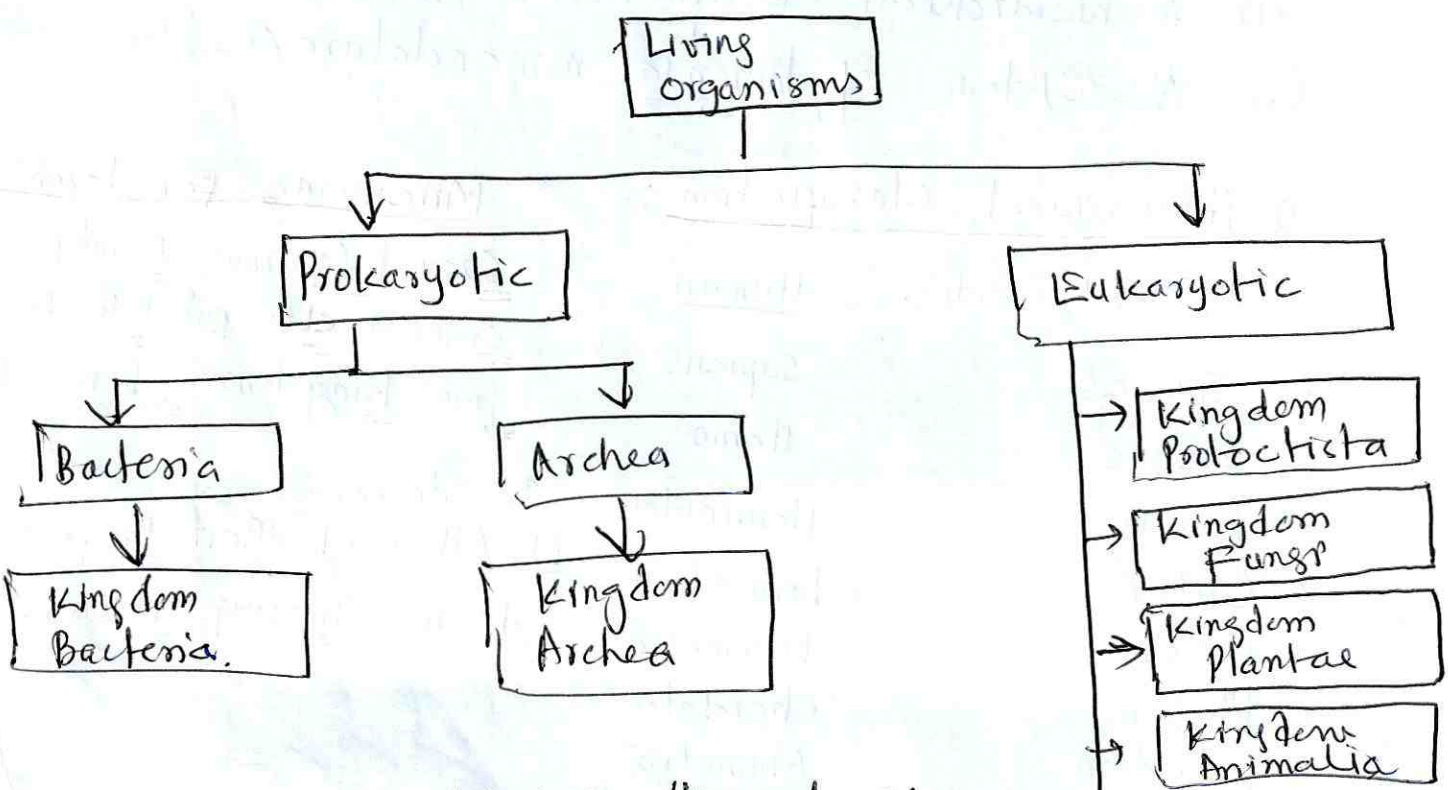
(2) Binomial Nomenclature :-

- It is formal system of naming species.
- This name is composed of two parts connected by latin grammatical system
- The first part identifies the 'genus' and the second part identifies 'Species' within the genus.

For : Homo sapiens ⇒ Homo + sapien
↓ ↓
Genus Species.

⇒ Domains

The biologist has divided organisms into two broad catagories which are prokaryotic and eukaryotic. Prokaryotic are further divided into two parts because some of them possess the characteristics of both prokaryotic and eukaryotic.



Flowchart : Hierarchy of Living Organisms

(1) ⇒ Domain Bacteria

STNDRMCECRF
STN-DR-M-CEC-RF

(1) ~~Prokaryotic~~

STN-DR-MW-ECRF

Size: They are small organisms and mually vary in size

Type: They are prokaryotic cells.

Nucleous: ~~These~~ In this cell have no nucleous but plasmids

DNA: Exist as a circular and no histone proteins are associated with it and its molecules called Plasmid

Ribosomes: Ribosomes are smalles than eukaryotic. (70s)

Membrane bounding: Organelles are not membrane bound.

Cell wall: It is present and contain peptidoglycan (not cellulose)

Existence: Usually exist as single cells or small groups of cells

Cell Division: cells divide by binary fission, not by mitosis.

Reproduction: transfer of DNA fragments only

(2) Domain Archea:

↳ Fredly type → Autotrophic & Heterotrophic

Size: Smaller organisms and ~~sib~~ similiar size of bacteria

Type: They are prokaryotic cells and extremophiles.

Nucleous: No nucleous

DNA: Circular DNA but histone proteins are associated with it.
↳ Plasmids molecules.

— Ribosomes: Smaller (70s) than eukaryotic ~~and~~ but possess same features of eukaryotic and differs from bacteria ribosomes

Membrane bounding: Organelles are not membrane bound.

~ Cell wall: It is present but not contain peptidoglycan

Existence: Mually exist as single cells or small groups of cells.

Cell Divisim: Cells divide by binary fission, not by mitosis.

Reproductim: transfer of DNA fragments Asexually | Autotrophic

* Domain Eukarya :-

Size: Larges (10-100um) in size than prokaryotic (0.1-5um) cells.

Type: They are eukaryotic cells.

Nucleous: They have nucleous

DNA: DNA is arranged in nucleous as linear chromosomes with histone proteins, but chloroplast and mitochondria have circular DNA like prokaryotic

Ribosomes: Ribosomes (80s) in cytosol are larger than prokaryotic; but chloroplast and mitochondria have same (70s) ribosomes

Membrane bound: In this organelles are bounded by membrane

cell wall, Some eukaryotic have cell wall like plant cell; all fungi; some protists, made of cellulose

Existence, Great diversity of forms: unicellular, colonial, and multicellular.

Cell division, Cell division is by mitosis.

Reproduction: Both sexually and a-sexually.

~~Feedtype → Animal → Heterotophic~~, ~~Plant, fungi~~ → ~~Autotrophic~~

Protoctista → Autotrophic

(i) Kingdom of Proctista:

All the eukaryotic cells except fungi, plant and animal are classified as protoctista, like protozeans algae such as seaweeds

(a) — Type: Eukaryotic cells

(b) — Existence: Mostly single-cell as ~~group~~ group of similar cells.

(c) — diversity:- • Some are animal like (no cell wall), are known as protozea.
• Some are plant like (with cellulose & chloroplast) are known as algae.
• Autotrophic • large vacuole.

(d)

(e) — Reproduction: sexual, asexual May be Plegela (Gametes in ferns)

(II) Kingdom of Fungi

They have some similiarities ~~not~~ with plants but none of them is able to photosynthesise.

ⓐ— Type: Eukaryotic cells

ⓑ— Existence: Simple body form, may be unicellular or made up of long threads called "hyphae".

ⓒ— Diversity: Some are animal like characteristics.
- Heterotrophic → They rely on others for food.
- No chlorophyl
- No photosynthesis

Some are plant like characteristics
- Have cell wall but made chitin or other substance, not cellulose.

ⓓ Celia or Flagella: Never have celia or flagella.

ⓔ Reproduction: Reproduction by means of spores.

(III) Kingdom of Plantae:
- They all are multicellular photosynthetic organisms.
- They are complex bodies, highly branched both above and below the ground. Feature are:

ⓐ Type: Eukaryotic multicellular cells.
- a few types of speciallized cells are there.

ⓑ Existence: (Diversity)
- Some cells have chloroplasts and photosynthesise.
- cell have large and permanent vacuoles for support of cell
- cell walls are prerent and made of cellulose.
- Autotophic nutsition.

ⓒ Flagella: Cells may have occasionally flagella. (males gametes in fern)

ⓓ Reproduction: Both a ~~sexual~~ non-sexual and sexual (Active (animal) & Passive (

(iv)- Kingdom Animalia :-

- They are multicellular heterotophic organisms.
- The nervous system is unique to animal kingdom.
- Characteristics features of animal are :

(a) Type: Eukaryotic, multicellular —
- a few type of speciallized cells are there.
- cells that are differentiated to form tissue and organ.

(b) Existence: Cells donot have chloroplast and donot photosynthesise.
- cell vacuoles are small and temporary. (for ex:- lysosomes and food vacuoles).
- ~~Heterotophic nutsition~~
- cells donot have cell walls, instead they have cell membrane.
- Heterotophic nutsition.

(c) Celia and Flagella : Cells may have celia and flagella.

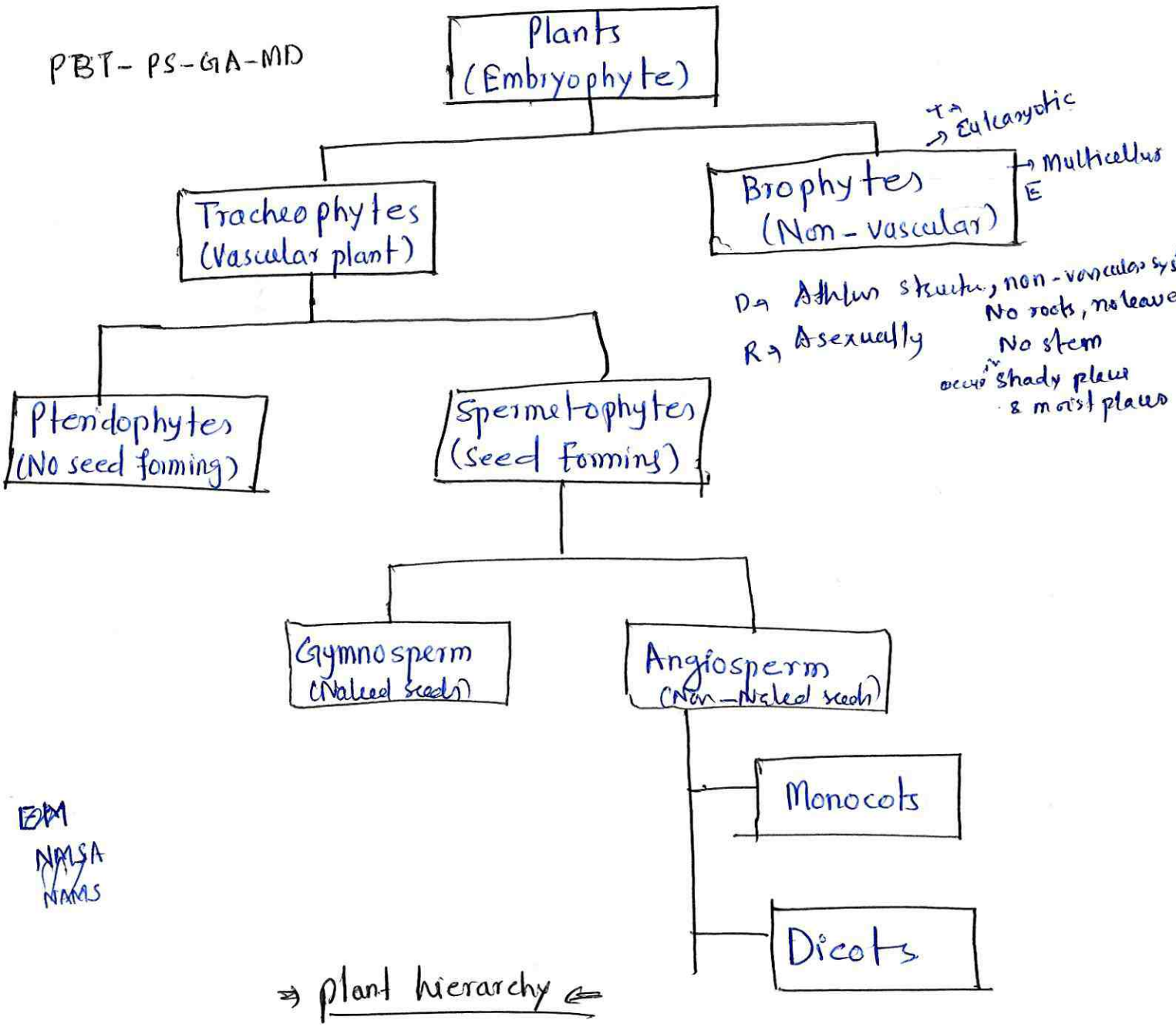
(d) Reproduction :- ~~Only~~ sexual production.
- In some cases embryo is produced externally and in other it is produced internally.

(e) Unique feature :- Communication is by the nervous system.

* Classification of plants *

- The kingdom of plant is known as kingdom Metaphyta.
- It includes all the eukaryotic multicellular photosynthetic plants found in this biosphere.
- It is divided into two major groups of plants bryophytes and tracheophytes. Both possess an embryo stage and collectively described under embroyphyta.

PBT - PS - GA - MD



D → Adult structure, non-vascular system, No roots, no leaves, No stem
R → Asexually
occur in shady place & moist place

EDM
NAMSA
NAMS

⇒ plant hierarchy ⇐

⇒ Tracheophytes :-

- These are the vascular plants.
- They have proper root system, stem and leaves.
- This adult grown tree plant is called sporophyte.
- Vascular tissues xylem and phloem are present for translocation of water & food.

Two types :-

(1) Pteridophytes : Vascular plants which donot produce seeds.

(2) Spermatophytes : Vascular plants which produce seeds.

(1) Pteridophytes :- (No-seed plants).

- It includes primitive vascular plants and ferns.
- They have no flowers, so no seeds are there.
- They are regenerated through spores.
- They have smaller-pointed leaves.
- The stem is herbaceous.

(2) Spermatophytes :- (Seed-bearing plants).

- This large division comprises the seed plants bearing seed, including gymnosperm and angiosperm.

(a) Gymnosperms :- (Naked-Seed plants)

- It is a seed bearing vascular plants without flower. There are several types: the cycad, ginkgo, conifer and yew.

(b) Angiosperm :- (Flowering plants)

- These are flowering plants, vascular plants, and seed bearing plants.
- They exceeds all numbers of plants in number & diversity

Angiosperm is farther divided into monocots and dicots.

(i) Monocots:- Single cotyledon (Monocotyledon).
These are the flowering plants whose seed contain only one embryonic leaf or cotyledon.

(ii) Dicots:- Dicotyledon
These are also the flowering plants whose seed contain two embryonic leaves or cotyledons.

Gymnosperm	Angiosperm
- Non-flowering plants - Naked seeds - leaves are needle-shaped. - Found in hilly and cold regions - Gymosperm produces cones - Produce soft wood that is used to make furniture. - Ex:- Conifer, chir, pinus, juniper, deodar	Flowering plants. enclosed seeds inside fruits. leaves are broad. Found in every kind of environment. Donot produce cones. Produce hardwood that is used to make furniture and agricultural implements. - all flowering plants and fruit-producing plants e.g. mango, rose, wheat, etc.

- Flower
- Seed
- leaves
- Wood
- Cones / broad
- Found

FSLW (CB) F

~~FSLF~~

FSLWF (CB)

* Animal kingdom *

- The animal kingdom includes eukaryotic multicellular organisms.
- They are heterotrophic in nature.
- They are called animals and differ from their counterparts - plants in the capacity to be able to move.
- There is great variety of animals in their form, size and lifestyle.

Animal diversity:

There are ~36 phylum of animal kingdom, and human beings and other animal who have vertebrates belong to chordata. Chordata includes following classes: Pisces (Fish), Amphibians, Reptiles, Birds and mammles.

(i) Fish (Pisces):

- It is a diverse group of animals - live and breathe in water.
- They have gills for breathing.
- Most fishes have fins for swiming, scales for protection and streamlined body for moving through water.

  Ex:- Rahu, Tuna, shark, ~~etc.~~ Trout, etc.

  Note:- Telly fish, star fish, & silver fish donot belong to fish because they are invertebrates.
- They have 2-chamber heart.
- It is cold blood animal.

Breath
Body
Heart
Cold
Production

BBHCR

Amphibians :- (Amphi → both ; bios : life)

- They are animals with moist hairless skin through water can ~~pass~~ live in and out of water.
- They are called amphibian because they live first part of their lives in water and second part in land.
- They cannot reproduce without water.
- They were first animals with backbone to adapt life on land.
- They have 3 - chamber heart.
- They are cold blooded animals. (ectotherm)

Ex:. Frogs, toads, salamanders, newts

Reptiles :-

They possess unique characteristics that distinguish them from amphibians

- They hatch eggs on Land
- They have developed respiratory system
- They have teeth except turtle.
- They have rough, dry and horny scales on skin.
- They are sometime venomous.
- They have 3 - chamber heart
- They are also cold-blood (ectotherm) animals

Ex:. ~~turtle~~ Turtle, crocodile, lizard, tortoise, snake, alligator.

4) **Birds (Aves):-**

- They possess feathers
- No teeth in jaws.
- Like mammals, they have four-chambered hearts.
- They are warm blood like mammles.
- Like reptiles, they ~~are~~ developed from embryos in eggs outside the mother's body.

Ex:- Parrot, pigeon, etc.

→ They have four-chamber heart.

~~- They are warm-blooded.~~

5) **Mammals :-**

- There vertebrates possess unique characteristics.
- Most mammals have fur, hair, teeth, etc.
- They possess unique nervous system characteristic.
- They give birth to child.
- They feed them through breast (breast milk).
- They are warm blooded.
- They have 4-chambered heart.
- They are viviparous (Produce living youngs instead of eggs)
  - → Fish
  - → all birds
  - → Reptiles
  - → amphibian

Extra knowledge.

- oviparous :- External fertilization after laying eggs.
- ovoviviparous :- Similar to viviparous. There is an internal fertilization. In this young ones are nourished by egg yolk.
  Ex:- Shark.

B → Body
B → Breath
H → Heart
C/W → Cold/warm blooded
R → Reproduction
T → Teeth

Vertebrates And Invertebrates:

- Animals are broadly catagorized in two catagories: vertebrates and non-vertebrates.
- Verteberates are those who have spinal column or backbone.
- Verteberates are often larger and having more complex bodies than invertebrates.
- The invertebrates are more in number than vertebrates.
- The verteberates are fast moving animals.

	Inverteberate	Verteberate.
1	No backbone or vertebral column	Have vertebral column
2	less developed internal skeleton and brain	Well-developed internal skeleton and highly developed brain.
3	They are classified into 36 phyla	Verteberates are classified in to chordates and divided in five class: fish, amphibians, reptiles, birds and mammals
4	Large in number	Smaller in number
5	They are slow moving	They are fast moving
6	Ex:- insects, flat-worms, etc	Ex:- Human, birds, snakes, etc

	V	IV
Backbone	✓	✗
Body	Complex	Simple
Number	Small	Large
Movement	Fast	Slow
Phylum	chordata	36 Phyla
Brain	Fully develop	Undeveloped

Chart of Vertebrates.

Characteristics	Fish (Pisces)	Amphibian	Reptilian	Birds (Aves)	Mammalian
Habitat	Aquatic	Amphibious	Terrestrial/ Aquatic	Terrestrial	Terrestrial
Exoskeleton	Scale (dermal)	usually absent	Scales (epidermal)	Feathers	Hair
Respiratory organs	Gills	Lungs (Gills at birth)	Lungs	Lungs	Lungs
locomotive organs	Fins	Limbs	Limbs	Limbs/ feathers	Limbs
Heart	Two chambers	Three chambers	Three chambers	Four chambers	Four chambers
Mode of Reproduction	Oviparous	Viviparous	oviparous/ viviparous	oviparous	Mostly viviparous
Fertilization	External	~~External~~ Enernal	~~External~~ External	~~External~~ External	Internal
cold / Warm blooded	cold - blooded	Cold - blooded	Cold - blooded	Warm - blooded	Warm - blooded.
Example	Shark	Frog	Snake	Eagle	Tiger.

Taxonomy

LAERL - HR - FBEx

S → Size
T → Type
N → Nucleus
D → DNA
R → Ribosome
M → membrane
C → cell wall
E → Existence
C → cell division
R → Reproduction
P → Facility type

T → Type
E → Existence
D → Diversity
C → Celia
F → Flagella
R → Reproduction

Prokaryotic & Eukaryo = STN - DR - M-CEC-R-F

~~Eu~~ Eukaryotic = EED (CF) R

Gymnos Angio PSLWF (CB)

~~Plant~~ Kingdom → HERL - HR - FB - Ex

F → Flowers
S → Seeds
L → Leaves
W → Wood
F → Found
C → Crop
B → broad

P → Plant
B → Bryophyte
T → Trakyophyte
P → Pteridophyte
S → Spermato
G → Gymno
A → Angio
M → Mono cot
D → Dicot

H → Habitat
E → Exoskeleton
R → Respiration
L → Locomotive organ
H → Heart
R → Reproduction
F → Fertilization
B → Blooded
Ex → Example.

~~PFB~~ PBTPSGAMD

~~PB - TP - SG - AMD~~

P - BT - PS - GA - MD