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GSA-Test 01

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Qno#01

(a)
Circulatory System:

Circulatory system is the system of body through which body transport Oxygen, nutrients, hormones and waste materials. It maintains homeostasis, support cellular respiration, and ensure survival of body tissues.

Main Components:

1. Heart - muscular pumping organ
2. Blood - transport medium
3. Blood Vessels - arterioles, veins, capillaries

Functions:

- Transport of O_2 and nutrients
- Removal of CO_2 and metabolic waste
- Temperature regulation - (homeostasis)
- Defense against diseases

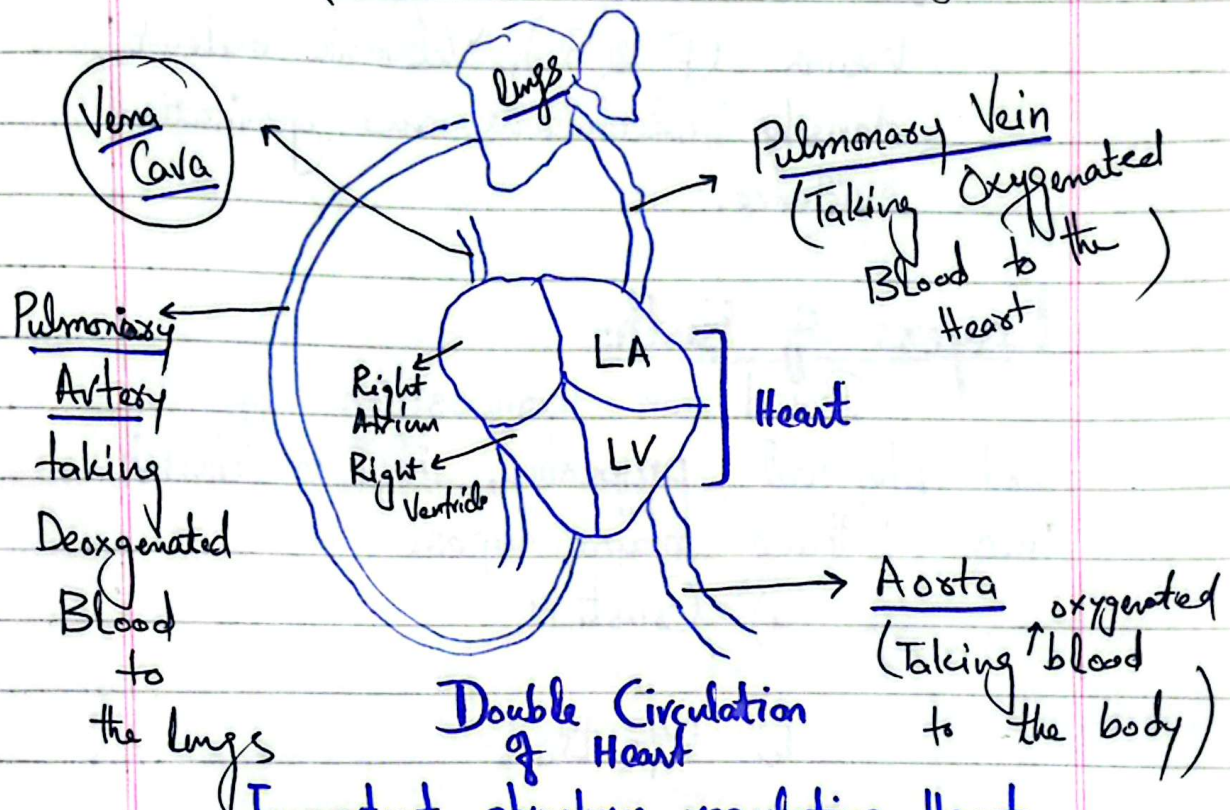
Working of Heart:

- The human heart is a four-chambered muscular organ.
- Humans possess double circulation, meaning blood passes through the heart twice in one complete cycle.

Step-wise Working:

1. → Deoxygenated blood from body enters Right Atrium via Vena Cava.
2. Blood moves to Right ventricle,

3. Then pumped to lungs via pulmonary artery
4. In lungs, blood becomes oxygenated.
5. Oxygenated blood returns to left Atrium, then pumped to left Ventricle and from here pumped to the body through Aorta.



Important structures regulating Heart Working:

- Valves — Tricuspid, Bicuspid, Mitral
- Diastolic Pressure and Systolic Pressure
- Vena Cava; Aorta; Pulmonary artery; pulmonary vein.

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(b) Internal Structure of Earth:

* The internal structure of earth refers to the layered arrangement of materials beneath Earth's Surface.

* It is studied through Seismic Waves (P & S), Volcanic materials, density calculations and gravitational evidence.

Layers of Earth:

Based on composition of and physical properties, it is divided into three major types:

a) Crust

b) Mantle

c) Core

a) Crust:

→ It is outermost and thinnest layer

→ Thickness is 5-30 km

→ It is subdivided into:

→ Continental Crust

→ Oceanic crust

→ Composition of Crust: (Sial)

Rich in Silica (Si) and Aluminium (Al)

→ Temperature: up to $< 1000^{\circ}\text{C}$

Functions and Importance:

→ Support life

→ Contains minerals, soil, oceans, and continents.

b) Mantle:

→ Lies below the crust

→ Thickness is 2900

→ Temperature 1500°C - 3500°C

→ Composition SIMA (Silica + Magnesium)

→ It is further divided into:

Upper Mantle

* Asthenosphere

* 670 km

* Magma

* SiO_2 , MgO , CaO

Lower Mantle

* Solid

* 2230 km

* Temp 3500°C

* Fe, Al, K oxides

* Solid because of high pressure

Core:

- Innermost layer of Earth
- Thickness ≈ 3470 km
- Composition NiFe = Nickel + Iron
- * It is further divided into two sub-types:

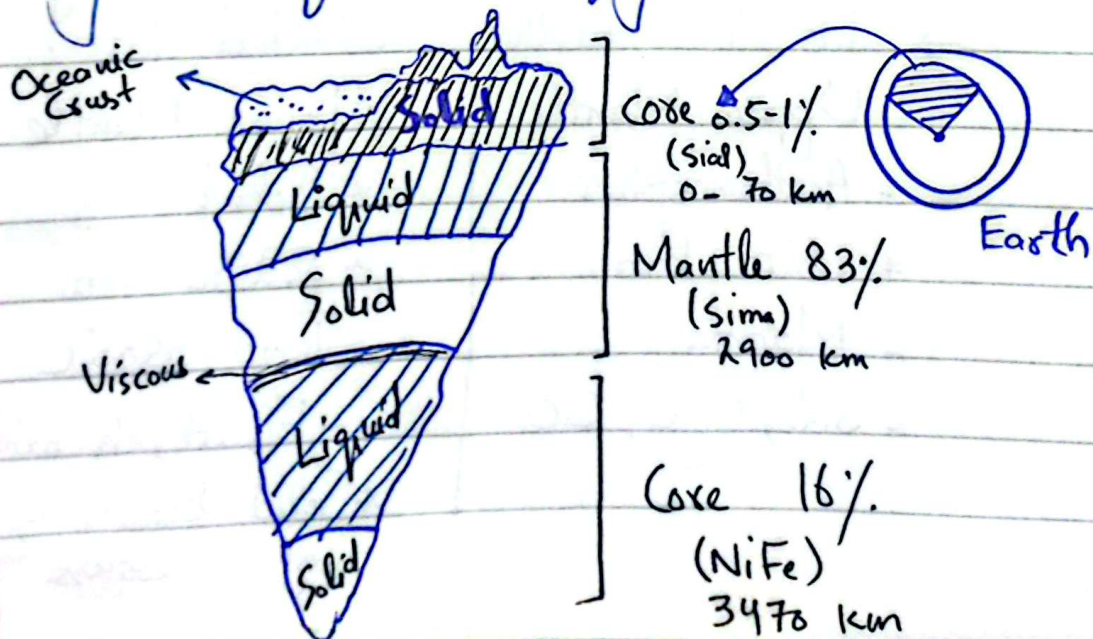
Outer Core

- * Liquid
- * Generates Earth's Magnetic field
- * 2250 km
- * Temp $\approx 5500^{\circ}\text{C}$
- * Liquid due to Low pressure
- * Iron + Nickel (NiFe)

Inner Core

- * Solid
- * 1250 km
- * Temp $\approx 6000^{\circ}\text{C}$
- * NiFe
- * Radioactive elements
e.g. Uranium

These layers control volcanism, earthquakes, plate tectonics and Earth's magnetic field. A figurative illustration is:



(c)

1) Bio-diesel:

Bio-Diesel is a Liquid Fuel produced from vegetable oils, animal fats, or used cooking oil.

It can be used directly in diesel engines or blended with petroleum diesel.

Raw Material:

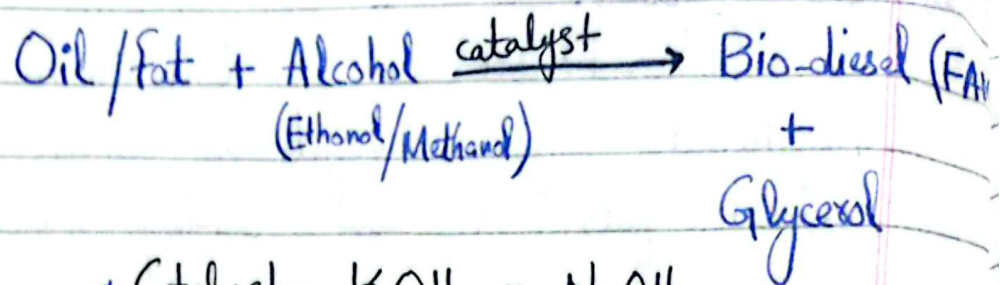
- 1) Vegetable oils (Soyabean, canola palm oil etc)
- 2) Animal fats
- 3) Waste cooking oil.

Process of Production:

Bio-Diesel is produced through a chemical process called Transesterification,

Transesterification: oils or animal fats reacts with alcohol in the presence of catalyst.

Production:



* Catalyst = KOH or NaOH

Biodiesel = Fatty Acid Methyl Ester (FAME)

Glycerol as by-product.

ii) Biogas and its production:

Biogas is a gaseous fuel produced by anaerobic decomposition of organic waste such as manure, plant residues and food wastes.

Process: Anaerobic Digestion:

Biogas is produced in the absence of air/oxygen by micro-organisms. The main stages are:

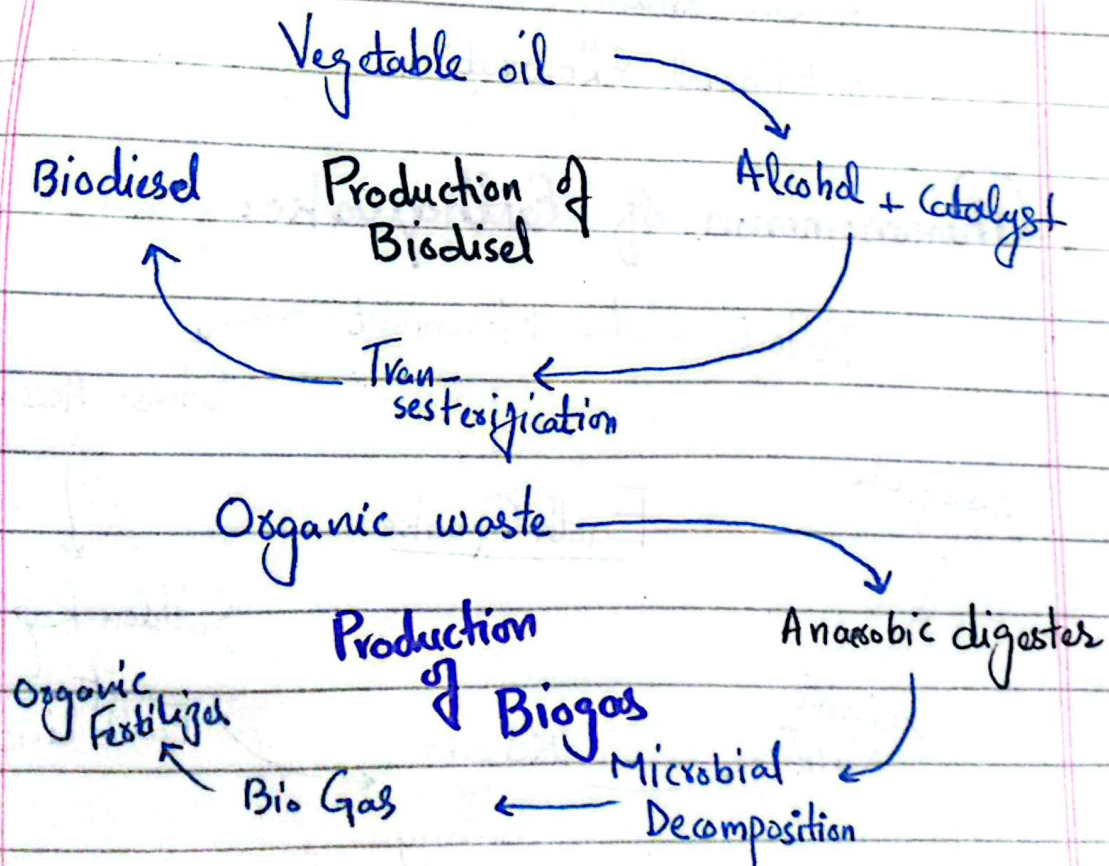
- 1) Hydrolysis: complex organic matter breakdown
- 2) Acidogenesis: formation of organic acids
- 3) Methanogenesis: Methane gas is produced

Composition of Biogas:

- * Methane (CH_4) - 55-70%
- * Carbon Dioxide - 30-45%
- * Traces of H_2S and Water Vapors

Advantages of Bio-diesel and Bio-Gas:

- * Clean and renewable energy
- * Reduce waste and pollution
- * Reduce dependence on Fossil Fuels
- * Produce organic waste as a fertilizer by-product



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Earthquake:

An earthquake is a sudden shaking ^{or vibration} of earth's ~~or~~ surface caused by released of stored energy in the earth crust.

Causes of Earthquake:

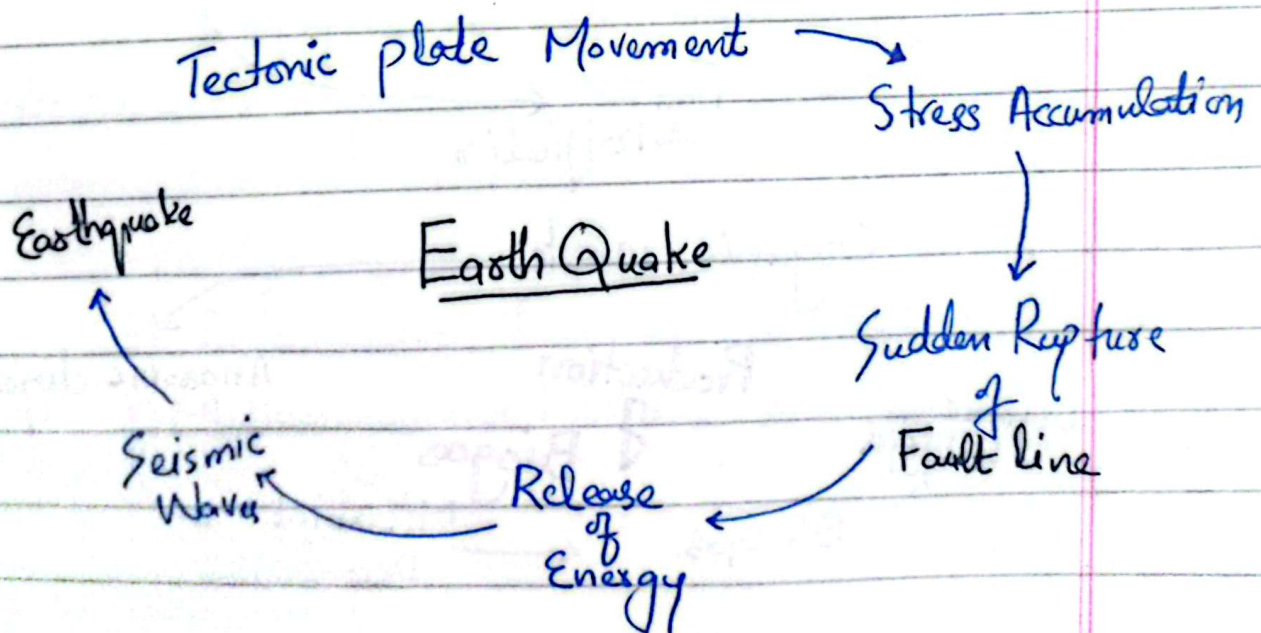
i) Natural:

- * Tectonic Plates Movement
- * Volcano exruption

ii) Human Activities:

- * Nuclear tests
- * Oil drilling
- * Mineral Exploration

Phenomenon of Earthquake:



Hypocenter: (Focus)

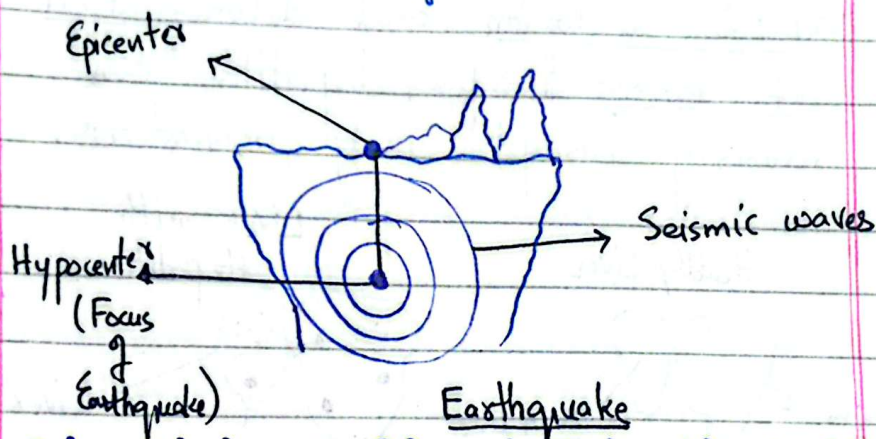
- * Point inside the Earth where Earthquake originates (Actual point)

Epicenter:

- * Point present vertically above a hypocenter

Seismic Waves:

- * Released energy travels through Earth in the form of seismic waves: P, S, L.



Magnitude of EQ

- * Measurement of seismic waves released from Hypocenter
- * Richter Scale used to measure
- * Fixed value; object
- * Numerical 1-10

Intensity of EQ

- * Severity of vibration of Ground/Earth's Surface; Epicenter
- * Mercalli Scale
- * Varies with distance to Epicenter; subjective
- * Roman I-XII

Effects: Loss of life; infrastructure; Tsunamis; Landslides

Some Famous EQ:

Chile 9.5 = world's largest; Balakot 2005 = 7.6

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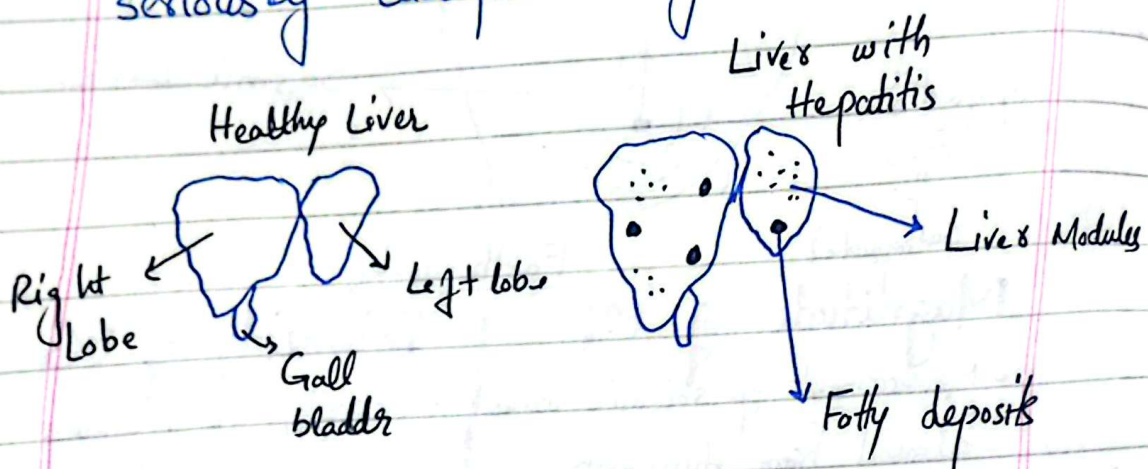
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(a)

Hepatitis:

Hepatitis is an inflammatory disease of liver that impairs its normal metabolic, detoxification, and synthetic function.

The liver plays an important role in protein synthesis, bile production, glucose regulation, and detoxification of toxins; therefore, hepatitis can seriously disrupt body homeostasis.



Types of Hepatitis:

- * Hepatitis A → Contaminated food; Acute
- * Hepatitis B → Blood, Unsafe Sex; Acute & Chronic
- * Hepatitis C → Blood Transfusion + injections; Chronic
- * Hepatitis D → With HBV; severe
- * Hepatitis E → Contaminated water; Acute

Symptoms:

Early Symptom

- * Fever
- * Loss of Appetite

- * Fatigue and Weakness
- * Nausea & Vomiting

Advanced Symptom

- * Jaundice
- * Abdominal Pain

- * Dark-colored Urine
- * Enlarged Liver

Causes:

Viral Causes

- * Infection by Hepatitis Virus (HAV, HBV, HCV, HEV)

- * Unsafe blood transfusions
- * Reuse of syringes
- * Unprotected sexual contact
- * Mother-to-Child (HBV)

Non-Viral

- * Excessive alcohol consumption
- * Drug-induced liver injury

- * Autoimmune disorders
- * Exposure to toxic chemicals

Preventive Measures:

i) Vaccination (Most Effect)

- Vaccines available for Hepatitis A and B
- WHO recommends universal HBV vaccination, especially at birth

ii) Safe Medical Practice:

- use of sterilized syringes

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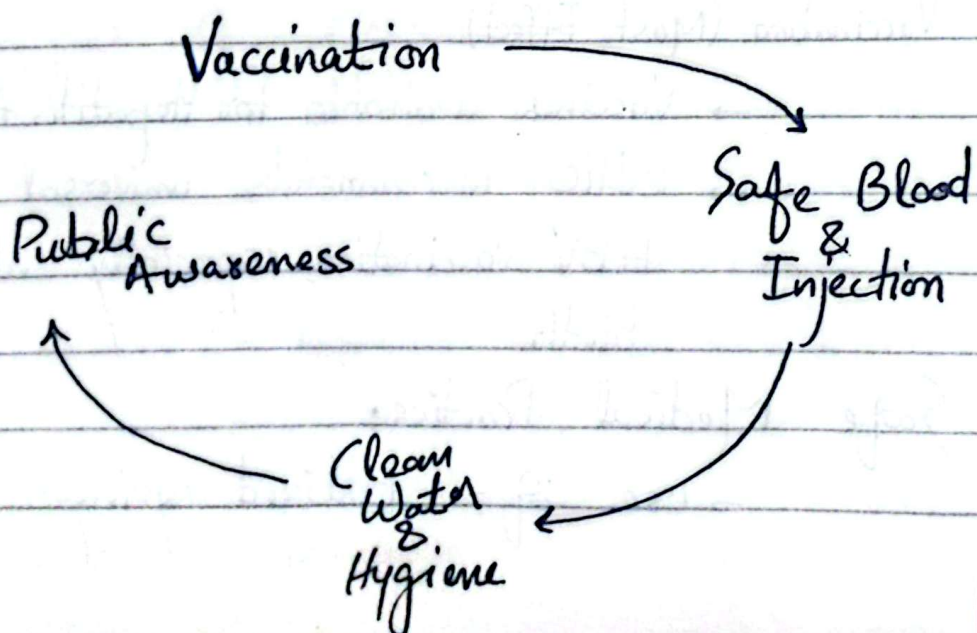
- Screening of blood before transfusion
- Proper disposal of medical waste

3) Hygiene and Sanitation:

- Safe drinking water
- Proper Handwashing
- Hygiene food preparation

4) Behavioral Measures:

- Safe sexual practices
- Avoid sharing razors, needles, toothbrushes, nail-cutters
- Avoid alcohol consumption particularly in infected individuals.

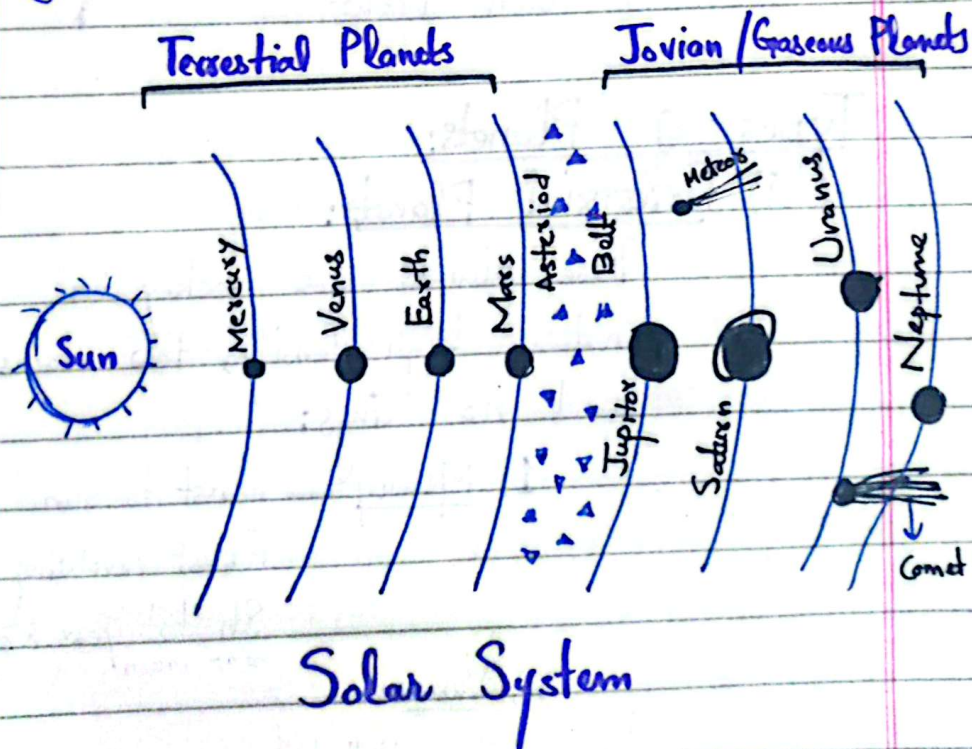


(b) Solar System:

The solar system is a vast gravitationally bound system consisting of sun, eight planets, their moons, dwarf planets, asteroids, comets, Asteroid belt, Kuiper's belt and other celestial bodies. It is present in Milkyway Galaxy.

Age:

It was formed about 4.6 billion years ago from a rotating cloud of gas and dust called the solar nebula.



a) Sun:

- The sun is central body.
- Contains 99.8% of the total mass of solar system.
- All the planets revolve around earth due to its strong gravitational pull.

b) Planets:

Planets are celestial bodies that:

- 1) Revolve around the sun
- 2) Have nearly circular orbit
- 3) Do not produce their own light.

Types of Planets:

i) Terrestrial Planets:

These planets are rocky in nature, high density, few moons and no rings:

- 1) Mercury — nearest to sun
Fastest revolving
Shortest year 88-days
→ no moon

2) Venus:

- Hottest
- Brightest
- Clockwise Rotation
- Slowest Rotating
1 day = 243 d

3) Earth

- Life sustaining planet
- Blue planet; presence of water
- Most dense
- 01 moon

4) Mars:

- Red planet
- Polar Ice Caps
- 02 moons

ii) Jovian / Gaseous Planets:

These planets are gaseous in nature, low density, having many moons, and rings. These are

- 1) Jupiter: Largest; Max. Moons; Shortest day 10 hrs
- 2) Saturn: Rings; many moons; 2nd largest
- 3) Uranus: Blue green color; orientation unique; ice
- 4) Neptune: Slowest Revolving 1 year = 165 years; coldest

c) Moon:

- Natural Satellites revolving around planets
e.g. Moon (Earth), Ganymede, Titan etc

d) Dwarf Planets:

- Smaller than planets; not cleared their orbital path e.g. Pluto, Ceres, Eris, etc

e) Miscellaneous:

Other bodies in solar system are Asteroids, Comets (Halley Comets), Oort cloud, Asteroid and Kuiper belts.

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P.T.O

(c)

Gaseous Exchange:

Gaseous exchange is physiological process through which the human body takes up Oxygen (O_2) and eliminates carbon dioxide (CO_2).

O_2 is essential for cellular respiration (ATP production), while CO_2 is a toxic metabolic waste.

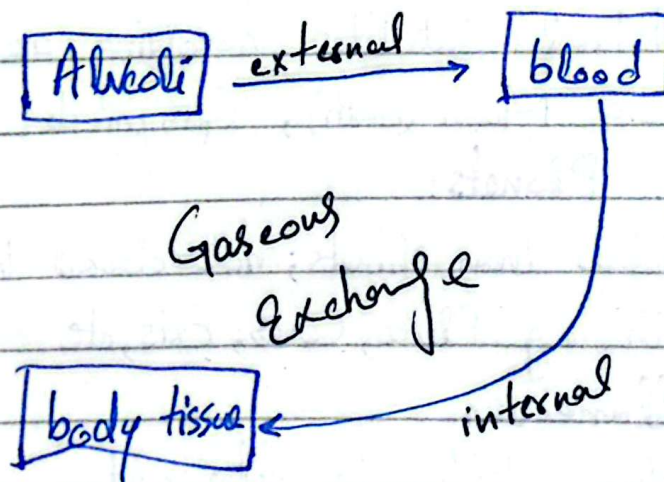
Types:

1) External Respiration:

↳ Exchange of gases between alveoli and blood.

2) Internal Respiration:

→ Exchange of gases between blood and body tissues



External Respiration:

→ Anatomical site → Alveoli

* Alveoli are:

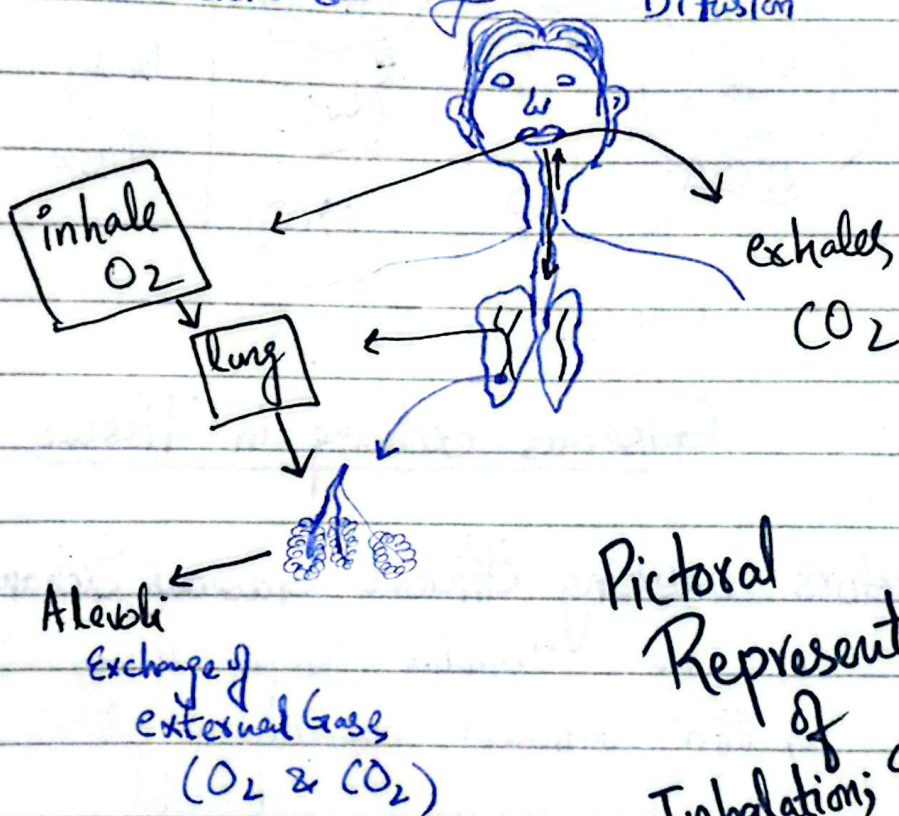
- One-cell thick
- Moist
- Richly supplied with capillaries.

These features maximize diffusion efficiency.

O_2 diffuses from Alveoli → Blood

CO_2 diffuses from Blood → Alveoli

→ Fick's law of Diffusion



Pictorial
Representation
of
Inhalation; Exhalation;
Lungs; Alveoli;
Gaseous
Exchange
P.T.U

II. Gaseous Exchange in body tissues:

Site: Systemic Capillaries and Cells

→ Oxygenated blood reaches tissues

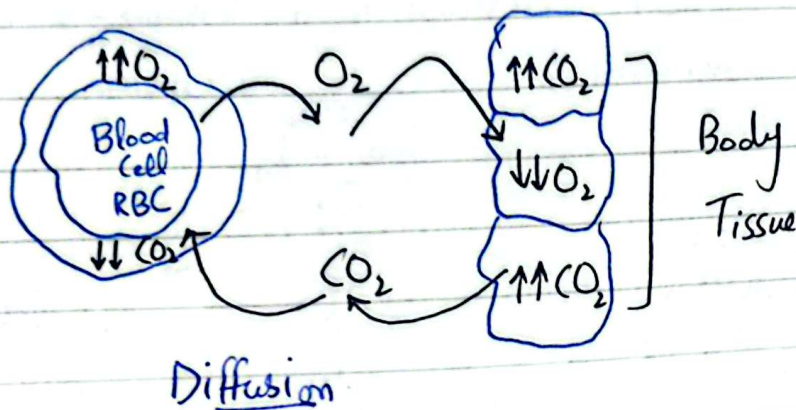
→ Cells are $\begin{cases} \text{Low in } O_2 \\ \text{High in } CO_2 \end{cases}$

* This creates a reverse gradient

Mechanism:

Oxygen diffuses from blood $\rightarrow$ cells

CO_2 — from cells $\rightarrow$ blood



Gaseous exchange in Tissues

Factors ensuring Efficient Gaseous Exchange:

- 1) Large Alveolar Surface Area
- 2) Thin diffusion membrane
- 3) Rich capillary network
- 4) Continuous Ventilation
- 5) Hemoglobin (RBC) Buffering

Failure of any factor can disrupt ^{smooth} gaseous exchange and lead to hypoxia.

(d)

I. Solar Eclipse:

Solar eclipse is an astronomical phenomenon that occurs when the Moon comes between the Sun and Earth, partially or completely blocking sunlight from reaching Earth.

Duration:

7.5 minutes

Occurance:

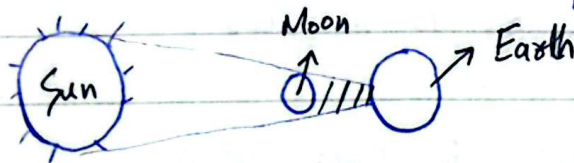
at New Moon

Observance:

at Day time.

Frequency:

04-07 times a year



Types:

1) Total Solar Eclipse:

- Moon completely covers the sun
- Observed from the umbra region
- Day turns into temporary darkness

2) Partial Solar Eclipse:

- Moon covers only part of the sun
- Observed from the penumbra region

3) Annular Solar Eclipses:

- Moon is farther from Earth
- Appears smaller and does not fully cover the sun
- A bright ring (Annulus) of sunlight remains visible.

* Syzygy → next expected on April 14, 2038

II. Lunar Eclipse:

A lunar eclipse occurs when the Earth comes between the Sun and the Moon, causing Earth's shadow to fall on the Moon.

Duration:

01 hr, 40 minutes

Occurance:

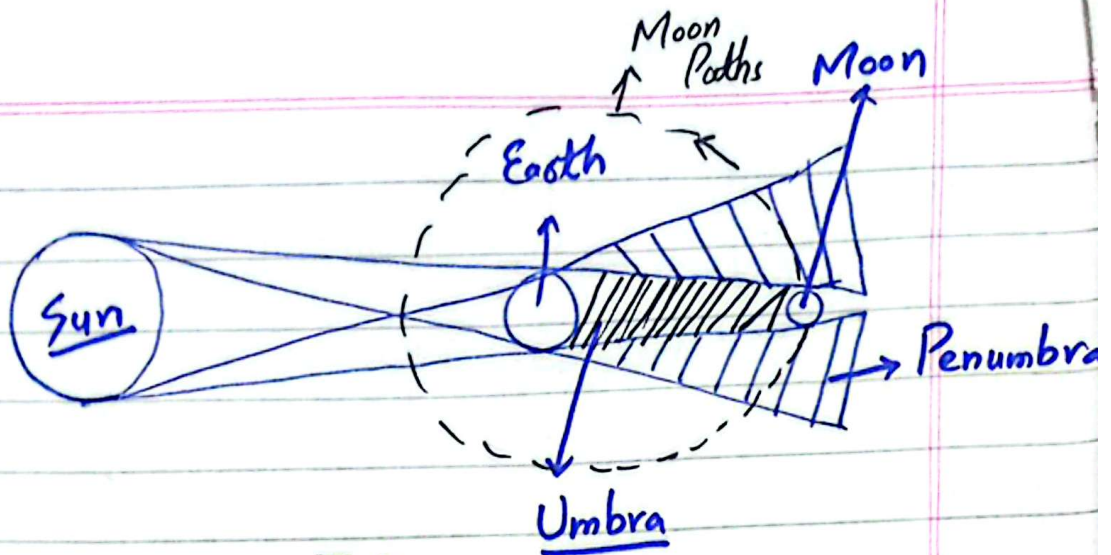
only at Full moon

Observation:

during night time

Frequency:

04-7 times per year



Lunar Eclipse

Types:

1) Total Lunar Eclipse (Umbra)

- Entire Moon enters Earth's Umbra
- Moon appears reddish (red moon)
- Caused by scattering of sunlight through Earth's atmosphere

2) Partial Lunar Eclipse:

- Only a part of Moon enters the umbra
- Rest remains illuminated

3) Penumbral Lunar Eclipse:

- Moon passes through the umbra
- Slight dimming; difficult to observe.

Umbra = Complete Shadow (Total Eclipse)
 Penumbra = Partial Shadow (Partial Eclipse)

