

Question #1:

What is circulatory system?
Describe the working of human heart.

I: Circulatory System:

Circulatory system is the transport system of body: that circulates blood throughout the body to supply oxygen, nutrients, hormones, and to remove carbon-dioxide and waste products.

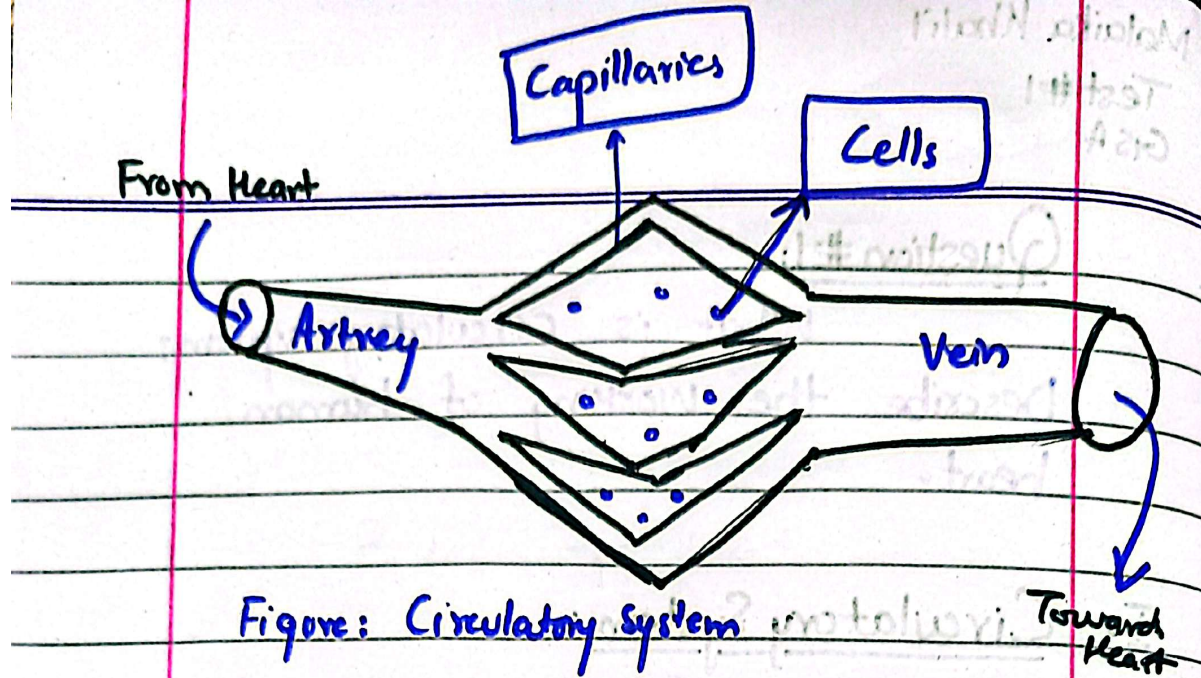
1. Main Parts of Circulatory System:

A circulatory system ^{mainly} consists of three parts

- (1) Heart: It pumps blood throughout the body.
- (2) Blood: Transports oxygen, nutrients and wastes.
- (3) Blood vessels: Carries blood through arteries, veins and capillaries.

2. Functions of Circulatory System:

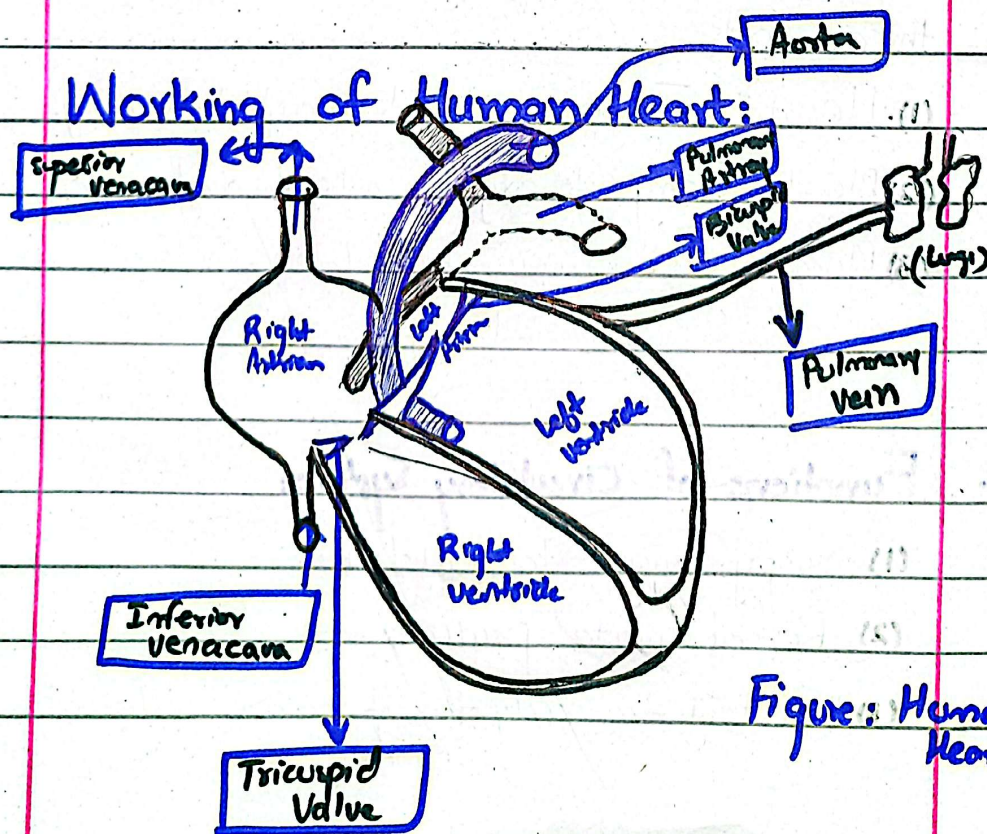
- (1) Supply oxygen to blood tissues
- (2) Remove waste products
- (3) protect the body through immune cells.



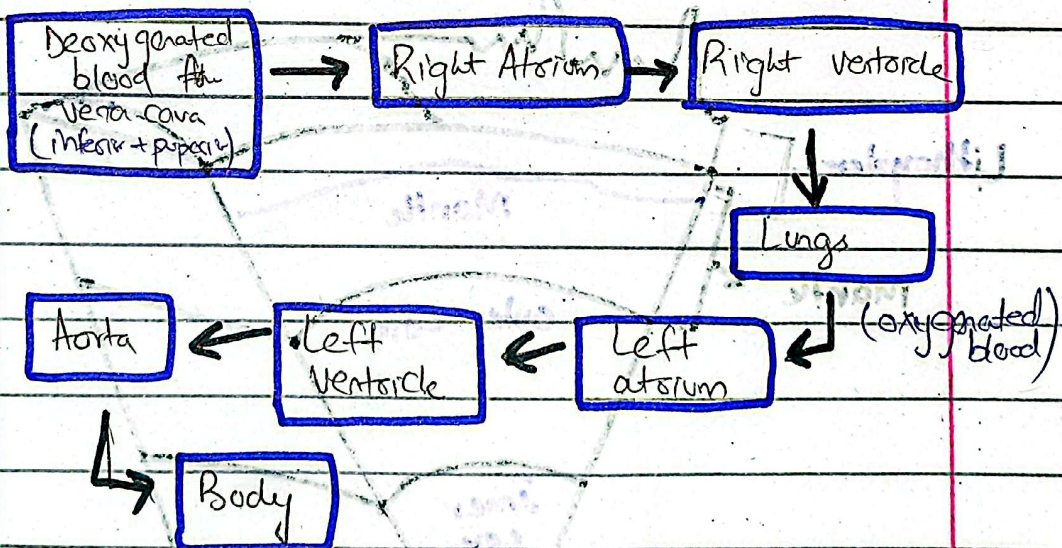
II. Human Heart:

Human heart is a fist-sized muscular organ that pumps blood through the body. It is positioned in a rib-cage. It has four chambers:

- Right Atrium
- Left Atrium
- Right Ventricle
- Left Ventricle



The superior and inferior vena cava first carry the deoxygenated blood to the right atrium. The right atrium then contracts, tricuspid valve opens and deoxygenated blood goes to right ventricle. From there, the pulmonary artery carries deoxygenated blood to lung for oxygenation. Then, the oxygenated blood is carried by pulmonary veins ^{from lung} towards the left atrium. The left atrium contracts, bicuspid valve opens and blood goes to left ventricle. Finally, from the left ventricle, aorta carries ^{oxygenated} blood and supplies it to whole body. (Neck, shoulders, and then lower body).



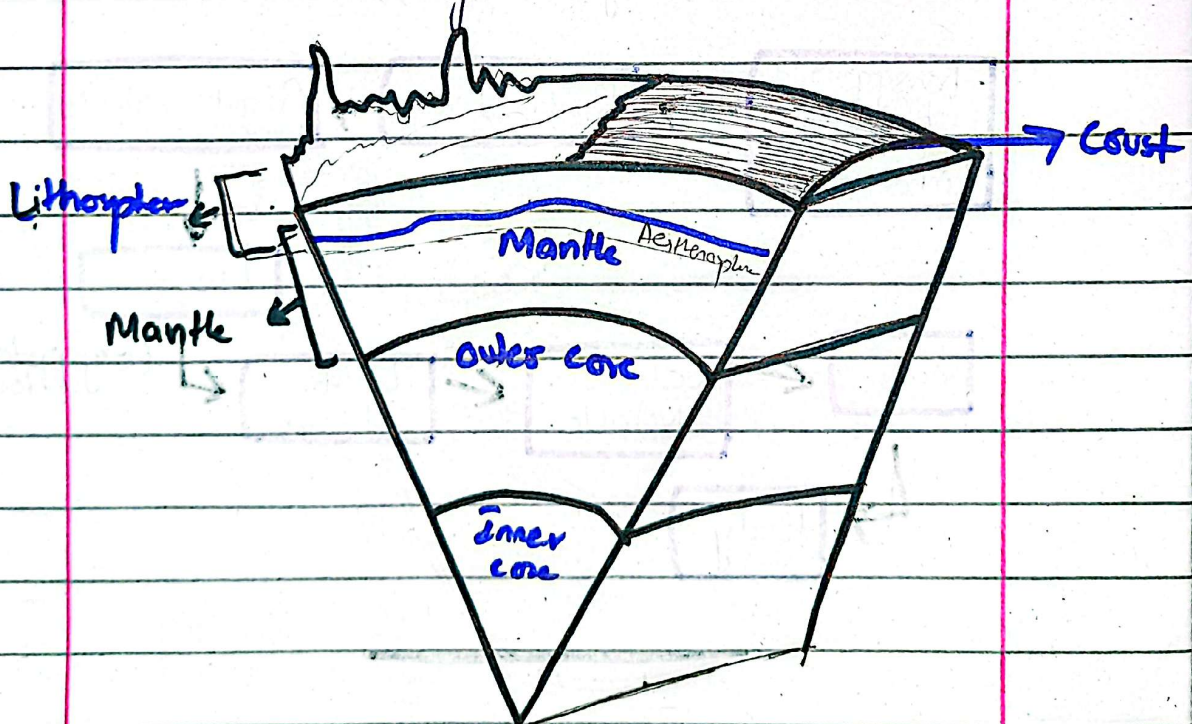
Question #2:

Explain the internal structure of Earth.

Earth is the third planet of our solar system. It is the only planet which supports life. The 71% of the earth's surface is covered with oceans.

I- Internal Structure of Earth:

The structure of earth is defined in two ways i.e. chemically and mechanically.



#1: Crust:

^{Crust}
It is the outer-most and thinnest layer of the earth. Its thickness ranges from 5km to 70km. It is mainly composed of solid rock, mainly silicate mineral.

→ Types of Crust:

1. **Oceanic Crust:** It is denser, basaltic and relatively young.
2. **Continental Crust:** It is lighter, granitic and relatively older.

→ Mohorovicic's discontinuity is the boundary between crust and mantle.

#2: Mantle:

Mantle is the layer next to crust. Its depth extends up to 2900km. It is the thickest layer mainly composed of iron and magnesium.

Types of Mantle:

1. **Upper Mantle:** Upper Mantle includes lithosphere - which forms tectonic plates - and asthenosphere - which drives tectonic plates.
2. **Lower Mantle:** It is more rigid but is still

capable of slow flow-

Transition region is where minerals change their structure due to change in pressure.

#3: CORE:

The core is innermost layer of earth with radius of 3470km. It is mainly composed of iron and nickel.

Types of Core:

1. **Outer Core:** Outer core is in liquid form. The movement of molten iron here generates Earth's magnetic field through geodynamo effect.

2. **Inner Core:** Inner core is solid in form, despite such a high temperature of 5000°C. It slowly grows as the earth cools.

The knowledge about the earth's internal structure comes from seismography or by geomagnetism.

Question #3:

Explain the production of Bio-diesel and Bio-gas.

I. Introduction to Bio-Fuels:

Bio-fuel is a renewable energy source which is derived from biological material such as plants, animal ~~waste~~ ^{fat}, and organic matter. It is mainly used as an alternative to traditional fossil fuel to reduce cost and environmental pollution. Bio-diesel, and Bio-gas are the types of Bio-fuel.

I. Bio-diesel and its Production:

Bio-diesel is a renewable and environment friendly fuel which is made up from vegetable oil, animal fat or waste cooking oil.

1. Production of Bio-diesel:

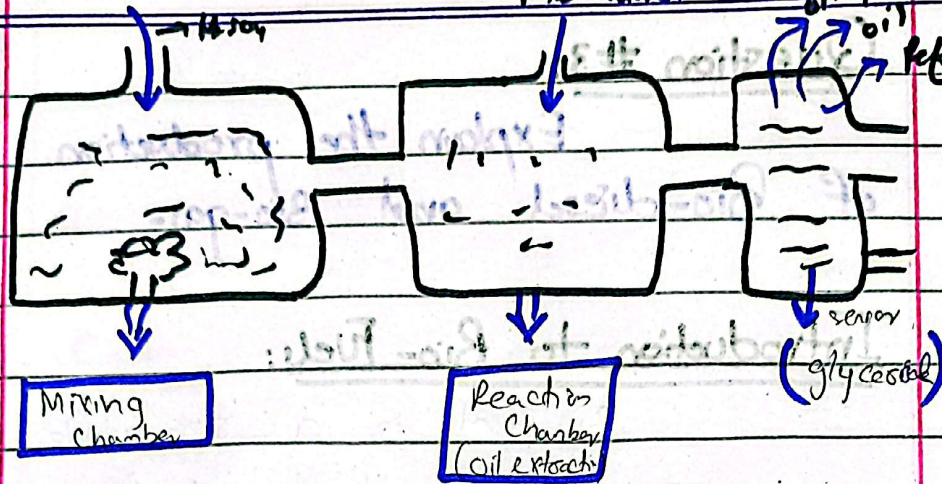
Transesterification is a chemical process through which bio-diesel is produced.

Raw Material

Methanol

oil separator

Refine (oil)



First, the raw material is filtered and heated to remove impurities. Then, methanol is mixed with the catalyst (H_2SO_4). The mixture then reacts with oil which break large molecules into small. Finally, bio-diesel and glycerol are produced by the reaction.

2. Uses of Bio-diesel:

It is used as a fuel for engine to remove pollution and dependence on fossil fuel.

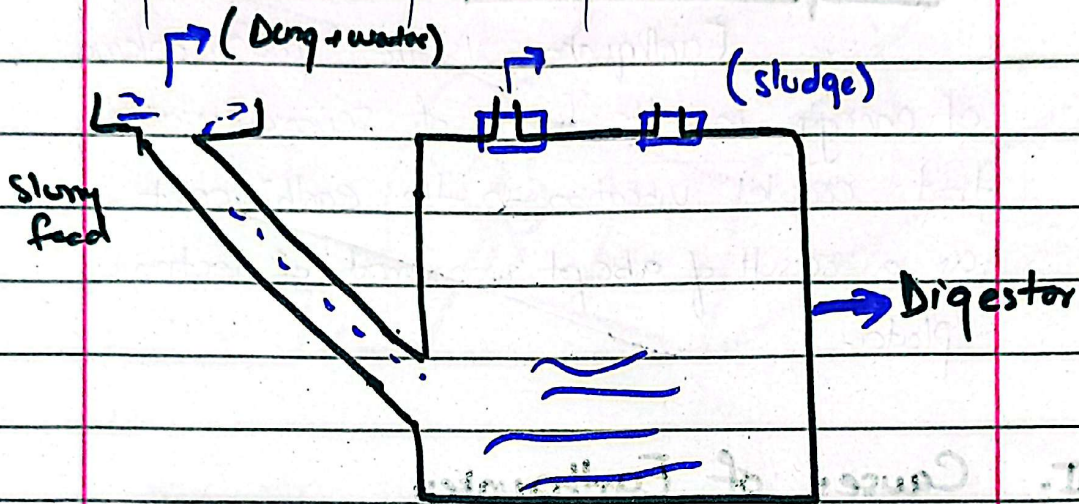
II. Bio-gas and its production:

Bio-gas is a combustible gaseous fuel produced by the anaerobic decomposition of organic waste such as animal dung.

and agricultural waste.

1. Production of Bio-gas:

Anaerobic digestion is a process by which bio-gas is produced.



First the organic waste is mixed with some amount of water to form a slurry, which is then fed into an airtight digester. In the absence of oxygen, the waste is broken down by micro-organisms. Resultantly, biogas mainly methane and CO_2 is produced. Gas is collected for use while slurry as an organic fertilizer.

2. Uses:

It is used as a cooking fuel, ^{and} electricity generation.

Question #4:

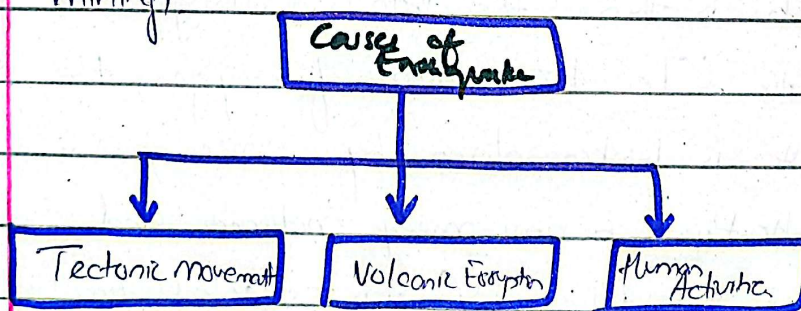
Explain the phenomenon of Earthquake.

I. Earthquake Definition:

Earthquake is the sudden release of energy in the form of seismic waves that create vibration in the earth's crust as a result of abrupt movement of tectonic plates.

II. Causes of Earthquakes:

Earthquakes are caused due to tectonic movements, volcanic eruption or by human activities (nuclear testing or mining).



III. Phenomenon of Earthquake:

The surface of earth is in continuous motion. When the tectonic plate

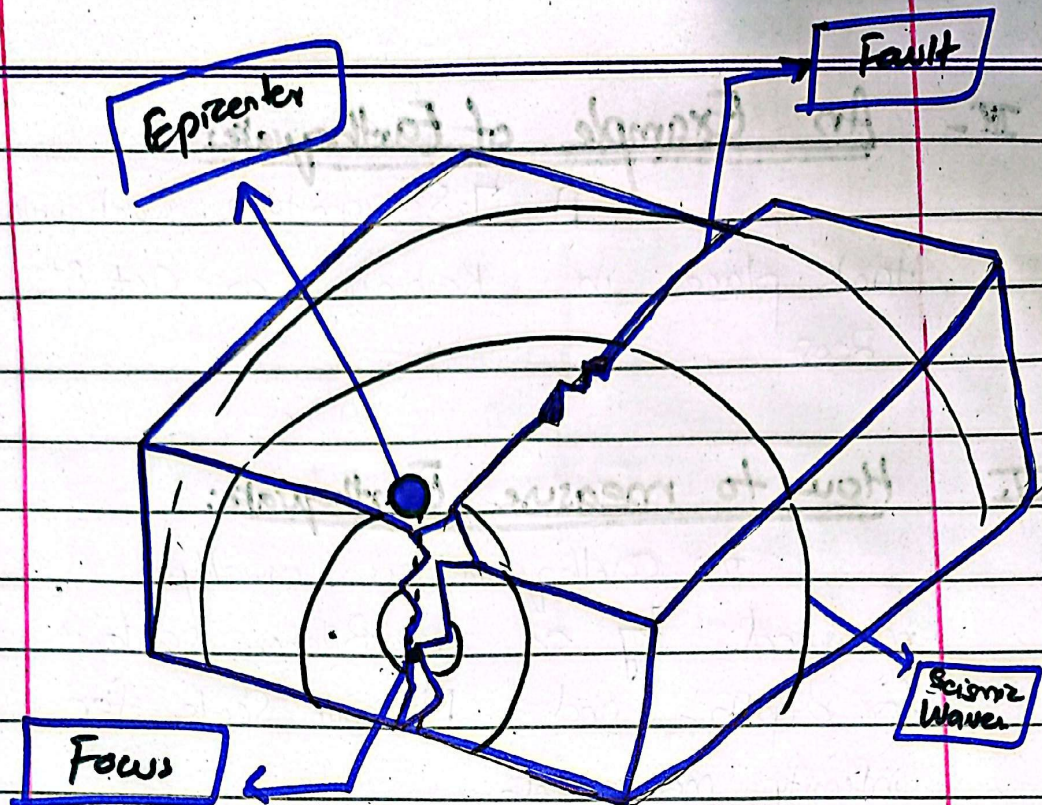


Figure: Earthquake

move they at times rub against each other, sink beneath each other, or spread apart from each other. At times, the plates get stuck with each other at a point. When they continue their movement, a strain develops - which bends the rock. When the rock cannot withstand further bending, it breaks at an abrupt move. This break produces shaking called earthquake. The point where rocks crack is known as fault. Further, the point on fault where break occurs is called focus and on surface of earth it is called epizenter.

III. An Example of Earthquake:

A 7.5 magnitude earthquake took place in Kashmir on Oct 8th, 2005.

IV. How to measure Earthquake:

An earthquake is usually measured by on a Richter scale for depth and Mercalli Scale for intensity measurement.

Question #1:

Differentiate in between plant cell and animal cell.

Explaining Plant Cell and Animal Cell:

Plant cell	Animal cell
1. Cell wall is present and made up of cellulose	Cell wall is not present in animal cell.

2. Chloroplasts are present in plants for the process of photosynthesis.

3. Large central vacuole is present in plant cell.

4. The shape of plant cell is usually fixed and rectangular.

5. Plant cells are autotrophic i.e. make their own food.

6. Plant cells store energy in the form of starch.

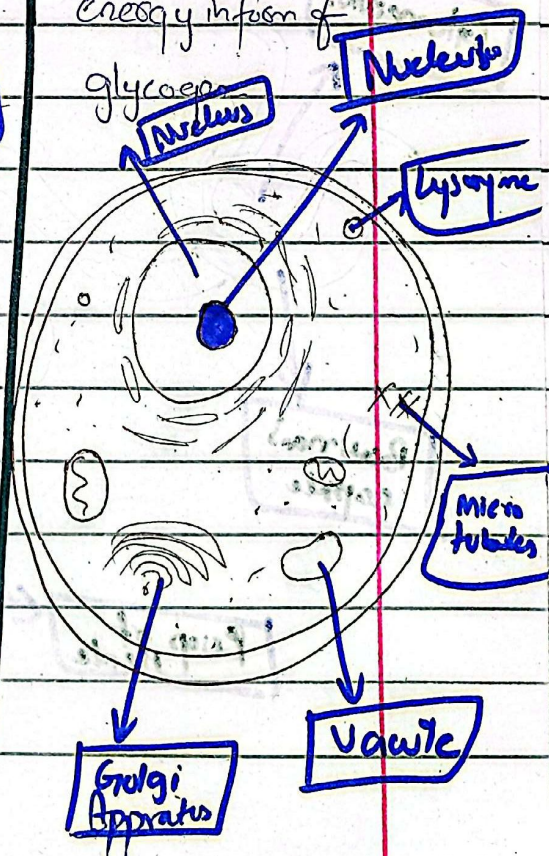
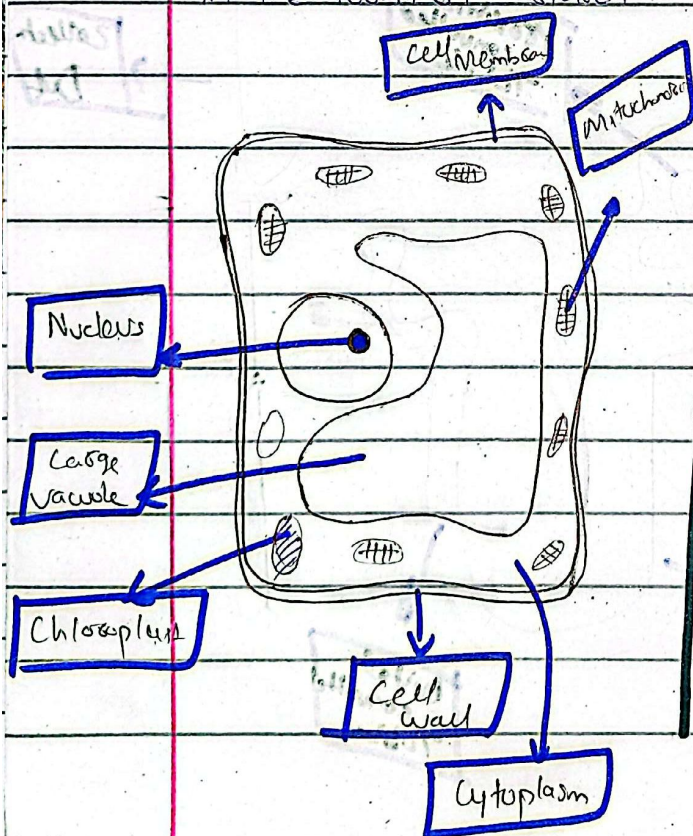
Chloroplasts are not present in animal cell.

Small or no vacuole is present in animal cell.

The shape of animal cell is round.

Animal cells depend on others for food.

Animal cells store energy in form of glycogen.



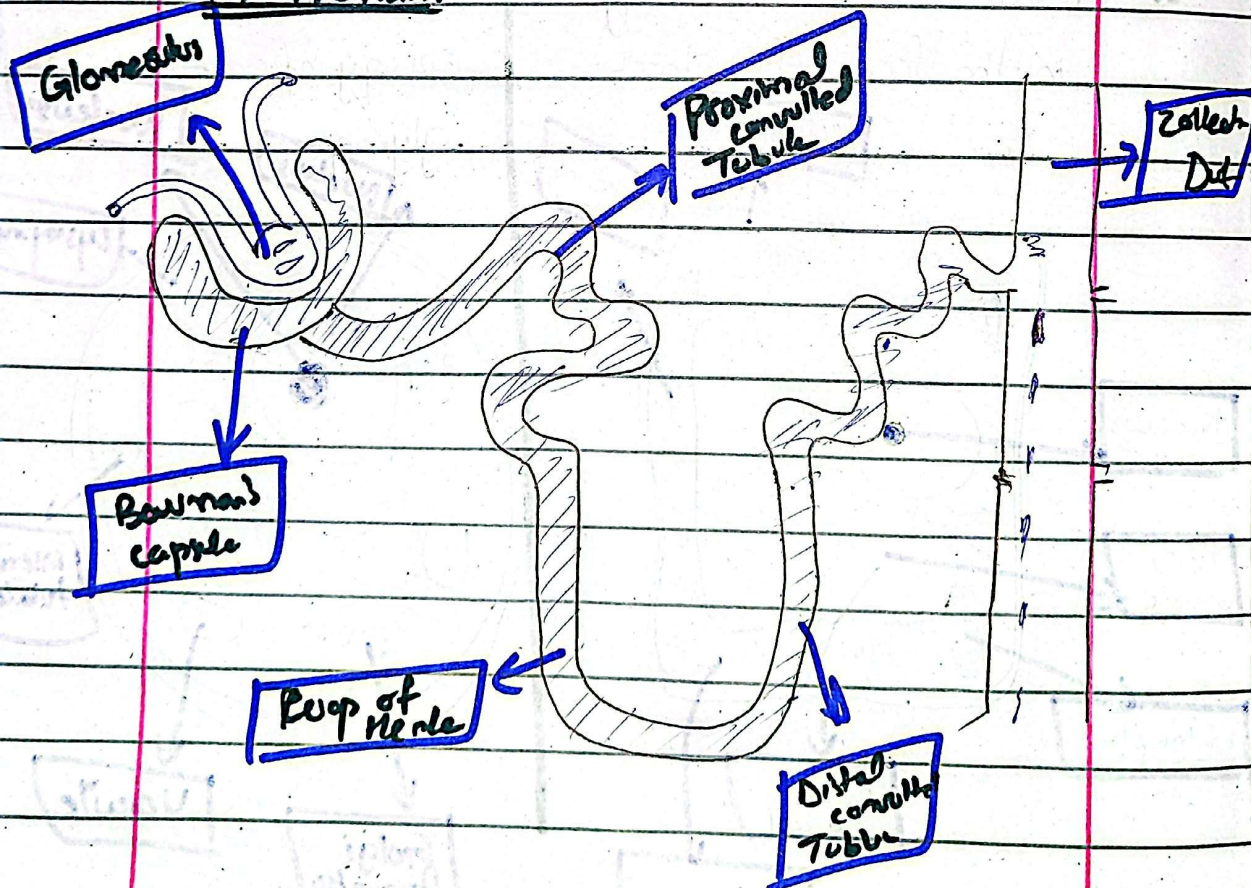
Question #2:

How urine formation takes place in the human body.

I. Urine Formation Meaning:

The process by which kidneys remove waste products, excess water and salts from the body to maintain the internal balance of body.

II. How Urine Formation takes place in human:



The urine formation takes place in three steps:

- ✓ Glomerulus filtration
- ✓ Tubular Reabsorption
- ✓ Tubular Secretion

#1: Glomerulus Filtration:

In nephrons, blood enters through the glomerulus (a filterate having capillaries) - Due to high pressure, excess water, salts, glucose, urea are filtered into Bowman's Capsule - However, large proteins ~~and~~ blood cell remain - Such filtered blood is called filterate.

#2: Tubular Secretion:

Filterate now enters the ^(renal tubule) tubular Section of nephron - Here the reabsorption of glucose, acid, salts and most water - This process occurs only in Proximal Convoluted Tubule (PCT) and Loop of Henle.

#3: Tubular Secretion:

Finally, the blood enters the Distal Convoluted Tubule (DCT) where harmful substances such as waste, drugs and excess salts are secreted from body into tubules.

The waste at final stage moves to the Ureters following the urinary bladder.

Question #2:

What is DRM? Highlight the weaknesses in DRM of Pakistan.

I- What is Disaster Risk Management:

Disaster Risk Management (DRM) is the systematic process of using policies, strategies, and practices to reduce risks, manage emergency situation and minimize loss of life, property and lives.

The DRM mostly includes prevention, mitigation, preparedness, response and recovery from disasters such as earthquakes, floods and cyclones.

II. DRM Institutes in Pakistan:

Main institutes for handling disaster in Pakistan are:

- ✓ National Disaster Management Authority (NDMA)
- ✓ Provincial Disaster Management Authority (PDMA)
- ✓ District Disaster Management Authority (DDMA)

III. Weaknesses Among in DRM of Pakistan:

DRM of Pakistan has following weaknesses which need to be addressed:

#1: Reactive rather than Preventive Approach:

Pakistan's DRM mostly focuses on preventing relief through financial aid rather than focusing on preparedness and strategies of early warning.

The less ^{the investment} early warning system and resilient infrastructure makes it difficult to manage.

#2: Lack of Coordination among institutions:

NDMA, PDMA and DDMA usually lack coordination and ultimate ^{case} delay in emergency situation.

#3: Inadequate Early warning System and Data System:

Early warning system is poorly managed - The weakness or procrastination in use of risk mapping and climate data makes it difficult to manage.

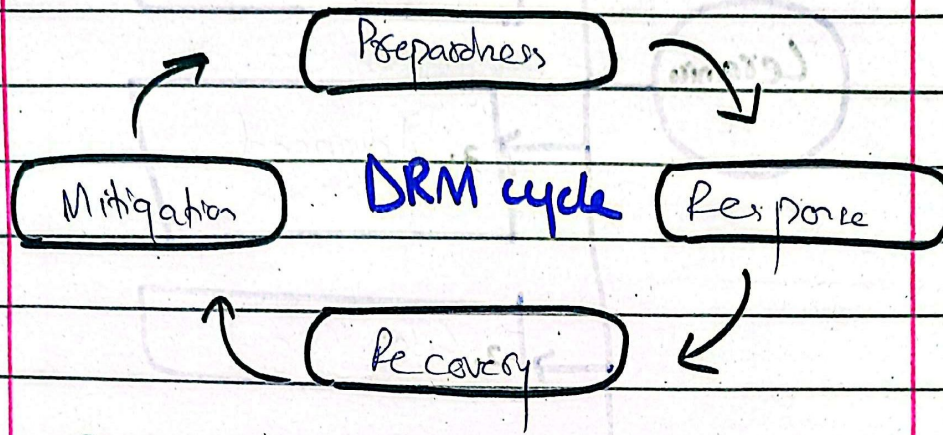
#4: Financial Constraints:

Limited Budget allocation and over-reliance on foreign aid such as UNDP, UNFPA, World Bank etc. weaken

#5: Weak Institutional Capacity:

DRM institutions mostly have undertrained or untrained data

staff which lack techniques to manage the issue.



Question #4:

Define ceramics and give their types and application.

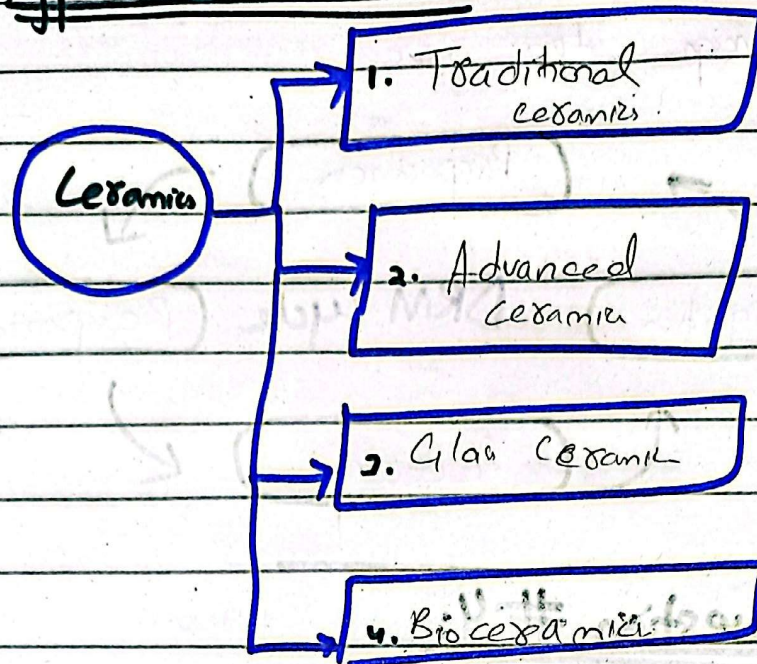
I. Definition of Ceramics:

Ceramics are inorganic, non-metallic materials made by shaping and then firing at high temperatures.

II. Properties of Ceramics:

1. Ceramics are hard and brittle under compression and bending.
2. Ceramics are corrosion-resistant.
3. Ceramics are brittle having little elasticity.

III. Types of Ceramics:



#1: Traditional Ceramics:

They Traditional ceramics are made up of clay-based materials. They are usually cheaper and have moderate strength. Bricks, Tiles and porcelain.

#2: Advanced Ceramics:

Advanced ceramics are made from high-purity synthetic compounds. They have high strength, wear resistant and thermal stability. Alumina and Silicon Carbide are examples.

#3: Glass Ceramics:

Glass ceramics are produced by crystallization of glass. They have low thermal expansion and high thermal shock resistance. Cookware are examples.

#4: Bio-ceramics:

Bio-ceramics are used in medical applications. They are bio-compatible and Cor-tane Dental Implants are examples.

IV- Applications of Ceramics:

Ceramics are used in a variety of things:

1. Construction: To make bricks, cement, tiles and sanitary ware.

2. Electronics: In the formation of insulators, capacitors and semiconductors.

3. Household items: To make cookware, crockery and decorative items.

Ceramics are used in diverse areas due to their durability and heat resistance property.
