CSS- 2023

What is Wild fire? Explain its types, causes, spread and prevention.

Wild Fire

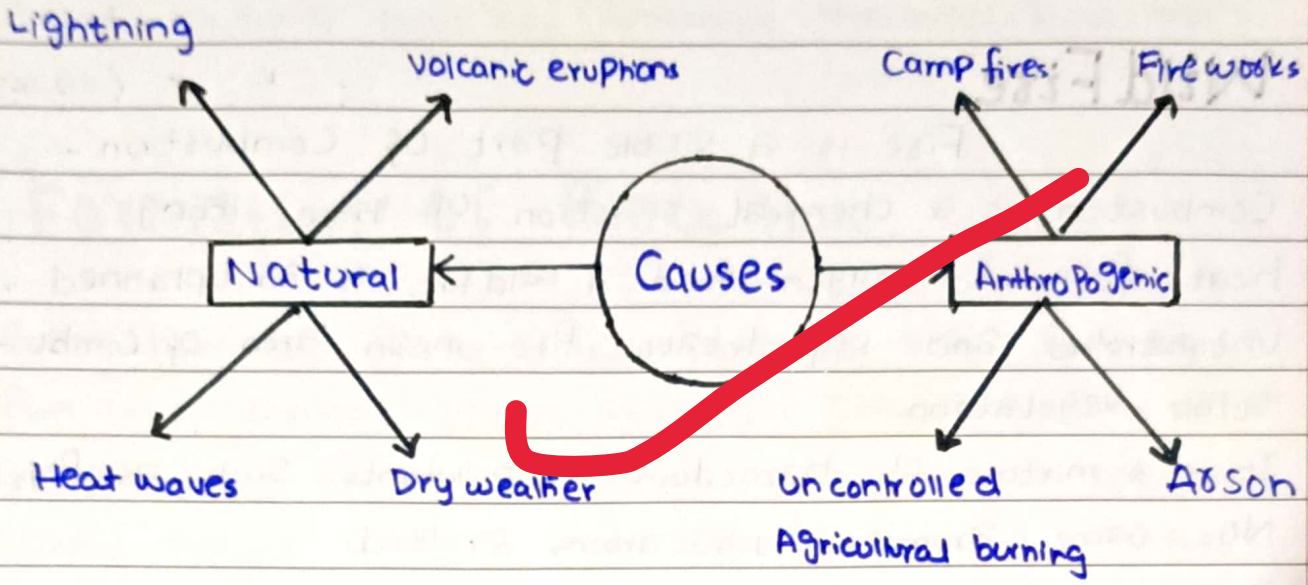
Fire is a visible part of combustion. Combustion is a chemical reaction of three things: heat, fuel and oxygen. And a wild fire is an uplanned, uncontrolled and unpredictable fire in an area of combustible vegetation.

It is a mixture of hazardous air pollutants. Such as $PM_{2.5}$, NO_2, Ozone, Aromatic hydrocarbons or lead.

Types of Wildfire

Ground Fires	Surface fires	Crown fires
It is a type of wildfire that burns below the ground, consuming organic material like dry leaves, bark, needles and twigs.	It is a type of wildfire that burns along the ground level, consuming grass, shrubs, lichens, saplings and small vegetation.	It is a intense wildfire that spread rapidly through the upper canopy of trees consuming live and dead branches, lichens in trees and tall shrubs.
• It can go undetected for long time because they produce almost no smoke and spread slowly.	• These are common and their intensity is usually low.	• It pose more high danger due to its high speed and intensity.

Causes of Wild fire



Spread of Wild fire

According to the National Interagency Fire Center (NIFC) Wildfire Annual Report for 2023, 55,571 fires were reported that have burned 2,633,636 acres, which is 47.39 acres burned / fire. Spreading of wildfires depend on several factors.

i- **Temperature** : Spread of wildfire $\propto$ Temperature

ii- **Humidity** : Spread of wildfire $\propto \frac{1}{\text{humidity}}$

iii- **Wind speed** : Spread of wildfire $\propto$ Wind speed

iv- **vegetation density**: Spread of wild fire ∝ vegetation density

v- **The amount of fuel**: Spread of wild fire ∝ amount of fuel

vi- **Fuel moisture content**: Spread of wild fire ∝ ⊥ fuel moisture

Prevention of Wild fire

(1) Do not

(1) Extinguish campfires, bonfires or burning piles completely.

(2) Avoid activities that create sparks when it is dry and windy.

(3) Safely dispose off cigarette

(4) Fire bans and restriction should be implemented and followed.

(5) Avoid burning trash and debris.

CSS-2024

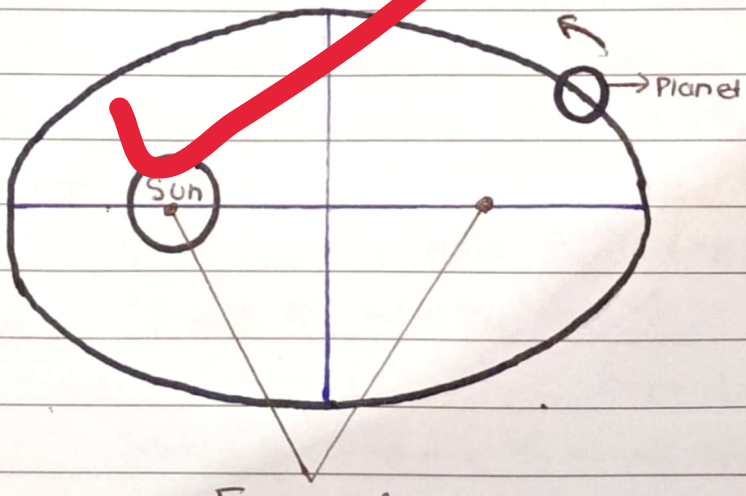
What are Kepler laws related to motion of planets.

Kepler's Laws of Planetary Motion

Johannes Kepler, a German mathematician and astronomer ~~discovered that the planets travel about the Sun in elliptical~~ studied the motion of planets around the sun, for this he gave three fundamental laws of Planetary motion.

(1) Kepler's First law of Planetary Motion OR Law of Ellipses

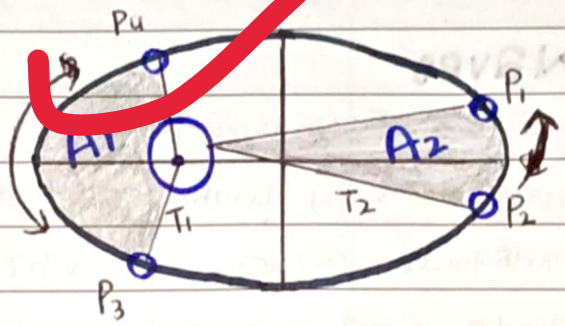
This law states that; "All planets move about the Sun in elliptical orbits, having the sun as one of the foci." This means that a planet's distance from the Sun varies throughout its orbit.



Focii of ellipse

(2) Kepler's Second Law of Planetary Motion OR Law of Equal Areas

This law states that, "A line segment joining a planet and the Sun sweeps out equal areas during equal intewals of time." This means that planets do not move with constant speed along their orbits. Rather planets move faster when they are closer to Sun (at perihelion) and slower when they are farther away (at aphelion).



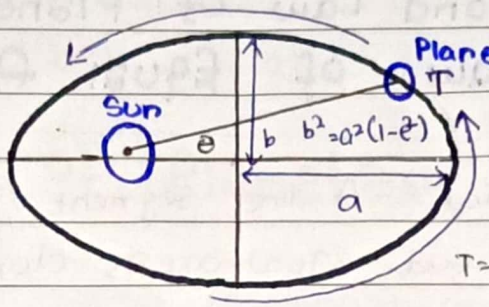
$A_1 = A_2$

$T_1 = T_2 = T$

(3) Kepler's Third law of Planetary Motion OR Law of Harmonies / Periods

This law states that, "The squares of the orbital periods of the planets are directly proportional to the cubes of the semi-major axes of their orbits." This means, the farther a planet is from the Sun, the longer it takes to complete one orbit.

Thus we find that mercury, the nearmost planet, takes only 88 Earth days to orbit the Sun. The earth takes 365 days, while Neptune take 60,190 Earth days (165 Earth years).



$T^2 \propto a^3$

T = time to complete orbit.

CSS-2024

What are two types of earthquake waves? Discuss.

Earthquake Waves

Earthquake A wave is a disturbance in a medium that carries energy without a net movement of particles. And earthquake waves are vibrations generated by an earthquake and propagate within Earth or along its surface.

Based on the medium they travel in, earthquake or seismic waves are classified under two categories.

Types of earthquake waves

- Body waves
  - Primary waves
  - Secondary waves
- Surface waves
  - Rayleigh waves
  - Love waves

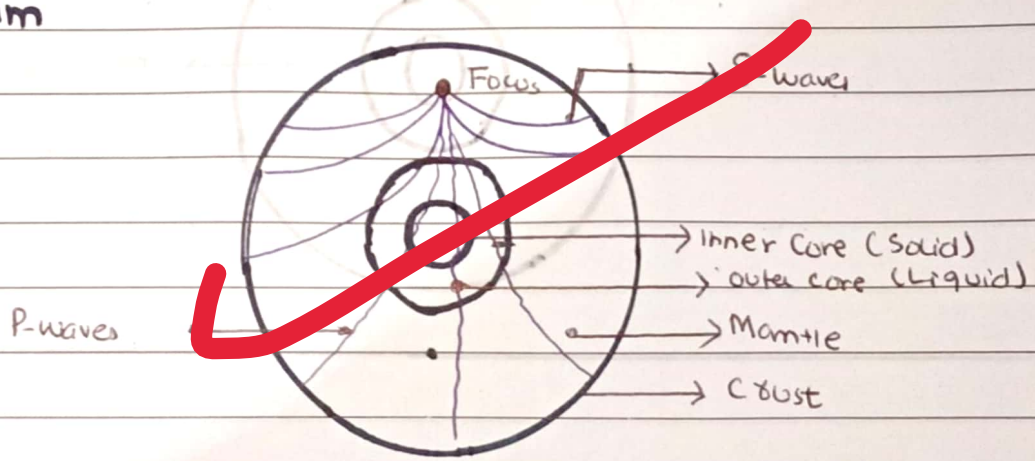
1) Body Waves

Body waves are those waves that travel through the earth - They originate at the epicenter (focus) of the earthquake and travel through earth at amazing speeds-

There are two types of body waves.

P or Primary waves	S or Secondary waves
• P waves are longitudinal waves.	• S waves are transverse waves.
• These are first waves to hit seismograph. These can	• These are second waves to hit the Seismograph.
• These can travel through solids as well as liquids.	• These can travel only through solids.
• These causes up and down movements.	• These causes side to side movement
• These are faster waves.	• These are slower waves.

Diagram

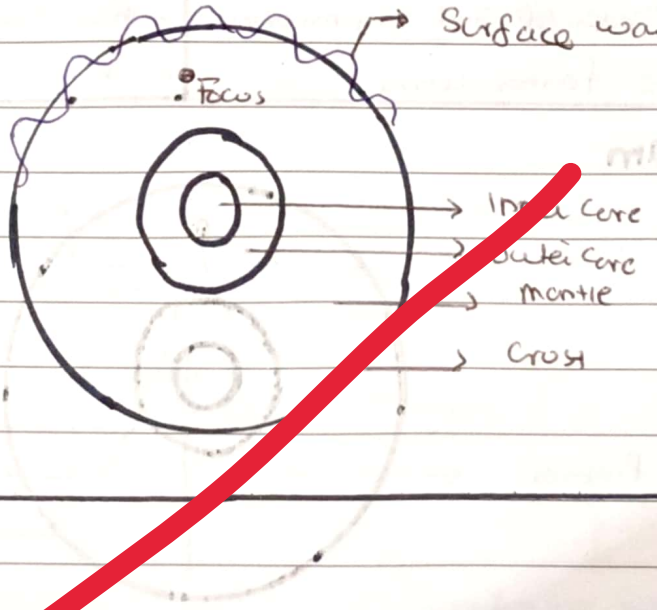


2) Surface waves

The waves that travel on the surface of earth are called surface wave. These waves are responsible for destruction caused due to earthquake. There are two types of surface waves.

Rayleigh waves	Love Waves
• The waves that move in a elliptical motion, produce both a vertical and horizontal component of motion in the direction of wave propagation are called Rayleigh waves.	• The waves in which particle vibrate perpendicular to the propagation direction are called Love waves.

Diagram

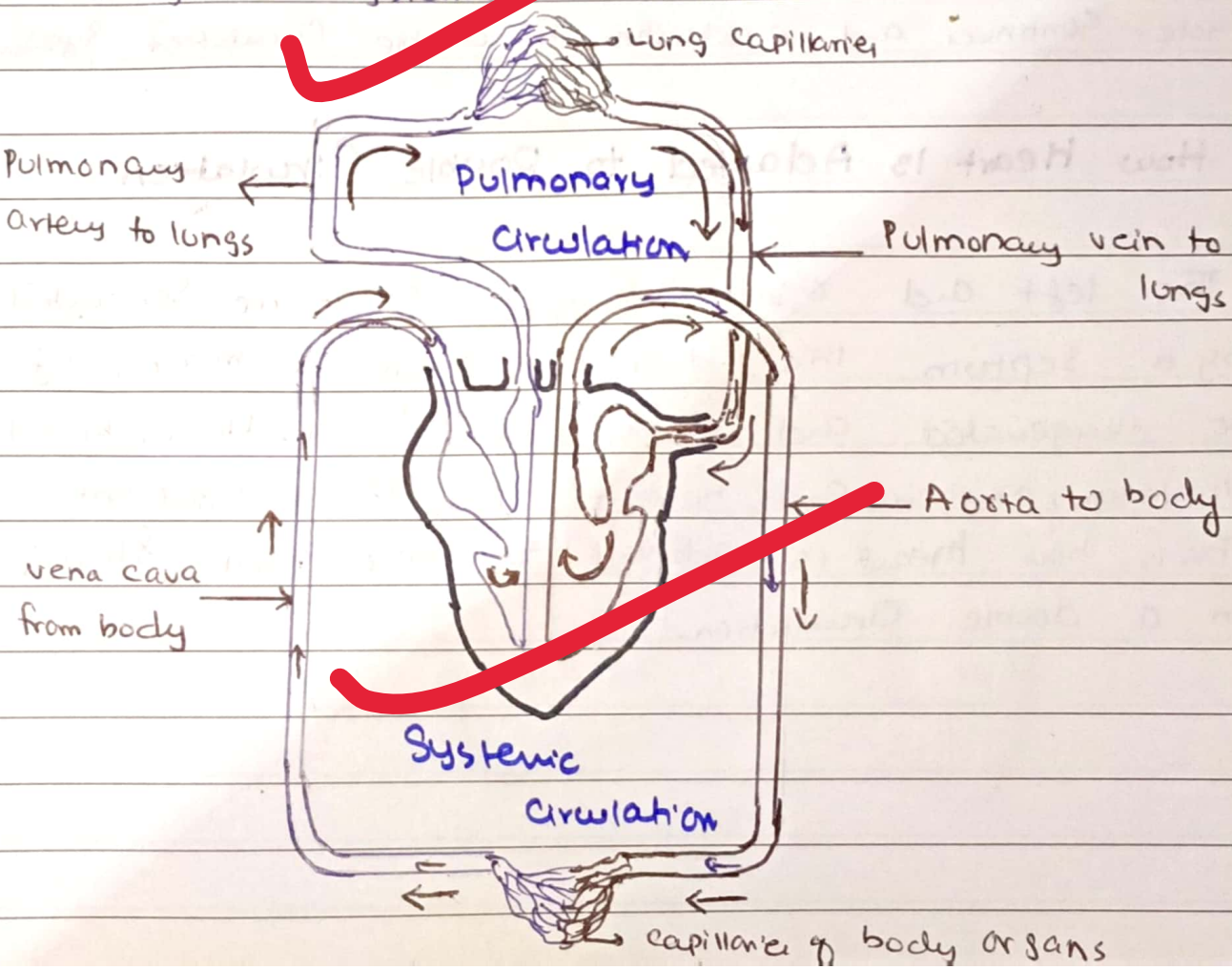


CSS- 2021

What is meant by the term double circulation? Explain. Briefly describe how the heart is adapted to keep blood flowing in a double circulation.

Double Circulation

Human and other mammals have a four-chambered heart, consisting of two auricles and two ventricles. Blood flows twice through the heart during each cycle. Hence, there occurs double circulation of blood. It includes Pulmonary and systemic circulation.



i- Pulmonary Circulation

In the pulmonary circulation, the deoxygenated blood is sent from the heart to the lungs through the pulmonary artery, and oxygenated blood is returned from the lungs to the heart through the pulmonary vein.

ii- Systemic Circulation

In the systemic circulation, oxygenated blood is carried from the heart to all body parts through the aorta, and deoxygenated blood is returned from all body parts to heart through the vena cava. Then again this deoxygenated blood is sent to lungs through the pulmonary artery. This cycle continues and establishes the double circulation system.

How Heart is Adapted to Double Circulation

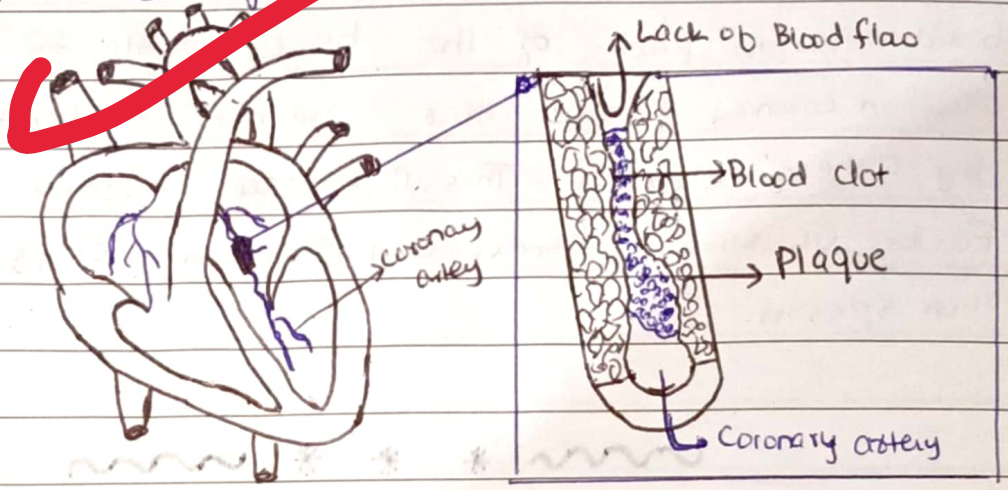
The left and right sides of the heart are separated by a septum that does not allow the mixing of the oxygenated and deoxygenated blood. Hence, blood circulation, oxygen and nutrient supply is are efficient. This is how heart is adapted to keep blood flowing in a double circulation.

CSS-2017

Explain in detail Common Cause of heart attack.

Heart Attack

A heart attack, medically known as myocardial infarction, occurs when the flow of oxygen-rich blood to a section of the heart muscle is blocked. The most common cause of a heart attack is Coronary artery disease (CAD), but several other factors and conditions can also contribute. Following are the some common causes of heart attack.



1. Coronary Artery Disease (CAD)

CAD is the primary cause of heart attacks and involves the building up of Plaque (atherosclerosis) in the coronary arteries. Plaque is made up of fat, cholesterol, and other substances. Over time, the plaque hardens and narrows the arteries, restricting blood flow to the heart.

2. Plaque Rupture and Blood Clots

When a plaque ruptures, it can causes a blood clot to form at the site of the rupture. This clot can block the blood flow through the coronary artery. If the clot is large enough, it can completely obstruct the artery, leading to a heart attack.

3. Coronary Artery Spasm

A spasm of coronary artery temporarily decrease or stop blood flow to part of the heart muscle. These spasms occur in coronary arteries that are not significantly narrowed by atherosclerosis. This potentially triggers heart attacks. Factors like smoking, stress and stimulant drugs can trigger such spasms.

* * *

CSS-2019

People suffering from cadiovasular diseases have high level of Cholesterol in their blood. This often leads to build up of fats in the internal arterial walls. Sussest how this might be harmful to the heart.

Ans: High levels of Cholesterol, especially low-density lipoprotein (LDL) cholesterol contribute to the buildup of fatty deposits (Plaques) in the arteries, a condition known as Atherosclerosis. This is harmful to the heart in several ways:

1. Narrowing of Arteries

Plaque buildup narrows the arteries, restricting blood flow to the heart muscle. This lead to Chest Pain and Coronary artery disease.

2. Blockage and Heart Attack

If Plaque ruptures, it forms a blood clot that Completely blocks the artery. This cause heart attack by cutting off the oxygen supply to part of the heart muscle, leading to tissue death.

3. Chronic Inflammation

Cholesterol and Plaque Cause

3.5

2 Chronic inflammation in the arteries, which destabilizes plaques and increases risk of rupture and subsequent clot formation. This leading to speedy heart failure.

4. High Blood Pressure

Plaques make the arterial walls hard and less elastic (arteriosclerosis), which increase blood pressure. High blood pressure further strains the heart and can lead to heart failure.

Add more arguments!!!

* * *

CSS- 2018

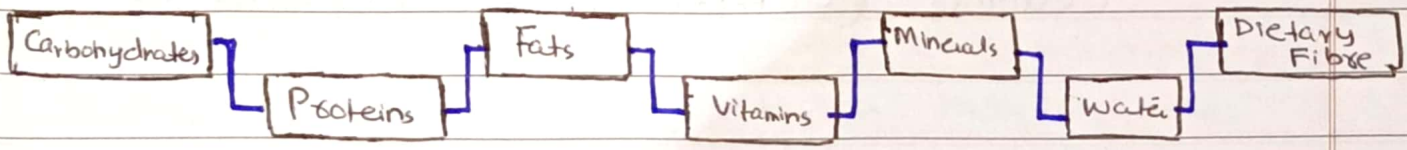
Write a comprehensive note on "Balanced Diet".

Balanced Diet

" To eat is a necessity, but to eat intelligently is an art." — Francois de La Rochae foucauld

A balanced diet is a nutritional regimen that provides all the essential nutrients in appropriate proportions and amounts necessary to maintain health, support growth, and sustain vital physiological functions.

Essential Nutrients for Balanced Diet



1. Carbohydrates

Function: Provide energy, support brain function, and are a primary fuel source for the body.

Sources: Whole grains (brown rice, oats), fruits, vegetables, and nuts.

2. Proteins

Function: Essential for growth, tissue repair, immune function, and maintaining lean muscle mass.

Sources : Milk, eggs, meat, fish, seeds, soy products etc

3. Fats/Lipids

Function: Provide a concentrated source of energy, support cell growth, protect organs, and help with nutrient absorption.

Sources: Avocados, olive oil, fatty fish, dairy products etc.

4. Vitamins

Function: vital for metabolic processes, immune function, and cell and tissue maintenance.

Sources: A variety of fruits and vegetables, whole grains, dairy products etc

5. Minerals

Function: Minerals are important for bone health, fluid balance, nerve signaling and muscle function.

~~Sources~~

Sources : Dairy products, meats, fruits, vegetables etc.

6. Water

Function: Water is crucial for maintaining hydration, regulating body temperature and metabolic processes.

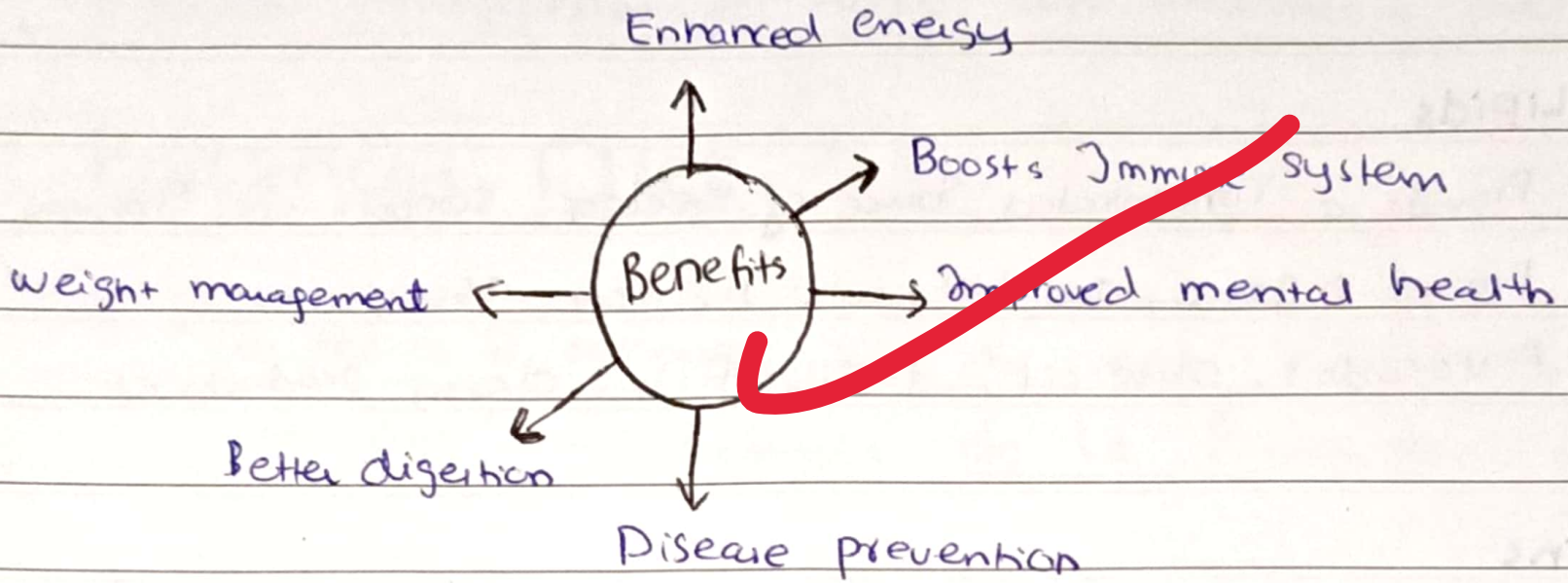
Sources: Intake, moisture rich foods like fruits and vegetables.

7. Dietary Fibre

Function: They aid in digestion, helps maintain bowel health, lowers cholesterol levels and helps control blood sugar levels.

Sources: whole grains, nuts, fruits, vegetables etc.

Benefits of Balanced Diet



14

CSS- 2016

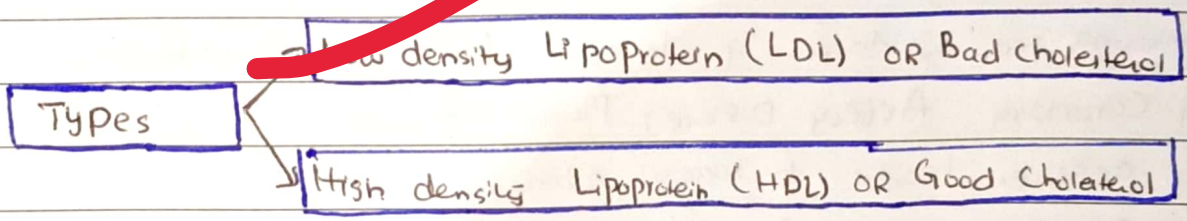
What is Cholesterol? Disuss its importance, normal blood level and dangers of elevated Levels with reference to the health & disease in humans.

Cholesterol

Cholesterol is a lipid molecule, specifically a sterol. It is a waxy, fat-like substance that is found in all cells of the human body and is essential for various physiological processes.

Chemical formula: $C_{27}H_{46}O$

Sources: Meat, Poultry, Full fat dairy products., Liver etc.



Importance Of Cholesterol

(1) Cell Membranes: It is crucial for maintaining the structure and fluidity of cell membranes.

(2) Vital Substances: It serves as precursor for the synthesis of steroid hormones, vitamin D, and bile acids.

(3) Digestion: It aids in the digestion of fats.

(4) Nerve Cells: It is important for the formation of myelin sheaths, which insulate nerve cells and enhance signal transmission.

Normal Blood Levels

of

Cholesteol levels are measured in milligrams per deciliter (mg/dL) of blood, and the desirable ranges are:

Cholesteral	Range
Total Cholesteol	< 200 mg/dL
LDL Cholesteol	< 100 mg/dL
HDL Cholesteol	> 50 mg/dL
Triglycerides	< 150 mg/dL

Dangers of Elevated Levels of Cholesteol to the Health

Following are the dangers of elevated levels of Cholesteol:

(1) Coronary Artery Disease: Plaque formation in coronary arteries leads to heart attacks.

(2) Atherosclerosis: Plaque buildup in arteries. Causes reduced blood flow.

(3) Peripheral Artery Disease: Reduced blood flow to limbs due to arterial Plaque buildup.

(4) High Blood Pressure: Narrowed arteries force the heart to work harder, increasing blood pressure.

(5) Gallstones: Cholesteol contributes to gallstone formation, causing abdominal pain.

CSS-2016

Comment: Liver is a Chief Chemist in human body.

Liver – A Chief Chemist in Human Body

Liver is called a chief chemist in human body because it is a vital organ performing over 500 chemical functions which includes, metabolic, detoxification, and synthetic functions.

- It is body's second-largest organ.

Location: The liver is located in the upper right quadrant of the abdomen, just below the diaphragm.

Weight: The liver typically weighs between 1.2 to 1.5 kilograms (approx 2.6 to 3.3 pounds) in an average adult.

Functions Of Liver

Following diverse activities of Liver highlight why the liver is seen as the body's Chief Chemist.

(1) Detoxification

The liver neutralizes and removes harmful substances, including drugs, alcohol, and environmental toxins from the blood.

Overall good answers! Structure and paper presentation is good!

(2) Metabolism Regulation

It manages the metabolism of carbohydrates, proteins, and fats, converting excess glucose into glycogen for storage and breaking it down when needed.

(3) Protein Synthesis

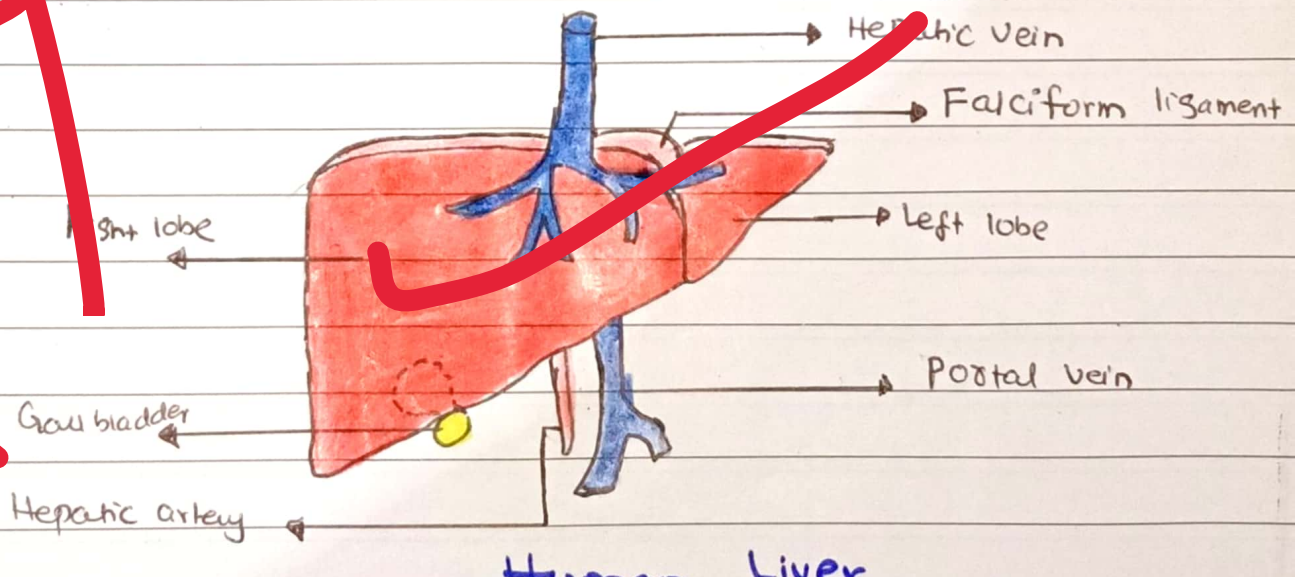
The liver produces essential proteins such as albumin (for blood volume and pressure) and clotting factors (for blood coagulation).

(4) Bile Production

It generates bile, crucial for the digestion and absorption of fats, and helps eliminate waste products.

(5) Vitamin and Mineral Storage

The liver stores vital vitamins (A, D, E, K, B12) and minerals (iron, copper), releasing them as needed to maintain bodily functions.



Human Liver