

GSA-CSS-2018

Question #03

A) Describe different causes and preventions of 'Polio'.

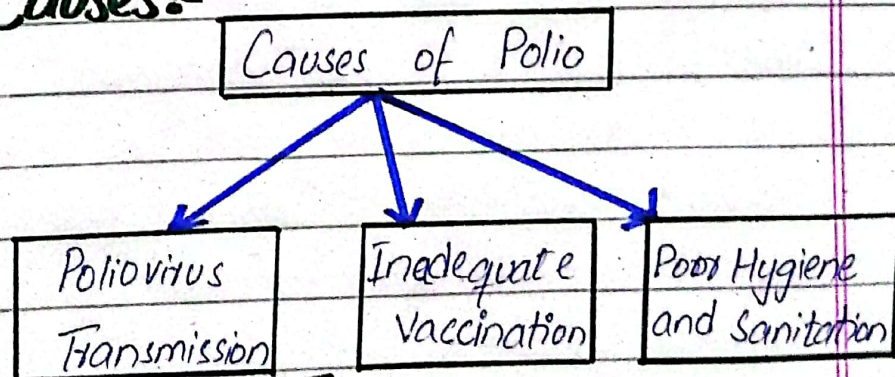
Polio:-

Polio, also known as 'poliomyelitis', is a highly contagious viral disease caused by the poliovirus. It primarily affects children under the age of 5 but can also affect older individuals. The virus is usually transmitted through fecal-oral route, which means it spread through contaminated food, water or contact with an infected person's feces.

Mechanism:-

PolioVirus → mouth/nose → Digestive/respiratory systems
Nervous system ← multiplication ← systems
→ whole body effected

Causes:-



i- Poliovirus Transmission:

Polio is caused by infection

with one of the three poliovirus types (type 1, type 2 or type 3). The virus enters the body through the mouth, multiplies in the intestines, and can then enter the bloodstream, leading to potential infection of the nervous system.

ii- Poor Sanitation and Hygiene:

In areas with inadequate sanitation and hygiene practices, the virus can spread easily through contaminated water sources and inadequate waste disposal, contributing to outbreaks. **For example**, in countries like South-Asian countries including Afghanistan, Pakistan and India etc, Sub-Saharan Africa, Northern Nigeria and Middle east countries like Syria, Yemen and Somalia etc faces a lot of polio cases due to poor sanitation and hygiene.

iii- Inadequate Vaccination:

Polio can be prevented through immunization. In regions with low vaccination rates or inadequate healthcare infrastructure, the virus can spread more easily and lead to

outbreaks.

Prevention:-

There is no cure for Polio, but it can be prevented through vaccination and good sanitation and Hygiene.

i- Improved Hygiene and Sanitation:

Encouraging and implementing better hygiene and sanitation practices help to prevent the spread of the virus. Access to clean drinking water, proper disposal of waste and promoting handwashing can significantly reduce the risk of poliovirus transmission.

ii- Vaccination:

The most effective way to prevent polio is through vaccination.

The **oral polio vaccination (OPV)** administered ^{orally} and the **inactivated polio**

vaccine (IPV) is given as an injection, ~~Routine~~ are the two commonly used vaccines. Routine immunization of the infants and young children is essential for building immunity against the virus and reducing the risk of transmission.

iii- Other preventive measures:-

Some other preventive measures include surveillance and outbreak response monitored properly, mass vaccination campaigns, maintaining high vaccination coverage, and vaccination during international travel are would proved very effective.

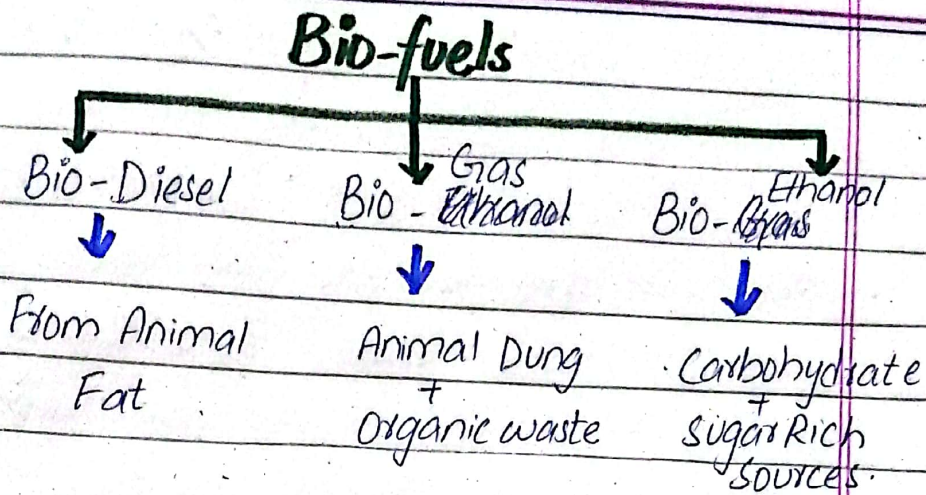
**B) Define the term "bio-fuel"?
How is it helpful to promote clean energy?**

Bio-Fuel:-

Biofuel refers to a type of renewable energy derived from organic matter, such as plants, agricultural residues and even waste materials.

It is considered a cleaner alternative of fossil fuels like coal, oil and natural gas because it is produced from renewable resources and generally results in lower greenhouse gas emissions when burned for energy.

There are several types of bio-fuel:



Bio-Fuels: Driving towards a Cleaner Future

Bio-fuels are very helpful in the production of pollution-free energy. For instance, Bio-ethanol, is the alternative of petrol, produce **48%** less CO_2 content than conventional gasoline. Biofuels play a crucial role in production of pollution free energy.

i- Renewable Resource:

Biofuels are produced from renewable resources, such as crops and waste materials, which can be replenished and grow again. Unlike fossil fuels, which are finite and take millions of years to form, biofuels offers a sustainable energy source that can be continually produced and used.

ii- Reduced Greenhouse Gas Emissions-

Biofuels generally have a lower carbon footprint compared to fossil fuels because the CO_2 released when they are burned is offset by the CO_2 absorbed during the growth of the feedstock. This makes biofuels a cleaner alternative to traditional fossil fuels, helping to mitigate climate change and reduce overall greenhouse gas emissions by up to **65%**.

iii- Waste-Management:-

Biofuels can be produced from various organic waste materials, offering a way to repurpose waste and reduce landfill volumes. This contributes to improved waste management and reduced environmental pollution.

iv- Rural Development:-

Biofuel production can provide economic opportunities in rural areas by creating jobs in farming, biomass collection and biofuel processing. It can also diversify income sources for farmers and promote agricultural development.

v- Energy Security:

By producing biofuels locally from domestic sources, countries can reduce their dependence on imported fossil fuels, enhancing energy security and reducing geo-political risks associated with energy trade. Biofuels reduces the demand for oil and the price of oil.

vi- Economic Security:

Not every country has large reserves of crude oil. For them, having to import the oil put a huge dent in economy. Shifting on biofuels can reduce dependency on fossil fuels, creation of new jobs will keep economy secure.

vii- Easy Adoption and economical:

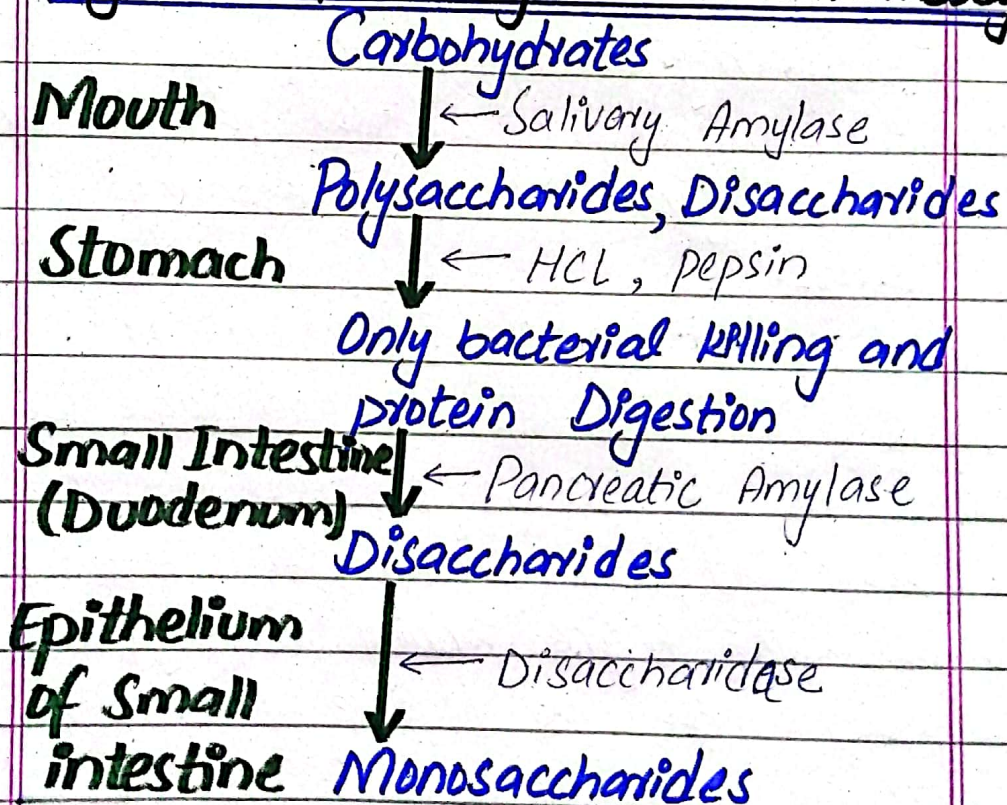
Biofuels are adaptable to current engine designs and perform very well in most conditions. This keeps the engine running for longer, requires less maintenance and brings down overall pollution check costs.

C) Define 'Carbohydrate'. Describe different steps to digest these in human body?

Carbohydrates:

Carbohydrate is derived from two words "Carbo" means carbon, and "hydrate" means hydrogen. Hence carbohydrates contain hydrated carbon. They are also called "sugars" and they are the most abundant molecules on the surface of the earth. Their empirical formula is $C_x(H_2O)_y$. They are mainly classified into three main types: Sugars, starches and Fibers.

Digestion of Carbohydrates in human body:



i- Mouth:-

The journey of carbohydrate digestion begins in the mouth. As, when

food is chewed, salivary gland releases an enzyme called **amylase**. This enzyme initiates the breakdown of complex carbohydrates (starches) into simpler sugars like maltose.

ii- Stomach:-

As the chewed food travels to the stomach, the acidic environment briefly interrupts carbohydrates digestion. However, any sugar or partially broken-down carbohydrates from the mouth continue to be processed.

iii- Small Intestine:-

The real action takes place in the small intestine. The pancreas releases pancreatic amylase into the small intestine, further breaking down starches and complex carbohydrates into maltose, maltotriose, and alpha-limit dextrins. Additionally, enzymes on the surface of the small intestine's lining break down disaccharides like maltose, sucrose and lactose into their monosaccharides components:

a) **Maltase:** Split maltose into two glucose molecules

b) **Sucrase:** Breakdown sucrose into one glucose and one Fructose molecule.

c) **Lactase:** Breaks down lactose into one glucose and one galactose molecules.

iv. Absorption:

Once carbohydrates are broken down into their simplest form (glucose, fructose and galactose), they are absorbed through small intestine's lining and enter the blood streams.

v. Transport and Utilization:

The absorbed monosaccharides are transported to the various cells throughout the body. Glucose is particularly essential as it serves as the primary fuel for cellular energy production. Some glucose is used immediately for energy, while the excess is stored in the liver and muscles as glycogen for future energy needs.

vi. Fiber:

Fiber, a special type of carbohydrates

that body cannot breakdown, reaches the large intestine mostly unchanged. While humans lack the enzymes to digest fiber, beneficial gut bacteria ferment some types of fiber, producing short-chain fatty acids and gases that can be absorbed and used by the body.

D) Describe the 'cell structure'.

Write down at least three differences between an animal cell and a plant cell?

Cell:

The cell is the basic structural and functional unit of life. Millions of cells are present in the human body. The size of cell is very small, thus cannot be seen through the naked eye. Instead, microscopes are used to see them. Robert Hook discovered it in 1665.

Cell structure:-

1-Cell Membrane:

The outermost layer of the animal cell and the second outermost

layer of the plant cells is called the cell wall. The inner layer of the cell is called the cell membrane.

The major components of the cell membrane are carbohydrates, phospholipids, proteins and other lipids such as cholesterol. Together these components make up the fluid mosaic model.

In plant cells, a different cell wall is present outside the cell membrane.

ii- Cytoplasm:-

Cytoplasm is the fluid-like material that is present between the cell membrane and nucleus.

All the cell organelles: **Endoplasmic**

Reticulum - Detoxify the harmful bacteria that enter through food along with the preparation of

protein, **Ribosomes** - helping in the digestion of food, **Golgi-bodies** - preparing the protein into the final product and sending it

to where it is needed; **Mitochondria** - the power house of the cell provides energy to the body, **Plastids** -

assisting the photosynthesis process, **Vacuoles** - acting as storehouses.

of water and other metabolic products etc, are located within the cytoplasm, each having its distinct composition for the particular function.

iii- Nucleus:-

The other major component of the cells is Nucleus, being in the center of Animal cells and at the side of the plant cells. The nucleus of the cell consists of the nuclear membrane, nucleolus, nucleoplasm, and chromosome that carries the genetic information in DNA, a part of Nucleus.

Difference between Plant and Animal cell:-

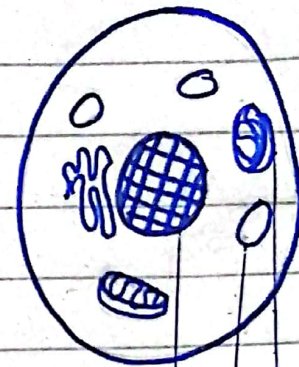
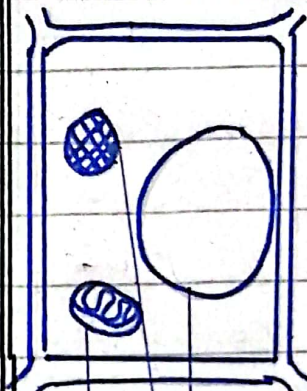
Features	Plant cell	Animal cell
1- Nucleus	Present near the cell membrane.	The nucleus is in the center of the cell.
2- Vacuole	Relatively large vacuole	Relatively small vacuole
3- Cell wall	Possess cell wall	Have no cell wall
4- Centriole	Do not have	They have

v-chloroplasts

Centrioles.
Have chloroplast responsible for photosynthesis.

Centrioles.
Do not contain chloroplast.

VI-Diagram



Nucleus

Vacuole

Mitochondria

Plant cell

Animal cell