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QUESTION No 1

Part A

1 Deficiency of vitamins causes different human diseases some of which are given in table below - - - - - -

Disease caused due to lack of vitamin	Name of the Vitamin
1. poor night vision	Vitamin A
2. Bleeding Gums	Vitamin C and K
3. Rickets in children	Vitamin D
4. Beri-Beri	Vitamin B1
5- Anaemia	Vitamin B12

Part B

2 People suffering from cardiovascular dieases have a high level of Cholesterol in their blood. This often leads to a build up of fats on the internal arterial walls. Suggest how this might be harmful to the heart.

1 **Cholesterol:**

Cholesterol is a fat-like substance belonging to the class of organic compounds named lipid. Inside the body, it is produced by the livers and its external intake sources include egg, milk, and meat due to its importance in maintaining the structure and function of the human cells - the basic unit of life.

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3 High Level of Cholesterol and Cardiovascular Diseases:

However, if the cholesterol level in the body is raised from normal, it can be a severe risk factor for multiple heart diseases that include:

1. Atherosclerosis:

The building of plaque in the vessels is called atherosclerosis. The arteries supplying blood from the heart to the body becomes narrowed and blood flow to the heart muscle is slowed down or blocked.

2. Ischemic Heart Disease:

When arteries are narrowed due to atherosclerosis, less blood and oxygen reach the heart muscle. This is also called coronary artery disease and Coronary heart disease. This can ultimately lead to a heart attack

3. Arrhythmia:

Arrhythmia or irregular heart rate is another heart anomaly that is caused by the blockage of heart vessels, that is, in return, due to raised cholesterol levels.

4. Heart-Attack:

Having too much cholesterol in your blood can cause fatty deposits to build up in your arteries. This can make the arteries narrow and stiff,

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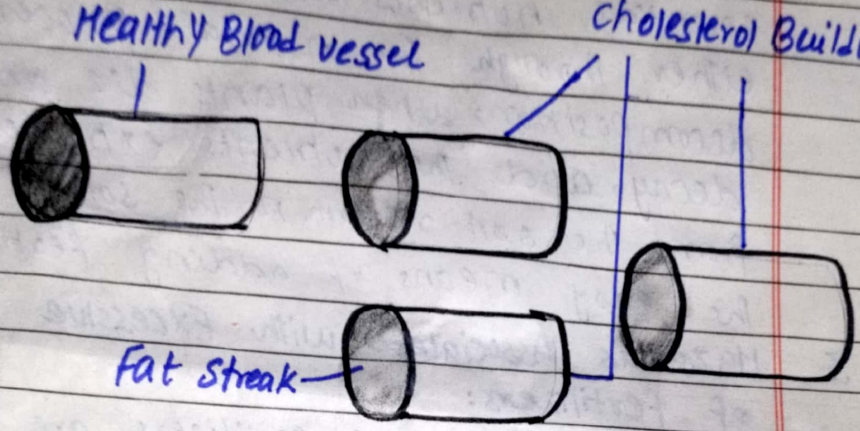
making it harder for blood to flow, causing heart-attack.

5- Heart-Failure:

Heart failure means the heart is unable to pump blood around the body properly. It usually happens because the heart has become too weak or stiff due to the raised level of cholesterol.



Damaged Heart

Part C

3 Why the excessive use of chemical fertilizers should be avoided?

1 Chemical Fertilizers:

Chemical fertilizers are substances containing chemical elements that increase the fertility of the soil and

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improve the growth and productivity of crops.

2 The need for chemical Fertilizer:

Plants require a number of nutrients like sulfur, nitrogen, and phosphorus for their growth. However, soil nutrient levels can decrease over time when crop plants are harvested. Hence, these essential nutrients need to be compensated either through the natural process of decomposition (when plants die and decay, and the nutrients extracted from the soil return to the soil) or by the easy means of adding fertilizers.

3 Hazards Associated with Excessive use of Fertilizers:

Although chemical fertilizers are no less than a blessing for human beings, their excessive uses are associated with numerous hazards.

(i) Chemical fertilizers affect microorganisms living in the soil by disturbing its pH more acidic

(ii) Such kinds of fertilizers are highly soluble in water; thus, they leach away from the soil without benefiting the plants to their maximum.

(iii) Excessive nitrogen used in the chemical fertilizer can emit greenhouse gasses into the atmosphere, contributing to environmental pollution.

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(iv). Since the fertilizers are chemical based, their inappropriate use can cause eutrophication. The phenomenon of accumulation of nutrients building a layer of green algae over water resources that endangers the existence of aequatic life.

(v) The excessive use of chemical fertilizers depletes the soil of natural essential nutrients. Consequently, the produced foods have less nutritious value.

Part D

Why are Scientists worried about the increase of Carbon Dioxide in the atmosphere?

Carbon dioxide is responsible for the enhancement in the ability of the atmosphere to heat. Moreover, the presence of carbon dioxide in the earth's tropospheric zone raises the temperature of the earth's atmosphere. Consequently, it can have devastating outcomes for the inhabitants of the planet earth i.e. global warming and climate change.

Thus, Scientist are worried about the increase of CO_2 in the atmosphere. To understand the concept, it is very important to first understand the function of CO_2 in the atmosphere as well as the causes that are responsible for its increase.

1 Main function of CO_2 in the atmosphere:

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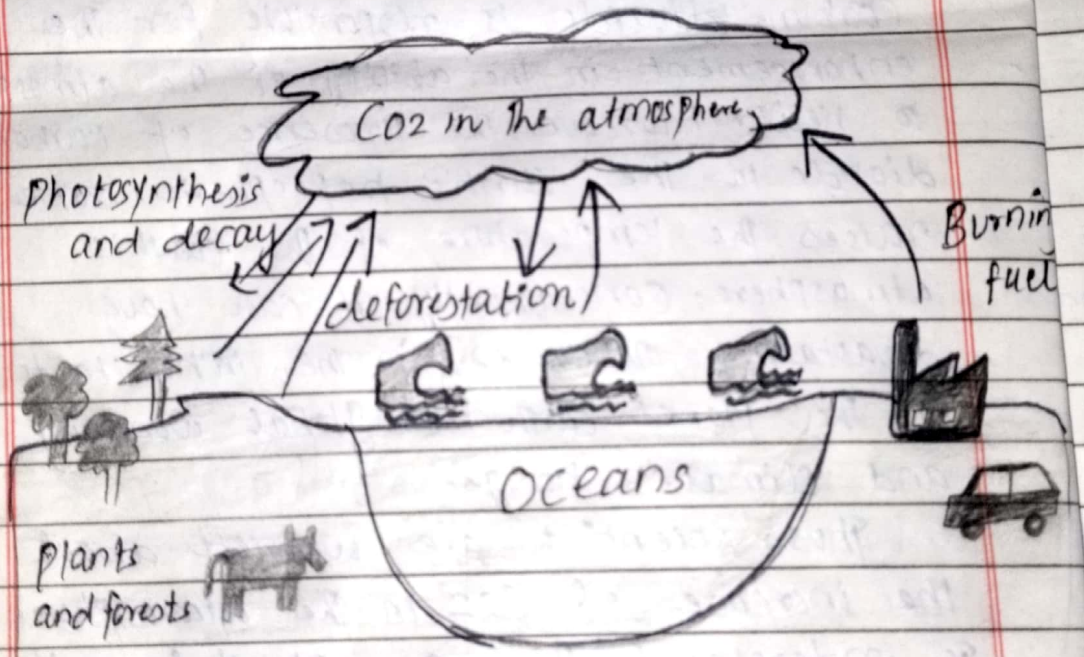
CO_2, being the most important greenhouse gas (GHG), helps in trapping the heat in the atmosphere. one can say that without CO_2 our planet would have been inhospitably cold. without it, Earth's natural greenhouse effect would be so feeble that it would be impossible to maintain its average surface temperature above freezing as it absorbs and holds the energy and heat it recieves from the sun in order to stop it from escaping back into space and re-release it in all possible directions. without it, Earth's ocean would be frozen solid.



2. Causes that are responsible for the increase of CO_2:

Because of the role of CO_2 in climate, feedbacks in the carbon cycle act to maintain global temperatures

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within certain bounds so that the climate never gets too hot or too cold to support life on Earth when this cycle gets disturbed due to some anthropogenic activities. These activities include:

1- Burning of fossil fuels
2- Use of other non-renewable energy resources
3- Deforestation
4- Industrialization.

3 Possible consequences that are making it a huge concern for Scientists:

1- Extreme weather conditions:
Rising temperature has drastic impacts as it can cause:
a. Melting glaciers
b. Floods and flash floods
c. Droughts leading to famine
d. The rising sea level- is an existential threat to human survival.

2- Global Warming and climate change:
Not to speak of the aforementioned impacts, this staggering increase in the level of carbon dioxide in the past few decades is of great concern to Scientists because of the phenomenon of global warming and climate change.
According to NASA, an increasing of 1.5 degrees fahrenheit in global temperature has been recorded which

has made 2022 the 6th warmest year in the continued trend.

4 Conclusion:

So sum it all up, with carbon dioxide enhancement in the atmosphere, the temperature has increased to an alarming level that has become a formidable challenge for the only inhabitable planet Earth.

QUESTION NO 2

Part A

Differentiate between the Renewable and Non-Renewable sources of energy giving examples of each one of them.

Characteristics	Renewable Energy Sources	Non-Renewable Energy sources
Definition	The resources that are continuously replenished and can never run out	The resources that cannot be replenish or recycled and deplete over time
Examples	Water, sunlight, wind, Geothermal	fossil fuels, coals, Natural gas, Petrol
Environmental implications	They are environment friendly as they are produced naturally, and do not emit any harmful gases or pollutants that can cause damage to the environment	They are not environ friendly since some non-renewable energy resources emit carbo monoxide and carbo dioxide, thus causin pollution and ozon depletion respectivel

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Maintenance cost	They require less maintenance as compared to non-renewable energy sources. for example, Turbines in hydropower stations or in wind farms do not require any external system for their functioning or rotating their parts.	They require more maintenance as a lot of time is consumed and takes considerable effort. For example, The process included in searching for coal mines like installation of complex machines, refining, drilling and transporting etc. is very time-consuming
Efficiency	The efficiency of renewable sources and technology is low	The efficiency of non-renewable energy sources and technology is high

Part B

Give a brief account of optic fibers. What is their importance in the present-day telecom system?

Optic fibers refers to the use of thin flexible fiber of glass that transmit information as a light pulses or signals mainly used for telecommunication. The number of optic fibers in a cable can vary from just few to couple hundreds.

The basic structure of optical fibers:

optical fiber consists of four layers

1. Core made up of glass
2. Cladding is a reflective layer made

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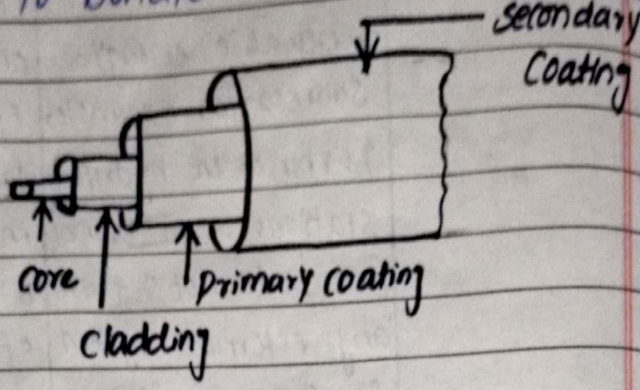
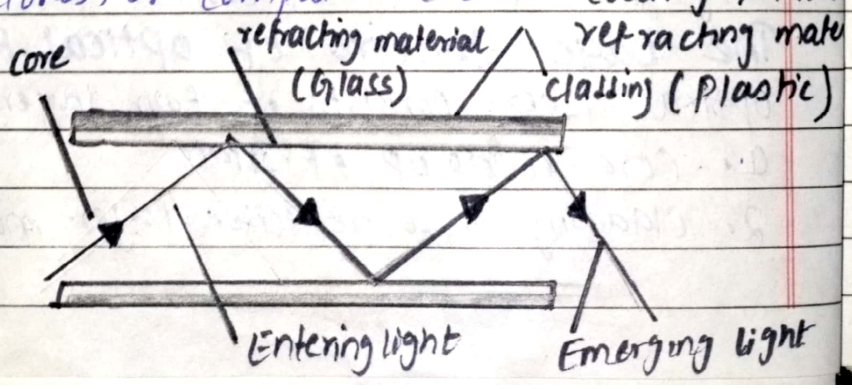
up of glass or plastic
3. Coating cover as a protective layer
4. Jacket to bundle all fibres in one cable



Structure of optical fiber

Working of optical fiber:

In a fibre-optic system, a machine called a transmitter turns information into the light. Then the transmitter sends the light through optical fibres. As the light moves at a high speed through the core, it bounces off the cladding either by the phenomenon of total internal reflection or continuous refraction. If the fibre has a bend in it, the light can bounce off the cladding and turn the corner to follow the bend. At the end of the fibres, a machine called a receiver accepts the light. The receiver turns the light back into sound, pictures, or computer codes



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Importance of optical fibers in present-day telecommunication:

In present-day telecommunications, fibre optics is used widespread due to a number of reasons.

1. Much lower levels of signal attenuation
2. Fibre optics provides a much higher bandwidth allowing more data to be delivered.
3. They are much lighter than the coaxible cables that might otherwise be used.
4. Fibre optics does not suffer from stray interference pickup that occurs with coaxial cabling.

Part C

3 What is the most dangerous part of a hurricane and how do cyclones affect humans?

1 **Hurricanes:**

A hurricane is a weather phenomenon that is essentially a rapidly rotating storm system with characteristics such as a low-pressure centre, strong winds, and thunderstorms that produced heavy rain.

2 **The most dangerous part of a Hurricane:**

Structurally, the eye-wall of a cyclone surrounds the eye or base of the storm where the most damaging winds and intense rainfall is found.

Cyclones are often accompanied by

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strong winds, torrential rains and storm surges among which storm surge is the most dangerous part of a hurricane. It is an abnormal rise of water generated by hurricanes, over and above the predicted astronomical tide.

Hurricane

3 Effects of Cyclones on Humans:

Storms, Cyclones, Hurricanes, Typhoons, etc. are the terms used for the same process; however, their names are based on where they happen - location. Following are the impacts of cyclones / hurricanes.

1- The rise in Sea level:

Cyclones out at sea can also destroy ships and cause shipwrecks which can cause many deaths. Money can also be lost if the ship is carrying expensive cargo

2- Damage to the human infrastructure:

The cyclones strong winds can rip the roof of a house or destroy it entirely. It can send flying debris into houses. Any objects that have not been tied down

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will get sent flying most likely never to be found again.

3- Migration of People:

After a cyclone has struck and the strong winds and flooding have subsided, people start to return to their houses to inspect the damage. Often the damage they find is devastating as almost everything is destroyed and thousands of people are left homeless.

4- Loss of biodiversity:

Cyclones leave negative impacts on biodiversity, causing the decline or disappearance of various varieties of plants and animals species.

5- Psychological impacts:

A disaster of any kind has long-lasting fear in minds of the masses. They have witnessed a large number of deaths, collapse of infrastructures, cries, pains and sorrow.

Part D

What's the difference between vaccines and antibiotics? How do antibiotics and vaccines contribute to health?

Differences	vaccines	Antibiotics
Definition	Dead or inactivated organisms or compounds are used to provide immunity to a particular infection.	Small molecular compounds that are effective in treating animals and humans against certain dieases
Source	They are produced by live or inactivated	Antibiotics are prepared naturally or synthetically

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	microbes, toxins, and antigens.	by different drugs
Functions	they are used to build immunity and prevent viral infections.	However, antibiotics are used to treat bacterial and parasitic infections
Adverse Effects	Sometimes cause allergic reactions and swelling.	they can cause gastr discomfort and allergic reaction
Examples	Polio, vaccine Measles, Mumps and Rubella (MMR) vaccine	Penicillin Cephalos. Porin's

Contribution of vaccines and antibiotics toward health

vaccines and antibiotics have significantly contributed to improving health and also increasing the longevity of human beings as vaccines strengthen your immune system so infections can't get started and antibiotics help fight an infection that is already making you sick.

QUESTION NO 3

A What is the importance of forests in the economy of a country?

1 **Forest:**

Forest are the most valuable assets for every nation. They provide timber, firewood,

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forage, and medical plants. They help in the conservation of soil fertility and thus enhance its productivity. They also help sustain the country's wildlife and provide a lot of recreational activities.

2. Significance of forests in the Economic Development of a country:

1- Monetized and cashed value contributions from the forests:

The forest sector is also an important source of both formal and informal jobs, particularly in remote areas where there are few economic alternatives. A lot of people are engaged as woodcutters sawyers, carters, and craftsmen, and therefore are full-time employed because of the presence of forests. For example: in Pakistan, 500,000 workers are employed by forest-products industries such as furniture, village carpentry, matches, particleboard, boats, crates, boxes, paper, pulp, and chipboard.

2- Forests economy at the household and community level:

Wood grown in forests serves as a source of energy for rural households. Wood is used for furniture, infrastructure and interior of houses as a construction material, environment-friendly products, tools, weapons, and fuel.

3- Sustainability supply chains and forests:

Forest, being the eco storehouse for

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Carbon, are Solar-powered and renewable resources of energy and they also have the potential to mitigate climate change by replacing non-renewable material and can act as a substitute for fossil fuels. Hence, they work as a sustainable supply chain for any country.

4- Paper obtained from woods:

According to some reports, the degree of economic development of a country is determined by its per capita consumption of paper. Hence, whenever a country gets economically developed, paper is utilized as packaging material, in communications and in scores of other uses.

B Give a brief account of Biotechnology.

1- Biotechnology:-

Biotechnology is the branch of science that makes the use of living organisms or their component molecules, cells, tissues, and organs through scientific or engineering procedures for the benefit of mankind.

2- Discovery:

The word "biotechnology" was first coined by Hungarian engineer Karl Ereky in 1919 who used it to describe the natural processes to create industrial products.

3- Importance of Biotechnology:

Biotechnology has been a blessing for.

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human life. following are some of the major categories which are encompassed by biotechnology.

1- Medical Biotechnology (Red):

As the name indicates, medical biotechnology is majorly concerned with the field of human health and medicine.

(i) It aids in the formulation of pharmaceuticals by determining the dosage of patients and, more particularly, treating patients based on genetic code.

(ii) In therapeutic medicine, the preparation of vaccines, the production of insulin for diabetes treatment and gene therapy for HIV/AIDS and cancer tissue treatment are all due to biotechnology.

2- Industrial Biotechnology (White):

The procedures deal with the organic technology advancement in the industry.

(i) It focuses on the use of natural resources for industrial processes that utilize less energy with high productivity.

(ii) It improves the efficiency and competence of manufacturing while lowering the environmental impact. To conserve natural resources, waste goods can be handled and recycled.

3- Environmental Biotechnology (Green):

Environmental and agricultural biotechnology comes under the category of green biotechnology.

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(i) Biotechnology can be used for energy production, bioremediation, and waste treatment to clean the surroundings.
(ii) It improves crop productivity by providing protection against diseases, which is doubled or even tripled compared to a typical harvest.
(iii) Biotechnology can transmit genetic traits of crops that can endure changing climate conditions while also improving nutritional quality.

4- Marine Biotechnology (Blue):

Blue biotechnology deals with the research of marine life, particularly sea animals.
(i) The blue biotechnology has a significant impact on the industrial, environmental, and food sectors since submarines create vast quantities of protein, enzymes, biomaterials, and biopolymers

C Do the mammals also lay eggs? If yes, where in the world do they live? Write the name of some of them.

1- Egg-laying Mammals:

Not all the members lay eggs. However, there is a group of mammals called Monotremes - for kingdom Animalia that lay eggs instead of giving birth to their young ones.

2- The Habitat and Examples of Egg-laying Mammals:

1- The duck-billed platypus is native

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to Tasmania and the neighbouring areas of eastern Australia.

2. There are four species of Echidna distributed as follows:
   a. Short-Beaked found across Australia and into New Guinea.
   b. Eastern Long-Beaked lives in humid forests, especially above sea level, in New Guinea.
   c. Sir David's Long-Beaked Echidna lives in the Cyclops Mountains of New Guinea
   d. Western Long-Beaked Echidnas live in alpine meadows and Montane forests. They are considered critically endangered; however, those that are remaining live in New Guinea.

D How can the Sun have such a strong gravitational field if it's made of gases?

1 **Gravitational Field:**

Every body of matter in this universe attracts other bodies of matter toward itself with a force known as gravitational force.

2 **Factor Affecting Gravitational Field:**

following are the factors that affect the gravitational field of an object.

a. Mass
b. Distance

$$F \propto m/d^2$$

3 **Why Sun has a very Strong magnetic**

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field?

Although the sun is made up of a huge amount of gases, it does not matter if a substance is comprised of gas or a liquid or a solid. The only physical factor that depends is mass, and the sun is extremely massive than all the planets of the solar system. Thus the sun has way more gravitational field through which the sun attracts all planets towards it.

QUESTION NO-4

A What does Ozone depletion mean and how can we protect the ozone layer?

1 **Ozone Depletion:**

It is a process where atomic particles such as chlorine and bromine react with ozone molecules (O_3) and can cause the ozone molecules to break down. The ozone layer present in the stratosphere functions in a way that it absorbs the UV rays and protects the earth from these rays emitted by sun, however depletion of the ozone layer means the earth will be exposed to ultra violate rays which can cause serious health issues such as cancer, blindness, and genetic mutation.

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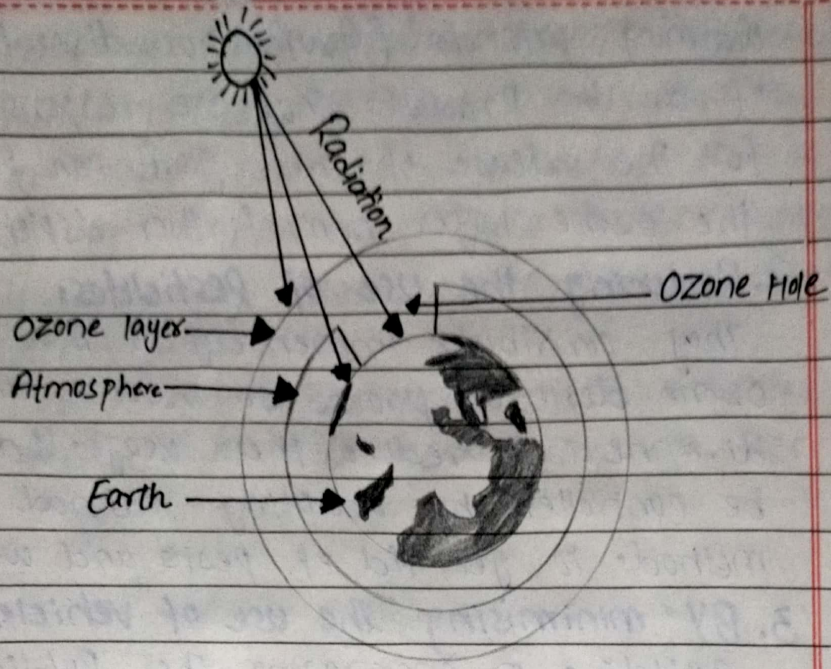

2- How Ozone layer can be Protected?

Ozone layers can be protected by adopting various measures. The depletion of the Ozone layer is a formidable challenge and various programmes have been launched by the government of various countries to prevent it. However, Pragmatic steps should be taken at the individual, societal, national and, above all, global levels to prevent the depletion of the Ozone layer.

Measures to Protect the Ozone layer:

1. Discontinuing the Products which Produce Chlorofluorocarbons (CFCs) Hydro-chlorofluorocarbons (HCFCs) and Halogens:

CFCs (Chlorofluorocarbons), HFCs, halogenated hydrocarbon, and nitrous oxide are some of the most dangerous gases as they have a very high global

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warming Potential (GWP). Thus, discontinuance of all the products that are responsible for the release of these gases can protect the ozone layer from further depletion.

2. Reducing the use of Pesticides:
They contribute immensely to the ozone depletion process so there is a dire need to reduce their usage. It can be controlled by adopting natural methods to get rid of pests and weeds.

3. By minimising the use of vehicles:
Switching or encouraging the public to switch from private transport to public can play role in reducing the emission of greenhouse gases, which is also a stimulant to ozone depletion.

B What are the different types of a network? Explain each briefly.

1 **Computer Network:-**
A network is a group of computers that are linked together in a way that enables the computer to communicate with another computer and share its resources, data, and applications.

2 **Types of a Network:-**
Based on the size of the coverage area, a network is mainly of four types

1- LAN (Local Area Network):
A computer network that covers

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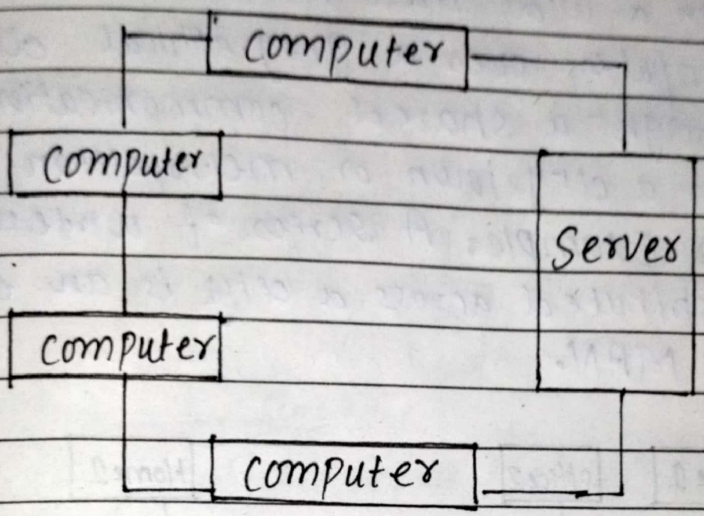
only a small areas for examples offices, buildings, etc. A LAN encompasses two or more computers connected over a server. In LAN, the data transfer system is extremely fast and provides higher security.

For example: The two important technologies involved in this network are Ethernet and Wi-fi.



Local Area Network (LAN)

2-PAN (Personal Area Network)

A network that is arranged within an individual personal area connecting the computer devices of personal - covering as far as 10 meters - use is known as personal Area Network.

For example: USB, computers, phones, tablets, printers, etc..., are some examples of PAN

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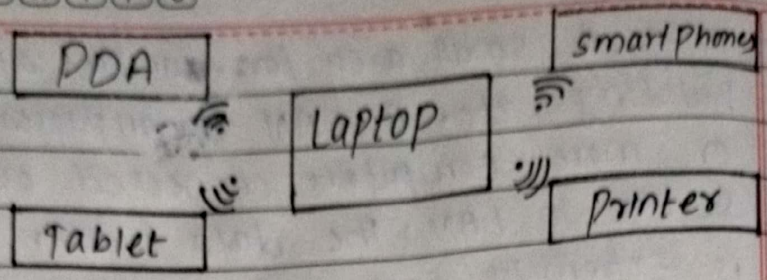
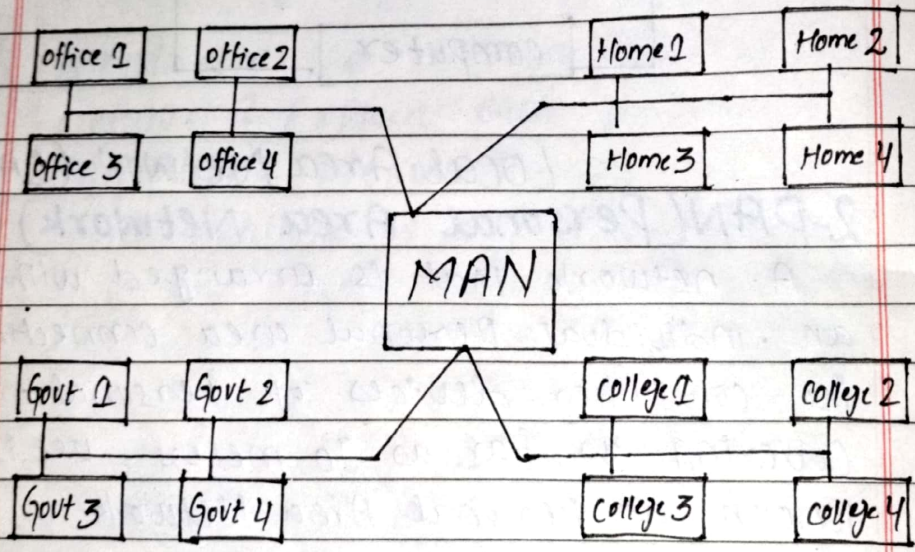


Personal Area Network (PAN)

3- MAN (Metropolitan Area Network)

A metropolitan network area is larger than a local area network but smaller than a wide area network, i.e -> It connects computers over a geographical distance through a shared communication path over a city, town or metropolitan area.

For Example: A series of wireless routers distributed across a city is an example of MAN.



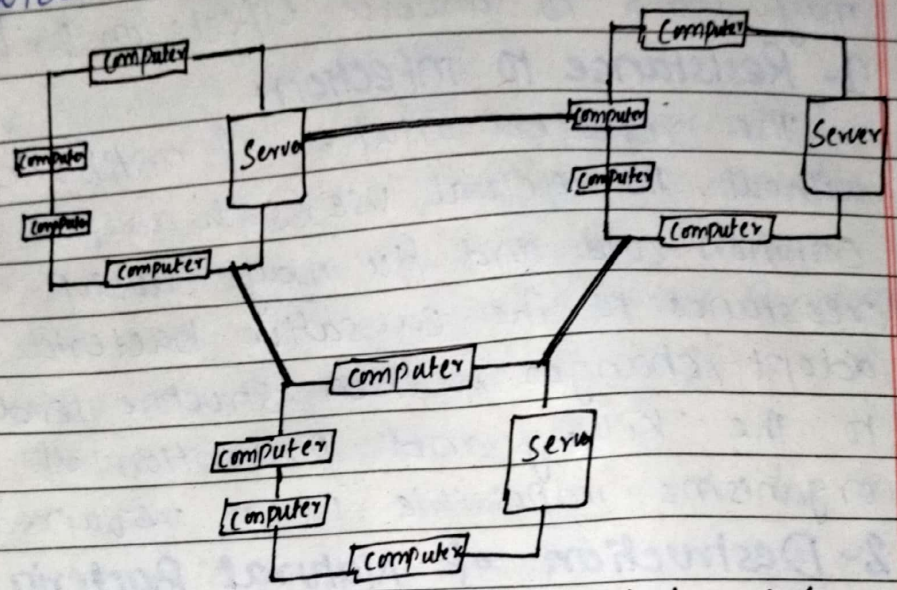
Metropolitan Area Network (MAN)

4- WAN (Wide Area Network)

A computer network that connects computers over a large geographical.

distance through a shared communication path is called a wide area network. It is extended over many locations rather than limited to a limited location.

For Example: The internet is one of the most widespread examples of a Wide Area Network.



Wide Area Network (WAN)

C Why an indiscriminate / casual use of Antibiotics may prove dangerous?

1 **Antibiotics:**

An antibiotic is a type of antimicrobial substance that is used to treat bacterial and other microbial infections.

For Example:

a. Penicillin
b. Cephalosporin
c. Tetracycline
d. Aminoglycosides.

2 **Dangers associated with the casual**

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Use of Antibotics:

Since antibiotics work on the basis of a particular mechanism on specific receptors, they are safe to use until taken according to a prescribed dose for a particular number of days. However, taking antibiotics repeatedly may lead to adverse effects on the body.

1- Resistance to infection:

The repeated intake of antibiotics without the actual use, such as for common cold and flu may develop resistance to the causative bacteria that adopt changes in their structure leading to the killing and prevention of organisms impossible when required.

2- Destruction of Natural Bacteria:

The inappropriate use of antibiotics sometimes also kills the naturally occuring good bacterias which exposes the body to many other killing infections, for instances, fungal and yeast infections.

3- Adverse Reactions of Antibiotics:

Antibiotics also produce adverse effect on the body that make the natural defence system of the body weak and imposes deadly effects on the other organs including the kidneys, livers, and gastric system.

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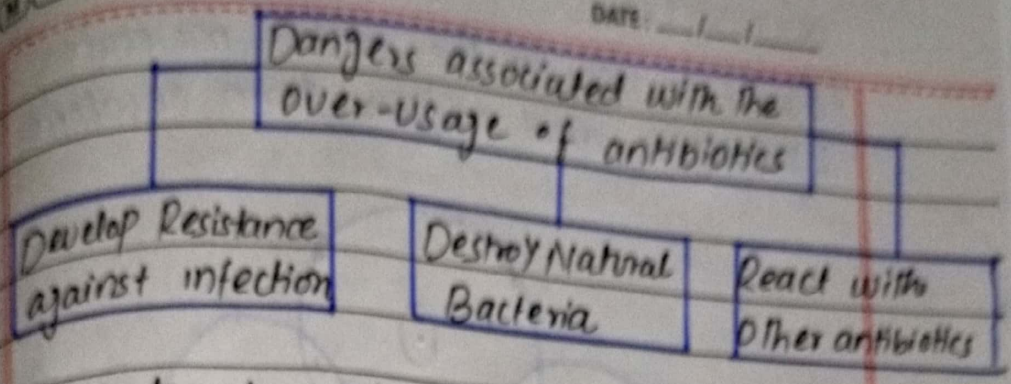

Q Why do atoms form bonds? Name three major types of chemical bonds.

1 **Chemical Bonding:**

The formation of a chemical bond between two or more atoms, molecules, or ions to give rise to a chemical compound is called chemical Bonding.

2 **Why do Atoms form Bonds?**

Atoms form bonds because

a. They always yearn to reach the most stable (lowest energy) state via donating, accepting, or sharing of electrons.

b. Atoms are only satisfied when they fill their valence shell with electrons and satisfy the octet rule by having eight valence electrons.

3 **Types of Bonds:**

1- **Covalent Bond:**

A covalent Bond is the force of attraction that holds together two non-metal atoms that share a pair of electrons. One electron is provided by each atom, and the pair of electrons is attracted to the positive nuclei of both atoms.

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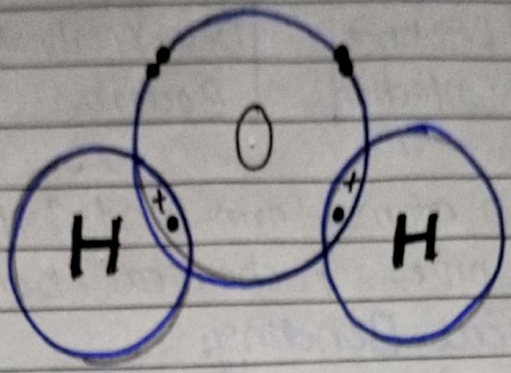
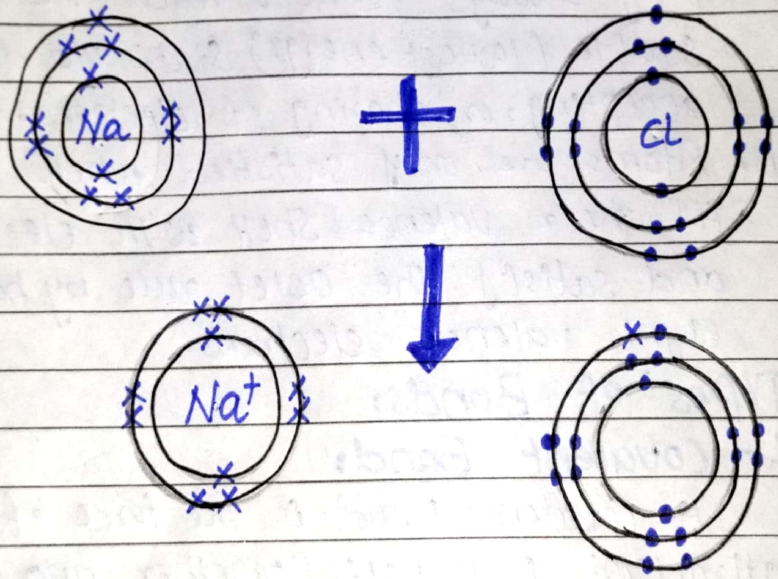
For Example: in the water molecules hydrogen and oxygen form covalent bonds.



2-Ionic Bond:

An ionic bond is the force of attraction that holds together oppositely charged ions Ionic bonds form crystals instead of molecules.

Example: Sodium chloride crystals.



3-Metallic Bond:

A metallic bond is the force of attraction between a positive metal ion and the valence electrons that surround it - both its own valence electrons

and those of other ions of the same metal. The ions and electrons form a lattice-like structure.

Example: copper