

What is the difference between fog and smog?

What are the causes of smog and its effects on human health? Write (short note on any one of the latest technologies to eliminate smog to avoid atmospheric pollution.)

Q: NO: 01

a) Difference Between Fog and Smog

i) Phenomenon

Fog

It is a weather condition when tiny water vapours turn into small droplets because of cold, humid and calm weather

Smog

It is not natural process. It happens due to spread of pollutants which surround over atmosphere

ii) Composition

Fog only consists of water in the form of droplets  
Smog possesses harmful gases such as  $\text{CFCs}$  (C, CO,  $\text{SO}_2$ ,  $\text{NO}_x$ , etc)

iii) Cause

It is caused by natural weather due to the process of condensation which changes air molecules in solid droplets  
It is caused by human activities like industry emission, vehicle emission and burning of fossil fuels

iv) Health concerns

No big concerns but reduces visibility  
Leads to asthma, Bronchitis, and cardiovascular diseases.



## Cause of Smog:

- i- Spread of pollutants like CO, SO<sub>2</sub>, NO<sub>x</sub>, PM<sub>2.5</sub>, and other gases, they stem from vehicle emissions.
- ii- Some pollutants are spread by industry emissions which contain processes in which C, O, S, and N gases emit.
- iii- Residential fuel combustion while using generators, motors and other home appliances.
- iv- No carbon sink due to extreme deforestation.
- v- Meteorological conditions like extreme heat and humidity and low precipitation.

## Effects on Human Health:

- i- Respiratory Disease: Chronic Bronchitis, Lung failure, Pneumonia and Asthma.
- ii- Cardio vascular Disease: Heart attack, strokes, high blood pressure, and atherosclerosis.
- iii- Brain related disease: Dementia, ADHD, etc.
- iv- Skin Problems such as itchy skin, aging & wrinkles, and allergy.
- v- Life Expectancy Reduced: Aged people do not live in this atmosphere due to prior illness.

## Latest Technology to Reduce Smog



In year 2024-25, China and Japan came up with new technology to offset the spread of smog with natural compounds. They invented "Atmospheric Hydroxyl Radical Generators". It releases hydroxyl radical ( $\cdot OH$ ) into the air which breaks compounds like  $NO_x$ ,  $SO_2$ ,  $C_6H_6$  and VOCs. The technology is more powerful than ionization and photocatalytic systems.

What are the different layers of the atmosphere? On what basis these layers are classified? In which layer Auroras are formed and where do satellites orbit?

## B) Layers of Atmosphere

Atmosphere is like a gaseous blanket over the Earth. It is generally divided into five layers, classified on the bases of temperature, pressure and altitude.

### i) Troposphere

It is the first layer of atmosphere, starting from earth crust to 12km of altitude. All of the biosphere lie in this layer such as animals and plants. Some commercial flights also carry in this layer. In this, with altitude temperature



decreases upto  $-52^{\circ}\text{C}$ .

## ii) Stratosphere

A Second layer of atmosphere having ozone ( $\text{O}_3$ ) gas which protects life on earth from sun's ultra violet rays. with altitude the temperature declines sharply upto  $-3^{\circ}\text{C}$  from  $-53^{\circ}\text{C}$ . Some huge aircrafts also fly in this layer. The distance is ~~12~~ ~~52~~ km in it.

## iii) Mesosphere

It is the coldest layer of atmosphere in which temperature reduces upto  $-100^{\circ}\text{C}$ , breaking the meteors. It expands upto 80 km.

## iv) Thermosphere

This layer is the hottest layer in the atmosphere because of charged particles growing from UV rays of sun. Due to charged particle, the Auroras (a light of color pink, blue and green) can be seen from it. Here the temperature is  $8000^{\circ}\text{C}$ .

## vi) Exosphere

The outmost layer of the atmosphere, connecting with space. Here satellites revolve due to negligible



air pressure and sound.

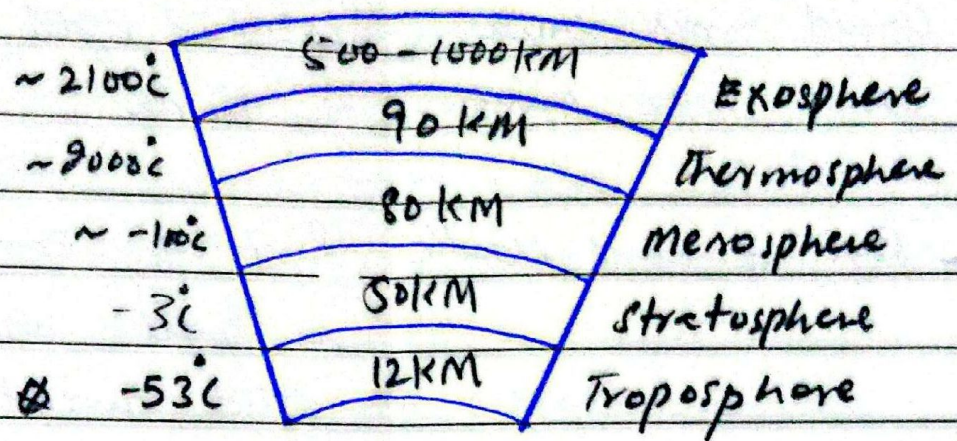


Fig: 1.1

### Formation of Auroras: Layer

Auroras are formed in thermosphere due to very high temperature. Particles become ionized and charged, therefore, they emit color like green, pink and blue.

### Orbit of Satellites

Artificial satellites like ISS and GPS rotates in exosphere, the outermost layer of atmosphere. This layer is like vacuum and it is easy for satellites to orbit there.

### c) Difference Between Asthenosphere and Lithosphere

Asthenosphere

Lithosphere



i- It is half solid and liquid rocks layer beneath the Earth crust. It is full rocky, solid and rigid layer of Earth.

ii- Part of Earth Mantle as well as upper solid mantle Part of Earth crust

iii- It is deep upto 350km from 100km It's continental crust is 40-70km thick, and oceanic crust is 5-10km thick

iv- It is made up of mantle, so composed of Ferr-magnesium silicates It is made up of both aluminous and magnesium silicates

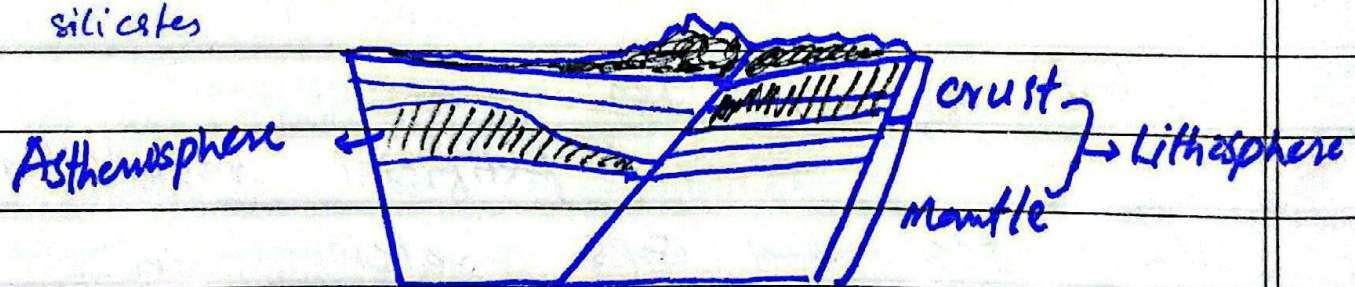


Fig: 1.2

## Components of Lithosphere

i- Crust

Crust is the surface part of earth which is called Lithosphere. It includes two main parts such as continental crust and Oceanic crust.



### a) Continental crust

The surface area of continents includes in this part which is above the sea level and also includes landscapes and mountains.

### b) Oceanic crust

All the rocky surface inside the ocean comes under the oceanic crust.

### ii- Mantle

It is a rocky as well as liquid or mixed layer underneath the crust. It is about 2800 km deep. The mantle is further divided in upper middle and lower mantle.

## D) Ozone Depletion

Ozone is a gas consists of 3 molecules of Oxygen,  $O + O + O \Rightarrow O_3$ . It helps impede Ultraviolet rays of the sun which are very harmful.

Ozone depletion is process when a thick of  $O_3$  surrounding the stratosphere get weaker due to sun's rays and



human made emissions of CFCs  
(C, CO, CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub>, PM<sub>2.5</sub>).

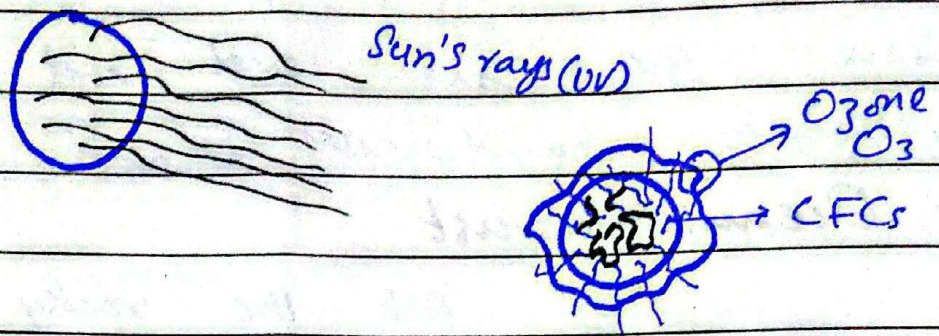


FIG: 1.3

Following steps should be taken to  
Protect Ozone Layer:

### i- Reducing Emissions of CFCs

CFCs are the biggest threat to Ozone layer. They are spread out by vehicles, Industries and other fossil fuel process.

### ii- Use of Renewable Energy

Renewable sources such as Solar, hydel, thermal and nuclear can be used instead of fossil fuels.

### iii- Promoting Carbon tax

There should be a world wide system which examine carbon emissions, if they <sup>(industry)</sup> cross the given limits, they should be imposed fines



#### iv- Promoting Green Automobiles

Automobile emission is the one of the highest contributor to CFCs, almost 40% of CFCs are because of carbon emissions from automobiles (UN-climate fund). So, there should be the usage of green automobiles to reduce the carbon emissions.

#### v- Promoting Institutional Framework

Framework such as Montreal protocol and Paris Agreement should be promoted despite political engineering. climate justice and finance should be protected by these frameworks.



(a) Recently, a new case of polio has been reported in Pakistan, raising concerns about public health and eradication efforts. Discuss the causes of the persistence of polio in Pakistan and suggest effective strategies to achieve complete eradication.

Section - A  
Q. NO: 01

a) CAUSES OF THE PERSISTENCE OF POLIO IN PAKISTAN

i) Poor Sanitation and water contamination

Polio is persistent in Pakistan because of improper sanitation. In urban as well as rural areas, people do not have proper sewerage system. Resultantly, water containing — animal and human — **excreted material** flows into farming land, leading the whole population, vulnerable to polio virus.

ii) Skepticism to polio vaccine

Due to misinformation on media, people are hesitant to get their children vaccinated. They fear that the vaccine may bring infertility.

iii) Issue of vaccine accessibility

There are many remote areas in Balochistan and FATA.



where delivering vaccination is a hectic task. There is also fear of terrorism due to prevailing terrorist outfit. So, vaccines hardly reach there.

#### iv) Discontinuity in Vaccine

Due to political unrest, vaccination drive face impediments. frequent government changes, makes harder for policy maker to draw a long-term policy.

#### v) Lack of waste Management

Pakistan lags behind proper solid waste management.

There no such mechanism in cities to keep wastages outside of the public area. Therefore, it leads to contamination in air & soil which make people more prone to polio.

### ⇒ Strategies to eradicate polio

#### i- Immunization Drive:

Government should speed-up immunization drive so that



children could get more immunity.

## 2- IPV (Inactivated Polio Vaccine)

Government needs to deliver IPV to remote areas where the virus is widespread. IPV is injection-based vaccine and a bit costly also.

## 3- OPV (Oral Polio Vaccine)

This is also one of basic strategies of preventing polio virus. Government should aid more workers to deliver OPV rapidly.

## 4- Solid Waste Management

Building management system of waste can be game changing. There is need of proper waste disposal in cities to reduce the chances of virus.

## 5- Proper Sanitation

District level town committee needs to revamp the infrastructure, so water leakage could be stopped. There is also dire need of proper water channelling.



13) High level of cholesterol intake can be life-threatening in the following ways;

(i) Increasing Blood Pressure

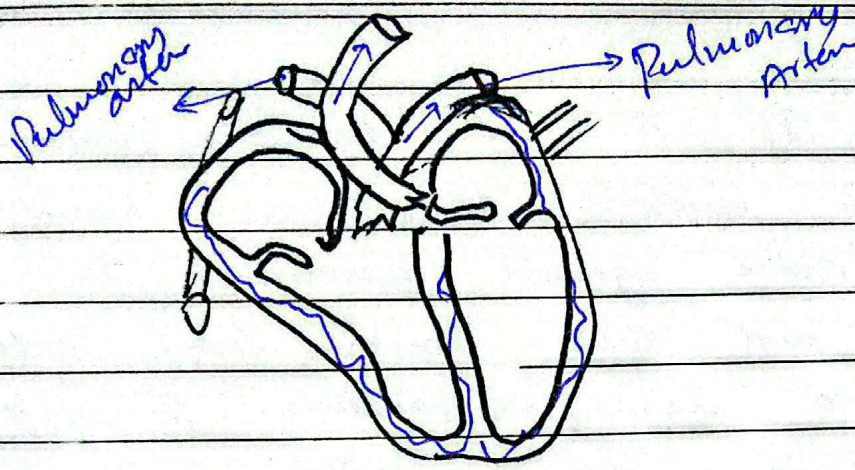
The LDL-based cholesterol create more fat in the body. It directly influence the heart. When fat becomes rigid and thickly in heart valves, it results in fast heartbeat and becomes pumping the blood too fastly. So, blood pressure rises which can lead to Brain stroke or heart attacks

(ii) Creating Blood Clots

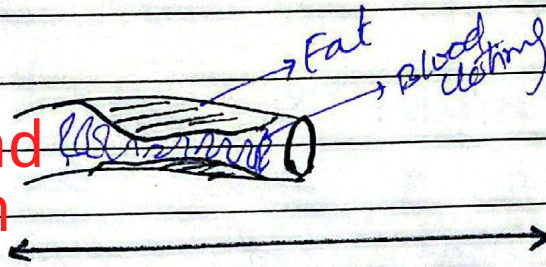
High levels of cholesterol may increase fat in arteries off the heart. When fats becomes thick in the arteries, it create a plaque which stops the heart flow and ends up in cardiac arrest.

(b) People suffering from cardiovascular disease having high level of cholesterol in their blood, this often leads to build of fats on its internal arterial walls, suggests how this might be harmful to the heart

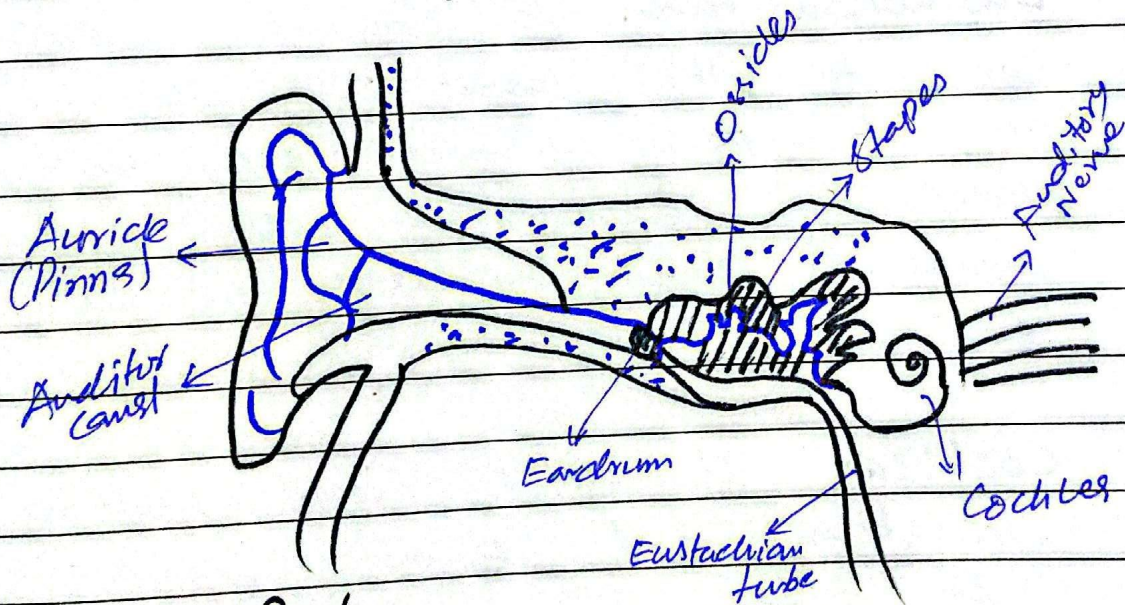




(c) Draw the structure of human ear and briefly explain its functions.



## c) Structure of Human ear



### Functions of Parts:

- i) **Auricle:** It helps collect sound waves travelling through air and directs into the auditory meatus (canal)
- ii) **Auditory canal:** A tube through which sound



waves travel.

- (iii) **Eardrum:** It is the boundary between outer & middle ear. When sound waves strike against eardrum, it vibrates and then converts them into sound energy. Afterwards, it sends vibrations to the middle ear.
- (iv) **Auditory Ossicles:** It contains the smallest bones of human body (malleus, incus and stapes) and transfers vibration from eardrum to inner ear.
- (v) **Eustachian tube:** It connects middle ear to the throat. It allows air to pass between the both sides of eardrum. It also equalises air pressure in the ear.
- (vi) **Cochlea:** It helps create hearing sensation and sends message to the brain.
- (vii) **Auditory Nerve:** A nerve which brings hearing messages to the brain, then brain transfers



(d) What are causative organism and vector for dengue, enlist possible ways of prevention from dengue.

## D) Causative Organism

There are specific micro-organisms (virus, bacteria, fungus, or parasites) that cause a disease. In short, it is the disease-causing agent that produces the infection.

In case of Dengue: It is virus

Family = *Flaviviridae*

Genus = *Flavivirus*

Serotypes = DENV (1, 2, 3, 4)

## i) Vector For Dengue

a. *Aedes Aegypti*

b. *Aedes albopictus*

Vector is an insect which carries virus and transmit a disease from one host to other. *Aedes* mosquito carries virus, it bites human and then another mosquito sucks human blood and infects another human.

Mosquito  $\rightarrow$  Human  $\rightarrow$  Mosquito  $\rightarrow$  Human



## (ii) Ways to Prevent Dengue:

- a. Proper waste disposal units around the cities
- b. Building proper sewerage system
- c. Dry out stagnant water.
- d. Use of Anti-mosquito spray at home-level as well as society-level
- e. Isolate the affected
- f. Use of safety nets from mosquitoes
- g. Use of full-sleeves and long socks.

