

THE ATMOSPHERE

Long Answer Questions

Q.1 What is the role of CO₂ in atmosphere?

Ans. Role of CO₂ in Atmosphere:

The CO₂ forms a layer around the Earth like an envelope. It allows the heat rays of the Sun to pass through it and reaches up to the Earth. These rays are reflected from the Earth surface and go back to upper atmosphere.

Normal concentration of CO₂ layer retains enough heat to keep the atmosphere warm. So, normal concentration of CO₂ is necessary and beneficial for keeping the temperature warm. Otherwise, the Earth would have been uninhabitable. The Earth's average temperature would be about -20°C, rather than presently average temperature 15°C.

Q.2 What are the effects of global warming?

Ans. Effects of Global Warming:

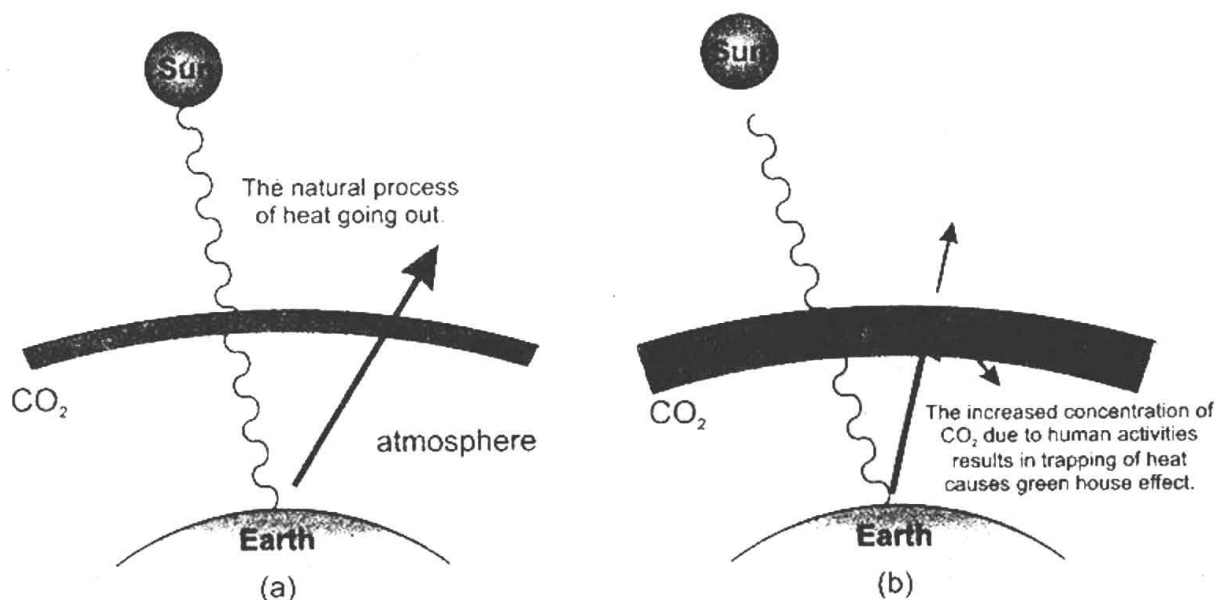
- (i) Accumulation of carbon dioxide in air is resulting in increasing atmospheric temperature about 0.05 °C every year.
- (ii) It is causing major changes in weather patterns. Extreme weather events are occurring more commonly and intensely than previously.
- (iii) It melts glaciers and snow caps that are increasing food risks and intense tropical cyclones.
- (iv) Sea-level is rising due to which low lying areas are liable to be submerged, turning previously populated areas no longer habitable.

Q.3 Write a note on Green House Effect?

Ans. Green House Effect:

Although CO₂ is not a poisonous gas, yet its increasing concentration due to burning of fossil fuels in different human activities is alarming. Because CO₂ in the atmosphere acts like a glass wall of a green house. It allows UV radiations to pass through it but does not allow the IR radiations to pass through it. It traps some of the infrared radiations emitted by the Earth. Hence, increased concentration of CO₂ layer absorbs the infrared radiations emitted by

the Earth's surface and prevents heat energy escaping from the atmosphere. It helps to stop surface from cooling down during night. As the concentration of CO_2 in air increase, less heat energy is lost from the surface of the Earth. Therefore, the average temperature of the surface gradually increases. This is called greenhouse effect as shown in figure. This effect is proportional to amount of CO_2 in air. Greater is amount of CO_2 , more is trapping of heat or warming. Due to increased warming this phenomenon is also called global warming.



Q.4 Is CO an air pollutant? If yes, What are its effect on human health?

Ans. CO is an air pollutant. It is a health hazard being highly poisonous gas. Being colorless and odorless, its presence cannot be noticed easily and readily. When inhaled, it binds with the hemoglobin most strongly than that of oxygen. Thus, hindering the supply of oxygen in body. Exposure to higher concentration of CO causes headache and fatigue. If inhaled for a longer time it results in breathing difficulties and ultimately death. It is the reason burning is not allowed in closed places. It is advised to switch off coal or gas heaters, cooking range, etc., before going to sleep.

Q.5 What should be the role of Government to control pollution?

Ans. Role of Government to Control Pollution:

(i) Quality of Fuel

First of all, quality of fuel must be improved by adding anti-knocking agents in fuels .at the same time, automobiles combustion engines must be efficient so that they should burn the fuel completely. No unburned hydrocarbon molecules (fuel) should come out of the exhaust. So government must guide the people to use converters in auto exhausts.

(ii) Alternative Fuel

Fossil fuel produces a number of air pollutants because of impurities and complex molecule nature of hydrocarbons. Government should promote the use of alternative fuels

such as methanol, ethanol and bio-diesel. These fuels are less polluting than hydrocarbons fuel, as their molecules are simple, and burn completely in the engine. Their burning produces less carbon monoxide, soot and other pollutants.

(iii) Battery-powered Electric Vehicles

The government must plan to avoid using carbon dioxide producing fuels as it is a greenhouse gas. It should go to battery-powered electric vehicles.

Government should provide efficient transport in the big cities, so that people should avoid using their own vehicles.

Q.6 How acid rain is formed? Explain

Ans. Formation of Acid Rain:

The burning of fossil fuels produces oxides of sulphur and nitrogen in air. Rain water converts SO_2 into H_2SO_4 and NO_x to HNO_2 and HNO_3 . Normal rain water is weakly acidic because it consists of dissolved CO_2 of the air. Its pH is about 5.6 to 6. But rain water on dissolving air pollutants (acids) becomes more acidic and its pH reduces to 4. Thus, acid rain is formed on dissolving acidic air pollutants such as sulphur dioxide and nitrogen dioxide by rain water.

Q.7 Write harmful effects of acid rain?

Ans. Harmful Effects of Acid Rain:

(i) Effects on Aquatic Life

Acid rain on soil and rocks leaches heavy metals (Al, Hg, Pb, Cr, etc) with it and discharges these metals into rivers and lakes. This water is used by human beings for drinking purpose. These metals accumulate in human body to a toxic level. On the other hand, aquatic life present in lakes also suffers because of high concentration of these metals. Especially high concentration of aluminium metal clogs the fish gills. It causes suffocation and ultimately death of fish.

(ii) Effects on Buildings and Monuments

Acid rain attacks the calcium carbonate present in the marble and limestone of buildings and monuments. Thus, these buildings are getting dull and eroded day by day.

(iii) Effects on Soil

Acid rain increases the acidity of the soil. Many crops and plants cannot grow properly in such soil. It also increases the toxic metals in the soil that poisons the vegetation. Even old trees are being affected due to acidity of soil. Their growth is retarded. They get dry and die.

(iv) Effects on Trees and Plants

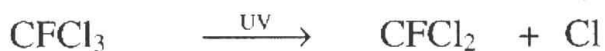
Acid rain directly damages the leaves of trees and plants, thus limiting their growth. Depending upon the severity of the damage, plants growth can be hampered.

Q.8 How ozone layer is depleted? Explain

Ans. Depletion of Ozone Layer:

Ozone layer is being depleted through various chemical reactions, such as

- (i) The ozone molecule absorbs solar radiations and dissociate readily, i.e., self dissociation of ozone takes place.
- (ii) However, chlorofluorocarbons (CFCs) (used as refrigerants in air conditioners and refrigerators) are major cause of depletion of ozone layer. These compounds leak in one way or other escape and diffuse to stratosphere. These ultraviolet radiations break the C-Cl bond in CFCl_3 and generates chlorine free radicals as



These free radicals are very reactive. They react with ozone to form oxygen as



A single chlorine free radical released by the decomposition of CFCs is capable of destroying up to many lacs of ozone molecules. The region in which ozone layer depletes is called ozone hole.

Q.9 What are the after effects of ozone layer depletion?

Ans: Effects of Depletion on Ozone Layer:

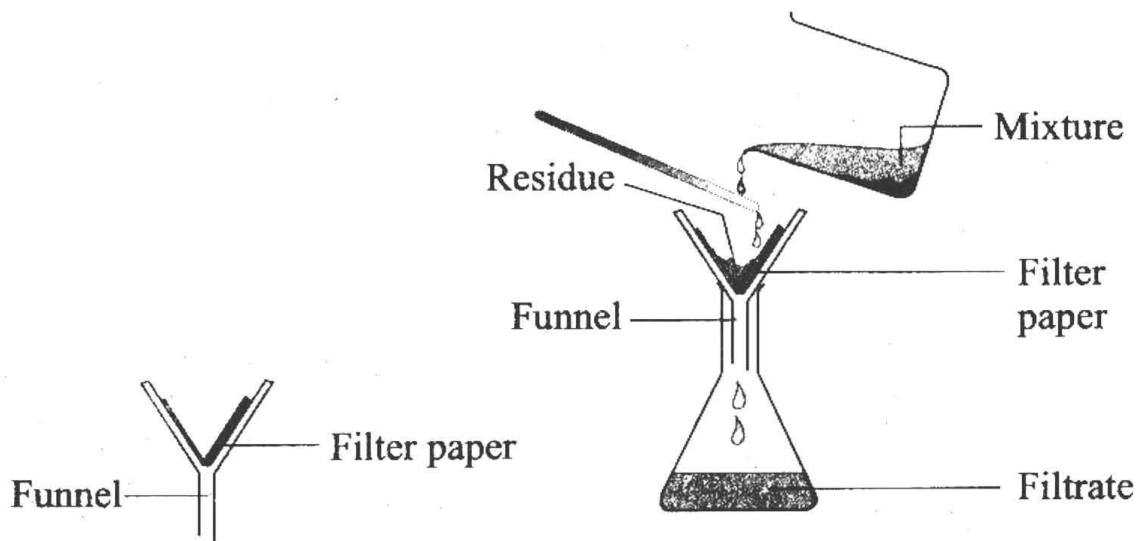
Even minor problems of ozone depletion can have major effects.

- (i) Depletion of ozone enables ultraviolet radiations of Sun to reach to the Earth, that can cause skin cancer to human beings and other animals.
- (ii) Decreased ozone layer will increase infections disease like malaria.
- (iii) It can change the life cycle of plants disrupting the food chain.
- (iv) It can change the wind patterns, resulting in climatic changes all over the world. Especially, Asia and Pacific will be the most affected regions, facing climate induced migration of people crisis.

Q.10 How the process of filtration is carried out? Explain

Ans: A filter paper is first folded half way, and then another fold is made, so that a filter paper gets four folds. This folded filter paper is placed in a filter funnel in such a way that on one side is three layers and on the other side is one layer as shown in figure.

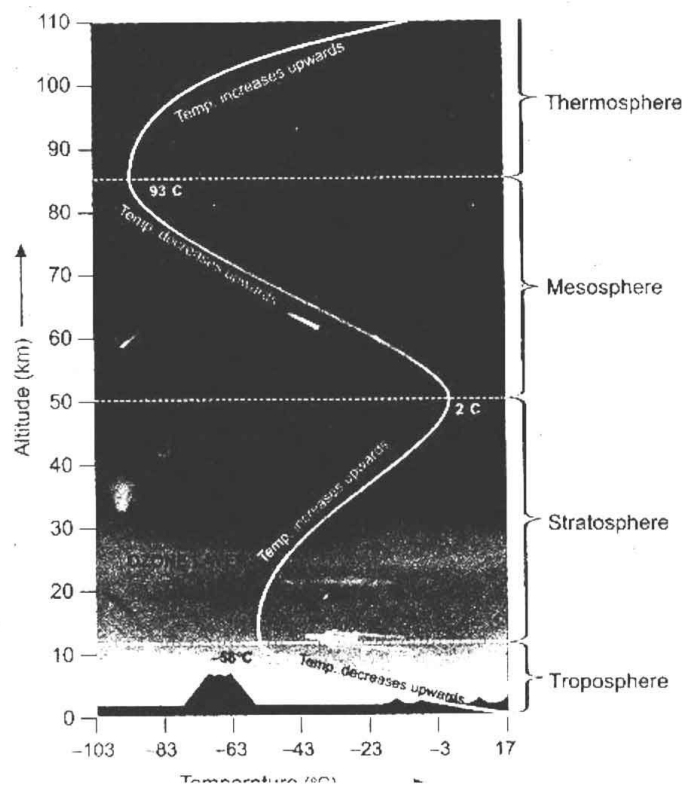
The mixture (sand in water or chalk in water) is poured into the filter paper as shown in figure.



Filtrate passes through the filter paper and is collected in a conical flask. The solid particles (residue) deposit on the filter paper. It is then dried.

Q.11 How atmosphere is divided on the basis of variation in temperature? Explain

Ans: Depending upon the temperature variation, atmosphere is divided into four regions. Temperature decreases from 17°C to -58°C regularly in the lowest layer extending upto 12 km. This layer of atmosphere is called troposphere. Above this layer lies the stratosphere that extends upto 50 km. In this layer temperature rises upto 2°C . Beyond the stratosphere lies the mesosphere, covering upto 85 km. In this region again temperature decreases down to -93° . Beyond 85 km lies the thermosphere in which temperature goes on increasing upwards.



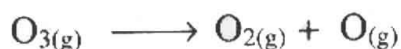
Characteristics of Atmospheric Regions

| Name of Region | Height above the Earth Surface | Temperature range and Trend |
|----------------|--------------------------------|-----------------------------|
| Troposphere | 0 — 12 km | 17°C — -58°C (decreases) |
| Stratosphere | 12 — 50 km | -58°C — 2°C (increases) |
| Mesosphere | 50 — 85 km | 2°C — -93°C (decreases) |
| Thermosphere | 85 — 120 km | > - 93°C (increases) |

Q.12 How ozone is formed in stratosphere? Explain

Ans. Formation of Ozone Layer

This atmospheric region is next to troposphere and extends upto 50 kilometers. In this region, temperature rises gradually upto 2°C. The presence of ozone (due to absorption of radiation) in this region is responsible for the rise of temperature in stratosphere. Within this region, temperature increases as a altitude increases, such as lower layer temperature is about - 58°C and upper layer is about 2°C. Thus, stratosphere is layered in temperature. Since ozone in the upper layer absorbs high energy ultraviolet radiations from the Sun, it breaks down into monoatomic (O) and diatomic oxygen (O₂).



The mid stratosphere has less UV light passing through it. Here O and O₂ recombine to form ozone which is an exothermic reaction. Ozone formation in this region results in formation of ozone layer. Thus, ozone layer exists in mid stratosphere.



The lower stratosphere receives very low UV radiations, thus monoatomic oxygen is not found here and ozone is not formed here.

Q.13 Write a note on troposphere?

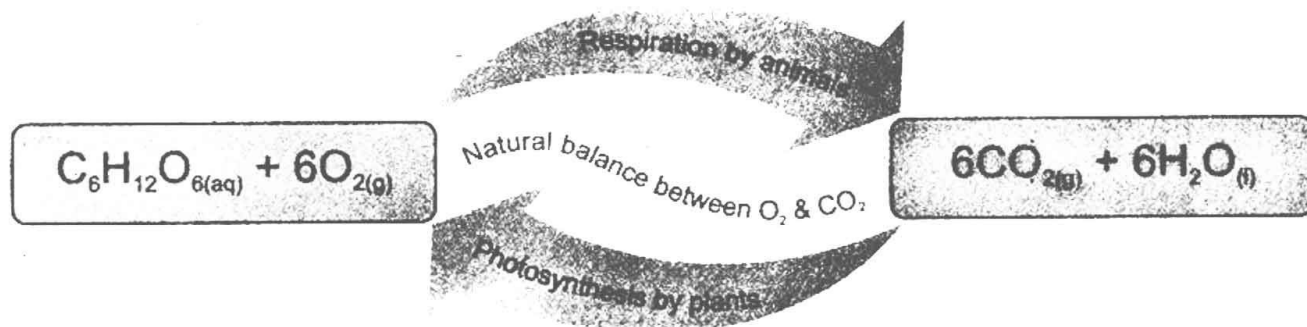
Ans. Troposphere

The major constituents of troposphere are nitrogen and oxygen gases. These two gases comprise 99% by volume of the Earth's atmosphere.

Although concentration of carbon dioxide and water vapours is negligible in atmosphere, yet they play a significant role in maintaining temperature of the atmosphere. Both of these gases allow visible light to pass through but absorb infrared radiations emitted by the Earth's surface. Therefore, these gases absorb much of the outgoing radiations and warm the atmosphere. As the concentration of gases decreases gradually with the increases of altitude, correspondingly temperature also decreases at a rate of 6K per kilometer. This is the region where all weathers occur. Almost all aircrafts fly in this region.

Q.14 Is CO₂ an air pollutant? How a natural balance exists between CO₂ and O₂ in atmosphere.

Ans. CO₂ is not an air pollutant. Rather, it is an essential gas for plants as O₂ is essential for animals. Plants consume CO₂ in photosynthesis process and produce O₂. While animals use O₂ in respiration and give out CO₂. In this way, a natural balance exists between these essential gases as represented here. But this balance is being disturbed by emitting more and more CO₂ in air through different human activities.



Short Answer Questions

Q.1 What is meant by atmosphere?

Ans. Atmosphere is the envelope of different gases around the Earth. It extends continuously from the Earth's surface outwards without any boundary. About 99% of atmospheric mass lies within 30 kilometers of the surface and 75% lies within the lowest 11 kilometers.

Q.2 Write composition of dry air.

Ans.

| Gas | % by Volume |
|----------------|-------------|
| Nitrogen | 78.09 |
| Oxygen | 20.94 |
| Argon | 0.93 |
| Carbon dioxide | 0.03 |

Q.3 What is the difference between primary and secondary pollution.

Ans. Primary pollutants are the waste or exhaust products driven out because of combustion of fossil fuels and organic matter. These are the oxides of sulphur (SO₂ and SO₃); oxides of