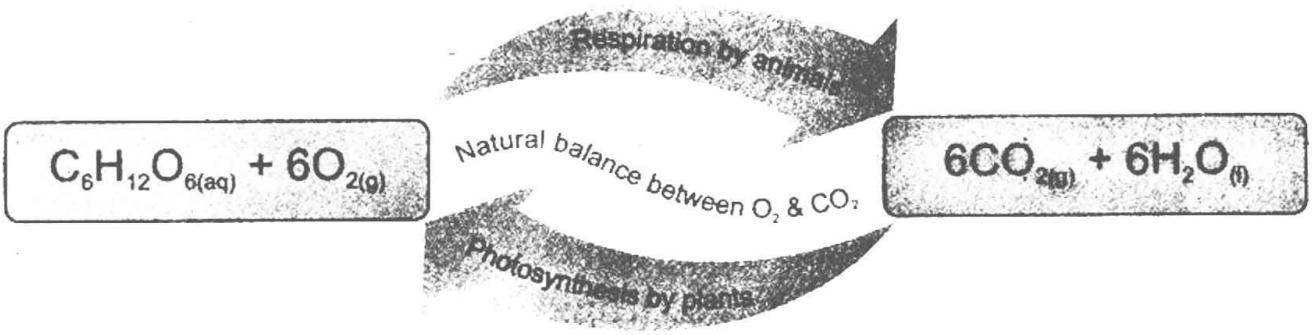
Q.14 Is CO_2 an air pollutant? How a natural balance exists between CO_2 and O_2 in atmosphere.

Ans. CO_2 is not an air pollutant. Rather, it is an essential gas for plants as O_2 is essential for animals. Plants consume CO_2 in photosynthesis process and produce O_2. While animals use O_2 in respiration and give out CO_2. 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 CO_2 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 (SO_2 and SO_3); oxides of

carbon (CO_2 and CO); oxides of nitrogen (specially nitric oxide NO); hydrocarbon (CH_4); ammonia and compounds of fluorine.

Secondary pollutants are produced by various reactions of primary pollutants. These are sulphuric acid, nitric acid, hydrofluoric acid, ozone and peroxy acetyl nitrate (PAN)

Q.4 What are the sources of CO_2 and CO?

Ans.

(a) Both of these gases are emitted due to volcanic eruption and decomposition of organic matter naturally.

(b) The major source for the emission of these gases is combustion of fossil fuels (coal, petroleum and natural gas). Fossil fuels burnt in combustion engine of any type of automobile, kiln of any industry, or open air fires emit CO_2 and CO.

(c) Forest fires and burning of wood also emit CO_2 and CO. Especially, when supply of oxygen is limited, emission of CO dominates.

Q.5 Why converters should be used in automobile exhausts?

Ans. Converters should be used in automobile exhaust so that they convert CO to CO_2 and oxides of nitrogen NO to N_2 before it enters in air.

Q6. Write importance of CO_2 to life on earth.

Ans. CO_2 is the 'life gas' for plants. CO_2 absorbs infrared radiations emitted by the Earth. Although CO_2 is negligible as compared to N_2 and O_2, yet its heat retaining capacity is tremendous. Without CO_2 life on earth would have been impossible.

Q7. Write occurrence of sulphur compounds in the atmosphere.

Ans. Naturally occurring sulphur containing compounds are emitted in the bacterial decay of organic matter, in volcanic gases and forest fires. But the concentration of sulphur containing compounds in the atmosphere because of natural sources is very small as compared to the concentration of those compounds emitted by fossil fuel combustion in automobiles and industrial units. About 80% of the total SO_2 is released by the combustion of coal and petroleum products.

Q.8 How SO_2 and SO_3 are formed? How these gases cause air pollution?

Ans. Fossil fuels contain Sulphur → Fossil fuels are burned to produce energy → The sulphur in the fuel forms oxides of sulphur. SO_2 and SO_3 → Oxides of sulphur escape into the air. They are air pollutants → Oxides of sulphur dissolve in water and form Acid Rain. That falls on the earth.

Q.9 What are the effects of SO_2 gas? Also writes its properties / characteristics.

Ans. It cause suffocation, irritation SO_2 forms sulphuric acid which damages buildings and vegetations. SO_2 is a colourless gas having irritating smell.

Q.10 How to control pollution because of sulphur?

Ans. To control pollution because of SO_2. It is necessary to remove sulphur from fossil fuels before they are burnt.

Q.11 How nitric oxide is produced in air?

Ans. naturally occurring oxides of nitrogen, mainly nitric oxide (NO), is produced by the electrical lightening in air.

Q12. How nitric oxide is produced by the combustion of fossil fuels?

Ans. Combustion of fossil fuels in internal combustion engine in thermal power stations and factories where huge amount of coal is burnt, NO is formed by the direct combination of nitrogen and oxygen.

$$N_{2(g)} + O_{2(g)} \longrightarrow 2NO_{(g)}$$

Q.13 How nitric oxide reacts with oxygen?

Ans. Nitric oxide quickly reacts with air to form nitrogen dioxide. NO is highly toxic gas.

$$2NO_{(g)} + O_{2(g)} \longrightarrow 2NO_{2(g)}$$

Q.14 How NO and NO_2 are formed? How these gases causes air pollution.

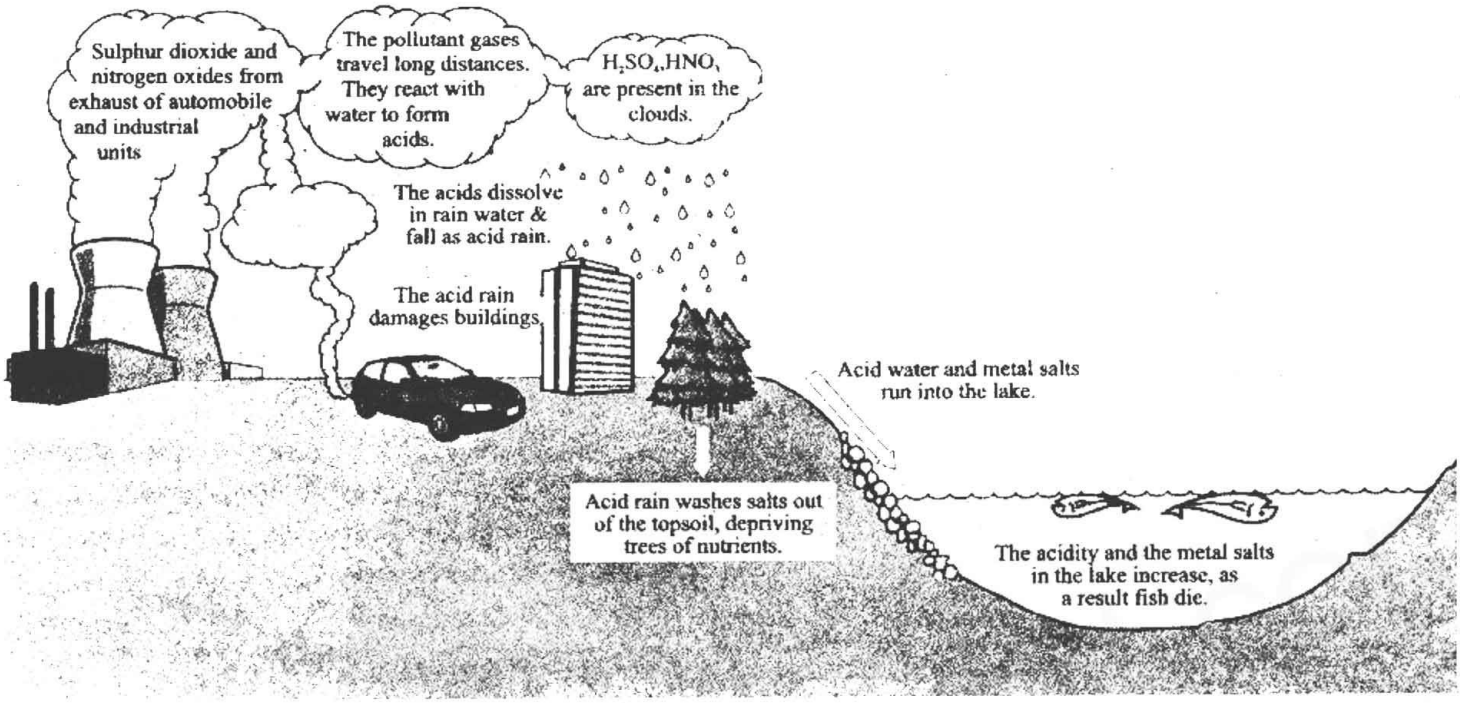
Ans. Nitrogen in the air is normally un-reactive → At high temperature it reacts with oxygen to form oxides of nitrogen. NO & NO_2 → These gases escape into the air. They are pollutants → Oxides of nitrogen dissolve in water and form Acid Rain. That falls on the earth.

Q.15 How the mixture of NO and NO_2 gases are represented? Write their effects.

Ans. Mixture of these gases represented as NO_x enter in the air through automobile exhaust and chimneys of thermal power station and factories. It irritates breathing passage. These oxide form nitric acid combining with water vapours in air. Nitric acid is a component of acid rain which damage soil, animals, plants and aquatic life.

Q.16 Sketch the labeled diagram showing the formation of acid rain and its effect

Ans:



Q.17 What is meant by ozone? How it is formed in atmosphere?

Ans. Ozone is an allotropic form of oxygen consisting of three oxygen atoms. It is formed in atmosphere by the association of an oxygen atom with an oxygen molecule in the mid of stratosphere.

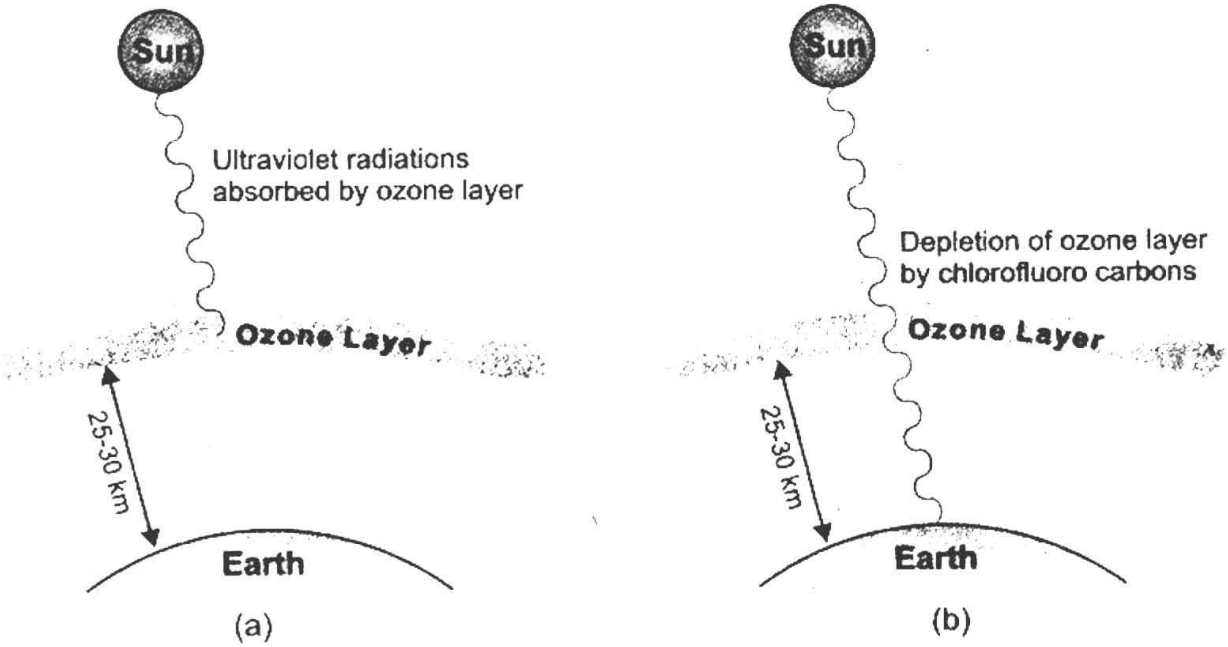
$$O_{(g)} + O_{2(g)} \longrightarrow O_{3(g)}$$

Q.18 What is meant by Ozone? Where ozone layers exist in atmosphere?

Ans. Ozone is an allotropic form of oxygen. It is represented by O_3. Ozone is present throughout the atmosphere. But its maximum concentration called ozone layer lies in stratosphere region about 25 to 30 km away from the Earth's surface.

Q.19 How ozone layer protects our earth?

Ans. Ozone layer surrounds the globe and protects Earth like a shield from harmful ultraviolet radiation of sunlight as shown in figure otherwise, ultraviolet radiations would cause skin cancer. Thus ozone layer is stratosphere is beneficial for life on Earth.



Q.20 How the concentration of ozone in stratosphere remains nearly constant?

Ans. Under normal condition ozone concentration in stratosphere remains nearly constant through a series of complex atmospheric reactions. Two reactions that maintain a balance in ozone concentration are as follows:

$$O_{2(g)} + O_{(g)} \longrightarrow O_{3(g)} \quad \text{(formation)}$$

$$O_{3(g)} + O_{(g)} \longrightarrow 2O_{2(g)} \quad \text{(decomposition)}$$

Q.21 What is meant by incineration?

Ans. Incineration is a waste treatment process that involves the burning of solid waste at high temperature between 650°C to 1100°C in incinerators.

Q.22 What is the function of incinerator?

Ans. Incinerators reduce the solid mass of the original waste by 80-85% and convert the waste materials into ash, flue gas and heat. Although, the volume of solid waste is reduced effectively by incineration, it produces highly poisonous gases and toxic ash.

Q23. Write composition of flue gas.

Ans. The flue gas includes dioxins, furans, sulphur dioxide, carbon dioxide, carbon monoxide, hydrochloric acid and a large amount of particulate matter.

Q.24 What is meant by filtration?

Ans. Filtration is separation of insoluble solid particles (sand, clay, dust or precipitates) from a liquid. It is carried out by filtering a mixture.

Q.25 What is the difference between pollutant and contaminants?

Ans. The pollutants are those substances which cause pollution. While contaminants are those substance that make something impure.

Q26. What is meant by air pollution? Write its effects.

Ans. The harmful substances present in air are called air pollutants. Even a beneficial substance beyond a specific concentration may be harmful. Air pollutants change the weather, badly affects the human health, damage the plants and destroy buildings.

Q.27 What do you mean by atmosphere?

Ans Our planet Earth has four natural systems; lithosphere, hydrosphere, atmosphere, and biosphere. So, atmosphere is the natural system of our planet Earth. It can be defined as Atmosphere is the envelope of different gases around the Earth. It extends continuously from the Earth's surface outwards without any boundary.

Q.28 What is difference between atmosphere and environment?

Ans.

Atmosphere	Environment
1. Atmosphere is the envelope of different gases around the Earth	1. Environment is the sum of all social, biological, physical and chemical factors which constitutes the surroundings of man.
2. It consists of four layers i.e., troposphere, stratosphere, mesosphere, thermosphere.	2. It consists of air, water, food and sunlight.

Q.29 Name the major constituents of atmosphere is maintained?

Ans. The major constituents of troposphere are as follows:

(a) Nitrogen (b) Oxygen

These two gases comprises 99% by volume of the Earth's atmosphere.

Q.30 How the temperature of atmosphere is maintained?

Ans. CO_2 and water vapours are present in atmosphere. Yet these are in low concentration but play an important role in maintaining temperature of atmosphere. Because both these gases allow visible light to pass through but absorb infrared radiations emitted by the Earth's surface. So, temperature of atmosphere is maintained.

Q.31 Where the ozone layer exists?

Ans. Ozone layer exist in mid stratosphere.

Q.32 Why the temperature of upper stratosphere is higher?

Ans. Because ozone in the upper layer absorbs high, energy ultraviolet radiations from the sun, it raises the temperature of stratosphere. That is the reason temperature of upper stratosphere is higher.

Q.33 What do you meant by an air pollutant?

Ans. The harmful substances present in air are called air pollutants.

For example: Carbon monoxide CO

Q.34 Name three primary air pollutants.

Ans. (i) Hydrocarbon (CH_4) (ii) Ammonia (NH_3) (iii) Oxides of nitrogen (NO_x)

Q.35 Identify as primary or secondary air pollutant SO_2, CH_4, HNO_3, NH_3, H_2SO_4, O_3

Ans.

Primary Pollutant	Secondary Pollutant
NH_3	HNO_3
CH_4	H_2SO_4
SO_2	Ozone

Q.36 Why CO_2 is called a greenhouse gas?

Ans. Carbon dioxide is called as a greenhouse gas because it forms a layer around the Earth like an envelope. It allows the heat rays of the sun to pass through it and reaches upto the Earth but does not allow the IR radiations to pass through. So, it acts like a glass and also called as a greenhouse gas.

Q.37 Why the flood risks are increasing.

Ans. CO is an air pollutant. It is a health hazard being highly poisonous gas. Being colorless and odourless, it 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.38 How sulphur containing compounds are emitted naturally?

Ans. Naturally occurring sulphur containing compounds are emitted in the bacterial decay of organic matter, in volcanic gases any forest fires.

Q.39 How combustion of fossil fuels in internal combustion engine produces oxides of nitrogen.

Ans. Combustion of fossil fuels in internal combustion engines, in thermal power stations and factories where huge amount of coal is burnt, NO is formed by the direct combination of nitrogen and oxygen.

$$N_{2(g)} + O_2 \longrightarrow 2NO_{(g)}$$

Q.40 How acid rain is produced?

Ans. Acid rain means presence of excessive acids in rain water. This rain is produced when normal rain water dissolved oxides of sulphur and nitrogen in air. Rain water converts SO_2 into H_2SO_4 and NO to HNO_2 and HNO_3. These acids reduces the pH of rain water upto 4. Thus acid rain formed on dissolving acidic air pollutant such as SO_2 and NO_2 in rain water.

Q.41 Why acid rain damages buildings?

Ans. 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.

Q.42 How aquatic life is affected by acid rain?

Ans. Water Pollution: 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.

Q.43 Why plants are dying day by day? Comment.

Ans. Damages Leaves of 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. Plants ability to bear cold or diseases reduce to get it die.

Q.44 Justify, ozone is beneficial for human beings.

Ans. Ozone is present throughout the atmosphere. But is maximum concentration called ozone layer lies in stratosphere region about 25 to 30 km away from the Earth's surface. This layer surrounds the globe and protects Earth like a shield from harmful ultraviolet radiations of sunlight. Otherwise ultraviolet radiations would cause skin cancer. Thus ozone layer in stratosphere is beneficial for life on the earth.

Q.45 Why ozone is depleting in atmosphere?

Ans. Cause of Depletion of Ozone Layer:

The ozone layer is being depleted through various chemical reactions, such as:

(a) The ozone molecule absorbs solar radiations and dissociates readily, i.e., self-dissociation of ozone takes place.

(b) However, chlorofluorocarbons (CFCs) (under 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;

$$CFCl_3 \xrightarrow{UV} CFCl_2 + Cl^{\cdot}$$

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

$$O_{3(g)} + Cl \longrightarrow O_{2(g)} + OCl^{\bullet}$$

$$OCl^{\cdot} \longrightarrow O^{\cdot} + Cl^{\bullet}$$

$$O^{\cdot} + O^{\cdot} \longrightarrow O_2$$

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

Q.46 What do you mean by ozone hole?

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

Q.47 Where the ozone layer is found?

Ans. Ozone layer lies in stratosphere region and formed by the associates of an oxygen atom with an oxygen molecule in the mid of stratosphere.

$$O_{(g)} + O_{2(g)} \longrightarrow O_{3(g)}$$

Multiple Choice Questions

1. About 99% atmosphere's mass lies within:

(a) 30 kilometre
(b) 35 kilometre
(c) 15 kilometre
(d) 11 kilometre

2. Depending upon temperature variation, atmosphere is divided into how many regions?

(a) one (b) two
(c) three (d) four

3. Just above the Earth's surface is