Atmospheric Pollution

1. **What is called Pollution?**
   Ans. The word Pollution comes from a Latin word **'Pollutus'** means **'Unclean'**.

2. **What is called Atmospheric Pollution?**
   Ans. The conditions of air made unclean due to introduction of foreign elements from natural and manmade sources to the air is called Atmospheric Pollution.

3. **Which Gases can make Atmospheric Pollutions?**
   Ans. Oxides of Sulphur (SO_2, SO_3)
   Oxides of Nitrogen (NO,NO_2,N_2O)
   Oxides of Carbon (CO,CO_2)
   Hydrogen Sulphide (H_2S)

4. **What are Pollutants?**
   Ans. The substances which pollute the atmosphere is called Pollutants.

5. **What are the Natural Sources of Pollutants?**
   Ans. The natural sources of pollutants are
   i. Disintegration of rocks and soil.
   ii. Decay of plants and animals, volcanic eruption
   iii. Lightening discharge, certain microbes
   iv. Volcanic eruption
   v. Respiration etc.

6. **What is Acid Rain?**
   Ans. Acid rain is a rain or any other form of precipitation that is unusually acidic. Acid rain is caused by emissions of sulphur dioxide and nitrogen oxide, which react with the water molecules in the atmosphere to produce acids.

7. **What are the pollutants are responsible for Acid Rain?**
   Ans. The main pollutants behind Acid Rain are-
   a. Oxides of Sulphur (SO_2)
   b. Oxide of Nitrogen (NO_2)

8. **State two form of deposition of acid Rain with example?**
   Ans. Wet Deposits- Rain, Snow, Fog, Dew
   Dry Deposits- Particles (SO_4. NO_3).

9. **State the natural and man-made sources of two pollutants responsible for Acid Rain/**
   Ans.

Pollutants	Natural Sources	Man-made Sources
Oxides of Sulphur (SO_2, SO_3)	• Decay of plants and animals, • Volcanic eruption	Burning of Fossil fuels, Sulphuric Acid plants, Smelting Plants
Oxides of Nitrogen (NO,NO_2,N_2O)	• Lightening discharge, Certain Microbes	Automobile Exhausts, Nitric Acid Plants, Fertilizer Industry

10. **From where maximum amount of Sulphur Di Oxide is added in Air?**
    Ans. The concentration of Sulphur Di Oxide in air is very high near
    a. Thermoelectric Plants used for generating electricity from coal.
    b. Oil refineries, where petroleum gas is flared.
    c. The highway where the density of vehicle is very high.

11. **How Fossil Fuel can increase Sulphur Dioxide in atmosphere?**
    Ans. All fossil fuels (Coal, Petroleum Oil, Natural Gas) are the remains of long dead plants and animals. When these fuels are burnt on large scale the small amount of sulphur compounds present in them burn to form sulphur di oxide in addition to Carbon-Di-Oxide gas produced by burning Carbon.
    $S+O_2$ ---------- SO_2
    $C+O_2$ ---------- CO_2
    Burning of Fossil Fuel accounts for 70% of Man-made SO_2Gas.

12. **How Bacterial Decomposition of Organic Matter can increase the SO_2 in atmosphere?**
    Ans. Bacterial Decomposition of Organic Matter can release H_2S which is oxidised to SO_2.
    $2H_2S+3SO_2$------ $2H_2O+2SO_2$

13. **During Metallurgy Smelting plants produce Sulphur Di Oxide, when metallic Sulphur is roasted in air. Give the Chemical equation for the same.**
    Ans. $2ZnS+3O_2$------ $2ZnO+2SO_2$

14. **At the time of burning Coal how Nitrogen Oxide is added in atmosphere?**
    Ans. When Coal is burnt in the furnaces of thermoelectric plants, by passing through it compressed air, the temperature of the furnace becomes more than 1500^0C. At such a high temperature small amount of nitrogen combines with oxygen to form nitric oxide gas.
    N_2+O_2---------- 2NO

15. **State why high temperatures in internal combustion engine can release pollutant-oxides of Nitrogen.**
    Ans. In the Internal Combustion Engine combustion occurs with air drawn in the combustion chamber and this air contains 80% of Nitrogen. This Nitrogen combines with Oxygen at high temperature produces oxides of Nitrogen.
    N_2+O_2---------- 2NO

16. **How is Acid Rain formed?**
    Ans. The Sulphur Di Oxide Gas and Nitrogen Di Oxide Gas desolve in the water vapour to form Sulphuric Acid and Nitric Acid under the action of Ultraviolet Reaction.
    SO_2+H_2O---------- H_2SO_3 (Sulphuras Acid)
    $2\ H_2SO_3+\ O_2$-------- $2\ H_2SO_4$ (Sulphuric Acid)
    $4NO_2+2H_2O+O_2$----- $4HNO_3$ (Nitric Acid)

17. **What is the pH level of Acid Rain?**
    Ans. Less than 5.6

18. **Starting from Nitrogen in air enlist the reactions with the help of balanced equtions which result in the conversion of nitrogen in an internal combustion engine to the acid formed which are responsible for acid rain.**
Ans. In the internal combustion engine atmospheric air containing 80% of Nitrogen for combustion of fossil fuel at high temperature.
N_2+O_2---------- 2NO
NO is released into air of atmosphere where it forms NO_2 in presence of lightning discharge.
$2NO+O_2$-------- $2NO_2$
NO_2 when comes in contact with water vapours to form nitric acid and falls in the form of acid rain.
$2NO_2+ H_2O$--------HNO_3+HNO_2
$2H_2O+4NO_2+O_2$----$4HNO_3$

19. **How can we control Acid Rain?**
Ans. We can control Acid Rain by
a. using alternative energy sources like Compressed Natural Gas (CNG), Hydro Power, Wind Energy which is cleaner energy and cause less pollution.
b. Using of technical devices like catalytic convertors, which can reduce nitrogen oxide emission from automobiles.

20. **How Acid Rain affects marine organisms?**
Ans. Toxic materials like Mercury, lead and Zinc present in the soil get leached by acid rain, thus toxicity enters rivers and streams and destroys aquatic plants and animals.

21. **How Acid Rain effects on buildings?**
Ans. The Acid Rain reacts with the building materials (mostly carbonates of calcium, and magnesium. Thus the masonry of the buildings start crumbling and in a few decades the building may collapse.
$CaCO_3+H_2SO_4$-------$CaSO_4+ H_2O + CO_2$
$MgCO_3+ 2HNO_3$ ----- $Mg(NO_3)_2+ H_2O + CO_2$

22. **State why Acid Rain causes 'Nutrient leaching' when it falls on the earth.**
Ans. The Hydrogen Ion which are added to the soil when acid rain falls on the earth interact chemically with existing soil minerals like potassium and calcium. This the soil is derived of nutrients. This is called Nutrient Leaching.
$H_2SO_4 = 2H^{1+}+ SO_4^{2-}$

23. **What is Global Worming?**
Ans. The gradual rise in the average temperature of the atmosphere due to the emission of gases by industrial activities of man is called Global Worming.

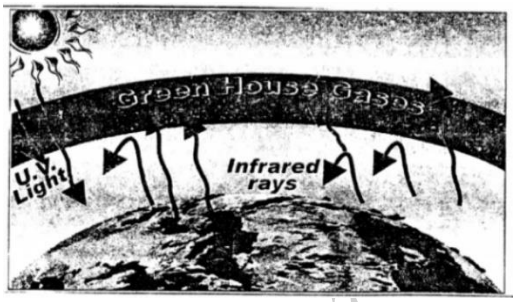
24. **What are Green House Gases?**
Ans. Green House Gases are those gases that contribute effectively in retaining heat in the atmosphere.

25. **What are Major Green House Effects?**
Ans. The Major Green House Effects are
Carbon Di Oxide, Methane, Water Vapour, Oxide of Nitrogen, Chlorofluorocarbons.

26. **What is Green House Effect?**
Ans. Green House Effect is the warming up of the earth's surface due to the concentration or blanketing effect of the Greenhouse gases.

27. Explain how global worming takes place in the presence of green house gases. Give a reason why the surface temperature of earth is maintained in absence of greenhouse gases.

Ans. As light from the sun passes through atmosphere of earth most of the U.V radiations are absorbed by ozone and only 30% of IR radiations react earth's surface and heat it.



As the earth becomes hot, it starts emitting radiations which have now less energy and hence longer wavelength. Some part of reflected IR radiations are absorbed by CO and this remains on earth and warm up the earth's surface.

In absence of greenhouse gases surface temperature on earth is maintained. Since heat radiations absorbed after passing clear atmosphere reach earth and some heat, radiations are reflected back.

28. Why the worming of atmosphere due to infrared radiation trapping named Greenhouse Effect?

Ans. In cold Countries, small plants and vegetables cannot be grown in winter, as the earth is covered with snow. Thus, people grow small plants and vegetables in large shades whose walls and roofs are made of glass. In these green houses the temperature does not fall below zero degree Celsius. Such greenhouses are called Green houses and their capacity to trap is called Greenhouse Effect.

29. What are the sources of Carbon Di Oxide?

Ans. **Natural Source**

a. At the time of respiration Oxidation of food substances in body cell releases CO_2
   $C_6H_{12}O_6+6O_2$-----$6CO_2+6H_2O$
b. Natural degradation of plants and animals the carbon tissues are oxidised to CO_2

Manmade Sources

a. Combustion of Fossil Fuels like coals Natural Gas produces huge amount of Carbon-Di-Oxide.
   Coal $C+O_2$-----CO_2+ Heat
   Natural Gas CH_4+2O_2----CO_2+2H_2O+ Heat

b. Chemical Industries
   i. Manufacturing of quicklime (CaO)
      $CaCO_3$----- $CaO+CO_2$
   ii. Fermentation of Sugar ($C_6H_{12}O_6$)
      $C_6H_{12}O_6$------ $2C_2H_5OH+ 2\ CO_2$
c. Exhaust from Automobile.

30. What are the sources of Methane (CH_4)?

Ans. **Natural Source**

a. Bacterial Decay of vegetable matter releases marsh gas which is mainly methane.
b. Natural Gas associated with petroleum contains about 75% machine.
c. Coal pockets contains methane.

Manmade Sources

a. Agricultural activities like natural wetlands and rice paddies release Methane.
b. Chemical Processes like gas drilling, coal mining, biomass burning produce methane.

31. What are sources of Oxides of Nitrogen (N_2O)?

Ans. **Natural Sources**

Anaerobic respiration activities of microorganism in soil release- nitrogen, nitric oxide and nitrous Oxides.

Man-made Sources

Agricultural activities use of nitrogenous fertilizers and soil cultivation release oxides of nitrogen.

32. Which of the following biofertilizers or nitrogenous fertilizers reduces the greenhouse gas- CO_2

Ans. Biofertilizers help in grow more plants which absorb more CO_2 for photosynthesis and help to reduce greenhouse gas- CO_2.

33. To reduce global worming which fuels are used?

Ans. Liquefied Petroleum Gas (LPG)
Liquefied Natural Gas (LNG)
Compressed Natural Gas (CNG)

34. State the advantages of use of CNG over combustion of fossil fuels.

Ans. CNG causes minimum pollution. It also does not contain lead and lower maintenance cost compared to vehicles with other form of energy.

35. Does the sea level rise or fall due to global warming? Explain.

Ans. The sea level rises due to global worming as increase in temperature melts ice on mountains ice caps.

36. What are the impacts of Greenhouse Gases?

Ans.

a. Geographical Impact:
Global Worming, increases melting of ice-caps which results in rise in sea levels causing coastal flooding and erosion.
b. Climatic Impact
Tropical regions experience more rainfall.
Northern latitudes experience shorter and wetted winters.
c. Ecosystem Impact
Causes large scale destruction of ecosystem and extinction of species.
d. Agriculture and Plant Life impact
Affects due to climatic changes
The lifecycle of trees and survival and reproduction of plants.
The soil fertility and amount of soil water retained in the soil.

37. What is Ozone Gas?

Ans. Ozone is a natural constituent of the atmosphere. It is a bluish, explosive gas with a pronounced odour.

38. How to control global warming?

Ans. To control global worming following steps are taken-

a. Use the minimum amount of fossil fuels for the production of electric energy.
b. Use of hybrid automobiles or electric vehicles.
c. Use alternative sources of energy such as solar energy, wind energy, geothermal energy, tides energy and nuclear energy.
d. Promote afforestation and deforestation should be reduced.
e. Grow less paddy as the decaying matter in paddy fields produces large amounts of methane. Encourage the rice-eating population of the world to switch over the other cereals.

39. What is Ozone Layer?

Ans. Ozone Layer is the layer of Earth's atmosphere which contains a relatively high concentration of Ozone. It absorbs 97-99% of sun's high frequency UV light which damage the life on earth.

Due to the presence of Ozone Layer the UV Rays and Infra-Red Rays from the solar radiation, cannot reach the earth's surface.

40. Where the Ozone Layer is located?

Ans. The Ozone layer is located in the Stratosphere above the earth.

41. How Ozone Gas is formed?

- In the upper part of the atmosphere (Stratosphere) when the ultraviolet rays coming from the sun fall on the oxygen molecules, they combine chemically to form Ozone Molecules.

$$3O_2 \xrightarrow{\text{UV Rays}} 2O_3$$

This reaction is called **photodissociation or photolysis**.

- In unpolluted air containing minimum chemical compounds, unstable ozone molecule (O_3) in presence of solar radiation may spot into molecular oxygen O_2 and an atom of atomic oxygen (O).

The atomic oxygen (O) then combines with another Ozone molecule (O_3) to form two molecules of Molecular Oxygen (O_2).

$$O_3 \xrightarrow{\text{UV Rays}} O_2+O \qquad O_3+O \longrightarrow 2O_2$$

This is a continuing process called 'Oxygen Ozone Cycle'.

42. How many types of UV Rays? How many types of UV Rays?

Ans. UV Ray is a form of electromagnet radiation with wavelength less than those of visible light.

Based on their Wavelength UV Rays are two types

a. UV A- (400-315 nm)
b. UV B- (315-280 nm)

43. What is Ozone Hole?

Ans. Ozone Holes are severe depletions of ozone layer seen above the Antarctic region every spring.

44. What is the function of Ozone Layer in the atmosphere?

Ans. Ozone Layer in the atmosphere makes life possible on earth.
Radiation from the sun consist of a. Electromagnetic Radiation, b. Cosmic and Gama Rays, c. UV and IR Radiation, d. Visible Lights.
Ozone Layer prevents harmful ultra-violet radiation from the sun and protects humans, animals and plants on the earth's surface.

45. What are the effects of UV Radiation?

Ans. UV A- is significantly less harmful but causes genetic damage in living organisms.
UV B- are more harmful and cause damage to humans, animals and plants.

- <u>Effects on Human and Animals</u>
  - i. Sunburn and Sun Cancer
  - ii. Eye cataract and eye damage
  - iii. Early aging of the skin.
  - iv. Weakening of the immune system.
  - v. Disruption in function of DNA.
  - vi. Severe damage to cells of animals.
- <u>Damage to Plants</u>
  - i. Retards plant growth
  - ii. Inhabits pollen germination.
  - iii. Reduces chlorophyll II content.
  - iv. Affects the quality of vegetables.
  - v. Increases harmful mutation
  - vi. Disrupts ecosystem.

46. Which chemicals are responsible for Ozone Layer Destruction?

Ans. The chemicals like

a. Chlorofluorocarbons (CFS, CFS_3)
b. Methyl Chloride (CH_3Cl)
c. Methyl Bromide (CH_3Br)
d. Carbon tetrachloride (CCl_4)
e. Bromo fluorocarbon
f. Methane (CH_4)
g. Nitrous Oxide (N_2O) etc.

47. What are the causes behind Ozone Layer Depletion?

Ans. Chemicals responsible for Ozone depletion are stable on earth but are broken down by UV radiation in the stratosphere.
By products of the brake down of those chemicals by UV Solar radiations or other chemical reactions results in increase in level of free radicals like atomic chlorine (Cl) and Bromine (Br), Nitric Oxide radicals, hydroxyl (OH) radicals.
These Cl, Br, and other free radicals initiate and catalyse a chain reaction capable of breakdown of over 100000 ozone molecules resulting in Ozone depletion.

48. How to prevent Ozone Depletion?

Ans. Ozone layer can be prevented by-

- Use of products that contain CFC's to be replaced by alternative products like HCFC (Hydrochlorofluorocarbons)
- Industrial Treaty was also initiated to prevent Ozone Layer depletion.