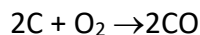


## AIR POLLUTION:

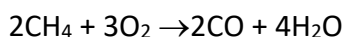
1. The major components in air are nitrogen, oxygen and water vapour.
2. The minor components in air are argon, carbon dioxide.
3. The tracer components in air are neon, helium, methane, krypton, nitrous oxide, hydrogen, xenon, sulphur dioxide, ozone, ammonia etc.
4. The density and pressure of the air decreases as we go up from the earth.
5. The important air pollutants are
  - a) Oxides of carbon: Carbon monoxide (CO) and Carbon dioxide.
  - b) Oxides of Nitrogen: NO, NO<sub>2</sub>
  - c) Oxides of Sulphur: SO<sub>2</sub>
  - d) Ozone - O<sub>3</sub>
  - e) Chlorofluoro carbons - (Freons)
  - f) Hydrocarbons-Methane, Butane etc.,
  - g) Metals - Hg,Pb etc.,
  - h) smog
  - i) Organic pollutants
  - j) Dust

### A. CARBON MONOXIDE (CO):

1. Due to incomplete combustion of petrol and diesel in automobiles under high pressure and temperature waste substances come out in the form of smoke. This smoke mainly contains carbon monoxide.

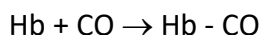


2. The organic matter present in fuel dissociates into methane. This methane also undergoes oxidation into carbon monoxide.



3. Nearly 80% of carbon monoxide is released from vehicles.
4. In urban area, at peak times the level of the CO gas increases upto 50-100 ppm where as the acceptable level of CO in the air is 9ppm.

CO combines with haemoglobin of blood and converts in to carboxyl hemoglobin, which can not act as oxygen carrier.



The poisonous effect is mainly due to it's strong tendency to form dative bond with iron of haemoglobin.

The concentration of carbon monoxide is high at 9. a.m. and at 5 a.m. in the day.

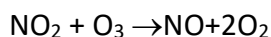
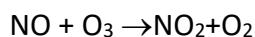
Table showing the effect of carbon monoxide.

<i>Level of CO in ppm in atmosphere</i>	<i>% of CO Hb formed from O<sub>2</sub>-Hb</i>	<i>Effect on the health of human beings</i>

10	2	Loss of vision
100	15	headache, fatigue
250	32	unconsciousness
750	60	death after few hours
1000	66	Immediate Death

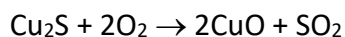
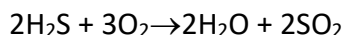
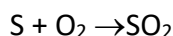
## B. NITROGEN OXIDES

1. The important oxides of Nitrogen which cause air pollution are NO, N<sub>2</sub>O and NO<sub>2</sub>.
2. The nitrogen oxides are produced during combustion of fossil fuels and fuels from automobiles.
3. The permissible level of nitrogen oxides is 10ppm. Beyond 10 ppm, plants can not perform photosynthesis.
4. The nitric oxide combines with ozone resulting in the decomposition of O<sub>3</sub> to O<sub>2</sub>.



## C. SULPHUR OXIDES - SO<sub>2</sub>:

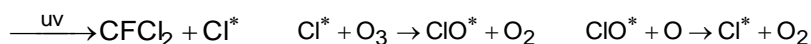
1. SO<sub>2</sub> is released into the atmosphere by burning of Sulphur, sulphide ores, and fuels containing sulphur.



2. SO<sub>2</sub> causes respiratory diseases in human beings, damaging the mucous membrane of the nose and the respiratory tract.
3. SO<sub>2</sub> bleaches the green colour of the leaves in plants to yellow colour. This prevents photosynthesis in plants.
4. If SO<sub>2</sub> is  $\geq 500$  ppm in air, it leads to death.
5. Oxides of nitrogen and sulphur combine with rain water and form acids resulting in acid rains.

## D. CHLOROFLUOROCARBONS(CFC's)- FREONS:

1. Chlorofluorocarbon's are synthetic compounds of chlorine, fluorine and carbon and are often referred to by the trade name 'freon'.
2. The important chlorofluoro carbon is trichlorofluoromethane (CFCl<sub>3</sub>).
3. CFC are commonly used as refrigerant propellants, solvents and also as foaming agents.
4. CFC's are colourless and odourless gases. They are very cheap to prepare and highly stable.
5. In stratosphere, CFC's absorb U.V. radiation and decompose into radicals. CFCl<sub>3</sub>



6. To restore the depleted ozone layer to the original level nearly 50 - 100 years are required though the production of CFC's has been banned.

#### **E. HYDROCARBONS:**

1. Among the hydrocarbons, methane is present in large quantity around the world.
2. Methane is produced by the degradation of organic matter.
3. The smoke from automobiles contain a mixture of hydrocarbons methane, ethane, acetylene, propane, butane etc.,
4. Benzopyrene, which causes cancer to human beings is from the diesel engines.
5. Peroxy acetyl nitrate (PAN) is another harmful substance which damages the plants.
6. Small amounts of PAN (0.02 to 0.05 ppm) is sufficient to cause considerable damage.
7. Peroxy benzoyl nitrate (PBN) causes irritation to eyes when present in the atmosphere.

#### **F. METALS :**

1. Lead particles are present in the fumes coming out from automobiles.
2. The gases coming out from industries contain carbon particles in the form of "aerosol".
3. Metal particles are produced into the air from metal industries.
4. If the gasoline, contains tetraethyl lead, ethylene chloride, ethylene bromide used in motor fuel the lead particles come into air by burning of that fuel.
5. By burning of sulphide ores, metaloxide particles come into the air.

#### **G. PHOTOCHEMICAL SMOG:**

1. Smoke and fog is called smog.
2. Photochemical smog was first identified in LosAngeles.
3. The smog which contains oxidising agents is called oxidising smog formed in summer
4. The smog which contains reducing agents like  $\text{SO}_2$  and carbon is called reducing smog formed in winter.
5. Peroxy benzoylnitrate (PBN) undergoes Photo chemical oxidation, mixes with ozone, oxides of nitrogen and forms photo chemical smog which is oxidising in nature.

#### **H. CARBON POLLUTANTS:**

1. Benzopyrene, pesticides and biocides weedicides organic air pollutants.
2. The harmful pesticides, biocides led out into the air by the factories when they are being manufactured, pollute the air and cause minor to major health hazards.

#### **I. DUST:**

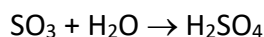
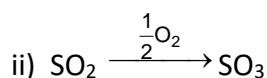
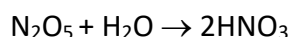
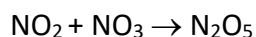
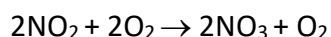
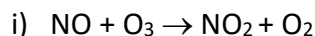
1. 22 metals are present in the air in the form of dust.
2. The metals like zinc, copper, magnesium and manganese are less in the air but calcium, silicon, aluminium and Iron are more in the atmosphere.
3. Dust produced by the heavy traffic and various industries pollutes air.

## 7) EFFECTS OF AIR POLLUTION:

Due to air pollution, the possible hazards will occur

- a) acid rains              b) depletion in ozone layer
- c) green house effect or global warming.

**a) ACID RAIN:** The oxides of nitrogen and the oxides of sulphur will produce nitric acid & sulphuric acid, which cause acid rains.



1. The rain water which contains nitric acid and sulphuric acid is called acid rain.
2. Acid rain is more in industrial area.
3. In 1918 the pH of acid rain is nearly equal to 5, but in 1962 it was decreased to 4.2.
4. Due to acid rain, the life of buildings will be considerably reduced.
5. The beauty of Taj Mahal is affected due to the action of acid rain on marbles stones.
6. Due to acid rain, the pH of the soil changes affecting the fertility.

## **b) DEPLETION IN THE OZONELAYER (OR) HOLES IN THE OZONELAYER:**

Holes in the  $\text{O}_3$  layer are found at north and south poles of earth, due to CFC's.

1. The decrease in ozone layer increase the U.V. radiation falling on the earth by 3%.
2. U.V. rays affect the photosynthesis reaction in the plants.

## **C) GREEN HOUSE EFFECT OR GLOBAL WARMING:**

1. Carbon dioxide and water vapour absorb infrared radiation coming to the earth and partly reflect it back to the earth's surface. Due to this, the surface of the earth gets heated up. This phenomenon of heating up of the surface of the earth is called green house effect.
2. Due to deforestation, the quantity of  $\text{CO}_2$  in the atmosphere is increasing.
3. A 50% increase in carbon dioxide level increases the surface temperature of the earth by  $3^\circ\text{C}$ .
4. If there is  $1^\circ$  increase in the temperature, the following bad effects are predicted.
  - a. The ice caps of the polar region melt there by increasing the level of the sea water by 90 cm.
  - b. Due to global warming, the rate of evaporation of water from the sea, rivers, ponds will increase. This leads to untimely rains, cyclones and hurricanes.
  - c. Agricultural sector will be badly affected due to fast evaporation of surface water.
5. The carbon dioxide content present in the earth atmosphere is 0.03%
6. The gases which cause green house effect are
  - a)  $\text{CO}_2$ (50%)              b)  $\text{CH}_4$  (19%)

- c) CFC (4%)                      d) O<sub>3</sub> (8%)
- e) NO (4%)                      f) Water Vapour (2%)
- 7. Ozone in the stratosphere is a protective layer, but harmful in the troposphere.
- 8. To prevent the global warming, one must increase the number of sinks, by growing trees, forests.

## 8) WATER POLLUTION:

If quality of water in the hydrosphere is decreased it is called as water pollution

1. Water pollutants are classified into

- a) Inorganic pollutants
- b) Organic pollutants
- c) Domestic waste
- d) Agricultural and industrial waste
- e) Sediments and oils
- f) Fluorides

Inorganic pollutants are salts, some elements like Cu, Zn, As, complex compounds, cyanides, H<sub>2</sub>S, CO<sub>2</sub>, NO<sub>2</sub>, phosphates, heavy metals like Pb and Hg.

Organic pollutants include industrial waste and agricultural waste.

Various organic pollutants are plastics fibres, detergents, paints, peroxides, insecticides, weedicides, dyes, pesticides etc.

Industrial waste coming from sugar, paper, leather, pulp industries.

Common examples: Malathion, DDT, chlorophenoxy compounds, phenylmercuric acetate.

- **Food chain:** The carriers of pollutants from one to another is called food chain. It includes plants - Fish - birds - animals, human beings.
- **Bio - amplification:** Increase in the concentration of pollutants as we go from lower animals to higher animals is called bio - amplification.
- **Eutrophication:** Pollutants like CO<sub>2</sub>, H<sub>2</sub>S, H<sub>2</sub>, O<sub>2</sub>, nitrates, phosphates, sulfate, boron, chlorine, copper, iron, Mn, V, Zn, etc. Will act as nutrients for the subsequent drying up occurs are called eutrophic or over nutritious.

## C. FLUORIDES:

- 1. The concentration of fluorides up to 3 ppm in drinking water is harmless.
- 2. The lower and higher limits of fluoride concentration should be in between 1 ppm and 3 ppm.
- 3. Fluorine concentration can be known with Zirconium Alizarin-S dye.
- 4. Fluorine gives a colourless substance ZrF<sub>6</sub><sup>-2</sup> with Zirconium-Alizarin-S.
- 5. When fluorine concentration increases the colour of the dye decreases.
- 6. When fluorine is present in the drinking water, it reacts with calcium present in bones and teeth. By this reaction, the colour of the teeth turns yellow, for the same reasons, the bones become weak and the disease is called "fluorosis"
- 7. In our state drinking water of Nalgonda, Prakasam and Guntur districts contains excess of fluorine

### **C. DEFLUORIDATION TECHNIQUES FOR DRINKING WATER:**

1. The methods for removing fluoride ion from water is called defluoridation technique.
2. Bleaching powder, lime and alum are added to water and stored. The fluoride ions of the water get precipitated as complex calcium aluminium fluoride. This is filtered and pure water is obtained. This method is introduced by NEERI (National Environmental Engineering Research Institute) of Nagpur in Nalgonda district first. So it is called Nalgonda technique.

### **OUR RESPONSIBILITY TOWARDS ENVIRONMENT:**

1. Micro organisms and enzymes can be used for the degradation of many waste substances like plastics.
2. By products formed in any reaction are pollutants. So methods should be developed without any by products i.e. environmental friendly reaction.
3. Instead of using conventional fuels and energy systems, non conventional fuels and non conventional energy systems must be used
4. Clean and green technologies should be developed and practiced.
5. The growth of population must be controlled.
6. Forests should be grown.

### **Activated carbon method:**

- Filters made of activated carbon are used
- F ions are adsorbed by carbon.
- Filters get deactivated after some time of usage
- 4% NaOH and 1%  $H_3PO_4$  are used to reactivate the filters.
- By this method,  $F^-$  ion concentration can be reduced from 5 -12 ppm to 1 ppm.  
This method is common because the substance used in is cheap and harmless.
- Polluted water has lower DO value, higher BOD value and higher COD value.  
Polluted water can be identified by
  - i) Change in the color and increase in saliency
  - ii) bad odour
  - iii) over growth of weeds
  - iv) Decrease in the growth of fish.
- Polluted water leads to contaminated diseases like cholera, typhoid, jaundice, diarrheic
- Polluted water affects tourism and aquatic.
- The main reasons for water pollution are
  - i) Industrial revolution
  - ii) Green revolution
  - iii) Blue revolution
  - iv) Increase in population