

ENVIRONMENTAL CHEMISTRY

→ Speciation: detection of different chemical forms of inorganic, organic and organometallic compounds present in environment causing pollution.

→ Chemical Oxygen Demand(COD): amount of oxygen required to oxidise organic matter present in water.

(50% of H_2SO_4 with $K_2Cr_2O_7$ is used to determine COD)

→ Biological Oxygen Demand(BOD): amount of oxygen used by microorganisms for 5 days at $20^\circ C$ in water.

PURE WATER – 1ppm of oxygen

MUNICIPAL SEWAGE – 100-4000ppm

B.O.D >17ppm

① AIR POLLUTION

TROPOSPHERIC POLLUTION:

(i) SO_x – low conc. SO_2 causes respiratory problems like asthma, emphysema, bronchitis, etc.. irritation to eyes and redness. High conc. stiffness of buds.

(ii) NO_x – high damage to leaves and plants and decrease rate of photosynthesis.

NO_2 is a lung irritant lead to respiratory diseases in children, NO_2 is harmful to fabrics and metals.

(iii) hydrocarbons causes ageing, breakdown of tissues and shedding of leaves and flowers and twigs.

→ pregnant women having habit of smoking leads to ↑ in CO level in blood, may induce premature delivery, spontaneous abortions, deformation of baby so, they are advised not to smoke because CO level ↑ and carboxyhaemoglobin causes weak eyesight, nervousness, headache, cardiovascular disorders.

Greenhouse effect: CO_2 , CH_4 , O_3 , CFC's, H_2O (vapour)

→ Atmosphere traps natural sun light keeps the earth warmth (natural).

→ Warm soil & plants emit IR radiation.

→ CH_4 production due to burning of vegetation.

→ due to global warming ↑ in infectious diseases like dengue, malaria, yellow fever, sleeping sickness, etc..

Acid rains: pH of rain <5.6 (oxides of S,N)

→ Particulate pollutants bigger than 5 microns block the (reside) in the nasal passage, 10 microns easily go into lungs.

→ Lead cracked petrol causes release of lead which interferes the development & maturation of red blood cells.

Classical smog – reducing (SO_2)



Smog(smoke+fog)



Photochemical smog- oxidizing (O_3 , NO_2)

[warm, dry and sunny climate]

reacts with unburnt hydrocarbons like HCHO, acrolein ($CH_2 = CHCHO$), peroxyacetyl nitrate ($CH_3 - CO - O - O - NO_2$)

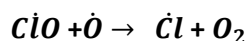
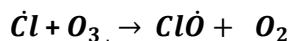
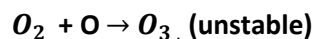
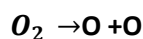
NO_2 , O_3 , are powerful eye irritants causes throat and nose irritation at high conc. headache, chestpain, dryness of throat, cough, difficulty in breathing.

→ This smog causes cracking of rubber and damage to plant life. To control photochemical smog we use plants like pinus, juniparus, querus, pyrus & vitis plants they metabolise NO_x .

STRATOSPHERIC POLLUTION:

Above 10 km -50 km from sea level, contains ozone layer which protects us from UV radiation.

→ UV radiation causes melanoma (skin cancer) in humans.



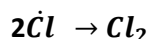
→ 1 CFC molecule can destroy 10^5 molecules of O_3 .

→ Ozone hole: atmospheric scientists in 1980's found around Antarctica.

→ Summer: $NO_2 + CH_4 + Cl\dot{O} + Cl_2 \rightarrow$ chlorine sink prevention of O_3 , degradation

→ Winter: polar stratospheric clouds provides surface on which chlorine nitrate formed gets hydrolysed to HClO.

After sunlight return $\text{HClO} \xrightarrow{h\nu} \dot{\text{O}}\text{H} + \dot{\text{Cl}}$



② WATER POLLUTION

→ Caused by disease causing agents called pathogens (Bacteria, fungi).

→ Human excreta contains E.Coli, streptococau faecalis causes gastrointestinal diseases.

→ If conc. of dissolved O_2 is 6ppm , it is good for survial of fishes

CHEMICAL POLLUTANTS : heavy metals like Cd,Ni,Hg, etc are pollutants dangerous to humans & cannot be excrete them causes damage to kidneys, CNS, liver ,etc .

→ Industrial chemicals like polychlorinated biphenyls (PCB's) are used as cleaning agents ,detergents and fertilizers are carcinogenic .

→ The process in which nutrient rich water bodies support the growth of plant population which kills animal life by depriving of O_2 results in subsequent low of biodiversity known as

Eutrophication.

INTERNATIONAL STANDARDS FOR DRINKING WATER

Fluoride : upto 1ppm or 1mg/dm^3 , F^- ions makes teeth enamel harder by converting it into much harder hydroxyfluapatite $[3\text{Ca}_3(\text{PO}_4)_2 \cdot \text{Ca}(\text{OH})_2]$ the enamel of teeth turned much harder

→ Above 2ppm of F^- ions causes browning of teeth ss

→ >10ppm harmful effect to teeth & bones

Lead (Pb): prescribed conc. of lead is 50 ppb, can cause damage to kidneys ,liver , reproductive system .

SO_4^{2-} : causes laxative effect above 500 ppm (moderate is harmless)

NO_3^- : max. limit = 50 ppm ,excess NO_3^- causes methemoglobinemia (blue baby syndrome)

③ SOIL POLLUTION

→ Pesticides – DDT

→ Organo-phosphates and carbonates are nerve toxins

→ Herbicides – NaClO_3 , Na_3AsO_3 causes birth defects

