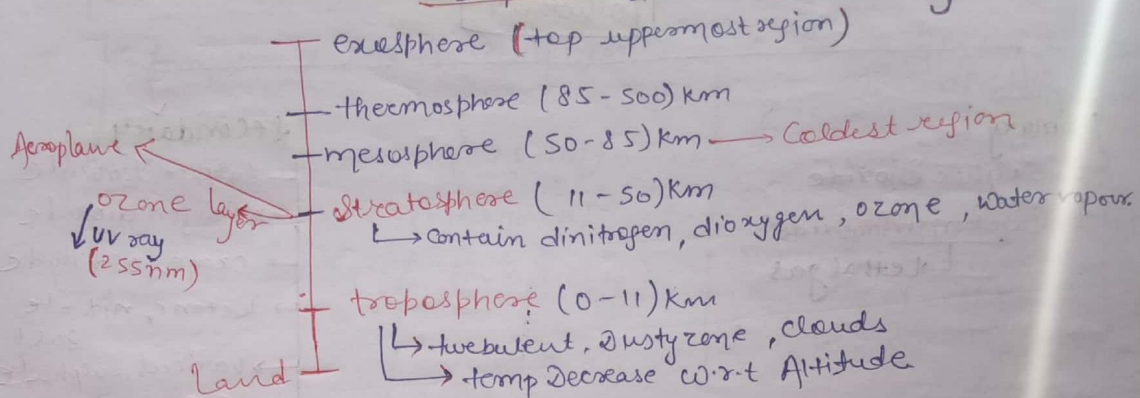


Environmental chemistry

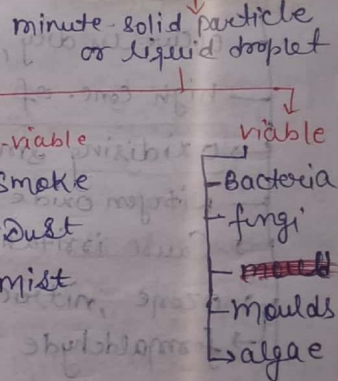


Tropospheric pollution

Gaseous air pollutant

- ① Oxides of sulphur
 - irritation to eye
 - stiffness of flower bud
 - low conc. of SO_2 cause respiratory disease.
 - Asthma, bronchitis
 - emphysema
- ② Oxides of Nitrogen
 - NO & NO_2
 - irritant seed haze in traffic
 - High conc of NO_2 damage leaves & retard the rate of photosynthesis
 - NO_2 is lung irritant
 - acute respiratory disease in children.
- ③ Hydro Carbon
 - Carcinogenic (cancer)
 - Shedding of leaves, flower bud & twigs & cause ageing in plants
- ④ Oxides of Carbon
 - CO → main pollutant
 - Odourless, Colourless, poisonous
 - haemoglobin + CO → carboxyhaemoglobin
 - 300 times more stable than oxygen haemoglobin complex
 - weak eyesight, headache, Cardiovascular disorder
 - premature births, spontaneous abortion, deformed baby

Particulate pollutant



- * lead used to be a major air pollutant emitted by vehicles.
- * lead interfere with development & maturation of RBC.

- ### Carbon Dioxide
- ⑤
 - released by respiration in atmosphere
 - Confined to troposphere only
 - green plant help to remove Excess of CO_2 .
 - Causes global warming

Pollutant

Primary

- Sulphur Dioxide
- Carbon monoxide
- ↳ lethal gas

Secondary

- Sulphur trioxide
- Nitrogen dioxide
- Ozone, aldehyde
- Ketone, nitrate salt
- various sulphate
- ↳ PAN

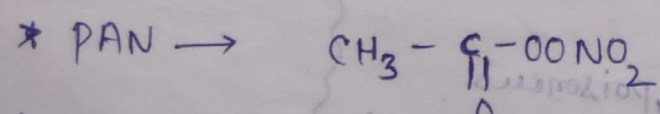
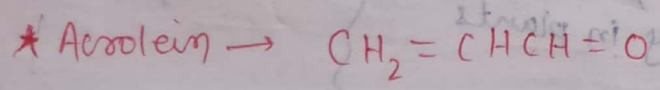
SMOG (Smoke + fog)

Photochemical

- occur in dry, warm, sunny weather
- high conc. of oxidising agent (NO)
- ↳ Oxidising smog
- Nitrogen oxide, unsaturated hydrocarbon
- Cause irritation in eye
- Ozone, nitric oxide, Acrolein
- ↳ formaldehyde, PAN
- ozone & PAN → eye irritant
- ↳ Irritate nose & throat
- ↳ headache, chest pain
- Cracking of rubber
- Corrosion of metal, painted surface.

Classical

- cool humid climate
- mixture of smoke fog & Sulphur dioxide
- ↳ Reducing smog



* NO_2 & O_3 are strong oxidising agent

↳ these both react with unsat. hydrocarbon in polluted air to produce formaldehyde, Acrolein, PAN

③ Stratospheric Pollution

→ formation & breakdown of ozone

→ ozone layer
 → UV rays radiation (225 nm)
 → skin cancer (melanoma)

→ Depletion due to CFC (freon) $[CCl_2F_2]$

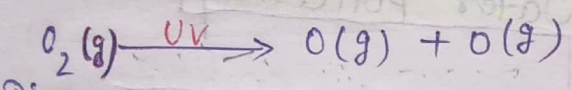
- non reactive
- non-flammable
- non toxic organic molecule
- therefore use in air conditioners, refrigerator.

* HFCs
 → hydrofluoro carbon use nowadays

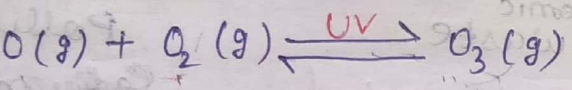
Effect of Depletion of ozone layer

- Skin Cancer, Cataract, aging of skin
- Killing of fish & phytoplankton
- Protein get affected
- mutation of cells
- decrease the moisture content of soil.
- damage paint & fibres

* formation of ozone



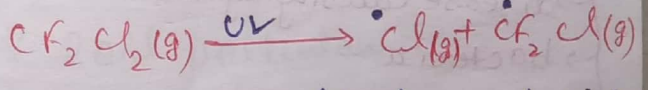
Dioxygen
 ~~$O_2(g)$~~



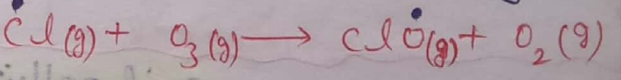
ozone is thermodynamically unstable & decomposes to molecular oxygen

* Break Down of Ozone

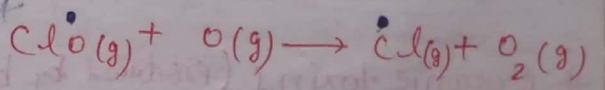
CFC release in Atmosphere & goes in stratosphere. & then they get broken down by UV ray, releasing chlorine free radical



then chlorine radical react with stratospheric ozone to form chlorine monoxide radicals and molecular oxygen.



Reacⁿ of chlorine monoxide radical with Atomic oxygen produces more chlorine radical.



* the chlorine radicals continuously regenerate & cause the breakdown of ozone.

Safe Drinking Water

- F⁻ ion ≤ 2 ppm
- Lead → ≤ 50 ppb
- Sulphate → < 500 ppm
- Nitrate → ≤ 50 ppm
 ↳ blue baby syndrome

B.O.D

- Clean Water ≤ 5 ppm
- highly polluted ≥ 17 ppm

→ Biological oxygen Demand

↳ oxygen needed by Aerobic organism to decompose organic matter in given sample of water in 5 days.

Max Conc. of some metal in Drinking Water.

- Fe → 0.2 ppm
- Mn → 0.05 ppm
- Al → 0.2 ppm
- Cu → 3.0 ppm
- Zn → 5.0 ppm
- Cd → 0.005 ppm

Lead

- damage kidney
- liner
- reproductive system

Cadmium & mercury kidney damage.

- * Cold water Dissolved oxygen
 - ↳ 10 ppm
- * oxygen in Air → 200,000 ppm
- * dissolved oxygen < 6 ppm
 - ↳ then growth of fish is inhibited.

Cause of Water Pollution

Pathogen

- disease causing agent
- bacteria
- Escherichia Coli & Streptococcus faecalis
- ↳ which causes gastro-intestinal disease

organic waste

- organic pollutant
- leaves, grass, trash
- biodegradable

chemical Pollutant

- Cadmium, mercury, nickel

- damage kidney
- nervous system

- ↳ PCB
- ↳ carcinogenic

- polychlorinated biphenyl

- Addition of phosphate in water enhance algae growth, which causes eutrophication.

Soil pollution

① World war II → Nicotine → pest controlling substance

② World war II → DDT → Control of malaria & they use in Agriculture

* Organic toxins (produced by bacteria in plants & animals)

- Aldrin
- Dieldrin

* herbicides

- NaClO_3 (Sodium chlorate)
- Sodium arsenite (Na_3AsO_3)

- toxic to mammals
- birth defect

* Non-biodegradable waste generate by thermal power.

* fuel obtained from plastic waste

- ↳ high octane rating
- ↳ no lead
- ↳ known as green fuel

* Green chemistry

① Dry cleaning of clothes

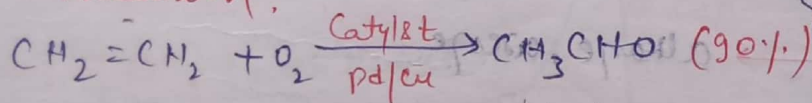
past	now
<p><u>tetrachloro ethane</u> used as solvent for dry cleaning ↳ Carcinogenic</p>	<p><u>H₂O₂</u> used for bleach clothes in lesser amount of water.</p>

② Bleaching of paper

past	now
<p>Chlorine gas for bleaching of paper.</p>	<p>H₂O₂ used now with suitable catalyst</p>

③ Synthesis of chemicals

↳ ethanal is now prepared by one step oxidation of ethene in the presence of ionic catalyst in aq. medium.



* Dioxin → waste incineration

* PAH → polycyclic aromatic hydrocarbon

* COD → chemical oxygen demand
↳ water is treated with oxidising agent usually $K_2Cr_2O_7$ in medium.

* I.R active molecule
↳ global warming.

* ozone & PAN is eye irritant
↳ photochemical smog

* Halons

- ↳ bromo-fluoro carbon
- ↳ use in fire extinguishers & pesticides

* Acid rain

- ↳ oxide of sulphur
- ↳ oxide of nitrogen
- ↳ HCl
- ↳ phosphoric acid

* Green house gas

- ↳ CO₂, O₃, CH₄, H₂O vapour
- ↳ CFC, oxide of nitrogen

* Fungi → without chlorophyll

- ↳ plant
- ↳ mercury use in fungicides

* Soil pollutant

- ↳ DDT, BHC, Aldrin
- ↳ NaClO₃, Na₂SO₃

* Antifouling Comp.

- ↳ Seamine

* Antioxidant

- ↳ BHA → increase the shelf life of butter
- ↳ BHT

↳ sulphite & sulphur dioxide

↳ Antioxidant for wine & beer, sugar syrup.