

# Environmental Chemistry..

4 marks

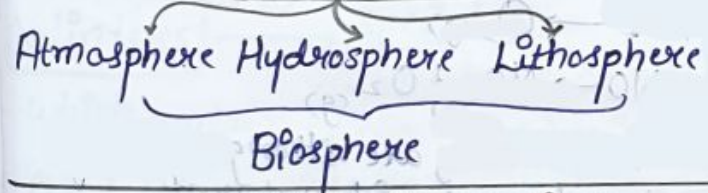
- Environmental pollution — Undesirable changes in surroundings, which affect living beings
- Pollutant — Substance which cause pollut<sup>n</sup>  
(Solid/liq/gas)

primary pollutant	Secondary pollutant
natural form. NO, SO <sub>2</sub> , NO <sub>2</sub> ...	PAN (Peroxacy acetyl nitrate) ★
Biodegradable pollutant	non-biodegradable pollutant
discarded, plant Vegetables, leaves	DDT, plastic waste, ★ Heavy metal, Hg, Ag, nuclear waste, Pb.

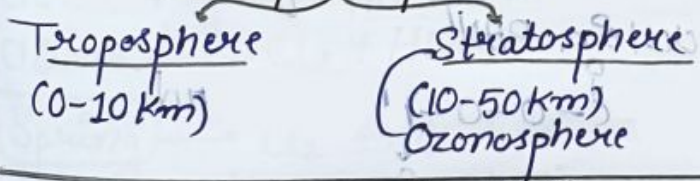
## Atmospheric pollution.

Tropospheric Stratospheric.  
Water pollution, Soil pollution.  
Green house effect

### Environment



### Atmospheric pollution →



### Tropospheric pollution →

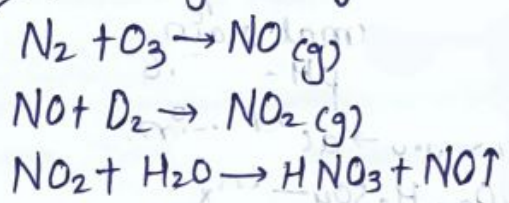
Tropospheric pollutants → SO<sub>x</sub>, NO<sub>x</sub>, CO<sub>x</sub>, H<sub>2</sub>S,  
C<sub>x</sub>H<sub>y</sub> → gaseous pollutants  
→ dust, mist, fume, smoke,  
smog (particulate pollutant)

SO<sub>x</sub> — produced when sulphur containing fossil is burnt in thermal plants.  
— produced by Volcanic eruption.

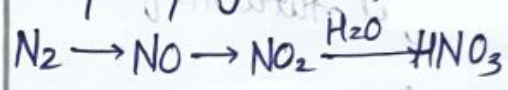
- Cause **asthma**, bronchitis, irritation to eyes. (low conc.)
- High conc. → **stiffness of flower buds**
- **acid rain**
- SO<sub>2</sub> + O<sub>2</sub> → SO<sub>3</sub> } (H<sub>2</sub>O<sub>2</sub>, Ozone)  
SO<sub>3</sub> + H<sub>2</sub>O → H<sub>2</sub>SO<sub>4</sub> } help in this rx<sup>n</sup>  
(acid rain)

NO<sub>x</sub> (N<sub>2</sub> gas)  
N≡N (requires high temp. to break)

⚡ When lightening occurs —



→ Combustion of fuel in motor vehicle  
(Spark plug-1473K)

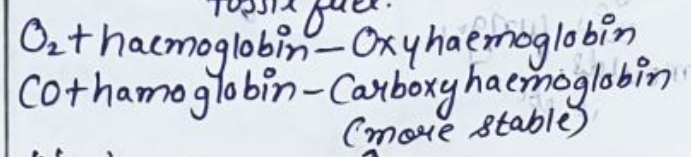


effects → damage plant leaves.  
decreases photosynthesis.  
Respiratory illness (children)

(C<sub>x</sub>H<sub>y</sub>) — Incomplete combustion of fuel in automobile  
— anaerobic bacterial decomposition of organic matter

These are Carcinogens  
Cancer-producing.  
ageing of leaves, plants shedding, flower die.

(CO<sub>x</sub>) CO — automobile exhaust, incomplete combustion of coal, fossil fuel.



#CO reduces oxygen carrying capacity of blood.



# Global Warming and Green house effect

↑↑ conc. of green house gases

↓  
↑↑ global temperature

↓  
polar ice caps melting, flooding in low areas.

green house gases →

$\text{CO}_2, \text{CH}_4, \text{O}_3, \text{CFC's}, \text{nitrous oxide}, \text{water vapour}.$

Green house effect →

Trapping of infrared radiation of green house gas. ↓

Heat earth's atmosphere

Acid Rain → normal rain  
pH → 5.6

pH < 5.6 → acid rain.

due to  $\text{HNO}_3, \text{H}_2\text{SO}_4 - \text{SO}_x, \text{NO}_x$

effect - Harmful for agriculture  
washes away useful nutrients for growth

- Damages aquatic ecosystem.

(↑↑ acid pH)

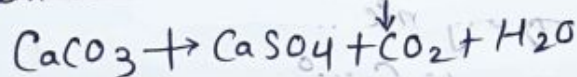
- Respiratory illness

- damage building made up of stone, marble, metal

Tajmahal Corrosion  $\text{CaCO}_3$

Yellowness

+  $\text{H}_2\text{SO}_4$



Smoke - cigarette, oil smoke.

Dust - crushing of stone, saw dust of wood, cement factory.

Mist - particles of spray liquid and by condensation of vapour in liquid

Fumes - Condensation of vapours during sublimation, distillation, boiling etc.

Note →

particle size →  $> 10 \text{ micron}$  - lodge in nasal cavity  
→  $< 1 \text{ micron}$  - effect lungs

Smog → major air pollutant

Smoke + Fog → Harmful gases

Smog →

Classical smog

London smog

Cool and Humid climate.

1° pollutant

Reducing smog

Photochemical smog

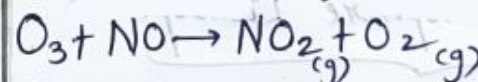
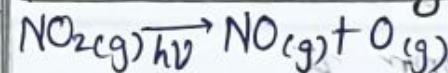
Los angeles smog.

Warm and dry climate

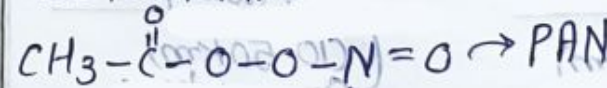
2° pollutant

Oxidizing smog

Photochemical Smog →



Both  $\text{NO}_2$  and  $\text{O}_3$  are strong oxidising agents and react with unburnt hydrocarbon to produce formaldehyde, acrolein, PAN



effects → Irritation in eyes, respiratory illness.

Cracking of rubber

extensive damage to plant life

↖ particulate pollutant ↗

Viable

small size living organism

Bacteria, fungi, moulds, algae etc.

non-viable

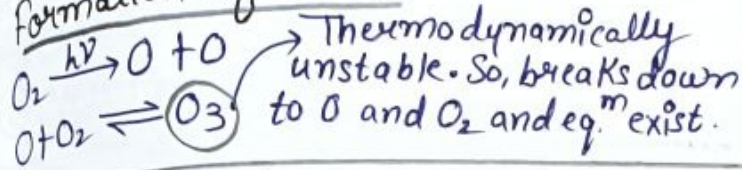
Smoke, dust, mist, fumes



# Ozonosphere / Stratospheric pollution

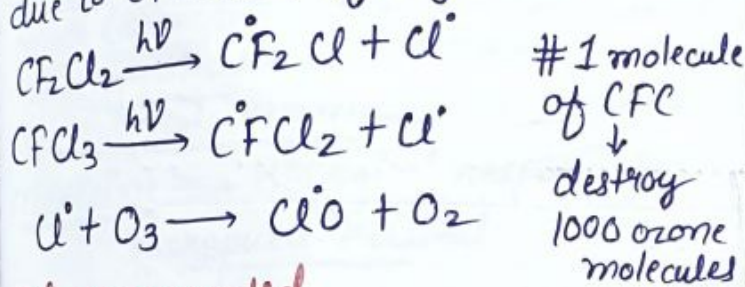
Stratosphere → Ozone protect us from harmful UV rays → carcinogens.

## Formation of Ozone →

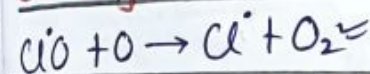


## Depletion of Ozone →

due to CFC's (AC, fridge) →

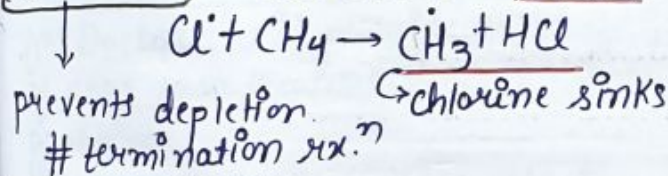
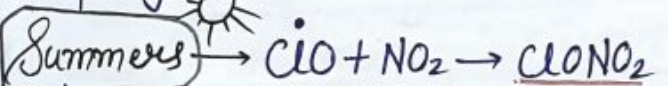


Cl<sup>•</sup> is regenerated

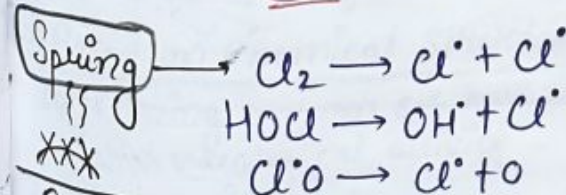
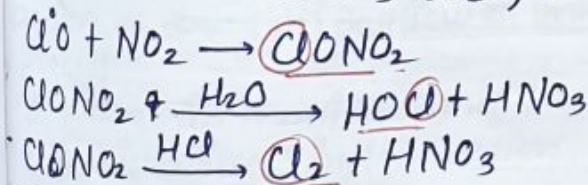


## Ozone hole in Antarctica →

Sept. and Oct → Ozone hole develops each year



Winters → special polar stratospheric clouds. which contain  $(\text{HNO}_3 \cdot 3\text{H}_2\text{O})$  or ice.



## Effect of Ozone layer depletion →

Skin Cancer # ↑ skin water evaporation

Eye damage - snow blindness, Cataract.

Harmful for agriculture.

# Water pollution →

## Water pollutant →

① pathogen → disease causing agents (from domestic sewage, human excreta).

② Organic Waste → leaves, grass trash, phytoplanktons.

③ BOD → pure water = BOD = < 5 ppm  
High polluted water = ≥ 17 ppm

④ Chemical pollutant → major oil spill, acid from mining.

## International Standard for pure drinking water → Vimp

Fluoride → 1 ppm ✓

above 2 ppm - brown mottling of teeth  
over 10 ppm - bones and teeth damage

Lead → 50 ppb ✓

damages kidney, liver, reproductive system.

Nitrate → 50 ppm ✓

blue baby syndrome (methemoglobinemia)

Sulphate → 500 ppm ✓

Causes laxative effect.

Fe - 0.2 Cu - 3

Al - 0.2 Zn - 5

Mn - 0.05 Cd - 0.005

## Soil pollution →

Causes → pesticide.

Chemical used to kill/stop growth of unwanted organism.

## Insecticide -

DDT, BHC, Aldrin - stays in soil for long period of time, and contaminate root crops. potato, carrot, radish.

## Herbicide -

$\text{NaClO}_3$ ,  $\text{Na}_2\text{AsO}_3$  - earlier used  
Triazines - These days.



Fungicide — organo mercury compound

↓  
leaves mercury in soil

↓  
Heavy metal = toxic

## Strategy for Controlling environmental pollution →

① Waste water management from household. ↓  
Swachh Bharat Mission → Urban  
→ Gramin  
aim — free from open defecation  
→ clean, hygiene. (not imp)

② Recycling.

③ Sewage treatment

Incineration

Combustion of organic material  
↓  
energy produce  
↓  
debris generation

Digestion

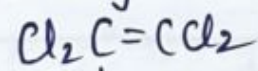
↓  
anaerobic bacteria

Dumping

↓  
dump sewage in land  
↓  
fertilizer

## Green Chemistry →

① dry cleaning of clothes



↓  
Carcinogen

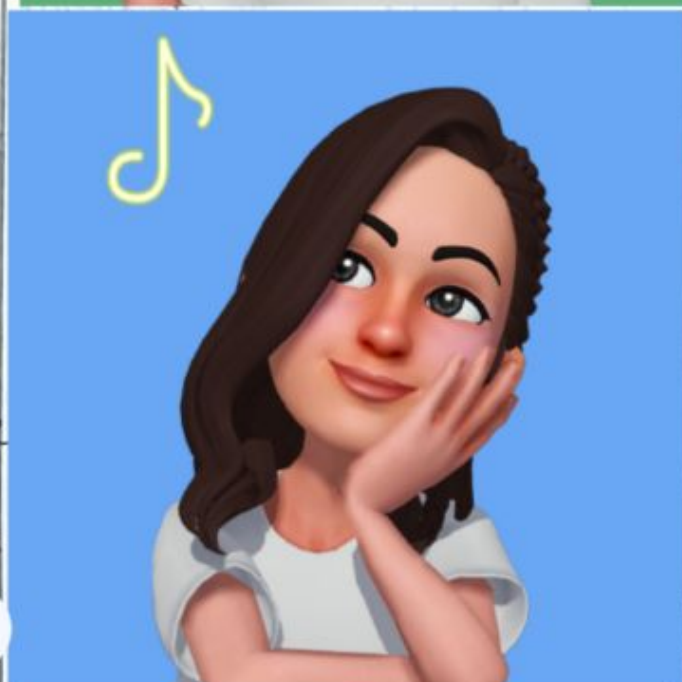
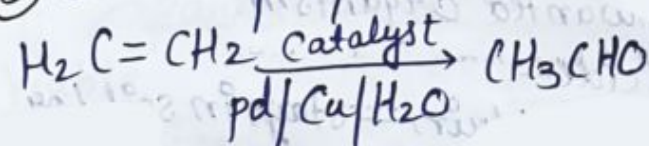
$\text{H}_2\text{O}_2$  |  $\text{liqO}_2$  > used.

② paper bleaching.

$\text{Cl}$  gas |  $\text{H}_2\text{O}_2$  → used.

↓  
pehle

③ ethanol preparation —



**NEET SLAYER**