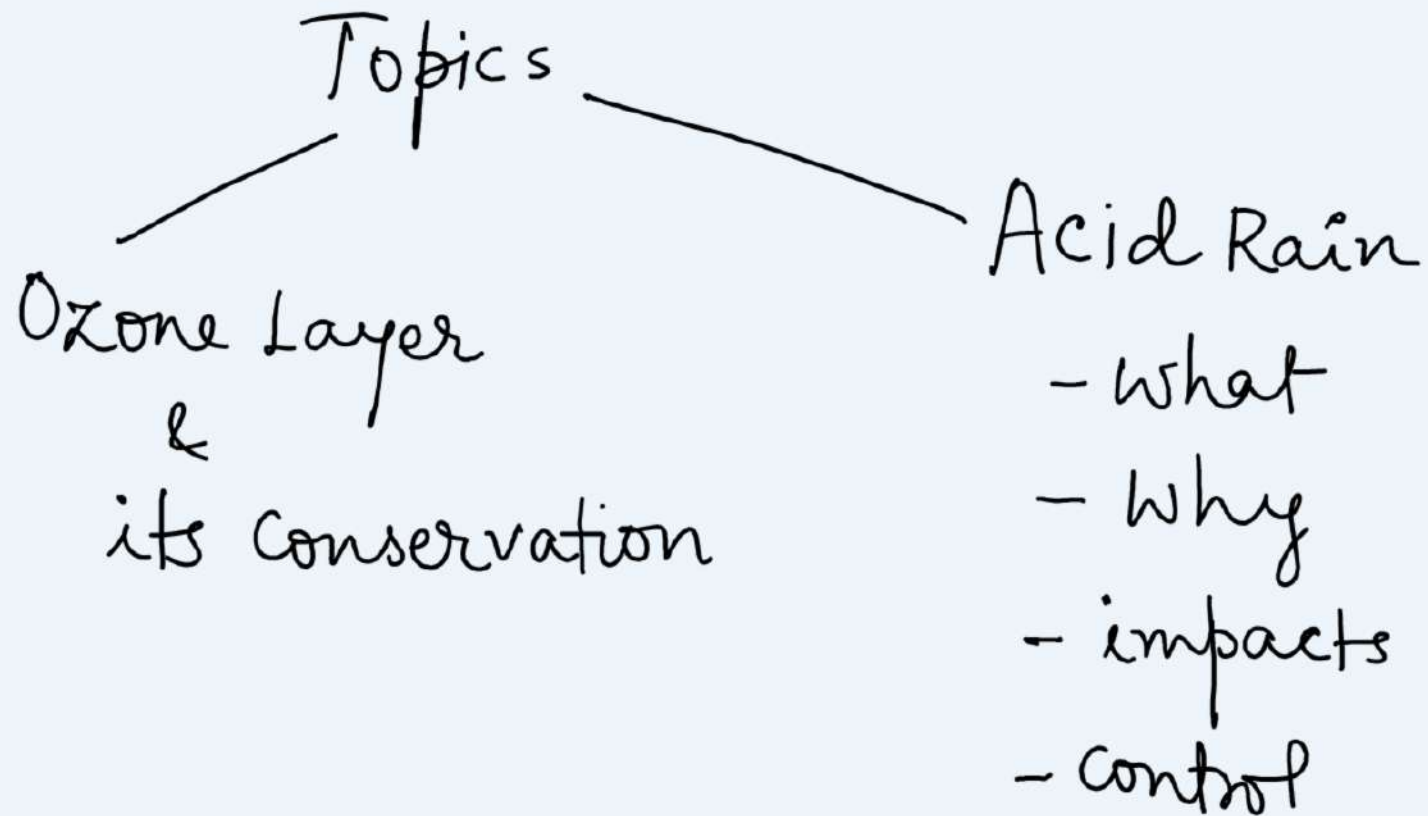


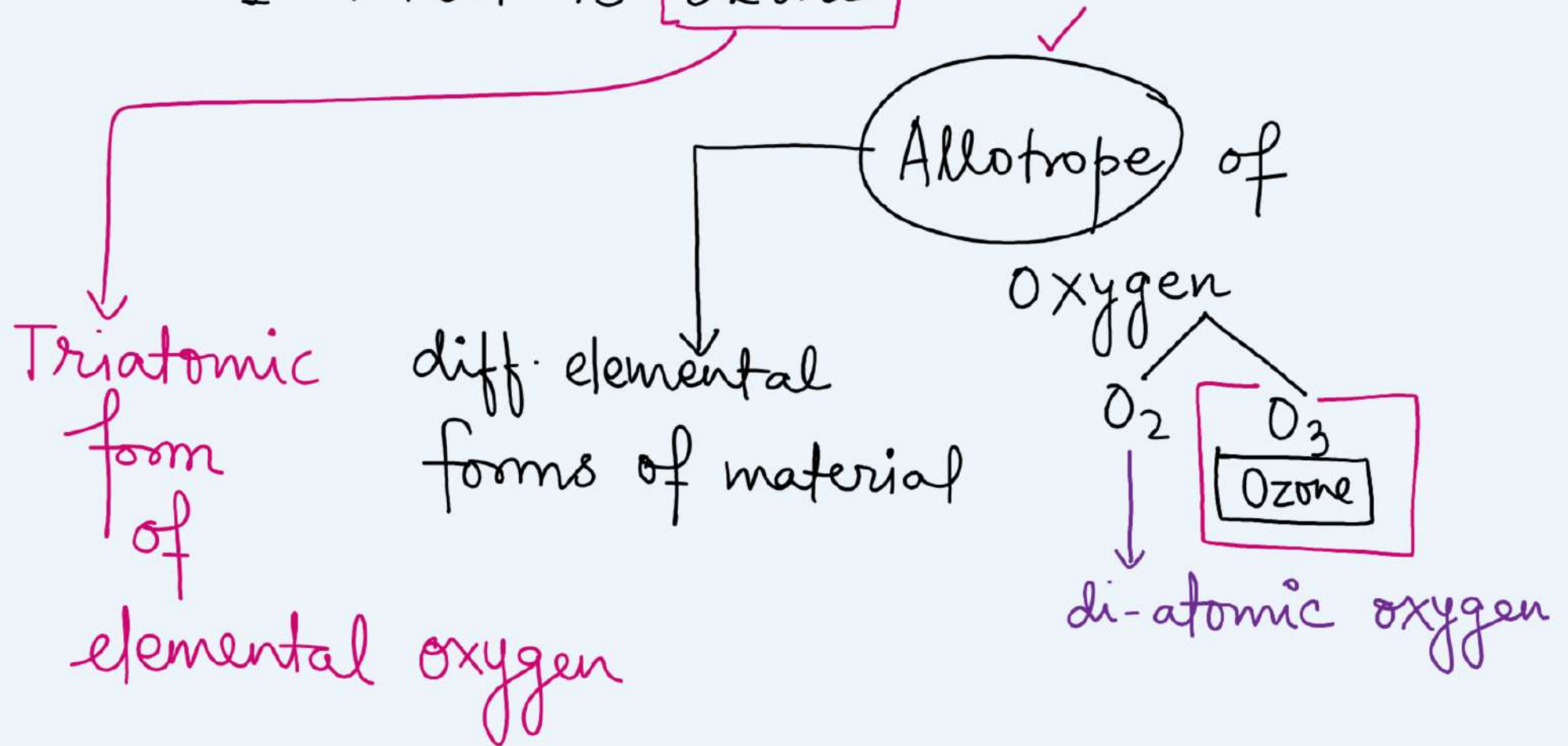
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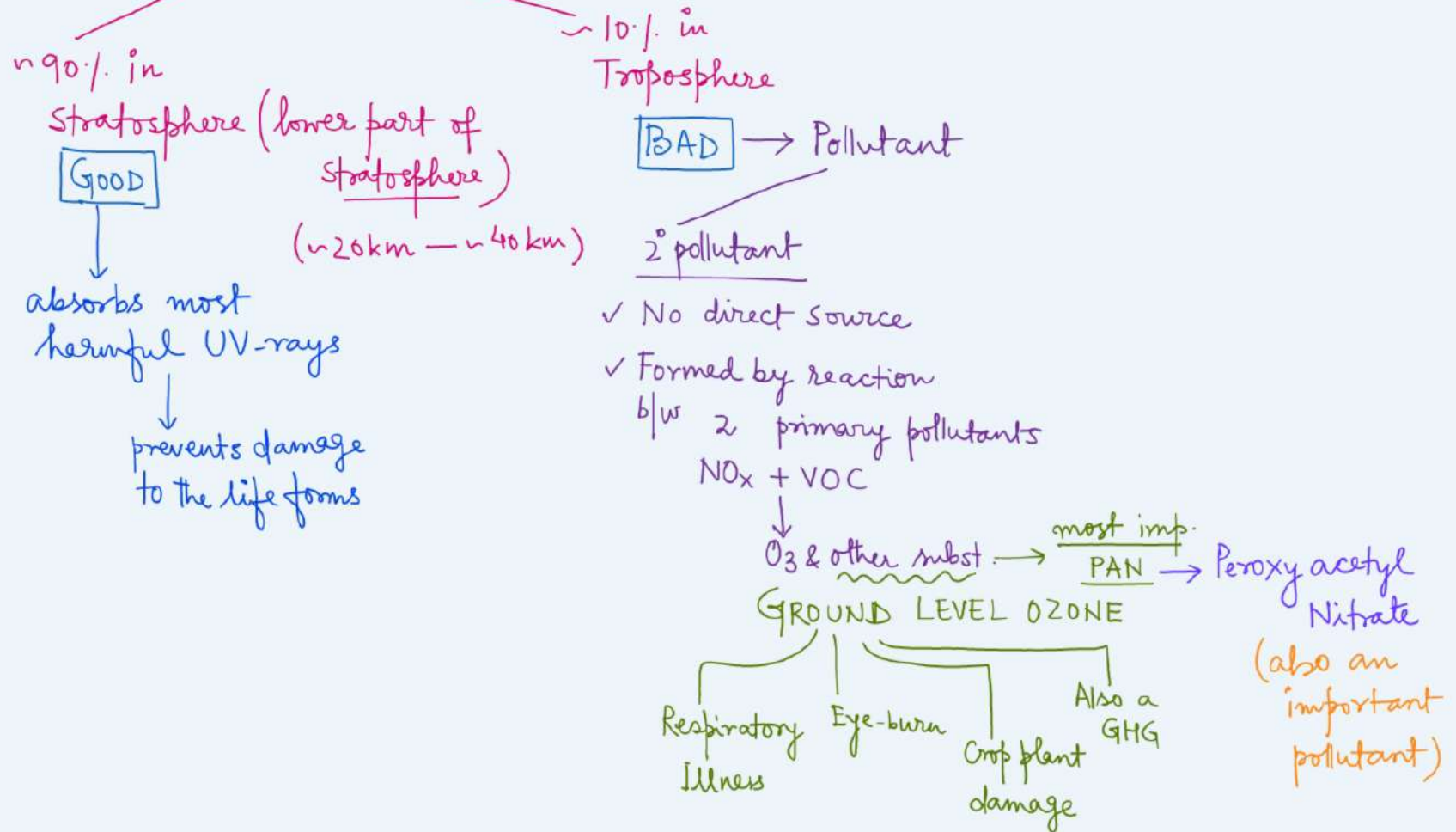


① Ozone Layer

1. What is **Ozone**

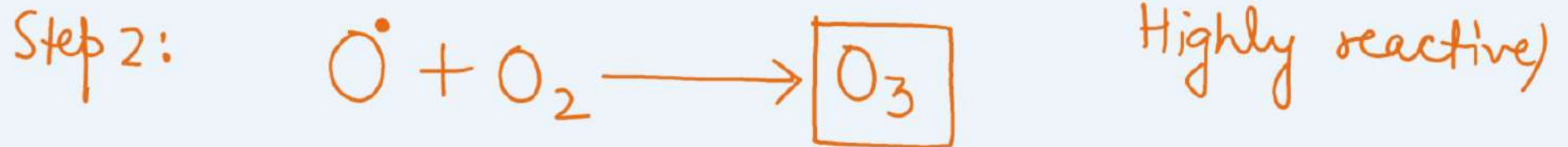
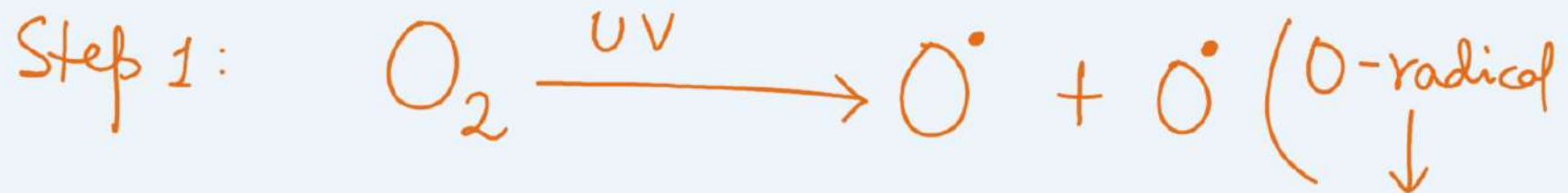


2. Where



3. Stratospheric Ozone

a) Formation: Chapman's Process (Locⁿ: Stratosphere)



b) Quantity : Unit Dobson Unit

↓
[2.69×10^{16} O₃ molecules]

Avg. in Healthy O₃ layer — 300–500 D.U.

O₃ depletion — < 300 D.U.

O₃ Hole < 200 D.U.

C) Importance

~ 90% of UV-B }
~ 100% of UV-C } Filtered out
by absorption

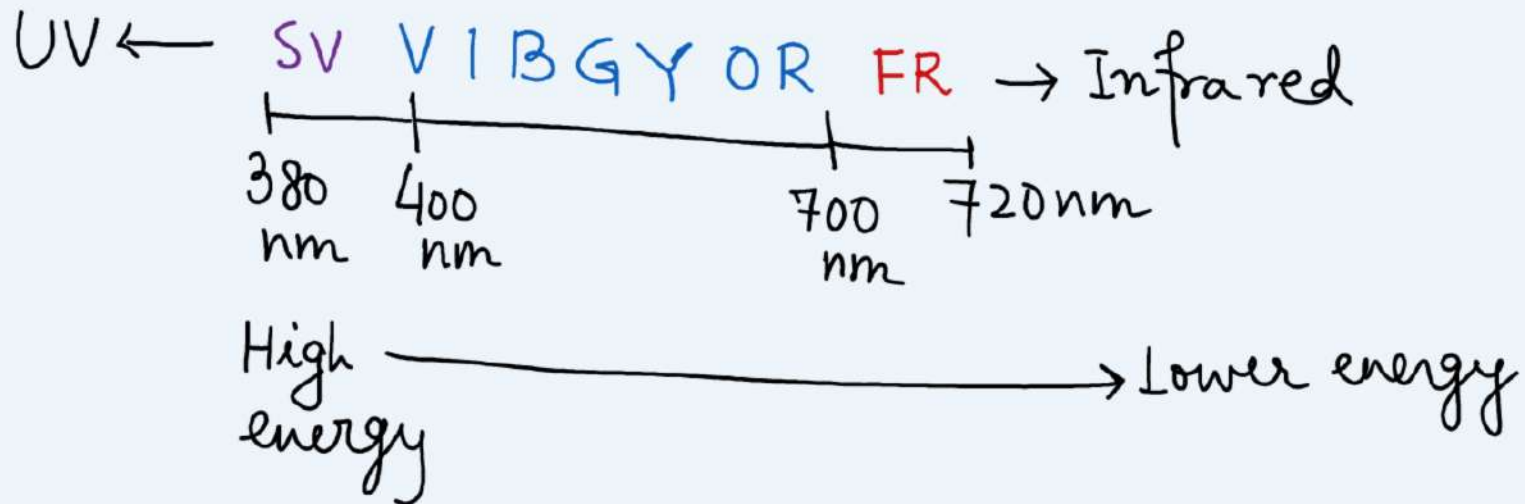
↓ ↓
most harmful UV

```
graph TD; UVB["~ 90% of UV-B"]; UVC["~ 100% of UV-C"]; Filter["Filtered out by absorption"]; Harmful["most harmful UV"]; UVB --> Filter; UVC --> Filter; Filter --> Harmful;
```

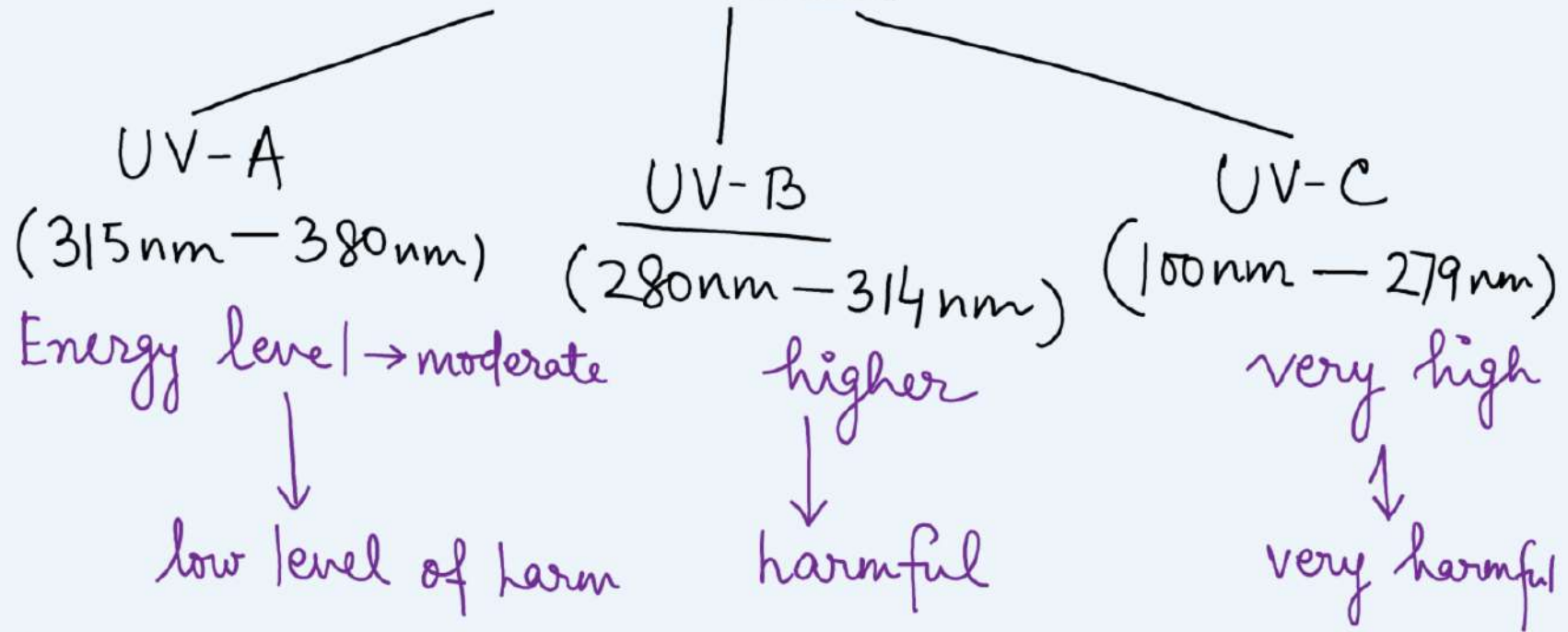

4. UV-rays

LIGHT

Visible part of EM spectrum



UV rays



Penetrance through O₃ layer → ~90%.

~10%.

~0%.

5. Ozone Depletion

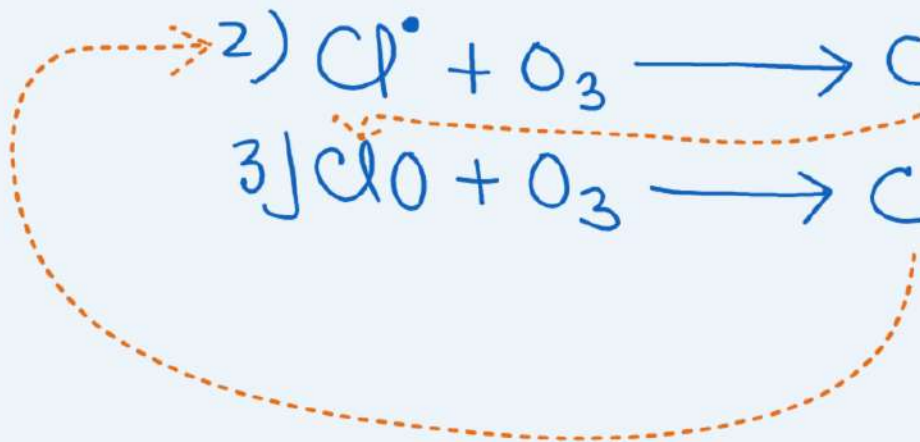
- Breakdown of Stratospheric O_3
 - Level : $< 300 \text{ D.U.}$
 - Reason: O_3 depleting Substances (O.D.S.)
 - Chloro-fluoro Hydrocarbons (CFC)
 - now banned
 - widely used from ~1925 to 2000
 - Hydrofluoro Carbons
 - weak ODS
 - also GHG
 - (presently used as substitute for CFCs)
 - N_2O
 - also a GHG
 - covered under Paris Agreement
- Being phased out:
Under KIGALI Agreement 2016
- use cases
- AC gas
 - Refrigerator
 - Compressor gas
 - Spray paint
 - Foam manufacture
 - Propellant gas in bottles
- Halons — $CFBr_3$
- Freons — $CFCl_3$

ODS reaction

CFCl_3
(Lighter than air
&
Non-reactive)

→ → → Reaches Stratosphere

↓
starts OD Cycle



Protecting Ozone Layer

Vienna
Convention
1985 1987 ✓

Montreal Protocol
1987 ✓ 1989

↳ Phasing out ODS
in universal &
time-bound manner.

↳ 1999 - 2000 India ODS (CFC)
free

⇒ 2016 : Kigali
Amendment
Agreement

↓
✓ HFC phasing out

Phase out schedule

| Set of countries | Base Year | Cut-down | Target Yr. |
|---|-----------|----------|------------|
| Developed Countries | 2011-13 | 85-1. | 2036 |
| Developing Countries China, Brazil, SA | 2020-22 | 85-1. | 2045 |
| Other developing Countries incl. India | 2024-26 | 85-1. | 2047 |

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