

Q2. Ozone Depletion Mechanism, Chemicals and impacts?

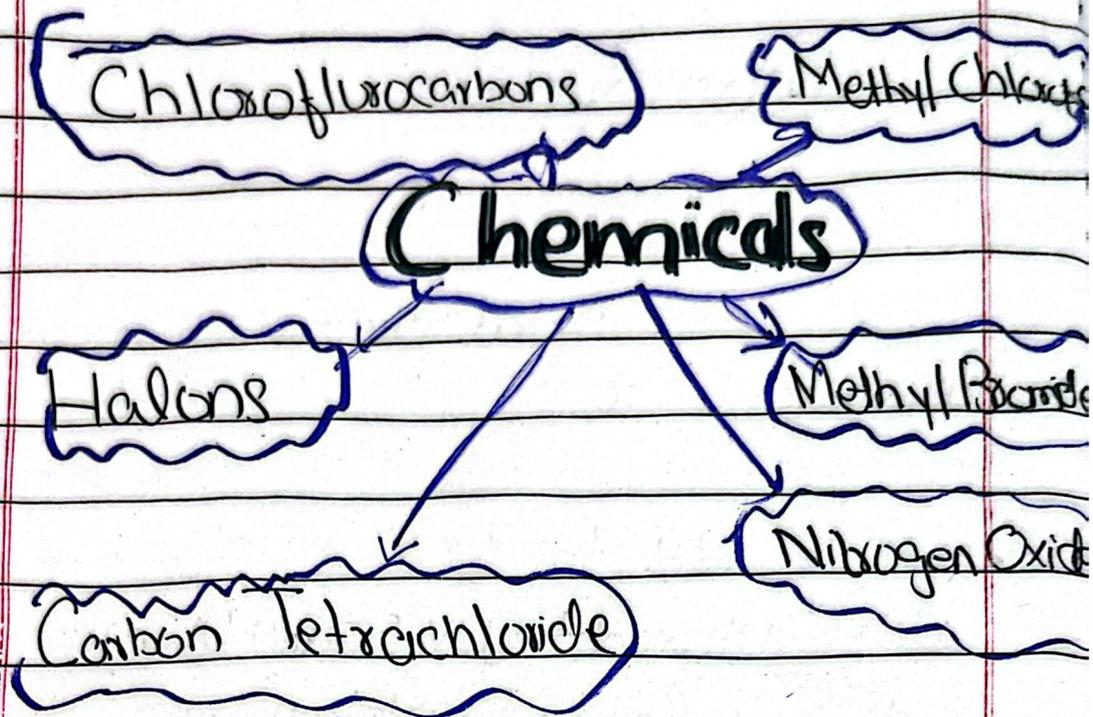
Introduction

The ozone layer is a thin gaseous shield in the stratosphere (15 km to 30 km above Earth). It plays a vital role in planetary survival by absorbing roughly 97% to 99% of the sun's lethal ultraviolet (UV-B and UV-C) radiation. "Ozone Depletion" refers to the thinning of this layer, primarily caused by anthropogenic (human-made) chemical emissions.

Chemicals Responsible for Ozone Depletion

According to G. Tyler Miller these ^{chemical} are known as Ozone-

Depleting Substance (ODS) Their



These chemicals does not ruin out but drift into upper atmosphere.

Chlorofluorocarbons.

known commercially as Freons, these were used in refrigerators ACs and aerosol sprays.

Halons I

Highly stable compounds containing Bromine, used primarily in fire extinguishers.

Carbon Tetrachloride (CCl₄)

An industrial solvent used in cleaning agents.

Methyl Chloroform

Used for degreasing metal.

Methyl Bromide

A fumigant used in agriculture to control pests.

Nitrogen Oxide

Released by high altitude supersonic jets.

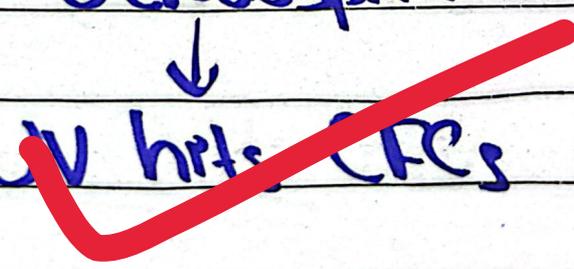
Mechanism of Ozone Depletion.

CFC Emission

Add diagrams to explain properly

Transport to Stratosphere

UV hits CFCs



Release of
Cl Radical

Ozone Destruction
Cycle

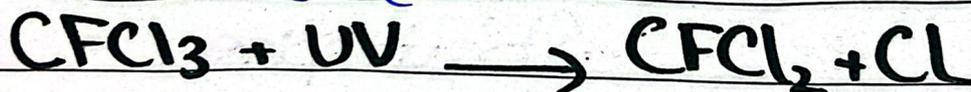
Ozone Layer
Thinning

Chemical Equations

The process occurs in three main stages:

1. Photolysis

UV radiation breaks the bond in a CFC molecule releasing a highly reactive Chlorine (Cl) radical.



Destruction of Ozone The

The Cl atom reacts with Ozone (O₃) creating Chlorine Monoxide



The Catalytic Cycle

The ClO reacts with a free oxygen atom releasing the Cl atom back to attack another ozone molecule



Impact of Ozone Layer Depletion

The primary consequence is the increased penetration of UV-B radiation to the Earth's surface.

Impacts on Human Health

Skin Cancer Increased risk of Melanoma and Non-Melanoma skin cancers.

Eye Damage Significant rise in Cataract (clouding of

eye lens and retinal damage,
Immune System.

UV-B radiation weakens the human immune response, making the body more susceptible to infections.

Environmental Impact

Impact on Eco-System

Marine Food Webs.

Increased UV kills phytoplankton which are foundation of oceans food chain and major oxygen producers.

Crops Yields

Sensitive Crops like rice, wheat, corn and soy show stunted growth and reduced nutritional value

Disruption of Biogeochemical Cycles

Changes in the nitrogen cycle and carbon sequestration

Capabilities of forests.

Material Degradation and Economic Impacts

UV radiation accelerates the weathering of outdoor material rubber and wood to cracks, peels and loose structural integrity.

Higher Cost of health care
agriculture and protective material

Examples

Antarctic ozone hole is the strongest

Montreal Protocol is a major global success story because it phased out many ODS.

Concise your conclusion

Conclusion

Ozone depletion mainly occurs because human-made gases (CFCs and halons) release chlorine and bromine radicals in the stratosphere.

These radicals destroy ozone in catalytic cycles and process becomes extreme over Antarctica due to polar stratospheric clouds. Ozone depletion increases

UV-B causing serious harm to health, ecosystem and materials.

Strong global control policies like the Montreal Protocol are essential to protect ozone layer.

