

Ozone Layer

These notes are your ultimate revision weapon to revise Ozone Layer. We've distilled years of previous exam questions (PYQs) into one powerful, concise resource. Everything you need to know, nothing you don't.

- **PYQs, Decoded:** All key concepts from past exams, organized and simplified.
- **Revise in Record Time:** Short, precise, and designed for last-minute review.
- **Focus on What Matters:** Master high-probability topics and boost your confidence.

1. The Ozone Layer: Basics & Location

- **Primary Location:** The stratosphere.
 - Approximately 90% of atmospheric ozone is located here.
- **Altitude:** Found in the lower part of the stratosphere, approximately **15 to 30 km** above the Earth's surface.
 - Its exact thickness varies by season and geographical location.
- **Measurement:**
 - Thickness is measured in **Dobson Units (DU)**.
 - 1 Dobson Unit is defined as a 0.01 mm thick layer of pure ozone at 0°C and 1 atmosphere of pressure.
- **Natural Regulation:** Naturally regulated by **Nitrogen Dioxide (NO₂)**.
- **Variability:** Ozone levels are not constant; they vary seasonally (e.g., more in spring, less in rainy seasons).
- **Atmospheric Layers (for reference):** The layers above the troposphere, in order, are: Stratosphere, Mesosphere, Thermosphere, and Exosphere.

2. Formation, Properties, and Function of Ozone

- **Chemical Composition:** A molecule composed of **three oxygen atoms (O_3)**.
- **Formation Process:** Created in the upper atmosphere when **sunlight (ultraviolet radiation)** reacts with oxygen molecules (O_2).
- **Toxicity:** While protective in the stratosphere, **ozone gas (O_3) at ground level is toxic** to living organisms.
- **Primary Function:** Acts as a protective shield for the biosphere by absorbing the sun's harmful **Ultraviolet (UV) radiation**.
 - It absorbs **93-99%** of the sun's harmful UV light.
- **Consequence of UV Exposure:**
 - Ultraviolet radiation can cause **skin cancer** by inducing genetic mutations.
 - The types of UV rays that reach the Earth and are harmful are **UV-A** and **UV-B**.

3. Ozone Depletion & the Ozone Hole

- **Primary Cause of Depletion: Chlorofluorocarbons (CFCs)** are the main cause of the ozone hole.
 - CFCs contain chlorine, which destroys ozone molecules.
 - CFCs are very stable and can remain in the atmosphere for **80 to 100 years**.
- **Other Ozone-Depleting Substances (ODS):**
 - **Halons** (e.g., HALON-1211 used in firefighting)
 - **Carbon Tetrachloride**
 - **Methyl Chloroform** (a solvent)
 - **Nitrous Oxide (N_2O)**
- **Mechanism of Depletion (The Ozone Hole over Antarctica):**
 - The depletion is maximum over **Antarctica**, forming the "ozone hole."
 - This is due to a combination of factors:

1. The presence of a prominent polar front.

2. The formation of **Polar Stratospheric Clouds (PSCs)**.
3. The inflow of **Chlorofluorocarbons (CFCs)**.
 - Nitric acid in the PSCs reacts with CFCs, releasing chlorine atoms that destroy ozone molecules. The clouds also help convert chlorine into its active, ozone-destroying form.
- **Discovery of Ozone Holes:**
 - The Antarctic ozone hole was first discovered in **1985 by a British team** using a Total Ozone Mapping Spectrometer.
 - An ozone halo over the **Tibetan Plateau** was discovered in **2005** by a research team led by **G.W. Kent Moore**.

4. Chlorofluorocarbons (CFCs): Common Uses (Now largely phased out)

- As **pressurizing agents** in aerosol cans.
- In the production of **plastic foams**.
- As **solvents** for cleaning electronic components (e.g., Trichlorofluoromethane).
- As **refrigerants** in cooling systems.
- *(Note: CFCs are **not** used in the production of tubeless tires.)*

5. Protection and International Efforts

- **Key International Agreement:** The **Montreal Protocol**.
 - It is an international treaty for the protection of the ozone layer.
 - It aims to phase out the production of ozone-depleting substances, primarily **CFCs**.
 - It was signed in **1987** and came into force on **January 1, 1989**.
- **International Ozone Layer Preservation Day:** Celebrated annually on **September 16** to commemorate the signing of the Montreal Protocol.
- **Refrigerants:** Modern refrigerators often use a type of halonic hydrocarbon (historically referred to as **Mafron**). While ammonia is used in large industrial plants, it was not the primary replacement for CFCs in domestic units.

6. Related Facts and Common Misconceptions

- **Greenhouse Effect:**
 - **CFCs are responsible** for contributing to the greenhouse effect.
 - Other major greenhouse gases include water vapor, **carbon dioxide (CO₂)** (a primary contributor), methane, and nitrous oxide.
- **Incorrect Associations:**
 - **Acid Rain:** Primarily caused by **Sulfur Dioxide (SO₂)** and **Nitrogen Oxides (NO_x)**, not Nitric Acid alone.
 - **Rocket Fuel:** Often a highly refined form of **Kerosene Oil**, not directly related to ozone-depleting substances.

Know More About Ozone Layer:

- [Ozone Layer – Old Year Questions](#)
- [Ozone Layer One Liner Questions & Answers](#)

