Class: 10th

Subject: Chemistry

Chapter 14: Environmental Chemistry

I The Atmosphere

Important MCQs:

1. What is the name of the gaseous envelope surrounding the Earth?

(a) Biosphere

(b) Hydrosphere

(c) Atmosphere ✅

(d) Lithosphere

2. Which layer of the atmosphere lies just above the Earth's surface?

(a) Stratosphere

(b) Troposphere ✅

(c) Mesosphere

(d) Thermosphere

3. The stratosphere extends up to:

(a) 12 km

(b) 25 km

(c) 50 km ✅

(d) 85 km

4. Which atmospheric layer contains the ozone layer?

(a) Troposphere

(b) Mesosphere

(c) Thermosphere

(d) Stratosphere ✅

5. In which layer of the atmosphere does temperature increase with height due to ozone presence?

(a) Troposphere

(b) Stratosphere ✅

(c) Mesosphere

(d) Thermosphere

6. Which gas is responsible for the greenhouse effect?

(a) SO_2

(b) CO ✅

(c) O_2

(d) NO_2

7. Which of the following gases is highly poisonous and dangerous to health?

(a) CO ✅

(b) O_2

(c) N_2

(d) CO_2

8. Which acid is formed when sulphur dioxide combines with water vapour?

(a) Nitric acid

(b) Carbonic acid

(c) Sulphuric acid ✅

(d) Hydrochloric acid

9. Which compound destroys the ozone layer and creates an ozone hole?

(a) Carbon monoxide

(b) Nitrogen

(c) Chlorofluorocarbons (CFCs) ✅

(d) Methane

10. Which is not a natural source of air pollution?

(a) Volcanic eruptions

(b) Forest fires

(c) Burning fossil fuels ✅

(d) Decomposition of organic matter

11. What is the atmosphere?

(a) A solid cover around Earth

(b) Envelope of gases around Earth ✅

(c) A layer of magnetic field

(d) Mixture of liquids

12. What percentage of the atmospheric mass is found within the first 30 km from Earth's surface?

(a) 90%

(b) 80%

(c) 99% ✅

(d) 70%

13. Which is the first (lowest) layer of the atmosphere?

(a) Mesosphere

(b) Thermosphere

(c) Troposphere ✅

(d) Stratosphere

14. In troposphere, temperature decreases at the rate of:

(a) 10°C/km

(b) 2°C/km

(c) 6°C/km ✅

(d) 5°C/km

15. All weather changes take place in:

(a) Mesosphere

(b) Stratosphere

(c) Troposphere ✅

(d) Thermosphere

16. Which gases make up 99% of the troposphere?

(a) Nitrogen and Oxygen ✅

(b) Carbon dioxide and oxygen

(c) Nitrogen and hydrogen

(d) Water vapours and carbon dioxide

17. What is the role of water vapours and carbon dioxide in the atmosphere?

(a) Cooling the Earth

(b) Absorbing infrared radiation ✅

(c) Reflecting ultraviolet rays

(d) Breaking down oxygen

18. What is the height of the stratosphere?

(a) Up to 12 km

(b) Up to 50 km ✅

(c) Up to 85 km

(d) Up to 100 km

19. In which layer does temperature increase due to the presence of ozone?

(a) Troposphere

(b) Mesosphere

(c) Stratosphere ✅

(d) Thermosphere

20. Which gas is responsible for absorbing ultraviolet (UV) radiation from sunlight?

(a) Oxygen

(b) Carbon dioxide

(c) Ozone ✅

(d) Nitrogen

21. Ozone layer is formed in which part of stratosphere?

(a) Upper stratosphere

(b) Lower stratosphere

(c) Mid stratosphere ✅

(d) Thermosphere

22. What happens to ozone in the upper stratosphere?

(a) It reflects IR radiation

(b) It breaks into O_2 and O ✅

(c) It turns into carbon dioxide

(d) It forms water

23. The formation of ozone is:

(a) A neutral reaction

(b) An endothermic reaction

(c) An exothermic reaction ✅

(d) A photochemical reaction

24. Why is ozone not formed in lower stratosphere?

(a) UV light is not present ✅

(b) Lack of oxygen

(c) High pressure

(d) No carbon dioxide

25. Which layer has temperature increasing with height?

(a) Troposphere

(b) Mesosphere

(c) Thermosphere ✅

(d) Stratosphere

26. What is a pollutant?

(a) A useful substance in air

(b) A material that purifies air

(c) A waste material that pollutes air, water, or soil ✅

(d) A natural gas

27. Which of the following determines the severity of a pollutant?

(a) Shape and color

(b) Concentration, persistence, and chemical nature ✅

(c) Temperature and smell

(d) Wind speed

28. What are substances called that make something impure, but not necessarily harmful?

(a) Pollutants

(b) Reactants

(c) Contaminants ✅

(d) Oxidants

29. Which of the following is not a primary air pollutant?

(a) Carbon monoxide (CO)

(b) Sulphur dioxide (SO_2)

(c) Nitric oxide (NO)

(d) Ozone (O_3) ✅

30. Which of the following is a secondary pollutant?

(a) CO

(b) CH_4

(c) PAN (Peroxyacetyl Nitrate) ✅

(d) NH_3

31. Which compound is not classified under primary air pollutants?

(a) CO

(b) SO_2

(c) NO

(d) H_2SO_4 ✅

32. Which human activity contributes most to increased carbon dioxide (CO_2) emissions?

(a) Freezing water

(b) Combustion of fossil fuels ✅

(c) Walking

(d) Planting trees

33. Which statement is true about carbon dioxide?

(a) It is a poisonous gas

(b) It is completely harmful to plants

(c) It is essential for photosynthesis ✅

(d) It is a secondary pollutant

34. What does increased CO_2 in the atmosphere cause?

(a) Acid rain

(b) Global warming ✅

(c) Ozone depletion

(d) Industrial rusting

35. What is the greenhouse effect?

(a) Cooling of the Earth's surface

(b) Melting of oxygen

(c) Trapping of infrared radiation by CO_2 ✅

(d) Formation of ozone in lower atmosphere

36. Which gas traps the heat in the Earth's atmosphere and prevents surface cooling at night?

(a) Nitrogen

(b) Oxygen

(c) Carbon dioxide ✅

(d) Neon

37. What is a major effect of global warming?

(a) Reduced rainfall

(b) Submerging of low-lying areas due to rising sea level ✅

(c) Thicker ozone layer

(d) Increase in plant growth only

38. What percentage of total SO_2 in the atmosphere comes from fossil fuel combustion?

(a) 20%

(b) 40%

(c) 80% ✅

(d) 90%

39. Which gas causes suffocation, irritation, and respiratory problems in asthmatic patients?

(a) CO_2

(b) CH_4

(c) SO_2 ✅

(d) O_2

40. Which harmful acid is formed when nitrogen

oxides react with water vapours in air?

(a) Sulphuric acid

(b) Hydrochloric acid

(c) Nitric acid ✅

(d) Carbonic acid

41. What is the pH of acid rain typically reduced to?

(a) 7

(b) 6.5

(c) 5

(d) 4 ✅

42. Which pollutants dissolve in rainwater to form acid rain?

(a) CO_2 and CH_4

(b) SO_2 and NO_2 ✅

(c) O_2 and N_2

(d) CO and H_2

43. Which harmful acids are formed in acid rain?

(a) Acetic and citric acids

(b) Sulphuric and nitric acids ✅

(c) Hydrochloric and oxalic acids

(d) Carbonic and phosphoric acids

44. Acid rain leaches heavy metals from soil and rocks. Which of the following is not a heavy metal?

(a) Aluminium

(b) Mercury

(c) Lead

(d) Calcium ✅

45. Which of the following is damaged by acid rain due to its calcium carbonate content?

(a) Iron bridges

(b) Wooden houses

(c) Marble buildings ✅

(d) Plastic structures

46. What happens to plants and trees when exposed to acid rain?

(a) Their growth accelerates

(b) Their growth is retarded ✅

(c) They become evergreen

(d) They produce more oxygen

47. What is the role of the ozone layer in the stratosphere?

(a) Produces oxygen

(b) Absorbs carbon dioxide

(c) Protects from ultraviolet rays ✅

(d) Reflects visible light

48. Which substances are the major cause of ozone layer depletion?

(a) Hydrocarbons

(b) Carbonates

(c) Chlorofluorocarbons (CFCs) ✅

(d) Sulphates

49. What is the dangerous effect of ozone depletion on humans?

(a) High blood pressure

(b) Skin cancer ✅

(c) Diabetes

(d) Allergies

50. What is the name of the region where ozone is significantly reduced?

(a) Greenhouse zone

(b) Dead zone

(c) Ozone pocket

(d) Ozone hole ✅

Exercise Short Questions:

1. Explain the phenomenon of decreasing temperature in troposphere.

Answer:

In the troposphere, temperature decreases with altitude.

This happens because:

- It gets heat from the Earth's surface, not directly from the Sun.
- As we go higher, the distance from Earth's surface increases, so heat decreases.
- Thus, air becomes cooler at higher altitudes.

2. Differentiate between primary and secondary air pollutants.

✅ Answer:

Type	Description	Example
Primary Pollutants	Directly emitted into atmosphere	CO, SO2, NO2
Secondary Pollutants	Formed by chemical reactions in air	Ozone, Acid Rain (H2SO4, HNO3)

3. State the major sources of CO and CO_2 emission.

Answer:

Major Sources:

- Combustion engines of vehicles (petrol/diesel)
- Burning of fossil fuels (coal, oil, gas)
- Open-air fires & industrial kilns
- These release both CO (Carbon monoxide) and CO_2 (Carbon dioxide) into the air.

4. CO_2 is responsible for heating up atmosphere, how?

Answer:

CO_2 gas forms a layer around Earth that absorbs infrared radiations emitted by Earth's surface.

This traps heat and causes greenhouse effect, which warms the atmosphere.

5. CO is a hidden enemy, explain its action.

Answer:

- CO (Carbon monoxide) is a colorless and odorless poisonous gas.
- It binds with hemoglobin in blood more strongly than oxygen.
- This reduces oxygen transport in the body.

- Leads to unconsciousness or death without any smell or warning.
- Hence, it is called a hidden enemy.

6. What threats are there to human health due to SO_2 gas as air pollutant?

Answer:

- SO_2 (Sulphur dioxide) causes:
- Irritation in eyes, throat, and lungs
- Breathing problems, especially in asthma patients
- Reacts with water vapors to form sulphuric acid, which causes acid rain
- Acid rain indirectly leads to contaminated water, damaging health.

7. Which air pollutant is produced on anaerobic decomposition of organic matter?

Answer:

- Methane (CH_4) gas is produced during anaerobic decomposition (without oxygen) of

organic matter.

- It is a greenhouse gas and contributes to global warming.

8. How does acid rain increase the acidity of soil?

Answer:

- Acid rain contains sulphuric acid (H_2SO_4) and nitric acid (HNO_3).
- When it falls on soil:
- It lowers the pH of soil (below 7), making it acidic.
- This damages crops and soil fertility.

9. Point out two serious effects of ozone depletion.

Answer:

1. Increased UV radiations reach the Earth, causing skin cancer and eye damage.

2. Disruption in plant life cycles and climate patterns like wind & rainfall.

10. How is ozone layer formed in stratosphere?

Answer:

Ozone is formed when:

- Oxygen molecules (O_2) absorb UV rays and split into O atoms.
- These O atoms react with O_2 to form ozone (O_3).

🧪 **Reaction:**

- $O_2 + UV \Rightarrow O + O$
- $O + O_2 \Rightarrow O_3$ (ozone)

This process creates the ozone layer in stratosphere.

11. Why does 75% of the atmospheric mass lie within the troposphere?

Answer:

Because:

- Gravity pulls most gases towards Earth's surface.
- The troposphere is the lowest layer, so it holds denser air and most mass.

- Hence, 75% of air is concentrated here.

12. How ozone layer is being depleted by chlorofluorocarbons (CFCs)?

Answer:

- CFCs release chlorine atoms when exposed to UV rays.
- These chlorine atoms:
- React with ozone (O_3) and break it down into oxygen (O_2).
- One CFC molecule can destroy thousands of ozone molecules.
- This leads to ozone depletion.

🧪 **Reaction:**

$Cl + O_3 \Rightarrow ClO + O_2$

Important Short Questions:

1. What do you mean by atmosphere?

Answer:

- Atmosphere is a layer of gases that surrounds the Earth.
- It protects life by absorbing harmful rays, controlling temperature, and providing oxygen and carbon dioxide for living organisms.

2. What is the difference between atmosphere and environment?

Answer:

- Atmosphere Environment
- Envelope of gases around Earth All living and non-living surroundings
- Includes layers like troposphere, stratosphere Includes air, water, land, plants, animals

3. Name the major constituents of troposphere.

Answer:

The major gases in the troposphere are:

- Nitrogen (78%)
- Oxygen (21%)

These two gases make up 99% of the troposphere

by volume.

4. How is the temperature of atmosphere maintained?

Answer:

Temperature is maintained by:

- Carbon dioxide (CO_2) and water vapours.
- They absorb infrared radiation emitted from Earth's surface.
- This process is known as the greenhouse effect, which keeps the Earth warm.

5. Where does the ozone layer exist?

Answer:

- The ozone layer exists in the stratosphere, about 25 to 30 km above Earth's surface.
- It protects the Earth from harmful ultraviolet (UV) rays of the Sun.

6. Why is the temperature of upper stratosphere higher?

Answer:

In the upper stratosphere:

- Ozone molecules absorb UV radiations from the Sun.
- This absorption releases heat energy, raising the temperature.
- Thus, temperature increases with altitude in this region.

7. What do you mean by an air pollutant?

Answer:

An air pollutant is any unwanted or harmful substance present in the air, which can damage health, environment, or climate.

Examples: CO, SO_2, NOx, smoke.

8. Name three primary air pollutants.

Answer:

Three major primary air pollutants are:

1. Carbon monoxide (CO)
2. Sulphur dioxide (SO_2)
3. Methane (CH_4)

9. Identify as primary or secondary air pollutant:

Answer:

Pollutant = Type

SO_2 = Primary

CH_4 = Primary

HNO_3 = Secondary

NH_3 = Primary

H_2SO_4 = Secondary

NO_3 = Secondary

10. Why is CO_2 called a greenhouse gas?

Answer:

- CO_2 absorbs infrared radiation emitted from Earth's surface and traps heat in the atmosphere.
- This leads to the greenhouse effect, which raises global temperature.

11. Why are the flood risks increasing?

Answer:

Flood risks are increasing due to:

- Global warming and climate change.
- Melting glaciers and heavy rainfall due to disturbed weather patterns.
- These are effects of greenhouse gases and pollution.

13. How are sulphur containing compounds emitted naturally?

Answer:

Sulphur compounds like SO_2 are naturally emitted by:

- Volcanic eruptions
- Decay of organic matter
- These sources release sulphur gases into the atmosphere.

14. How does combustion of fossil fuels in internal combustion engine produce oxides of nitrogen?

Answer:

During combustion of petrol or diesel at high

temperatures, the nitrogen in air reacts with oxygen and forms:

- Nitric oxide (NO)
- Nitrogen dioxide (NO_2)
- These are called oxides of nitrogen (NOx), which are primary air pollutants.

15. Justify, ozone is beneficial for humankind.

Answer:

- Ozone is beneficial because it forms a protective layer in the stratosphere, which:
- Blocks harmful ultraviolet (UV) rays of sunlight.
- Protects humans from skin cancer, eye diseases, and immune system damage.
- Maintains climate balance and supports life on Earth.

🌤️ Hence, ozone acts like a natural shield.

16. Why is ozone depleting in atmosphere?

Answer:

Ozone is depleting due to human-made chemicals

like:

- Chlorofluorocarbons (CFCs) used in refrigerators, air conditioners, and aerosol sprays.
- CFCs release chlorine atoms which destroy ozone molecules.

🧪 This leads to ozone depletion in the upper atmosphere.

18. What do you mean by ozone hole?

Answer:

- The ozone hole is the region of the stratosphere where the ozone layer becomes thinner or depleted due to pollutants like CFCs.
- It appears especially over the Antarctic region.
- ⚠ It allows more UV rays to reach Earth's surface, causing serious health and environmental issues.

19. Where is the ozone layer found?

Answer:

- The ozone layer is located in the stratosphere, about 25 to 30 kilometers above the Earth's surface.
- It surrounds the planet and absorbs UV radiation.

🌐 It is essential for preserving life on Earth.

Exercise Long Questions:

🌟 **Q1: Write down the significance of atmospheric gases.**

❖ **Introduction:**

The atmosphere is the layer of gases that surrounds the Earth. These gases are essential for maintaining life and the environmental balance on Earth.

🔹 **Major Atmospheric Gases & Their Significance:**

1. Nitrogen (N_2) – 78%

- Maintains inert environment.
- Controls rapid burning by diluting oxygen.

- Important for plant growth (used in nitrogen cycle).

2. Oxygen (O_2) – 21%

- Essential for respiration in humans and animals.
- Supports combustion (burning of fuels).
- Required for metabolism and energy production in cells.

3. Carbon Dioxide (CO_2) – 0.03%

- Used by plants in photosynthesis.
- Helps in regulating temperature through greenhouse effect.
- Plays a role in carbon cycle.

4. Water Vapours (H_2O vapours)

- Causes cloud formation and rainfall.
- Helps in heat regulation through condensation and evaporation.

5. Ozone (O_3)

- Found in stratosphere.

- Absorbs ultraviolet (UV) rays from sunlight.
- Protects living organisms from radiation damage.

🔹 Other Trace Gases:

Methane (CH_4), Nitrous oxide (N_2O), Argon (Ar) — contribute to climate regulation and chemical reactions in the atmosphere.

📘 Summary:

Atmospheric gases are crucial for life, climate control, and environmental safety. Without them, Earth would be uninhabitable. Their balance is essential for survival of all living organisms.

🌟 Q2: Give the characteristics of troposphere. Why temperature decreases upwards in this sphere?

❖ Introduction:

Troposphere is the lowest layer of the Earth's atmosphere. It extends from Earth's surface up to about 12 km. It is the most important layer for living beings.

🔹 Characteristics of Troposphere:

1. Closest to Earth:

- Directly above Earth's surface (from 0 to 12 km).
- Contains 75% of atmospheric mass and weather phenomena.

2. Rich in Gases:

- Contains most oxygen and nitrogen essential for life.
- Almost all water vapours, clouds, and dust are found here.

3. Weather Occurs Here:

- Rainfall, storms, winds, and clouds form in this layer.
- Controlled by temperature, water vapours, and pressure changes.

4. Air Pressure:

- Highest at Earth's surface.
- Decreases with altitude.

5. Temperature Gradient:

- Temperature decreases by about 6.5°C per km as we go upwards.
- From surface (-60°C).

🔹 **Why Temperature Decreases Upward in Troposphere?**

✅ **Reason:**

- The Earth's surface absorbs heat from sunlight and radiates it back as infrared rays.
- Air near surface is warmer due to conduction and radiation.
- As we move upward, distance from heat source (Earth) increases, so air becomes cooler.

✅ **Result:**

This temperature difference causes air movements and formation of clouds and winds — important for weather.

🌟 **Q3: What are the characteristics of stratosphere? Why does temperature increase**

upwards in this sphere?

❖ Introduction:

The stratosphere is the second layer of the atmosphere, located above the troposphere. It extends from about 12 km to 50 km above the Earth's surface.

🌤️Characteristics of Stratosphere:

1. Altitude Range:

- The stratosphere lies between 12 km and 50 km altitude.
- It starts just above the troposphere.

2. Ozone Layer Presence:

- The ozone layer is found within the stratosphere, between 25–30 km above the Earth.
- Ozone molecules absorb harmful ultraviolet (UV) rays from the sun.

3. Stable Weather Conditions:

- There are no strong weather disturbances like

storms or rainfall in this layer.

- It is considered calm and stable compared to the troposphere.

4. Commercial Jet Flying Zone:

- Commercial airplanes fly in the lower part of the stratosphere due to smooth air movement.

🌡️ **Why Does Temperature Increase Upwards?**

- In the stratosphere, temperature increases with height (called temperature inversion).
- This is due to the presence of the ozone layer which:
- Absorbs UV rays from the sun.
- Converts this solar energy into heat.
- As we go higher in the stratosphere, more ozone is present, hence more UV is absorbed, and temperature rises.

🌟 **Q4: CO_2 is necessary for plants, but why is its increasing concentration alarming for us?**

❖ **Answer:**

🌱 Importance of CO_2 for Plants:

- Carbon dioxide (CO_2) is essential for photosynthesis, the process by which plants make their food.
- Plants absorb CO_2 from the air and convert it into glucose using sunlight and water.
- It also helps maintain the carbon cycle on Earth.

🚨 Why is Increasing CO_2 a Danger for Humans and the Environment?

1. Greenhouse Effect:

- CO_2 is a greenhouse gas.
- It forms a layer around the Earth that traps infrared radiation (heat).
- This leads to global warming – a rise in Earth's average temperature.

2. Melting of Ice Caps:

- Increased temperature causes glaciers and polar ice to melt.
- It leads to rise in sea levels, flooding, and loss

of habitats.

3. Extreme Weather Events:

- Global warming causes more frequent floods, droughts, heatwaves, and storms.

4. Ocean Acidification:

- CO_2 dissolves in oceans, forming carbonic acid, making oceans acidic.
- This harms marine life like corals, fish, and plankton.

5. Disruption of Ecosystems:

- High CO_2 levels affect plant growth patterns, animal habitats, and natural food chains.

📘 **Summary:**

Although CO_2 is vital for plant life, its excess in the atmosphere is dangerous. It causes climate change, damages ecosystems, and poses a threat to human survival.

🌟 **Q5: Why is CO (Carbon Monoxide) considered a health hazard?**

❖ Introduction:

Carbon Monoxide (CO) is a colorless, odorless, and tasteless gas. It is produced mainly by incomplete combustion of fuels like petrol, wood, and coal. Despite being invisible, it is extremely dangerous to human health.

🔬 Sources of CO Gas:

- Incomplete burning of petrol or diesel in engines.
- Domestic stoves and gas heaters.
- Open-air fires and forest fires.
- Industrial processes.

☠️ Why CO is a Health Hazard?

1. Formation of Carboxyhemoglobin:

- CO combines with hemoglobin in blood to form carboxyhemoglobin.
- This compound blocks oxygen transport in the body.
- As a result, organs and brain receive less

oxygen.

2. Silent Killer:

- CO cannot be detected by smell or color, making it a "silent killer".
- People may not realize they are inhaling it.

3. Symptoms of CO Poisoning:

- Headache, dizziness, weakness
- Confusion, blurred vision

In severe cases: unconsciousness or death

⚠ Sensitive Groups:

- Pregnant women, infants, and elderly are at higher risk.
- People with heart disease are also more vulnerable.

📘 Summary:

CO is a deadly air pollutant that affects the body silently. Its presence in polluted air is a major health threat. Proper ventilation and reduced fuel burning can help control its emission.

🌟 Q6: Define Acid Rain. How is it formed and what are its effects?

❖ Definition:

Acid rain is a form of precipitation (rain, snow, fog) that contains harmful acids like sulfuric acid (H_2SO_4) and nitric acid (HNO_3). Its pH is less than 5.6, making it highly acidic.

🔹 How is Acid Rain Formed?

1. Emission of Pollutant Gases:

- Factories, vehicles, and power plants release SO_2 (sulfur dioxide) and NO_x (nitrogen oxides) into the air.

2. Chemical Reactions in Atmosphere:

- These gases react with water vapor and oxygen in the atmosphere to form:
- Sulfuric acid (H_2SO_4)
- Nitric acid (HNO_3)

3. Precipitation:

These acids mix with cloud water and fall as acid

rain on Earth.

🔹 Effects of Acid Rain:

1. On Soil and Plants:

- Increases soil acidity.
- Damages roots and reduces nutrient absorption in plants.
- Affects crop yield and forest life.

2. On Aquatic Life:

- Lowers pH of lakes and rivers.
- Kills fish, insects, and aquatic plants.

3. On Buildings and Monuments:

Corrodes buildings made of limestone and marble.

Damages historical monuments like the Taj Mahal.

4. On Human Health:

- **Indirect effects**: acid rain pollutes drinking water and causes respiratory problems.
- hrough cleaner fuels and technologies.

🌟 **Q7: Compounds of sulphur are air pollutants.** Describe the sources of these compounds along with their effects.

❖ **Introduction:**

Sulphur-containing compounds like Sulphur Dioxide (SO_2) and Sulphur Trioxide (SO_3) are major air pollutants. These gases are produced naturally as well as through human activities and have harmful effects on the environment and human health.

🔹 **Sources of Sulphur Compounds:**

🔸 **A. Natural Sources:**

- **Volcanic Eruptions:** Release SO_2 directly into the atmosphere.
- **Anaerobic Decomposition**: Organic matter decomposes in the absence of oxygen, producing hydrogen sulfide (H_2S), which further forms SO_2.

🔸 **B. Human Activities (Anthropogenic Sources):**

- Burning of fossil fuels (coal and oil) in factories and power plants.

- Industrial processes such as metal smelting.
- Vehicle exhausts (especially diesel engines).
- Open air fires and kilns in brick-making industries.

⚠ Harmful Effects of Sulphur Compounds:

1. On Human Health:

- Irritation in eyes, nose, and throat.
- Difficulty in breathing, especially for asthma patients.
- Long-term exposure may damage lungs.

2. Formation of Acid Rain:

- SO_2 reacts with water vapors in the air forming Sulfuric Acid (H_2SO_4).
- This leads to acid rain, which harms plants, aquatic life, soil, and buildings.

3. Environmental Impact:

- Reduces photosynthesis in plants by damaging leaf structure.
- Acidifies lakes and rivers, killing fish and

aquatic organisms.

📘 **Summary:**

Sulphur compounds like SO_2 are dangerous air pollutants. They come from both natural and industrial sources and affect health and environment. We can reduce their emission by using clean energy sources and installing filters in factories.

🌟 **Q8: Where does ozone layer lie in atmosphere? How is it depleting and how can we prevent its depletion?**

❖ **Introduction:**

The ozone layer is a protective shield in the atmosphere that absorbs harmful ultraviolet (UV) rays from the Sun. It plays a vital role in protecting life on Earth.

🔹 **Location of the Ozone Layer:**

- Found in the Stratosphere, which is the second layer of the atmosphere.
- Lies approximately 25 to 30 km above the

Earth’s surface.

⚠ Ozone Depletion – How is it happening?

🔸 Main Cause: Chlorofluorocarbons (CFCs):

These are synthetic gases used in:

- Refrigerators
- Air conditioners
- Aerosol sprays
- Foam-blowing agents

🔸 Mechanism of Depletion:

1. CFCs rise to the stratosphere.

2. UV rays break them down, releasing chlorine atoms.

3. Each chlorine atom reacts with ozone (O_3) and destroys it:

🔸 Result:

- Formation of ozone holes, especially over Antarctica.
- Increase in UV radiation reaching Earth's

surface.

⚠ Effects of Ozone Depletion:

1. On Human Health:

- Skin cancer and eye diseases (like cataracts).
- Weakens the immune system.

2. On Plants and Animals:

- Damages crops and reduces agricultural productivity.
- Affects phytoplankton and disrupts aquatic food chains.

3. On Climate:

Alters weather patterns and increases global warming effects.

✅ Preventive Measures:

🔹 1. Ban Harmful Chemicals:

Phasing out CFCs and replacing them with eco-friendly alternatives like HFCs (hydrofluorocarbons).

🔹 2. Follow Montreal Protocol:

An international agreement to reduce ozone-depleting substances.

🔹 **3. Public Awareness:**

Educating people about the importance of ozone and eco-friendly products.

📘 **Summary:**

The ozone layer is critical for life on Earth. Its depletion is mainly due to human-made chemicals like CFCs. By using safer alternatives and reducing harmful emissions, we can protect this natural shield.

🌟 **Q9. Oxides of nitrogen cause air pollution. Describe the sources of these compounds.**

❖ **Introduction:**

Oxides of nitrogen, especially Nitric Oxide (NO) and Nitrogen Dioxide (NO_2), are toxic gases that are considered primary air pollutants. These compounds are released into the atmosphere from both natural and man-made sources and contribute to environmental and health problems.

🌋 Types of Nitrogen Oxides (NO_x):

The term NO_x refers mainly to:

- Nitric oxide (NO)
- Nitrogen dioxide (NO_2)
- (Sometimes includes nitrous oxide N_2O, but it is less reactive.)

📍 Sources of Nitrogen Oxides:

🔸 A. Natural Sources:

1. Lightning Activity:

- During thunderstorms, high temperatures break down nitrogen (N_2) and oxygen (O_2) in the atmosphere.
- These recombine to form NO and NO_2.

Example reaction:

$$N_2 + O_2 \xrightarrow{\text{High Temperature}} 2NO$$

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2. Biological Activity in Soil:

- Certain bacteria in soil release nitrous oxide (N_2O) during nitrification and denitrification processes.
- This contributes slightly to atmospheric nitrogen oxides.

🔸 B. Anthropogenic (Human-made) Sources:

1. Combustion of Fuels in Vehicles:

- Burning of petrol or diesel in car engines at high temperatures forms NO and NO_2.
- Internal combustion engines are the main contributors in urban areas.

2. Power Plants and Factories:

- Industrial boilers and thermal power stations burn coal and oil, releasing large amounts of nitrogen oxides.

3. Burning of Biomass:

- Open burning of wood, crop residues, and garbage also emits NO_x gases.

4. Aircraft Emissions:

- Jet engines emit nitrogen oxides at high altitudes, affecting the upper atmosphere.

⚠ Why Are Nitrogen Oxides Dangerous?

- They react with oxygen and hydrocarbons in the presence of sunlight to form photochemical smog.
- NO_2 is a reddish-brown toxic gas that irritates the eyes and respiratory system.
- Contributes to acid rain by forming nitric acid (HNO_3).
- Damages plants by affecting photosynthesis.

Note:

This chapter is designed to provide a solid foundation of knowledge, with the goal of deepening understanding and encouraging further exploration of the subject. The content has been

carefully selected to support effective learning and inspire students to engage with the topic more deeply.

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Purpose: To contribute to education by offering insightful, valuable content that enhances learning and understanding.

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