

GUJARAT TECHNOLOGICAL UNIVERSITY
5 SEMESTER – OLD PAPER – S22 TO S26 – QUESTION BANK
Subject Name & Code: Fundamentals of Air Pollution - 3151309

Chapter 1: Introduction

Repeated Questions:

1. Air Pollution: Definition, Sources and Classification of Pollutants:

- **Q.** Define air pollution & give classification of sources of air pollution. / Define Air pollution. Enlist and explain the sources of air pollution in detail. **(SUMMER 2023, 3 Marks; WINTER 2023, 3 Marks; WINTER 2024, 3 Marks)**
- **Q.** Differentiate between primary & secondary air pollutants. / Explain primary and secondary air pollutants with examples. **(SUMMER 2023, 4 Marks; WINTER 2024, 3 Marks; SUMMER 2026, 4 Marks)**
- **Q.** Give the classification of air pollutants with the examples. / Define Air Pollutants. Enlist various sources of Air pollutants. Explain the classification of Air Pollutants. **(WINTER 2022; SUMMER 2024, 4 Marks)**

2. Fuels and Fuel Analysis:

- **Q.** Make a list of fuels and name the potential air pollutants generated from each type of fuels. / Enlist the different types of fuels used in vehicles also enlist the air pollutants emitted by each type of fuel. **(WINTER 2022; WINTER 2023; SUMMER 2024)**

3. Effects of Air Pollutants:

- **Q.** Discuss the effects of oxides of sulfur (SO_x) on Human health, Plants & Property. / Describe the effects of Sulfur dioxide on human health, vegetation & materials. / Describe the effects of NO_x on human health, vegetation & materials. **(WINTER 2022 OR; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks OR; WINTER 2024, 4 Marks; SUMMER 2026, 7 Marks)**
- **Q.** Name the air pollutants & write down the effect of particulate matter on plants & human health. / Explain the effects of Particulate matter on human, animals and vegetation. / Write down the effects of SO₂ & Particulate Matter (PM) on Human health. **(SUMMER 2022, 3 Marks; WINTER 2024, 4 Marks; SUMMER 2025, 3 Marks)**
- **Q.** Discuss the Effects of Carbon Monoxide on Plants, Vegetation and Human health. / Write down the effect of SO₂ & CO on Human health. **(WINTER 2022; SUMMER 2024, 3 Marks)**

Other Important Questions:

1. Air Pollution: Definition, Sources and Classification of Pollutants:

- **Q.** Give the example of the fugitive & line source of air pollution. **(SUMMER 2022, 4 Marks)**
- **Q.** Explain the Stationary & Mobile sources of air pollution with suitable examples. **(SUMMER 2025, 4 Marks)**
- **Q.** Define following terms: (a) Aerosol (b) Mist (c) Fog. **(WINTER 2024, 3 Marks)**

2. Fuels and Fuel Analysis:

- **Q.** Define proximate and ultimate analysis of fuel. **(WINTER 2024, 3 Marks OR)**

3. Effects of Air Pollutants:

- **Q.** Explain the aesthetic, climatic, and related effects of air pollution. **(SUMMER 2024, 4 Marks)**

Chapter 2: Air quality monitoring

Repeated Questions:

1. Ambient Air Sampling, Instruments and Monitoring Programmes:

- **Q.** Write short note on High Volume Air Sampler (HVAS). / Explain the working of the high-volume air sampler for the measurement of the particulate matter. / Explain in brief: Construction and Working of a High Volume Sampler / Draw a neat sketch of high volume air sampler (HVAS) & label the components. **(SUMMER 2022, 7 Marks; WINTER 2022; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 3 Marks; SUMMER 2026, 7 Marks)**
- **Q.** Write down the application of the following equipment; 1. Anemometer 2. Thermocouple 3. Manometer. **(WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks)**
- **Q.** Discuss various aspects of sampling to be considered while developing a sampling programme. **(SUMMER 2023, 4 Marks OR; WINTER 2025, 7 Marks)**
- **Q.** Discuss important requirements for carrying out the ambient air quality monitoring. / What are the basic requirements for carrying out the ambient air quality monitoring? **(SUMMER 2022, 4 Marks OR; WINTER 2023, 4 Marks)**
- **Q.** Discuss the need of representative sampling in air pollution monitoring. / How you collect representative sample of air? **(SUMMER 2024, 3 Marks; SUMMER 2026, 3 Marks)**

2. Stack Monitoring and Isokinetic Sampling:

- **Q.** Discuss the Iso kinetic sampling in detail. / Define the iso kinetic condition. / Mention the purpose of stack monitoring & explain the need of iso kinetic sampling. / Explain in detail Isokinetic sampling and its importance. **(SUMMER 2022, 3 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks; WINTER 2024, 3 Marks OR; WINTER 2024 OR; SUMMER 2025, 7 Marks; SUMMER 2026, 7 Marks OR)**
- **Q.** Write a detailed note on "Procedure for stack gases Sampling." / Explain the step by step procedure of stack monitoring. **(WINTER 2022; SUMMER 2024, 7 Marks OR; WINTER 2024, 7 Marks OR; SUMMER 2026, 4 Marks)**
- **Q.** Discuss the purposes of stack monitoring. / Explain the step by step procedure of stack monitoring. **(SUMMER 2022, 4 Marks; WINTER 2022)**

3. Concentration Conversions and Flue Gas Calculations (Numerical):

- **Q.** Derive the relationship between ppm and $\mu\text{g}/\text{m}^3$. **(SUMMER 2023, 3 Marks)**
- **Q.** Find out the flow of flue gas and particulate matter concentration in mg/Nm^3 . Type of fuel is lignite (Mata no madh), fuel consumption is $[4 / 1.5 / 2]$ T/day. Assume suitable data. **(SUMMER 2023 OR; WINTER 2023; SUMMER 2024; SUMMER 2025, 4 Marks)**
- **Q.** The exhaust gas from an automobile contains $[1.5 / 3]$ percent by volume of carbon monoxide. What is the concentration of CO in milligrams per cubic meter (mg/m^3) at 25°C and 1 atm pressure? / The Concentration of CO in cigarette smoke reaches 200 ppm / 420 ppm... [Data truncated in source – refer to the original question paper] **(WINTER 2022; WINTER 2023 OR; WINTER 2024; WINTER 2024 OR; WINTER 2025, 4 Marks)**
- **Q.** The average daily concentration of SO_2 is observed to be $[420 / 350]$ $\mu\text{g}/\text{m}^3$ at 25°C and 1 atm pressure at a given location. What is the concentration of SO_2 in ppm? **(SUMMER 2024; SUMMER 2025)**

Other Important Questions:

1. Ambient Air Sampling, Instruments and Monitoring Programmes:

- **Q.** Write down the full form of the NAAQS. **(SUMMER 2022, 3 Marks OR)**
- **Q.** Name the instrument used for determination of the following atmospheric parameters; I. Wind speed & direction II. Humidity III. Rainfall. **(SUMMER 2022, 3 Marks)**

- **Q.** Draw a chart of National Ambient Air Quality Monitoring Programme. **(WINTER 2025, 3 Marks)**
- **Q.** Draw a flowchart for measurement of sulphur dioxide from ambient air. **(WINTER 2025, 4 Marks OR)**

2. Stack Monitoring and Isokinetic Sampling:

- **Q.** Differentiate between the stack gases sampling and ambient air sampling. **(SUMMER 2023, 7 Marks OR)**
- **Q.** Which pollutants are measured from the stack? Enlist those pollutants with its permissible limits. **(WINTER 2022)**
- **Q.** Compare stack monitoring & ambient air quality monitoring. **(SUMMER 2025, 3 Marks OR)**
- **Q.** Define Traverse Point. Enlist the steps for particulate matter sampling from the point source. **(SUMMER 2025)**
- **Q.** Define following terms: 1. Representative sample 2. Traverse points (sketch) 3. KIOSK. **(WINTER 2025, 3 Marks)**
- **Q.** Give the specification of followings: 1. Panel Box 2. Impingers 3. Set of nozzles 4. S-type Pitot tube. **(WINTER 2025, 4 Marks)**
- **Q.** Briefly explain followings: 1. Selection of sampling location with sketch 2. Number of sampling port with sketch 3. Size of sampling port 4. Platform loading. **(WINTER 2025, 7 Marks OR)**
- **Q.** What is Turbulence? How is it formed in the stack? **(WINTER 2025, 3 Marks OR)**
- **Q.** Describe the following during stack monitoring condition in detail with sketch: 1. Velocity of gas stream is lower than the probe velocity 2. Velocity of gas stream is higher than the probe velocity 3. Velocity of gas stream is equal than the probe velocity. **(WINTER 2025, 7 Marks)**

Chapter 3: Meteorology

Repeated Questions:

1. Lapse Rate, Inversion, Stability and Mixing Depth:

- **Q.** Derive the equation of DALR $(-dT/dz) = 9.8^\circ\text{C}/\text{km}$ / Derive Dry Adiabatic Lapse Rate (DALR). (SUMMER 2022, 7 Marks OR; WINTER 2022 OR; SUMMER 2023, 7 Marks OR; SUMMER 2024; WINTER 2024, 7 Marks; SUMMER 2026, 7 Marks OR)
- **Q.** Define the terms: (1) Lapse Rate (2) Inversion (3) Maximum Mixing Depth (MMD). / Define the lapse rate & explain the method for determination of environmental lapse rate for a particular location. (SUMMER 2023, 3 Marks; WINTER 2023; SUMMER 2024; SUMMER 2025)
- **Q.** Give the difference between Dry adiabatic and wet adiabatic lapse rate. / Differentiate between Dry Adiabatic lapse rate and Wet Adiabatic lapse rate. (SUMMER 2022, 4 Marks; WINTER 2022; WINTER 2025, 7 Marks OR)
- **Q.** Write a short note on Maximum mixing depth (MMD) / Define Maximum mixing depth and explain it with example. (SUMMER 2022, 7 Marks; WINTER 2022 OR; WINTER 2023, 7 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 3 Marks; SUMMER 2026, 3 Marks OR)
- **Q.** Define inversion. Give at least three differences between radiation Inversion and subsidence inversion. / Define Inversion and explain the subsidence and radiation inversion. / Differentiate between Radiation inversion & Subsidence inversion. / Classify the types of Inversion. (WINTER 2022; SUMMER 2024, 7 Marks OR; WINTER 2024, 4 Marks; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks; SUMMER 2026, 4 Marks OR)
- **Q.** Enlist the stability condition of atmosphere and explain any one type with diagram. (SUMMER 2024, 7 Marks OR; SUMMER 2025, 7 Marks)

2. Plume Behaviour, Plume Rise and Dispersion Modelling:

- **Q.** Enlist various types of plume behaviors & explain any two with figure. / Classify the plume behavior, explain it with diagram. (SUMMER 2022, 3 Marks; SUMMER 2023, 4 Marks; WINTER 2023; SUMMER 2024, 7 Marks; WINTER 2024, 7 Marks OR; SUMMER 2025, 7 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 7 Marks)
- **Q.** Write a Short note on Gaussian Dispersion Model. / Write down the Gaussian dispersion equation & discuss the assumptions thereof. (SUMMER 2023, 7 Marks OR; WINTER 2023, 7 Marks; SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks OR)
- **Q.** Define the plume rise & write down any two equations of plume rise calculation. / Write a short note on Plume rise. (SUMMER 2022, 4 Marks OR; SUMMER 2022, 7 Marks OR; WINTER 2023, 3 Marks OR)

3. Wind, Heat Island and Other Meteorological Factors:

- **Q.** Define the Heat Island effects with neat sketch / Write a short note on Heat Island effect with figure. (SUMMER 2022, 7 Marks OR; WINTER 2022 OR; SUMMER 2024, 4 Marks OR; WINTER 2024, 7 Marks OR; SUMMER 2025, 7 Marks OR; SUMMER 2026, 4 Marks)
- **Q.** Write a short note on wind rose diagram. / Define the Wind rose diagram & discuss its application in environmental engineering field. / Explain Wind rose diagram and enlist its application. (SUMMER 2022, 7 Marks; WINTER 2022 OR; SUMMER 2023, 7 Marks; WINTER 2023, 4 Marks OR; SUMMER 2024, 3 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 7 Marks; SUMMER 2026, 3 Marks)
- **Q.** Enlist the meteorological factors influencing the air pollution. / Write Down the Factors Affecting Meteorological Condition? (WINTER 2022; SUMMER 2023, 4 Marks OR; WINTER 2024, 3 Marks; SUMMER 2026, 3 Marks)
- **Q.** Draw general wind velocity profile for rural & urban area. / Discuss wind velocity profile in detail with neat sketch. (SUMMER 2024, 3 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 3 Marks; SUMMER 2026, 4 Marks)

Other Important Questions:**1. Lapse Rate, Inversion, Stability and Mixing Depth:**

- **Q.** What do you mean by the term MMD? Explain in brief radiosonde measurements. **(WINTER 2022 OR)**

2. Plume Behaviour, Plume Rise and Dispersion Modelling:

- **Q.** Write down the equations used for the determination of stack height. / Write down the equation for calculation of effective stack height. **(SUMMER 2022, 4 Marks)**
- **Q.** What are three dominant mechanisms that account for dispersion of a pollutant into atmosphere? **(WINTER 2025, 4 Marks)**
- **Q.** Write down a procedure for determination of effective stack height. **(SUMMER 2025, 7 Marks OR)**
- **Q.** Derive all the equation for dispersion of the pollutant in the atmosphere and calculate the effective stack height. **(SUMMER 2026, 7 Marks OR)**

3. Wind, Heat Island and Other Meteorological Factors:

- **Q.** Name the primary meteorology parameters that affects air pollution & define Coriolis force. **(SUMMER 2025)**
- **Q.** How Self Contained Circulatory System established in urban and rural area? Explain it with neat sketch. **(WINTER 2025, 7 Marks OR)**
- **Q.** Define planetary boundary layer with sketch. The wind has a velocity of 10 mi/hr at 10m. On a day when lapse rate is small, what is the velocity at an elevation of 150m in miles/hr? **(WINTER 2025, 3 Marks)**
- **Q.** Explain solar radiation. **(SUMMER 2026, 3 Marks OR)**

Chapter 4: Noise Pollution and Odour pollution

Repeated Questions:

1. Sound and Noise: Basics and Terms:

- **Q.** Write the difference between sound & noise. / Differentiate between noise & sound. (SUMMER 2022, 3 Marks OR; WINTER 2022 OR; SUMMER 2023, 4 Marks; WINTER 2023, 3 Marks OR)
- **Q.** Define the terms; 1. Wavelength 2. Sound power 3. Frequency / Sound pressure. (SUMMER 2023, 3 Marks; SUMMER 2024, 3 Marks; SUMMER 2025, 3 Marks; WINTER 2025, 4 Marks OR)

2. Noise: Effects, Sources and Control:

- **Q.** Write a short note on effects of noise on Human. / Discuss the effects of noise pollution on human health. (SUMMER 2022, 7 Marks OR; WINTER 2022 OR; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks OR; SUMMER 2024, 4 Marks; WINTER 2024, 3 Marks; SUMMER 2025, 4 Marks; SUMMER 2026, 3 Marks)
- **Q.** Enlist various noise control strategies & explain any three in details. / Discuss the methods for Noise pollution control. (SUMMER 2022, 7 Marks; WINTER 2022; WINTER 2023, 7 Marks; WINTER 2024, 7 Marks; SUMMER 2026, 3 Marks)

3. Odour: Characteristics, Sources and Control:

- **Q.** Enlist the characterization of Odour. / Discuss the odor characteristics. / State eight characteristics of odor. / Define odor. Explain the characteristics of odor. (SUMMER 2022, 4 Marks OR; WINTER 2022 OR; WINTER 2023, 4 Marks; SUMMER 2024, 3 Marks OR; SUMMER 2025, 3 Marks OR; WINTER 2025 OR)
- **Q.** Enlist the odor pollution control technology & explain any two in detail. / Give the classification of Odor pollution reduction technology. (SUMMER 2022, 4 Marks; WINTER 2022 OR; WINTER 2023, 4 Marks OR; SUMMER 2024, 4 Marks OR; WINTER 2024, 7 Marks OR; SUMMER 2025, 4 Marks OR)
- **Q.** Enlist various odor control methods. / Enlist odor control techniques and explain any three in detail. (SUMMER 2022, 7 Marks; SUMMER 2026, 3 Marks OR)

Other Important Questions:

1. Sound and Noise: Basics and Terms:

- **Q.** Differentiate between continuous, intermittent & impulse noise. (SUMMER 2023, 3 Marks OR)
- **Q.** Distinguish between compression and rarefaction with neat sketch. (WINTER 2025, 3 Marks)
- **Q.** Write down the equation for the Sound Intensity level, Sound Pressure Level, Sound Power Level, Equivalent Noise Level. (SUMMER 2026, 4 Marks OR)

2. Noise: Effects, Sources and Control:

- **Q.** Enlist various sources of Noise pollution. (SUMMER 2026, 4 Marks)

3. Noise Numerical Problems:

- **Q.** If, Sound power from a tool is 0.0015 watt, then what is sound power level? (WINTER 2022 OR)
- **Q.** It is required to find out the day-night equivalent noise level at a location. The four hourly day average values in dB are 55, 62, 61, 64 and four hourly night average values in dB are 35, 45. Compute Ldn. (WINTER 2025, 7 Marks)

4. Odour: Characteristics, Sources and Control:

- **Q.** List down the odor pollution detection instruments used in field. (WINTER 2023, 3 Marks)
- **Q.** Enlist the methods to eliminate the odors and explain any three methods in brief. (WINTER 2022 OR)
- **Q.** List out the various methods of Odour control. (WINTER 2025, 4 Marks)

- **Q.** Enlist the sources of odours. **(WINTER 2025, 3 Marks OR)**
- **Q.** "Odour is undoubtedly the most complex of all the air pollution problems." Do you agree with this statement? Give reasons. **(WINTER 2025, 7 Marks OR)**

Chapter 5: Atmospheric Photochemical reactions

Repeated Questions:

1. Photochemical Smog: Formation, Factors and Effects:

- **Q.** Enlist the four factors responsible for formation of photochemical smog. / Enlist factors affecting photochemical reaction. (**SUMMER 2022, 3 Marks OR; SUMMER 2023, 4 Marks; WINTER 2023, 3 Marks OR; WINTER 2024, 4 Marks OR; WINTER 2025, 4 Marks OR**)
- **Q.** Describe the episodes of London smog cause due to photochemical effect. / Describe the episodes of London smog. (**SUMMER 2024, 3 Marks OR; SUMMER 2026, 7 Marks**)

2. Oxidants, Oxides of Nitrogen and Hydrocarbon Reactivity:

- **Q.** Explain the role of oxides of nitrogen in photo oxidation. (**WINTER 2022; WINTER 2023, 3 Marks**)
- **Q.** Enlist the photochemical oxidants and write the reactions of their formation. (**SUMMER 2024, 7 Marks; SUMMER 2025, 4 Marks OR**)
- **Q.** With reference to atmospheric photochemical reaction, explain in detail Hydrocarbon reactivity. / Write a Brief note on Photochemical Smog and Hydrocarbon Reactivity. (**SUMMER 2024, 7 Marks; SUMMER 2025, 4 Marks; SUMMER 2026, 7 Marks OR**)

Other Important Questions:

1. Photochemical Smog: Formation, Factors and Effects:

- **Q.** Name the major eye irritants present in the photochemical smog. (**SUMMER 2022, 3 Marks**)
- **Q.** Explain Photochemical smog in brief. (**WINTER 2022**)
- **Q.** Explain the effects of photochemical smog on human beings, plants and materials. (**WINTER 2025, 7 Marks**)

2. Oxidants, Oxides of Nitrogen and Hydrocarbon Reactivity:

- **Q.** Explain the term "oxidants". How are they measured? (**WINTER 2025, 3 Marks OR**)

Uncategorised Questions

Questions Not Mapped to a Chapter:

1. General:

- **Q.** Define the following terms: [Data truncated in source – refer to the original question paper]
(SUMMER 2023, 3 Marks)
