

**SCAD ENGINEERING COLLEGE, CHERANMAHADEVI****DEPARTMENT OF CIVIL ENGINEERING****CE 2038 AIR POLLUTION MANAGEMENT****UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS****PART A****1. Define Air pollution**

Air pollution is the excessive concentration of foreign matters in the air which adversely affects the human beings of the individual or causes damage to the property (Or) Any substance in the air that causes damages to health and properties. (Or)

The presence in ambient atmosphere of substances, generally resulting from the activity of man, in sufficient concentration, present for a sufficient time and under circumstances to interfere significantly with comfort, health or welfare of persons or with full use or enjoyment of property.

**2. What are natural contaminants?**

Natural fog, pollen grains, bacteria and product of volcanic eruption

**3. How inhalation of carbon monoxide affects human health?**

It reduces the ability of the hemoglobin to carry oxygen to the body tissues. Neurological disorders take place

**4. What is Fog**

Visible aerosols in which the dispersed phase is liquid.

**5. Correlations between weather variables and ozone concentrations**

Better correlation in summer and at inland stations. Most important variables for ozone prediction: 850-mb (about 5,000 feet high) temperature. 950-mb temperature, inversion base height, inversion magnitude, and maximum mixing height also show significant correlations with ozone concentration.

**6. Briefly explain the formation of Ozone**

Photochemical (summer smog) forms when pollutants such as nitrogen oxides and organic compounds react together in the presence of sunlight. A gas called ozone is formed  
 $\text{Nitrogen Dioxide} + \text{Sunlight} + \text{Hydrocarbons} =$

**7. Ozone**

This is a very general representation of the formation of ozone in the lower atmosphere. In actual fact, many different chemical reactions produce Ozone.

**8. List out any four sources of Air Pollution.**

Combustion process  
Chemical processes  
Petroleum operations.  
Metallurgical processes

**9. What is Smog? Give the types.**

Smog is a synchronism of two words- smoke and fog. Smoke can be of two types- photochemical or coal induced.

**10. Briefly Explain Particulate matters:-**

Particulate matter," also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

**11. Effect of Pollution Damage to Plants**

With the destruction and burning of the rain forests more and more CO<sub>2</sub> is being released into the atmosphere. Trees play an important role in producing oxygen from carbon dioxide. "A 115 year old Beech tree exposes about 200,000 leaves with a total surface to 1200 square meters.

During the course of one sunny day such a tree inhales 9,400 liters of carbon dioxide to produce 12 kilograms of carbohydrate, thus liberating 9,400 liters of oxygen. Through this mechanism about 45,000 liters of air are regenerated which is sufficient for the respiration of 2 to 3 people". This process is called photosynthesis which all plants go through but some yield more and some less oxygen. As long as no more wood is burnt than is reproduced by the forests, no change in atmospheric CO<sub>2</sub> concentration will result.

**12. How to Reduce the Pollution**

You can help to reduce global air pollution and climate change by driving a car that gets at least 35 miles a gallon, walking, bicycling, and using mass transit when possible. Replace incandescent light bulbs with compact fluorescent bulbs, make your home more energy efficient, and buy only energy efficient appliances. Recycle newspapers, aluminum, and other materials.

Plant trees and avoid purchasing products such as Styrofoam that contain CFCs. Support much stricter clean air laws and enforcement of international treaties to reduce ozone depletion and slow global warming

**13. What are the effects of photo chemical smog?**

Eye irritation, Vegetation Damage, Visibility Reduction, Cracking of Rubbers

**15. Classification of sampling Methods**

In situ sampling and remote sensing

**16. Define Acid rain**

Acid rain (or acid deposition, as it's called in technical circles) is produced by the burning of fossil fuels. It is formed when emissions of sulfur dioxide and nitrogen oxides react in the atmosphere with water, oxygen and oxidants to form various acidic compounds. These compounds then fall to the ground in either wet or dry form. Refer to all precipitation-rain, snow, and dew which is more acidic than normal.

**17. Define Photo chemical reaction**

Any chemical reaction that is initiated as a result of absorption of light.

**18. List out the Air pollution emission source**

Point source, Line sources, Area source, Volume source

**19. Definition of the Term “Portable”**

The word portable typically conveys an object that is “Carried or moved with ease, such as a light or small box

**20. Definition of the Term “Mobile”**

The definition of mobile is essentially “...capable of moving or of being moved readily from place to place: a mobile organism; a mobile missile system.”

**21. Briefly explain greenhouse effect**

The greenhouse effect is the heating of the surface of a planet or moon due to the presence of an atmosphere containing gases that absorb and emit infrared radiation. Thus, greenhouse gases trap heat within the surface-troposphere system. This mechanism is fundamentally different from that of an actual greenhouse, which works by isolating warm air inside the structure so that heat is not lost by convection. The greenhouse effect was discovered by Joseph Fourier in 1824, first reliably experimented on by John Tyndall in 1858, and first reported quantitatively by Svante Arrhenius.

**22. Explain the term global warming**

Global warming is the increase in the average temperature of the Earth's near-surface air and oceans since the mid-20th century and its projected continuation. Global surface temperature increased  $0.74 \pm 0.18$  °C ( $1.33 \pm 0.32$  °F) during the last century. The Intergovernmental Panel on Climate Change (IPCC) concludes that most of the observed temperature increase since the middle of the 20th century is caused by increasing concentrations of greenhouse gases resulting from human activity such as fossil fuel burning and deforestation

**23. Define aerosols.**

An aerosol can be defined as a dispersion of solid and liquid particles suspended in gas. Atmospheric aerosols, unsurprisingly, refer to solid and liquid particles suspended in air. Aerosols are produced by dozens of different processes that occur on land and water surfaces, and in the atmosphere itself. Aerosols occur in both the troposphere and the stratosphere, but there are considerable differences in the size ranges, chemical nature and sources of the aerosols that occur in these two atmospheric layers.

**24. Effect on CO,**

The main and immediate benefits of using reformulated gasoline in the car is the reduction in the CO exhaust emissions levels. The addition of an oxygenate such as MTBE to the gasoline provides extra oxygen to the fuel combustion process and it works in the same way as the oxygen contained in the external combustion air supplied to the engine. As a result, more complete combustion of the hydrocarbons occur and more CO is oxidized to CO<sub>2</sub>. The net results is a decrease in the concentrations of CO exhaust emissions.

## 25. Effect on Ozone Formation

The reformulated gasoline containing MTBE decreases the ozone formation in the atmosphere. The oxygen present in the MTBE added to the gasoline ensures more complete combustion of fuel hydrocarbons and thus UBHC released to the atmosphere are reduced. As stated earlier, a reduction in NO<sub>x</sub> level is also achieved using MTBE-gasoline blends. Both hydrocarbons as well as NO<sub>x</sub> are precursors of ozone formation. Thus a reduction in the concentrations of precursors decreases the ozone formation in the atmosphere.

## 25. What are Effects of Air Pollutants

Air pollution effects may also be divided into several categories, with such effects encompassing those that are health-related as well as those associated with damage to materials or which cause decreases in atmospheric aesthetic features. Examples of effects on human health include eye irritation, headaches and aggravation of respiratory difficulties. Plants and crops have been subjected to undesirable consequences of air pollution, including abnormal growth patterns, leaf discoloration or spotting and death. Property damage include property devaluation because of odors, deterioration of materials such as concrete statutory, discoloration of painted surfaces. The aesthetic effects include reductions in visibility, discoloration of air, photochemical smog- related traffic disruptions at airports and the general nuisance aspects of odors and duct.

## UNIT II DISPERSION OF POLLUTANTS

### PART A

#### 1.What is adiabatic lapse rate?

The decrease of atmosphere temperature with height

#### 2. List out any four sampling methods.

Sedimentation, filtration, Impingement, ESP

#### 3.National Ambient Air Quality Standard for ozone (NAAQS)

Primary standard to protect public health. One-hour average ozone > 0.12 ppm for federal standard. One-hour average ozone > 0.09 ppm for state standard.

#### 4.Define Ambient air quality

A physical and chemical measure of the concentration of contaminants in the ambient atmosphere. The quality is usually monitored over a specific period.

#### 5.What is the word MINAS stands for?

Minimum National Air Quality Standards

#### 6.What is Mixing Height

Height above the earth's surface to which related pollutants will extend, primarily through the action of atmospheric turbulence

**7. Define Fumigation**

The phenomenon in which pollutants that are aloft in the air are brought rapidly to ground level when the air destabilizes

**8. Define Dispersion.**

The mixing of gases contain the high concentration of pollutant

**9. Write short note on Air monitoring.**

The process of detention and measurement of pollutants in air

**10. Define Mass concentration**

Concentration expressed in terms of mass of a substance per unit volume of gas or liquid.

**11. What do you meant by Pressure drop**

The differential pressure b/w two points in a system. The resistance to flow b/w in the two points.

**12. Relative humidity**

The ratio of the actual vapors pressure of the air to the saturation vapor pressure.

**13. What is Inversion**

Condition in the atmosphere in which air temperature increases with elevation, under this conditions, the atmosphere is said to be in stable equilibrium.

**14. Briefly explain Box model dispersion**

The box model is the simplest of the model types It assumes the air shed (i.e., a given volume of atmospheric air in a geographical region) is in the shape of a box. It also assumes that the air pollutants inside the box are homogeneously distributed and uses that assumption to estimate the average pollutant concentrations anywhere within the airshed. Although useful, this model is very limited in its ability to accurately predict dispersion of air pollutants over an air shed because the assumption of homogeneous pollutant distribution is much too simple.

**15. Briefly explain Gaussian model**

The Gaussian model is perhaps the oldest (circa 1936) and perhaps the most commonly used model type. It assumes that the air pollutant dispersion has a Gaussian distribution, meaning that the pollutant distribution has a normal probability distribution. Gaussian models are most often used for predicting the dispersion of continuous, buoyant air pollution plumes originating from ground-level or elevated sources. Gaussian models may also be used for predicting the dispersion of non-continuous air pollution plumes (called puff models). The primary algorithm used in Gaussian modeling is the Generalized Dispersion Equation for a Continuous Point-Source Plume.

**16. Explain Lagrangian dispersion model**

A Lagrangian dispersion model mathematically follows pollution plume parcels (also called particles) as the parcels move in the atmosphere and they model the motion of the parcels as a random walk process. The Lagrangian model then calculates the air pollution dispersion by computing the statistics of the trajectories of a large number of the pollution plume parcels. A Lagrangian model uses a moving frame of reference] as the parcels move from their initial location. It is said that an observer of a Lagrangian model follows along with the plume.

**17. Briefly explain Eulerian dispersion model**

Eulerian dispersions model is similar to a Lagrangian model in that it also tracks the movement of a large number of pollution plume parcels as they move from their initial location. The most important difference between the two models is that the Eulerian model uses a fixed three- dimensional Cartesian grid as a frame of reference rather than a moving frame of reference

**18. Briefly explain Dense gas dispersion model**

Dense gas models are models that simulate the dispersion of dense gas pollution plumes (i.e., pollution plumes that are heavier than air). The three most commonly used dense gas models are:

The DEGADIS model

The SLAB model

The HEGADAS model

**19. What is Lofting?**

A type of plume which occurs when an inversion exists only below the plume and the plume is inhibited from mixing downward.

**20. What is Looping**

A type of plume which has a wavy character. It occurs in a highly unstable atmosphere because of rapid mixing.

**21. What is Chimney**

A structure with an opening or outlet from or through which any air pollutant may be emitted.

**22. Define Coning**

A type of plume which is like a cone. This take place in a near neutral atmosphere when the wind velocity is greater than 32km/h.

**23. What Is Plume**

The path and extent in the atmosphere of the gaseous effluent released from the source, usually a stack

**24. Briefly explain Chimney effect:**

The vertical penetration of smog through the inversion layer on the south slope of the San

Gabriel and San Bernardino Mountains caused by the strong solar heating in the afternoon.

### **25. Define Fall out**

A radioactive pollutant in the air caused after the explosion of a nuclear device, its degree of contamination depending on several factors, such as distance, wind, and power of the device.

## **UNIT III AIR POLLUTION CONTROL**

### **PART A**

#### **1. Explain the principle behind settling chambers.**

Particles in the air or gas stream settle due to gravity

#### **2. Write down the various types of Inertial Separation**

Baffle type, Louvre type, Dust trap

#### **3. Name the common method of filter cleaning**

Rapping, Shaking, Reverse air flow, Pulse jet

#### **4. State the Principle of cyclone filter.**

Control of gas borne pollution, particulates using centrifugal and inertial methods

#### **5. What is adsorption?**

Removal of impurities from a gas stream by concentration on the surface of solid or liquid

#### **6. What are the Advantages of ESP**

High collection efficiency

Particle as small as 0.1 mm can be removed

Low maintained and operating cost

Low-pressure drop (0.25 – 1.25 cm of water)

Treatment time is negligible (0.1 – 10. s)

#### **7. What are the Dis advantages of Esp**

High initial cost

Space requirement is more

Possible explosion hazards during collection of combustible gases or particles

Poisonous gas, ozone, is produced by the negatively charged electrodes during gas ionization

**8. Briefly explain Bag filter**

The most common type of collector is tubular type, consisting of tubular bags. A bag house or bag filter consists of numerous vertical bags. They are suspended with open ends attached to a manifolds

**9. List out the type of Scrubbers**

Spray towers

Venturi scrubbers

Cyclone scrubbers

Packed scrubbers

Mechanical scrubbers

**10. Define Impinger**

A sampling instrument adopting the principle of impingement for the collection of particulate matters.

**11. What is Bag house**

An air pollution control device that traps gas borne particulate by forcing the gas through filter bags

**12. Define the term Contaminant**

Unwanted material usually harmful or of a nuisance value are both

**13. Define Cyclone filter**

A type of particulate collector which depends upon centrifugal force for its action

**14. What is meant by Dry bulb temperature**

The actual temperature of the gas. Measured with a conventional thermometer

**15. Define Fumigation**

The phenomenon in which pollutants that are aloft in the air are brought rapidly to GL when the air destabilizes.

**16. What is Incineration**

Combustion of solid, liquid, or gases wastes under controlled condition.

**17. What is meant by Inertial separators**

Air pollution control equipment that utilizes the principles of inertial to remove particulate matter from a stream of air or gas.

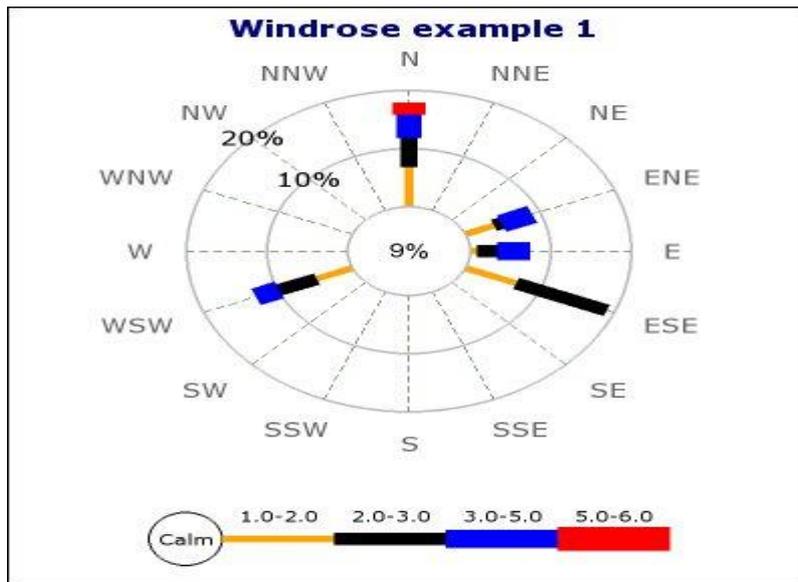
**18. What Is the Chemical Composition of Air?**

Atmosphere is made up of only five gases: nitrogen, oxygen, water vapor, argon, and carbon dioxide. Several other compounds also are present. Although this CRC table does not list water vapor, air can contain as much as 5% water vapor, more commonly ranging from 1-3%. The 1- 5% range places water vapor as the third most common gas

### 19. What is a wind rose?

A wind rose is a circular display of how wind speed and direction are distributed at a given location for a certain time period. [or]

Windrose plots are usually used to display values which are related to compass directions. For example it could be used to illustrate measured wind strengths over a time period in different directions. An basic Windrose plot Illustrates a basic example of a windrose graph with one windrose plot.



### 20. What causes condensation?

Condensation is the formation of liquid drops of water from water vapor. It is the process which creates clouds, and so is necessary for rain and snow formation as well.

Condensation in the atmosphere usually occurs as a parcel of rising air expands and cools to the point where some of the water vapor molecules clump together faster than they are torn apart from their thermal energy.

### 21. Combustion Definition:

Combustion is a chemical reaction chemical that occurs between a fuel and an oxidizing agent

that produces energy, usually in the form of heat and light.

### 22. Define Atmospheric Stability and Instability

Atmospheric stability : The resistance of the atmosphere to vertical motion. Temperature distribution and lapse rates were discussed in Unit 4, where you learned that temperatures normally increase as we get closer to the earth's surface. This is due in part to the greater molecular activity of denser, more compressed air at lower altitudes. These conditions change throughout a 24-hour period, as the daytime solar heating and nighttime heat loss to and through the atmosphere tend to modify the temperature distributions.

### 23. Define Stable and Unstable Air

Weather is strongly affected by how stable or unstable the atmosphere is. Stable air means that the weather is likely to be calm. It may rain or snow slowly and steadily, it may be

sunny, but the weather will not change quickly. Unstable air means that the weather might change quickly with very little warning. Unstable air leads to sudden thunderstorms. What makes the atmosphere stable or unstable? Picture an invisible box of air called an air parcel. If we compare the temperature of this air parcel to the temperature of air surrounding it, we can tell if it is stable (likely to remain in place) or unstable (likely to move).

#### **24. Briefly explain the Control equipment in air pollution**

Any apparatus, devices, equipment or system to control the quality and manner of emission of any air pollution and includes any devices used for securing the efficient operation of any industrial plant.

#### **25. Define Dew point**

For air containing water vapor, it is the temperature at which liquid water begins to condense for a given state of humidity and pressure, as the temperature is reduced.

#### **26. What is Dust fall**

The weight of particulate matter deposited due to gravitational action per unit time per unit area of the surface.

### **UNIT IV AIR QUALITY MANAGEMENT**

#### **PART A**

#### **1. How do you calculate the efficiency of the separating Device?**

$\eta = \left\{ \frac{\text{Quantity of particulates collected from the gas}}{\text{Quantity present in the gas}} \right\}$

#### **2. What do you mean by Emission standards**

Level for specific group of emitter and require that all member of these groups emit no more than these permitted emission level

#### **3. Define Particle Re-entrainment**

It is associated with particle charging, It occurs due to inadequate precipitator area, or inadequate dust removal from hopper

#### **4. Air pollution index**

An arbitrarily derived mathematical combination of air pollutants which give a single number trying to describe the ambient air quality.

#### **5. Define Pollution Standard Index (PSI)**

A numerical scale of 0-500 corresponding to various pollution concentrations

#### **6. Define Air quality criteria**

Scientific information about the levels of air pollution and the durations of exposure which result in adverse effects on health and welfare.

#### **7. Air Quality Index (AQI implemented since July 23, 1999 by EPA)**

AQI is calculated for the 6 criteria pollutants according to the EPA formulas. The highest AQI value is adopted as the daily AQI. For example, if the AQI for ozone is 90 and 88 for

SO<sub>2</sub>. The reported AQI is 90

### **8. Define Pollution Potential**

Holzworth's definition:

$$C/Q = L/UH$$

C: pollution concentration.

Q: emission rate.

L: city size along wind dimension (10 km or 100 km).

U: wind speed.

H: mixing height (height to which an air parcel can rise)

### **9. How do you Measure Air Quality**

There are many ways to measure air pollution, with both simple chemical and physical methods and with more sophisticated electronic techniques. There are four main methods of measuring air pollution.

Passive sampling methods

Active sampling methods

Automatic methods

Remote optical / long path-analyzers use spectroscopic techniques, make real-time measurements of the concentrations of a range of pollutants including nitrogen dioxide and sulphur dioxide.

### **10. Definition of the Term “Instrumented”**

Instrumented means to be “a device for recording, measuring, or controlling, especially such a device functioning as part of a control system.”

### **11. Name some NO<sub>x</sub> control units**

Low NO<sub>x</sub> burners

Selective catalytic reduction (SCR)

Selective non-catalytic reduction (SNCR), NO<sub>x</sub> scrubbers

Exhaust gas recirculation and Catalytic converter (also for VOC control)

### **12. Effective Methods to Control Air Pollution**

Some of the effective methods to Control Air Pollution are as follows: (a) Source Correction Methods (b) Pollution Control equipment (c) Diffusion of pollutant in air (d) Vegetation (e) Zoning.

### **13. What is the Air Quality Index for Health?**

The Environmental Protection Agency's Air Quality Index for Health (AQIH) is a number from one to 10 that tells you what the air quality currently is in your region and whether or not this might affect the health of you or your child. A reading of 10 means the air quality is very poor and a reading of one to three inclusive means that the air quality is good. The AQIH is calculated every hour. You can see the current readings on the AQIH map.

### **14. Is indoor air quality (IAQ) a health and safety concern?**

Indoor air quality has become an important health and safety concern.

Common issues associated with IAQ include:

Improper or inadequately maintained heating and ventilation systems. Contamination by construction materials, glues, fiberglass, particle boards, paints, chemicals, etc. Increase in number of building occupants and time spent indoors

**15. What are the common causes of IAQ problems?**

IAQ problems result from interactions between building materials and furnishing, activities within the building, climate, and building occupants. IAQ problems may arise from one or more of the following causes:

Indoor environment - inadequate temperature, humidity, lighting, excessive noise

Indoor air contaminants - chemicals, dusts, moulds or fungi, bacteria, gases, vapours, odours

Insufficient outdoor air intake

**16. What are indoor air contaminants?**

Here are examples of common indoor air contaminants and their main sources:

Carbon dioxide (CO<sub>2</sub>), tobacco smoke, perfume, body odours – from building occupants

Dust, fibreglass, asbestos, gases, including formaldehyde – from building materials

Toxic vapours, volatile organic compounds (VOCs) – from workplace cleansers, solvents, pesticides, disinfectants, glues

Gases, vapours, odours – off-gas emissions from furniture, carpets, and paints

Dust mites – from carpets, fabric, foam chair cushions

Microbial contaminants, fungi, moulds, bacteria, – from damp areas, stagnant water and condensate pans

Ozone – from photocopiers, electric motors, electrostatic air cleaners

**17. Define Zoning**

Zoning describes the control by authority of the use of land, and of the buildings thereon. Areas of land are divided by appropriate authorities into zones within which various uses are permitted.

**18. What is the necessity for air quality?**

The levels of air quality necessary with an adequate margin of safety, to protect the public health, vegetation and property.

**19. Define frequency and Method of Air Quality Measurements**

The present study of air quality measurement in terms air pollution concentration has been obtained by continuous monitoring for a period of eight hours at all directions and at the proposed project site. The annual mean wind direction pattern has been compiled from the long- term data made available from meteorological department. The sampling directions around the project site has been selected so as to reflect the impact of anthropogenic activities such as emissions from transportation, generation of dust with movement of vehicles, emissions from industrial and domestic activities. Considering the facilities and significant impact on air quality we have selected Suspended Particulate Matter (SPM), Sulphur dioxide (SO<sub>2</sub>), Nitrogen Oxides (Nox) and Carbon monoxide (CO).

**CE 2038 AIR POLLUTION MANAGEMENT  
UNIT V NOISE POLLUTION  
PART A**

**1.What is noise?**

In simple terms, noise is unwanted sound. Sound is a form of energy which is emitted by a vibrating body and on reaching the ear causes the sensation of hearing through nerves.

**2.How can noise affect us?**

Temporary Deafness: This Persists for about 24 hours after exposure to loud noise. Permanent Deafness: Repeated or continuous exposure to noise of around 100 dB results in permanent hearing loss.

**3.How can we control the Noise source?**

Reducing the noise levels from domestic sectors, Maintenance of automobiles, Control over vibrations, Low voice speaking, Prohibition on usage of loud speakers and Selection of machinery

**4.What is the difference between sound and noise?**

Noise is unwanted sound. Sound is a form of energy emitted by a vibrating body and on reaching the ear it causes the sensation of hearing through nerves.

**5.What is the purpose of frequency analysis?**

The frequency analysis allow to separate the main components of the signals by dividing the frequency range of interest into smaller frequency bands using a set of filters

**6.List out typical sources of noise pollution.**

Source Noise level dB(A)

Air compressors 95-104 Quiet garden 30

110 KVA diesel generator 95 Ticking clock 30

Lathe Machine 87 Computer rooms 55-60

Milling machine 112 Type institute 60

Oxy-acetylene cutting 96 Printing press 80

Pulveriser 92 Sports car 80-95

Riveting 95 Trains 96

Power operated portable saw 108 Trucks 90-100

Steam turbine (12,500 kW) 91 Car horns 90-105

Pneumatic Chiseling 118 Jet takeoff 120

**7. What are the impacts of noise?**

Physiological effects, Loss of hearing, human performance,

Nervous system: Annoyance,

Sleeplessness, Damage to material.

**8. What are the methods to control noise pollution?**

Identify the noise sources from each zone

Find out the noise levels of each zone

Compute Ldn values

Identify the likely causes of noise from noise sources.

Develop methodologies to solve the problem

Attempt to solve

### **9. What are the noise exposure limits in a workspace environment?**

Regulations prescribe that, noise level of 90 dB (A) for more than 8 hr continuous exposure is prohibited. Persons who are working under such conditions will be exposed to occupational health hazards.

### **10. What are the ambient noise limits?**

Sounds produced by all vibrating bodies are not audible. The frequency limits of audibility are from 20 HZ to 20,000 HZ.

Noise generation is associated with most of our daily activities. A healthy human ear responds to a very wide range of SPL from - the threshold of hearing at zero dB, uncomfortable at 100-120dB and painful at 130-140 Db. Due to the various adverse impacts of noise on humans and environment noise should be controlled.

### **11. Write short notes on Decibel, dB and Ldn**

DECIBEL is measurement unit of sound, represented by dB. The day night equivalent noise levels of a community can be expressed as -Ldn , dB(A) = 10 x

$\log_{10} [15/24 (10L_d/10) + 9/24 (10(L_n + 10)/10)]$  where, L<sub>d</sub> = day-equivalent noise levels (from 6AM - 9 PM), dB (A) L<sub>n</sub> = night equivalent noise levels (from 9 PM - 6 AM), dB (A)

The day hours in respect to assessment of noise levels, is fixed from 6 AM - 9 PM (i.e., 15hrs) and night hours from 9 PM - 6 AM (i.e., 9 hrs). A sound level of 10 dB is added to L<sub>ndue</sub> to the low ambient sound levels during night for assessing the Ldn values.

### **12. Write short notes on Infrasonic and Ultrasonic**

Infrasonic: The sound of frequency less than 20HZ.

Ultrasonic: The sound of frequency more than 20,000 H

### **13. Equipment used in the measurement of noise levels**

Sound level meter

Type-0 : Laboratory reference standard

Type-1: Lab use and field use in specified controlled environment

Type-2: General field use (Commonly used)

Type-3: Noise survey Impulse meters For measurement of impulse noise levels e.g. hammer blows, punch press

strokes etc. Frequency analysers For detailed design and engineering purpose using a set of filters. Graphic recorders Attached to sound level meter. Plots the SPL as a function of time on a moving paper chart. Noise dosimeters Used to find out the noise levels in a working environment attached to the worker

**14. What is noise?**

Noise is defined as unwanted sound. A sound might be unwanted because it is loud, distracting, or annoying.

**15. How is noise measured?**

Literally speaking, noise can't be measured directly, since there is no instrument for objectively detecting how "unwanted" something is. What can be measured is the sound level, a quantification of a sound's pressure or intensity and related to its loudness. Sound level is measured in decibels (dB), by a device called a sound level meter.

**16. What is a decibel?**

What are typical decibel levels of some common sounds? A whisper is 30 dB, conversational speech is 60 dB, and someone shouting at you from an arm's length away is 85 dB. Noise levels of home appliances range from 50 dB (a refrigerator) to 95 dB (a food processor). Lawn equipment and power tools have noise levels of 80–120 dB.

**17. How many decibels can the human ear handle?**

Immediate and irreversible nerve damage can be caused by sounds at 140 dB or higher (120 dB in young children). However, damage also occurs at lower sound levels, and this harm accumulates over time. Any sound above 85 dB can cause wear and tear on your ears that reduces your hearing acuity over time.

**18. What is the loudest sound possible?**

Sound is normally carried in air as a pressure wave. When the pressure of a sound wave becomes as high as the air pressure itself, the sound becomes a shock wave. Normal air pressure at sea level is 14.7 pounds per square inch (psi), or 101,325 pascals (Pa), which is equivalent to 194 decibels (dB). So 194 dB is the loudest sound possible in air at sea level; beyond that point it becomes a shock wave. (Sound waves that are transmitted through water or other substances would have different limits.)

**19. What are the effects of noise on human health?**

Noise has direct physiological effects such as hearing damage (including hearing loss and tinnitus, or ringing in the ears), as well as cardiovascular and hormonal disturbances. Indirect effects include sleep loss, interference with concentration and learning, mood changes and aggression, and social isolation.

**20. How does noise affect babies and children?**

Because the ear canal of a young child is smaller than an adult's, sound pressure is up to 20 dB greater than that in an adult ear. In addition to the threat to a child's hearing, noise causes physiological and mental stress, and significantly impacts learning and cognitive development. Background noise also interferes with speech perception and language acquisition.

**20. What is "white noise"?**

White noise is a sound similar to radio static, or the sound a fan makes, that is often used to mask unpleasant sounds. Some people find it helpful for sleeping, and it can be a soothing sound for babies.

**21. What are the most common sources of noise pollution?**

Worldwide, the most common sources of noise pollution are cars, trucks, and other motor vehicles. Planes and trains also contribute to noise pollution. Other sources include factory machinery, power tools, and construction equipment.

**22. What problems does noise pollution cause for people?**

The World Health Organization (WHO) cites seven categories for the ways noise adversely affects human health:

Noise-induced hearing impairment

Interference with speech communication

Sleep disturbances

Cardiovascular and physiological effects

Mental health effects

Effects on performance of tasks

Annoyance and effects on behavior

**23. What problems does noise pollution cause for animals?**

Wild animals rely on their hearing for detecting predators, finding mates, establishing territory, and recognizing warning alerts. Unnaturally high levels of noise can damage their hearing and can also mask more subtle sounds that they need to hear in order to survive and reproduce. They may also react with a fight-or-flight response to artificial sounds such as aircraft noise, thereby using up valuable energy reserves to flee from a non-existent predator. If noise in an area becomes too intrusive, animals may shift to a new territory or alter their migration patterns, which can create new complications for their mating and survival.

**24. What are the laws regarding noise pollution?**

Occupational noise is treated as a health and safety issue and is regulated at the state or national level in many countries. Community noise is typically regarded as a nuisance issue rather than a matter of health, and is normally regulated at local levels of government. The regulations and levels of enforcement vary widely across different communities, and worldwide. Noise-generating products such as automobiles and aircraft may be controlled by industry regulations, and building codes may set requirements for reducing sound transmission in new building construction projects.

**25. What can you do personally to reduce my own noise pollution?**

Mow your lawn at times that are reasonable for your neighborhood.

Avoid using high-noise yard tools such as leaf blowers and power hedge trimmers.

Keep your motor vehicle's muffler in good condition.

Only honk your horn in an emergency.

Train your dog not to bark inappropriately.

Put your cell phone on "vibrate" mode, and excuse yourself to a private area to conduct a phone conversation.

Turn off the TV if no one is watching it.

If you want to enjoy loud music, use headphones.