

**Environmental Health Sciences
Self-Study Course SS3010**

Lesson 6: Air Pollution and Noise Control

Part I: Multiple Choice

1. Air Pollution is the presence of _____ in the outside air in amounts that are injurious or detrimental to humans, animals, plants, or property.
 - a. solids
 - b. gases
 - c. liquids
 - d. all of the above.

2. When two pollutants are combined, the effects are greater than the sum of the individual effects. This is called
 - a. commensalism
 - b. synergism
 - c. magnification
 - d. multiplication.

3. The effects of air pollution are influenced by
 - a. wind speed, and direction
 - b. sunlight
 - c. precipitation
 - d. all of the above.

4. Air is vital to existence. In fact, humans breathe in a day's time an average of
 - a. 3 to 4 pounds of air
 - b. 35 pounds of air
 - c. 37 pounds of air
 - d. 1,600 ft³ of air.

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5. Which component of clean, dry air has the smallest volume?
- a. carbon monoxide
 - b. nitrogen dioxide
 - c. ammonia
 - d. sulfur dioxide. - smallest by 100 fold $< NO_2 < NH_3$
6. Ozone reduces the useful life of all of the following **except**
- a. rubber
 - b. textiles
 - c. dyes
 - d. nylon.
7. Major effects on humans are caused by Los Angeles- and London-type smog, along with what two pollutants?
- a. sulfur dioxide and hydrogen fluoride
 - b. sulfur dioxide and carbon monoxide
 - c. hydrogen sulfide and peroxyacyl nitrates
 - d. ozone and nitrogen dioxide.
8. Photochemical smog has been reported in congested areas with
- a. large industries
 - b. chemical processing plants
 - c. industries processing hazardous wastes
 - d. high motor vehicle traffic.
9. What type of air pollution causes bleaching of leaves in plants?
- a. PAN - peroxyacyl nitrate - glazing, silencing, bronzing
 - b. sulfur dioxide - necrosis/bleaching of areas between veins
 - c. industries processing hazardous wastes
 - d. high motor vehicle traffic.

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10. Injury to plants due to _____ shows up as flecks, stipple and bleaching, tip burns on conifers, and growth suppression.
- a. ozone
 - b. peroxyacyl nitrates
 - c. hydrogen fluoride
 - d. sulfur dioxide.
11. Glazing, silvering, or bronzing on the underside of a leaf is evidence that injury has occurred by
- a. ozone
 - b. peroxyacyl nitrates
 - c. sulfur dioxide
 - d. hydrogen fluoride.
12. _____ have been known to cause crippling skeletal damage to cattle through ingested contaminated vegetation.
- a. sulfides
 - b. fluorides
 - c. nitrates
 - d. chlorides.
13. Animals are primarily affected by the fluorides in the air
- a. through ingesting vegetation
 - b. by inhaling pollution
 - c. by consuming contaminated water
 - d. by consuming highly toxic food and water.
14. Fluorocarbons in the atmosphere are of concern because they may
- a. react with the ozone in the upper atmosphere, thus reducing the total amount of ozone available
 - b. cause an increase in ultraviolet radiation reaching the earth
 - c. cause an increase in skin cancers and changes in our climate, animal, and plant life
 - d. all of the above.

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15. Which of the following are not major sources of sulfur dioxide pollution?
- a. metal smelters
 - b. coal and oil burning power plants
 - c. refineries
 - d. electrical substations.
16. Which of the following is not a malodorous gas?
- a. sulfur dioxide
 - b. hydrogen sulfide
 - c. carbon monoxide
 - d. phenol.
17. What size particle can reach the lowest parts of the lung?
- a. 15 microns
 - b. 50 microns
 - c. 3 microns
 - d. any size particle.
18. Street dust would be considered what type of pollution?
- a. paradox pollutant
 - b. fugitive pollutant
 - c. uncontrolled pollutant
 - d. laps rate.
19. A primary pollutant is
- a. one that is formed in the atmosphere as a result of reactions such as hydrolysis, oxidation, and photochemistry - *Secondary Pollutant*
 - b. one that is found in the atmosphere due to natural reactions
 - c. one that is found in the atmosphere in the same form as it exists
 - d. none of the above.

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20. Emissions which find their way into the ambient air without being vented through a stack are known as
- a. escaped emissions
 - b. fugitive emissions
 - c. phantom emissions
 - d. all of the above.
21. _____ can be formed as a result of the sun's action on nitrogen oxides and hydrocarbons
- a. sulfur dioxide
 - b. hydrogen sulfide
 - c. chlorofluorocarbons
 - d. ozone.
22. Which of the following is not a primary pollutant?
- a. sulfur dioxide
 - b. hydrocarbon
 - c. nitrogen dioxide
 - d. sulfuric acid.
23. In what part of the earth's atmosphere are photochemical oxidants produced?
- a. lithosphere
 - b. stratosphere
 - c. troposphere
 - d. hydrosphere.
24. Impurities in combustible hydrocarbons (coal and oil) combine with oxygen to produce _____ when burned.
- Sulfates*
- a. nitrogen oxide
 - b. sulfur dioxide
 - c. nitrogen dioxide
 - d. carbon monoxide.

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25. How are total suspended particles measured?

- a. flame photometry and weighing
- b. gas filtration
- c. flame ionization
- d. collection and weighing.

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Part II: Multiple Choice

1. Particle size selective inlets are used to separate particulates above and below 2 to 3 microns in size on
 - a. high volume samplers
 - b. outfall vacuums
 - c. baghouse air filters
 - d. atmospheric respirator sieves.

2. A particle count of above _____ is said to be representative of an urban area
 - a. 10,000
 - b. 50,000
 - c. 100,000
 - d. 200,000

3. In the United States, the Ringlemann smoke chart consists of how many rectangular charts?
 - ~~a. three~~
 - ~~b. four~~
 - c. five
 - d. six.

4. The Ringlemann chart method of evaluating particle pollution in the atmosphere is being replaced by a determination of the
 - a. percent density
 - b. percent mist
 - c. percent dusts
 - d. percent opacity.

5. _____ involves the chemistry, physics, and dynamics of the atmosphere and includes many direct effects of the atmosphere on the earth's surface, ocean, and life.
 - a. topography
 - b. meteorology
 - c. micrometeorology
 - d. none of the above.

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11. Stability of the atmosphere

- a. is the ability to enhance or suppress vertical air motions
- b. is largely determined by the vertical temperature profile
- c. refers to the inertness of its composition
- d. a and b above.

12. The normal change in temperature with altitude is -0.6°C per 100 m ^{height increase}

- a. noted as an increase due to the increased closeness and lack of filtering of sunlight
- b. noted as a decrease due to expansion and thus adiabatic cooling of air
- c. noted as a decrease due to black-body emission into space, coupled with the lessening of insulation provided by other air
- d. noted as an increase due to the rising of warm air.

13. Which of the following inversions develops at night under conditions of relatively clear skies and very light winds?

- a. subsidence inversion - high pressure system
- b. frontal inversion - colliding air masses of diff. temp.
- c. radiational inversion
- d. stack emission inversion. - pollutant stays at height of stack

14. Precipitation accomplishes an effective cleansing process of pollutants in the atmosphere by

- a. accumulation of small particles in the formation of raindrops or snowflakes in clouds
- b. the washing out or scavenging of large particles by falling raindrops or snowflakes
- c. removal of gaseous pollutants by dissolution and absorption
- d. all of the above.

15. Which of the following items are not natural topographic features?

- a. rivers
- b. canals
- c. foliage
- d. hills.

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16. Air pollution control should first be considered at the
- a. source
 - b. stack
 - c. industrial level
 - d. suburban level.
17. Scrubbers are wet collectors generally used to remove particles that form as a
- a. nonsoluble vapor
 - b. mist, solid, or vapor
 - c. fog, mist, or dust
 - d. fume, dust, or mist.
18. The information needed to use an air quality model includes
- a. pollutant concentration data, population, and meteorological data
 - b. population, source emissions data, and pollutant concentration data
 - c. meteorological data, pollutant concentration data, and source emissions data
 - d. stack size, population, and pollutant concentration data.
19. Sources of pollutants can generally be classified as
- a. line sources
 - b. area sources
 - c. point sources
 - ~~a. d. all of the above. *~~
20. The pitch of a sound is determined primarily by
- a. frequency
 - b. wavelengths
 - c. sound pressure
 - d. all of the above.
21. The distance that a sound wave travels in one cycle or period is the
- a. sound intensity
 - b. wavelength of the sound
 - c. sound pressure
 - d. frequency.

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22. The speed with which sound travels through a particular medium is dependent on
- a. the compressibility of the medium
 - b. the density of the medium
 - c. the compressibility and density of the medium
 - d. none of the above.
23. A _____ is a dimensionless unit to express physical intensity or sound pressure levels.
- a. noise level
 - b. decibel
 - c. hertz
 - d. sound pressure level (SPL).
24. The _____ of a sound wave is the energy transferred per unit time (sec) through a unit area normal to the direction of propagation.
- a. sound pressure
 - b. frequency - 1 second
 - c. intensity - seconds
 - d. speed.
25. For a pure tone (single frequency) to be produced, there must be a one-to-one correspondence between
- a. loudness and intensity
 - b. frequency and intensity
 - c. pitch and loudness
 - d. pressure and pitch.

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Part III: Multiple Choice and True-False

1. If 10 decibels is 10 times more intense than one decibel, how many times more intense is 20 decibels than one decibel?
 - a. 20
 - b. 30
 - c. 100
 - d. 1000.

2. The unit of measurement most commonly used to measure loudness is called
 - a. hertz
 - b. phon
 - c. decibel - physical intensity - sound pressure
 - d. none of the above.

3. The major factors related to hearing loss are
 - a. time duration of exposure and repeated impact
 - b. intensity of sound waves
 - c. frequency content of sound
 - d. all of the above.

4. For workers, a sound level above _____ dBA should be considered unsafe for daily exposure over a period of months.
 - a. 80
 - b. 85
 - c. 90
 - d. all of the above.

5. The most common type of noise measurement device used for initial surveys to provide rapid evaluation and identification of potential problem areas is the
 - a. octave-band analyzer
 - b. noise dosimeter
 - c. sound level meter
 - d. sound analyzer.

6. It is possible to control noise
- a. at the source
 - b. in its path of transmission
 - c. where it is received
 - d. all of the above.
7. Some specific measures that can be used to reduce the effect of highway noise include
- a. setting lower speed limits for certain sections of a highway
 - b. establishing alternate truck routes
 - c. enclosure of highways going through residential areas
 - d. all of the above.
8. Which of the following types of materials are known to **reflect** sound?
- a. rubber tiles
 - b. heavy drapes
 - c. carpets with felt pads
 - d. rugs.
9. The ratio of the energy passing through a wall, floor, or ceiling to the energy striking it is called
- a. sound absorption
 - b. sound transmission loss
 - c. noise reduction
 - d. all of the above.
10. A hammering type noise often heard in a plumbing system is usually due to
- a. a quick-closing valve requiring installation of an air chamber
 - b. vibrations from machines that require rubber mountings or resilient pads
 - c. the high mineral content of flowing water
 - d. low sound transmission loss of plumbing materials.

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11. The first Federal standards for occupational exposure to noise were issued by

- a. the Department of Transportation
- b. the Federal Aviation Administration
- c. the Department of Housing and Urban Development
- d. the Department of Labor.

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True-False: Mark answer sheet under column "A" if the statement is true, or under column "B" if the statement is partially or totally false.

- F 12. The precise levels at which specific pollutants become a health hazard are relatively easy to establish by existing surveillance systems.
- T 13. A deterioration in the ozone layer of the stratosphere can cause an increase in ultraviolet radiation reaching the earth.
- F 14. Chlorofluorocarbons increase the amount of ozone in the atmosphere. - (NO_x + CH)
- T 15. Pollutants may be in the form of microorganisms.
- F 16. Particulates larger than 10 microns can penetrate easily into the respiratory tract.
- T 17. Transportation is the largest source of air pollution.
- T 18. Bacteria and spores are considered natural sources of air pollution.
- T 19. Ozone can be formed by the action of sunlight on nitrogen oxides and hydrocarbons. ←
- F 20. A primary pollutant is one that is formed in the atmosphere as a result of chemical reactions.
- T 21. Stack samples must be collected at the same speed of flow that gases normally pass through the stack.
- F 22. A sampling train is a device used to measure emissions from locomotives.
↳ series of samples or tests
- F 23. The concentration resulting from a continuous emission of a pollutant is directly proportional to wind speed. (inversely proportional)
- F 24. Areas on the windward side of mountain ranges can expect less precipitation due to the forced rising, expansion, and cooling of moving air masses. → more precip.
- T 25. The terms "washout" and "rainout" both refer to a cleansing process of pollutants in the atmosphere.

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Part IV: True-False and Multiple Choice

Mark answer sheet under column "A" if the statement is true, or under column "B" if statement is partially or totally false.

- T 1. Sounds with a frequency of 30 hertz (Hz) are considered very low pitch.
- T 2. The frequency of a sound determines its pitch.
- F 3. In general terms, it is safe to assume that any two identical sound levels will have the effect of increasing the overall level by 10 dB. (+3 dB)
- T 4. Almost all sound contains multiple frequencies.
- F X 5. Continuous exposure to high-level noise is less harmful than intermittent or occasional exposure.
- T 6. Individuals react differently to noise depending on age, sex, and socioeconomic background.
- F 7. Dry cotton ear plugs are just as effective against noise control as expensive fitted ear plugs and earmuffs.
- T 8. The amount of sound energy a material can absorb is a function of its absorption coefficient at a specified frequency.
- F 9. Sound absorbing materials absorb low frequency sounds much more effectively than high frequency sounds. high frequency much more than low freq
- F 10. The United States Environmental Protection Agency has the sole responsibility for implementing "The Noise Control Act of 1971."
EPA + DOT have joint responsibility

Multiple Choice

11. The Montreal Protocol categorizes _____ and _____ in two classes based on their ozone-depletion potential.
- a. CO₂ and PAN
 - b. CFCs and halons
 - c. Ozone depleting greenhouse chemicals
 - d. SO₂ and CO
12. Halon-1301 is used primarily in _____.
- a. portable fire suppression systems
 - * b. ~~fixed fire suppression systems~~ *
 - c. precision cleaning processes
 - d. plastic foam blowing.
13. Halon-1211 is used primarily in _____.
- a. portable fire extinguishers
 - b. fixed fire suppression systems
 - c. printed circuit board cleaning
 - d. vapor degreasing.
14. _____ is considered to be the least damaging to the stratospheric ozone layer.
- a. CFCs
 - b. methyl bromide
 - c. halon
 - d. HCFCs.
15. CFCs are widely used because of their
- a. chemical stability
 - b. herbicide
 - c. pesticide
 - d. fungicide.

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16. Methyl bromide is used primarily as a
- a. fertilizer
 - b. herbicide
 - c. pesticide
 - d. fungicide.
17. The "Ozone Hole" was first noticed in
- a. Antarctica
 - b. the Arctic
 - c. Canada
 - d. Chile.
18. The Safe New Alternatives Policy program
- a. specifies alternatives for all ozone-depleting substances
 - b. lists unacceptable alternatives to ozone-depleting substances
 - c. considers only ozone depletion potential
 - d. is based on global warming potential.
19. Consumption of ozone depleting substances is
- a. the amount of compound used by an industry
 - b. the amount of compound produced by a country
 - c. the amount of compound produced and imported by a country
 - d. the amount of compound imported minus the amount exported.
20. A major effect of stratospheric ozone layer depletion is
- a. increase in incidence of non-melanoma skin cancer
 - b. higher mean temperature in the Northern Hemisphere
 - c. increase in phytoplankton population
 - d. increase rate of photosynthesis in plants.