Public Health Training Network

SELF-STUDY COURSE 3010-G

Lesson 6

Air Pollution and Noise Control

Environmental Health Sciences
Self-Study Course SS3010

Lesson 6: *Air Pollution and Noise Control*

I. Lesson Consists of

A. Part I: 25 multiple choice questions
B. Part II: 25 multiple choice questions
C. Part III: 11 multiple choice and 14 true-false questions
D. Part IV: 10 true-false questions and 10 multiple choice questions

II. References

Salvato, J. A. *Environmental Engineering and Sanitation.* 4th ed. New York: John Wiley & Sons, 1992.

Salvato, J. A. and J. E. Beck, *Environmental Engineering and Sanitation: 1994 Supplement- New Tools for the Environmental Engineer/Specialist.* New York: John Wiley & Sons, 1994.

III. Topics and Reading Assignments

1. Chapter 6 - Air Pollution and Noise Control	**(Page No.)**
A. The Air Pollution Problem and Its Effects	767 to 777
B. Sources and Types of Air Pollution	778 to 783
C. Sampling and Measurement	783 to 790
D. Environmental Factors	790 to 797
E. Air Pollution Surveys	797 to 799
F. Ambient Air Quality Standards	799 to 804
G. Controls	804 to 820
H. Program and Enforcement	820 to 822
I. Noise Control	823 to 845

2. Salvato, J. A. and J. E. Beck, *Environmental Engineering and Sanitation: 1994 Supplement-New Tools for the Environmental Engineer/Specialist* Chapter 6, 59-67

IV. Suggested Supplementary Readings

American Lung Association. *Air Pollution Primer.* New York: American Lung Association.

American Lung Association. *Controlling Air Pollution.* New York: American Lung Association.

Hesketh, H. E., Cross, F. L., *Odor Control: Including Hazardous and Toxic Odors.* Technomic Publish Co. Inc., 1990. ISBN: 87762-608-1

Stern, Arthur C. *Fundamentals of Air Pollution.* 2nd ed. New York: Academic Press, 1984.

V. Objectives

Upon successful completion of Lesson 6, students should be able to correctly

- recognize and appropriately use air pollution control terms associated with all major practical aspects of air quality
- associate air pollution control apparatus and procedures with the types of sources and pollutants to which they are usually applied
- identify the meteorological and topographic factors that affect dispersion estimated used in program development and the sources and limitations of related data
- recognize the health and welfare goals which motivate efforts to improve and/or maintain the quality of the air
- define and explain selected terms and properties of sound recognize health hazards associated with the effects of noise
- identify major sources of noise and the proper use of noise measurement equipment
- understand the importance of noise control and its relationship to Federal, State, and local regulations.

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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 ft^3 of air.

5. Which component of clean, dry air has the smallest volume?

   a. carbon monoxide
   b. nitrogen dioxide
   c. ammonia
   d. sulfur dioxide.

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 peroxacyl 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
   b. sulfur dioxide
   c. industries processing hazardous wastes
   d. high motor vehicle traffic.

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 inhalating 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.

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
    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.

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.

    a. nitrogen oxide
    b. sulfur dioxide
    c. nitrogen dioxide
    d. carbon monoxide.

25. How are total suspended particles measured?

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

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. oustfall 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.

6. Which of the following are examples of short-range primary pollutants?

   a. total suspended solids and sulfur dioxide
   b. sulfur dioxide and ozone
   c. ozone and acid rain
   d. total suspended solids and acid rain.

7. The meteorological elements that have the most direct and significant effects on the distribution of air pollutants are

   a. solar radiation
   b. wind speed and direction
   c. precipitation and stability
   d. all of the above.

8. Long-term wind data of a given location are presented graphically in the form of a

   a. wind rose
   b. wind table
   c. wind tree
   d. wind iris.

9. The accumulation or increased concentration of a continuously emitted pollutant is

   a. referred to as episodic filtration
   b. referred to as explosive stockpiling and is potentially a very hazardous situation if left unchecked
   c. directly proportional to wind speed
   d. inversely proportional to wind speed.

10. Turbulence is the wind characteristic that is

   a. most predictable
   b. the most effective mechanism for the dispersion or dilution of a cloud or plume of pollutants
   c. responsible for generating cyclonic pollutants
   d. responsible for the agitation of otherwise harmless ions.

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

    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
    b. frontal inversion
    c. radiational inversion
    d. stack emission inversion.

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 of 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. foliages
    d. hills.

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. nonsoluable 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
    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.

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
    c. intensity
    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.

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
   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 NEED TO KNOW THE Permanent & BEST METHOD

   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.

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.

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.

12. The precise levels at which specific pollutants become a health hazard are relatively easy to establish by existing surveillance systems.

13. A deterioration in the ozone layer of the stratosphere can cause an increase in ultraviolet radiation reaching the earth.

14. Chlorofluorocarbons increase the amount of ozone in the atmosphere.

15. Pollutants may be in the form of microorganisms.

16. Particulates larger than 10 microns can penetrate easily into the respiratory tract.

17. Transportation is the largest source of air pollution.

18. Bacteria and spores are considered natural sources of air pollution.

19. Ozone can be formed by the action of sunlight on nitrogen oxides and hydrocarbons.

20. A primary pollutant is one that is formed in the atmosphere as a result of chemical reactions.

21. Stack samples must be collected at the same speed of flow that gases normally pass through the stack.

22. A sampling train is a device used to measure emissions from locomotives.

23. The concentration resulting from a continuous emission of a pollutant is directly proportional to wind speed.

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.

25. The terms "washout" and "rainout" both refer to a cleansing process of pollutants in the atmosphere.

Part IV: True-False and Multiple Choice

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

1. Sounds with a frequency of 30 hertz (Hz) are considered very low pitch.
2. The frequency of a sound determines its pitch.
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.
4. Almost all sound contains multiple frequencies.
5. Continuous exposure to high-level noise is less harmful than intermittent or occasional exposure.
6. Individuals react differently to noise depending on age, sex, and socioeconomic background.
7. Dry cotton ear plugs are just as effective against noise control as expensive fitted ear plugs and earmuffs.
8. The amount of sound energy a material can absorb is a function of its absorption coefficient at a specified frequency.
9. Sound absorbing materials absorb low frequency sounds much more effectively than high frequency sounds.
10. The United States Environmental Protection Agency has the sole responsibility for implementing "The Noise Control Act of 1971."

Multiple Choice

11. The Montreal Protocol categorizes_____ and _____in two classes based on their ozone-depiction potential.

    a. CO_2 and PAN
    b. CFCs and halons
    c. Ozone depleting greenhouse chemicals
    d. SO_2 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.

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.

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Answer Keys

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Environmental Health Sciences
Answer Keys (Page No.)

Lesson 6: Part I

1. D (767)	6. D (770)	11. B (772)	16. C (772)	21. D (782)
2. B (767)	7. A (771)	12. B (772)	17. C (778)	22. D (782)
3. D (767)	8. D (771)	13. A (772)	18. B (778)	23. C (782)
4. B (767)	9. A (772)	14. D (775)	19. C (782)	24. B (782)
5. D (768)	10. A (772)	15. D (776)	20. B (778)	25. D (785)

Part II

1. A (785)	6. A (790)	11. D (793)	16. A (807)	21. B (824)
2. B (786)	7. D (791)	12. B (793)	17. C (812)	22. C (824)
3. B (788)	8. A (791)	13. C (794)	18. C (819)	23. B (826)
4. D (789)	9. D (791)	14. D (795)	19. D (819)	24. C (830)
5. B (790)	10. B (793)	15. B (795)	20. A (824)	25. A (830)

Part III

1. C (830)	6. D (836)	11. D (841)	16. B; false (778)	21. A; true (789)
2. B (830)	7. D (838)	12. B; false (768)	17. A; true (778)	22. B; false (789)
3. D (832)	8: A (839)	13. A; true (774)	18. A; true (778)	23. B; false (791)
4. C (832)	9. B (839)	14. B; false (774)	19. A; true (776)	24. B; false (797)
5. C (834)	10. A (840)	15. A; true (782)	20. B; false (782)	25. A; true (795)

Part IV

1. A; true (826)	5. B; false (832)	9. B; false (839)	13. A (64)	17. A (59)
2. A;true (826)	6. A; true (832)	10. B; false (842)	14. D (70)	18. A (62)
3. B; false (830)	7. B; false (837)	11. B (62)	15. A (64)	19. D (62)
4. A; true (824)	8. A; true (838)	12. B (63)	16. C (84)	20. A (60)