**Registered Environmental Health Specialist Exam Study Guide**

**This exam is comprised of the following categories:**

Toxicology 3.5%

Wastewater 3.0%

Drinking Water 8.5%

Epidemiology 4.5%

Food Safety 31.5%

Housing and Institutions 8.5%

Industrial Hygiene 8.0%

Investigations/Inspections Process 2.5%

Pest and Vector Control 9.0%

Public Pools and Recreational Waters 7.0%

Solid and Hazardous Waste 3.5%

Tanning Beds 1.0%

Body Art (tattoo, body and ear piercing) 1.0%

Basic Science 8.0%

There are sixteen lessons provided below to help you in your preparation journey.

**Lesson 1**

## Environmental Engineering: Nemerow, Agardy, Sullivan and Salvato

***Prevention and Response to Water, Food, Soil, Airborne Disease and Illness Sixth Edition***

***Chapter 1 Disease Transmission by Contaminated Water Page: 1-72***

1. The most plentiful form of available water is .
2. Provide several examples for each of the following categories of disease transmission by contaminated water:
* Waterborne diseases
* Water-washed diseases
* Water-based infections
* Water-related diseases
* Inhalation of contaminated water aerosols
1. The etiologic agent of cyclosporiasis is .
2. A food associated with cyclosporiasis is .
3. Most waterborne disease fatalities occurred before 1940 and were attributed to the waterborne illness .
4. Waters suitable for drinking water supplies and shellfish rearing are monitored routinely for .
5. Only % of the global content of water constitutes fresh water.
6. A waterborne disease that can be prevented through vaccinations is .
7. The World Health Organization (WHO) estimates that % of all diseases are attributable to inadequate water or sanitation.
8. Viral infections readily spread through drinking water, food and water-contact recreation activities.

***Provide information requested for each of the following water and foodborne diseases:***

1. **Shigellosis:**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Botulism:**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Bacillus cereus food poisoning** (Emetic Type)
* Specific Agent
* Reservoir (s)
* Symptoms
* Incubation period
1. **Bacillus cereus foodborne illness** (Diarrheal Type)
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Typhoid Fever**
* Specific Agent
* Reservoir(s)
* Symptoms
1. **Campylobacter enteritis**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Amebiasis**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Staphylococcus food poisoning**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Cholera**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Yersiniosis**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Trichinosis**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Cryptosporidiosis**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Clostridium perfringins food poisoning**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Giardiasis:**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Listeriosis**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period
1. **Scombroid fish poisoning**
* Specific Agent
* Reservoir(s)
* Symptoms
* Incubation period

**Lesson 2**

## Environmental Engineering: Nemerow, Agardy, Sullivan and Salvato

***Prevention and Response to Water, Food, Soil, Airborne Disease and Illness Sixth Edition***

***Chapter 1 Historical Waterborne Disease Background Page: 45-58***

1. Prior to the 19th Century, civilization regarded the onset of infections being caused by foul air, commonly called .
2. Diseases such as typhus, , , and were common in Europe, the United States, and other parts of the world prior to the 20th century.
3. Who was John Snow and what was his role in the cholera epidemic of 1849 and 1854?
4. What role did Robert Koch play in the study of cholera in the 1880s?
5. Water treatment, specifically the application of disinfectant, has practically eliminated many of the traditional waterborne diseases in developed countries, however waterborne diseases such as , and still occur.
6. Waterborne diseases in the U.S. occur more frequently in water systems.
7. Drinking water contaminated with is the principal cause of waterborne diseases.
8. Cryptosporidium oocysts can survive in surface water at 4 0C for months.
9. What are the six barriers of a multiple barrier plan of water treatment to ensure the safety of the consumer?
10. What do security concerns of a water treatment system take into account?
11. What are the EPA recommendations for a minimum state regulatory program regarding the surveillance of a public water supply?
12. What is involved in the security of water treatment facilities?
13. Schistosomiasis is largely endemic to , , and

 .

1. Schistosomiasis is spread by freshwater .
2. It is estimated that there are more than cases or more annually of schistosomiasis and the number is expected to increase.

***Lesson 3***

## Environmental Engineering: Nemerow, Agardy, Sullivan and Salvato

***Prevention and Response to Water, Food, Soil, Airborne Disease and Illness Sixth Edition***

***Chapter 2 Control of Diseases of the Air and Land Page: 99-137***

1. Define Communicable Disease and describe how communicable diseases are transmitted.
2. List five core health problems of developing countries.
3. What are three factors that make developing countries susceptible to illnesses listed in the above question?
4. When a country shifts from infectious disease mortality to chronic disease mortality, the country is said to have undergone an .
5. To an epidemiologist, the term environment has a different meaning than what the general public might define it as. To an epidemiologist, the term refers to
6. How can the availability of clean water and better nutrition morbidity and mortality rates?
7. What are the goals of environmental health programs? (List 4)
8. Analyzing the Epidemiologic Triangle, what are the three factors that influence disease transmission?
9. Give one example of each of these Epidemiologic triangle factors.
10. The only infectious disease to be eradicated by humans is .
11. Define herd immunity:
12. Arthropods involved in the transmission of human and animal disease are called

 .

1. The is the source of infection which is often a non-human animal.
2. List 3 control measures for eliminating or reducing the incidence of insect borne diseases.
3. What is a nosocomial transmission (disease) and give an example from the text relating to sinks.
4. What is the agent of West Nile Virus, what is the disease it causes and what species of mosquito is the vector?
5. Match the Description to the Disease: (Insert corresponding letter to each disease in the blank.)
	1. Myasis f. Rocky Mountain Spotted Fever
	2. Dengue fever g. Bubonic plague
	3. Tularemia h. Filariasis
	4. Psittacosis i. Colorado Tick Fever
	5. Trypanosomiasis

 The reservoirs include dog ticks, wood tick, and the lone star tick. The etiologic Agent is Rickettsia rickettsii and it is transmitted by the bite or crushed tick blood with an incubation of 3-10 days.

 Is transmitted by the bite of an infective flea, X. cheopis, with rodents being the other reservoir being wild rodents. The etiologic agent is Pasteurella pestis and Yersinia pestis.

 Transmitted by the bite of infected tsetse flies, the reservoir of this agent includes humans, wild game and cattle

 Transmitted by the bite of an infected tick (Dermacentor andersoni). Symptoms occur usually four to five days after being bitten. The agent is a virus.

 The reservoirs are rabbits, muskrats, and other wild animals. The agent is transmitted by the bite of infected flies or ticks or ingesting undercooked rabbit meat.

 Caused by nematode worms, this disease is transmitted by the bite of a mosquito; Culex, Aedes, and Anopheles species with the reservoir being blood from the person harboring the agent.

 Also known as break bone fever, this viral disease is transmitted by the bite of infected Aedes aegypti and A. albopictus.

 The etiologic agent’s reservoirs include infected parrots, parakeets, love birds and other birds. The disease is contracted through contact with infected birds or inhalation of their desiccated waste and the incubation is 4-15 days.

 Fly infestation of humans and vertebrate animal tissue with fly larvae transmits this etiologic agent commonly known as the screwworm.

1. Nearly 40% of the world’s population lives in regions at risk of contracting the vector borne disease and the WHO estimates over 500 million cases annually.
2. Describe the following as it relates to Malaria:
* Etiologic agent
* The Reservoir
* How it is transmitted
* Incubation period and symptom
* Environmental factors
1. Describe the following as it relates to Plague:
* Etiologic agent
* The Reservoir
* How it is transmitted
* Incubation period and symptom
* Environmental factors
1. Define zoonoses and discuss its prevalence in today’s world.
2. Describe the following at it relates to Rabies
* Etiologic agent-
* The Reservoir-
* How it is transmitted
* Symptoms of a rabid dog
* Prevalence and Mortality
* Rates
1. Also known as wool sorter’s disease, is an infectious disease principally of cattle, swine, sheep, and horses.
2. In 2001, , in a purified spore form was implicated in an intentional release/terrorism event that resulted in deaths in five U.S. states.
3. What actions should be taken in the possible event of a dog bite of a suspect animal?

**Lesson 4**

## Environmental Engineering: Nemerow, Agardy, Sullivan and Salvato

***Prevention and Response to Water, Food, Soil, Airborne Disease and Illness Sixth Edition***

***Chapter 2 Lead Poisoning Page: 151-157***

1. Lead is a cumulative poison ending up in the body’s ,

 , and .

1. Lead is not easily excreted from the body of children; therefore children may experience afflictions such as:

 .

1. What precautions must one take when removing lead-based paint to protect children, adults and the workers during mitigation?
2. What year was lead banned from being used in paint , in the manufacture of cans , in gasoline .
3. What has been the result of the ban on lead in such items above?
4. How do adults differ from children in the absorption of lead ingested?
5. List five sources of lead other that those mentioned in question 4.
6. What blood lead level is considered potentially harmful to children?
7. The FDA has set a limit of ppm lead leachate for ceramics used for liquids in food service dishes.

***Carbon Monoxide Page: 166-168***

1. Why is carbon monoxide sometimes confused with foodborne illness?
2. What symptoms differentiate it from foodborne illnesses?
3. Explain the physiologic effect of carbon monoxide on the human body?
4. Carbon monoxide gas has a distinctive odor and taste. True or False?
5. What are some of the more common causes of carbon monoxide poisoning?
6. What levels of CO can cause headaches?
7. What levels of CO can lead to unconsciousness?

***Mercury Poisoning Page: 155-157***

1. What foods are associated with mercury poisoning?
2. The form of mercury found in fish has been found to be practically all

 .

1. A whole-blood level above ppm may pose a mercury poisoning hazard.

***DEFINITIONS: Page: 165-169***

1. Endemic-
2. Epidemic/Outback-
3. Pathogen-
4. Teratogen-

## Lesson 5

## Environmental Engineering: Nemerow, Agardy, Sullivan and Salvato: Environmental Health and Safety for Municipal Infrastructure, Land Use and Planning and Industry

***Chapter 1 Residential and Institutional Environment Starting on Page: 83***

1. The World Health Organization’s definition of housing is
2. Substandard housing is said to exist when
3. To “blight” is to
4. According to a 1974 housing survey, what common problems in the late 1940s had almost been eliminated.

# *Chapter 2 Backflow Prevention Page: 134-137*

1. The best way to eliminate the danger of a plumbing backflow is to terminate the water inlet or faucet a distance above the flood-level rim of the fixture. This distance, referred to as the , is one inch for a inch or smaller diameter faucet or inlet pipe and two inches for a inch diameter pipe.
2. What are some installation guidelines for vacuum breakers?

# *Indoor Air Quality Page: 137-154*

1. List four recently utilized energy saving techniques that resulted in an increase in the concentration of indoor air pollutants in our homes.
2. Good indoor air quality practices dictate that at least % of the re-circulated should be clean fresh air.
3. Photocopying machines emit into our indoor air we breathe.
4. The U.S. National Ambient Air Quality Standards (NAAQS) guidelines sets the limits of carbon monoxide exposure at ppm for 8 hours and ppm for one hour.
5. What is radon and from where does it originate?
6. Radon has a half-life of and is primarily emitting decay products.
7. The EPA has set a guideline limit of per 24 hours for radon in our homes.
8. The EPA estimates million homes exceed the radon level limits.
9. The major health problem associated with excessive radon exposure over a period of years is
10. List five potential entry sources of indoor radon from the soil into our homes.
11. What are some measures that can be taken to reduce radon contamination levels in an existing dwelling.
12. List five sources of formaldehyde in our home’s indoor air.
13. Formaldehyde exposure levels of 1.0 to 5.0 ppm can cause symptoms such as

 , levels of 0.3 to 2.7 ppm have been found to cause people to . Exposure of 10 to 20 may produce .

1. Based on animal studies, PCBs are considered
2. Possible major exposure routes to PCBs are
3. Typical chimney conditions apt to result in dangerous back-drafts, such as chimney placement, can be prevented by assuring a minimum clearance of feet above the highest point of the roof line.

# *Institution Sanitation Page: 155-169*

1. A nosocomial infection is

 .

1. It has been estimated that percentage of patients admitted to hospitals incur infections during their stay annually.
2. Hospital acquired infection rates are highest in type hospitals and lowest in hospitals.
3. The infection rate is highest on the surgical service floor followed by

 , , and .

1. Wash-water temperatures for hospital laundry should be, at minimum, to oF for minutes.
2. Hospital wastes may include , ,

 , and radioactive waste, as well as ,

 and .

1. Only % of all hospital wastes are infectious waste.
2. Hospital wastes are regulated by EPA, OSHA, and the and

 .

1. Overcrowding and are major problems at many jails and prisons, being the major reason for prisoner discontent.
2. List 5 of the most commonly found enteric pathogens reported in day care outbreaks.

**Lesson 6**

## Environmental Engineering: Nemerow, Agardy, Sullivan and Salvato: Environmental Health and Safety for Municipal Infrastructure, Land Use and Planning and Industry

***Chapter 3 Solid Waste Management, Page: 177-258***

Define these terms:

1. Garbage-
2. Leachate-
3. Rubbish-
4. Source Reduction-
5. Integrated Waste Management (IWM)-
6. EPA has identified four basic management options for IWM. List them in hierarchal order:
7. Give three examples of source reduction:
8. How can consumers participate in source reduction practices?
9. is perhaps the most positively perceived and doable of all the waste management options.
10. are the one form of waste management that nobody wants, but it is the only one that is both necessary and efficient.
11. The IWM option that reduces the volume of waste nine-fold is .
12. Many superfund sites are what is left of poorly managed operations.
13. How do today’s modern landfills differ from the older landfills?
14. Residential and commercial wastes make up % of the total municipal waste generated per person in the United States.
15. Recycling will flourish where and the costs of land filling is at least dollars per ton or higher.
16. The latest data (2006) estimates that generated in the U.S.

pounds per capita per day

1. The Resource Conservation and Recovery Act (RCRA) defines medical waste as:
2. Examples of medical waste includes:

 and excludes

1. Most infectious waste can be treated for disposal by or .
2. The frequency of collection of solid waste in residential areas is during warm months.

**Lesson 7**

## Environmental Engineering: Nemerow, Agardy, Sullivan, and Salvato

## Environmental Health and Safety for Municipal Infrastructure, Land Use and Planning and Industry

***Chapter 3 Solid Waste Management Page: 177-258***

1. How can recycling affect savings in landfill space?
2. Why has the recycling of glass, for the most part, ceased?
3. Compost improves , but is a poor

 .

1. How can compost be utilized?
2. EPA requires compost attain temperatures of oF for days to obtain pathogen destruction before compost land spreading.
3. The principal federal requirements for municipal solid waste landfills are in

 of RCRA.

1. The sanitary landfill method is used primarily on level grounds.
2. In any landfill method, all exposed solid waste should be covered with inches of earth at the end of each day’s operation.
3. Landfills should be located at least feet from any surface water. Distance is based on , ,

 and .

1. EPA and others have reported that hazardous wastes probably represent less than

 % of the total waste generated by a household.

1. The two primary constituents in landfill gas generated is and .

# *Hazardous Wastes Page: 292-305*

1. According to regulation, the term hazardous waste means
2. Hazardous wastes are regulated under EPA’s Act.
3. A waste is regarded hazardous if it is , and .
4. EPA lists four characteristics of hazardous waste. They are:

a.

 b.

 c.

 d.

1. Domestic wastewater and irrigation waters are not covered by hazardous waste regulations.
	1. TRUE b. FALSE
2. Under the 1976 RCRA regulations, businesses considered small quantity Generators, generating less than pounds of hazardous waste per month, were exempted from regulations.
3. The most common problems associated with the disposal of hazardous wastes are

 , ,

 and .

1. List the three top generators of hazardous wastes among the 15 industries studied by EPA.
2. Of all the options available to the management of hazardous wastes, the last resort is and .

**Lesson 8**

## Environmental Engineering: Nemerow, Agardy, Sullivan and Salvato:

***Water, Wastewater, Soil and Groundwater Treatment and Remediation***

***Chapter 1 Water Supply Page: 1 to 108***

1. A public water system is defined under the Safe Drinking Water Act as a system having at least service connections, regularly serving at least individuals daily at least days out of the year.
2. About percent of the world’s population do not have a safe and adequate water supply.
3. Three-fourths of all illnesses in the developing world are associated with

 and .

1. According to the World Health Organization (WHO), how many people die each year from waterborne diseases caused by microbiologically contaminated water supplies or due to lack of access to sanitation facilities? .
2. List four factors that should be considered when determining a safe distance between a well and a sewage disposal system.
3. The percentage of the earth’s water that is salt water is , and the percentage that is fresh water is .
4. Is rainwater soft or hard water?
5. Rocks that are formed by the cooling and hardening of molten rock are known as

 rock.

1. Give examples of the following rock formations:
	1. Sedimentary
	2. Metamorphic
	3. Igneous
2. Karst areas are formed by movement of groundwater through rock.
3. What quantity of water is expected from igneous rock, from metamorphic rock and sedimentary rock?
4. Explain the main difference between the Primary Drinking Water Standards and Secondary Drinking Water Standards.
5. When collecting a water sample for bacteriological examination:
	1. What kind of container should be used?
	2. What should be added to the container if chlorinated water being sampled?

 .

* 1. Samples should be examined within hours.
1. If repeat samples are positive for coliform, the water system must also analyze to determine if are present.
2. A ml standard sample volume must be used in analyzing for total coliform, regardless of the analytical method used.
3. If the membrane filter technique is used, the coliform bacteria trapped on the filter produce a metallic sheen within hours on a medium containing lactose when placed in an incubator at oC.
4. The fecal coliform test involves incubation at oC for hours as the formation of indicates the presence of coliform.
5. An average person yields billion coliform per day through excrement.
6. Normally, five hundred gallons of water (sample size) must be filtered to identify
7. Sampling for usually involves the Filtration of about gallons of water through a 1 micrometer pore size filter at a rate of one gallon per minute.
8. Why is it not practical to test water for specific pathogenic organisms?
9. How are odors in drinking water controlled?
10. What causes turbidity in drinking water supplies?
11. What are some constituents that cause water to have an unacceptable taste?
* Ppm
* mg/l
* Fecal Coliform
* Indicator bacteria
* Hard water
* Soft water
* Hypochlorites
* Annular space
* Organic chemicals
* Inorganic chemicals
* Disinfection
* Filtration
1. There are several types of wells found in Kentucky. What are the differences between them?
2. What are some of the common chemical contaminates of well water?

In Kentucky what is the regulatory agency for public water supplies?

1. When should a private water supply be sampled for bacteriological safety?
2. What are some of the diseases that can be transmitted to people from water?
3. Staining and corrosion are problems that occur in private water supplies. How can we reduce these problems?
4. What is Ultraviolet disinfection?
5. What does it mean when a water sample comes back noted “unsafe”?
6. What types of chemicals are used to disinfect wells?
7. How do nitrates affect a water supply?
8. How do you properly sample a well?
9. What type of well is considered least likely to become contaminated?

**Lesson 9**

## Environmental Engineering: Nemerow, Agardy, Sullivan and Salvato:

***Water, Wastewater, Soil and Groundwater Treatment and Remediation***

***Chapter 1 Chemical Examination of Water Page: 48-69***

1. The alkalinity levels of water passing through distribution systems made of iron pipes should be in the range of to mg/l as CaCO3 to prevent corrosion.
2. Game fish require a dissolved oxygen level of at least mg/l to reproduce.
3. Levels of fluoride that are beneficial to children during their permanent teeth developing is to mg/l.
4. What two inorganic substances are primarily responsible for water hardness?
5. There is ample evidence arsenic in drinking water may cause

 .

1. A dose of mg/kg of arsenic is a probable lethal dose
2. The MCL for arsenic in drinking water was lowered to \_\_\_\_\_ mg/l by EPA in 2001.
3. Game fish require a dissolved oxygen level of at least mg/l to reproduce.
4. The compound is most frequently found in groundwater as a natural constituent and is easily identifiable by a rotten egg smell.
5. The final oxidation product of ammonia is .
6. Levels of nitrate above mg/l appears to cause , commonly known as blue baby syndrome.
7. Under what circumstances are trihalomethanes (THMs) formed?
8. The direst health effect from extended exposure to THMs is?

**Source Protection of Water Supply Page: 77-104**

1. “Wellhead area” has been defined, under the 1986 Safe Drinking Water Act amendments, as
2. List five critical factors in determining the wellhead protection area.
3. A well for a private home should preferably have a capacity of at least gallons per hour.
4. About % of the U.S. population depends on groundwater for drinking and domestic purposes.
5. It is estimated that there is more than four times more groundwater than there is surface water.
	1. TRUE b. FALSE
6. wells are not usually dependable sources of water supply.
7. What two types of wells are characterized as having small yields, being easily polluted, and are affected by draughts?
8. When well water shows the presence of bacterial contamination, it usually due to:

a.

 b.

 c.

 d.

1. What advantages do drilled wells have over all other types of wells?
2. To obtain satisfactory water from a spring it is necessary to
3. It is recommended that cistern water be treated after every rain event with a chlorine compound of at least mg/l of chlorine.

***Domestic Well Water Supplies: Special Problems Page: 105-117***

1. What causes water hardness and how does one treat the problem?
2. What causes turbidity and how does one treat the problem?
3. Iron and manganese is usually found in water from wells.
4. What are the effects of higher-than-normal levels of manganese and iron in water?
5. Chlorine bleach can be used to remove stains caused by iron on laundry.
	1. TRUE b. FALSE
6. What problems can corrosive water cause and how might the problem be treated?
7. What two protozoa are not affected by normal chlorination or UV radiation?
8. Typically, about % of tap water flowing into a reverse osmosis system is wasted

**Lesson 10**

## Environmental Engineering:

##  Nemerow, Agardy, Sullivan and Salvato:

***Water, Wastewater, Soil and Groundwater Treatment and Remediation***

***Chapter 2 Water Treatment Page: 133***

1. The most common chemicals used in the disinfection of drinking water include

 , , and

 .

1. Of these listed in the preceding question, is the most common method of destroying disease-producing organisms that normally might be found in drinking water.
2. A chlorinator should have a capacity to provide at least mg/l free chlorine residual with minute contact time at maximum flow and chlorine demand.
3. The recommended field test for measuring chlorine in water are the and the stabilized methods.
4. The water treatment step that removes 99% of all viruses is .
5. The minimum free chlorine residual at distant points in the distribution system should be to mg/l and a combined chlorine reading of

 to mg/l.

1. What is plain sedimentation?
2. If sedimentation detention times are 10 to 30 days, a bacteria and virus removal of to % can be expected.
3. What happened when aluminum sulfate is added to water during the water treatment process?
4. The mixing of coagulant is usually done in two steps. What are they?
5. For the control of coagulation, tests are performed in the

laboratory to determine appropriate dosage of chemicals.

1. The primary purpose of filters, in the drinking water treatment process is to:
2. List some microorganisms that cause odor and taste problems.
3. What problems do zebra mussels present to a water treatment plant?
4. From where did zebra mussels originate and how did they get to the U.S.?

***Emergency Water Supply and Treatment Page: 262-269***

1. Boiling water vigorously for minutes will kill most pathogens in possibly polluted water.
2. If a water is not grossly polluted, is 68 F and has a low pH and turbidity level,

 is a satisfactory method for disinfecting water in emergency situations.

1. If iodine is used as a disinfectant during emergency situations, drops of 2% tincture of iodine may be used to disinfect one quart of water, which is equivalent to mg/l of iodine.

**Lesson 11**

## Environmental Engineering:

##  Nemerow, Agardy, Sullivan and Salvato:

***Water, Wastewater, Soil and Groundwater Treatment and Remediation***

***Chapter 3 Wastewater Treatment and Disposal Page: 283***

1. Define the following terms:
	1. Gray Water-
	2. Black Water-
	3. Excreta-
	4. Non-point pollution-
	5. Aerobic bacteria-
	6. Anaerobic bacteria-
2. Soils are divided into five classifications, they are
3. and soils do not drain well and thus are not usually considered suitable for the disposal of sewage by sub- surface means.
4. What effect does calcium and magnesium have on soil?
5. According to information in this chapter, it is necessary to have at least inches of suitable soil between the bottom on an absorption field trench and the highest groundwater table or impermeable layer.
6. What are septic tanks capable of accomplishing?
7. What are septic tanks **not** capable of accomplishing?
8. The detention time should not be less than hours.
9. If a septic tank is to receive waste from an under the sink garbage disposal unit, its capacity (size) should be increased by at least %.
10. A septic tank for a private home will generally require cleaning, by a licensed septic tank cleaning company, every years.
11. Septic tanks serving commercial operations should be inspected at least every

 .

1. Sludge accumulation in a normal home septic tank has been estimated at

 gallons per person per year.

1. What are 4 possible results of using septic tank cleaning solvents, additives, or other such hazardous chemicals to a septic tank?
2. What other kinds of household items should a homeowner not introduce into a septic tank?
3. Why is the use of copper sulfate crystals recommended for some septic tank systems
4. List six common causes of septic tank system failures.
5. In a septic tank, when the depth of settled sludge or floating scum approaches the depth of inches in a 1000-gallon tank with a 30 inch liquid depth, the tank needs cleaning; in a septic tank with 36 inches of liquid depth, the depth of sludge requiring one to clean the tank.
6. The septic tank absorption field should be feet from any well, feet or more from any lake, swamp, ditch or watercourse.

***Sewage Works Design- Small Treatment Works Page: 322***

1. What is the overall purpose of bar screens, comminutors, and grit chambers?
2. The most commonly used biological treatment process for removal of organic matter from wastewater is .
3. The use of a mass of activated microorganisms in a basin that is aerated is a biological treatment process known commonly as .
4. What are Rotating Biological Contactors (RBCs)?
5. How are RBCs similar to trickling filter systems?
6. What is the BOD removal efficiency for the following treatment processes:
	1. Activated Sludge
	2. Trickling Filters
	3. RBCs
7. Provide the following information related to facultative ponds:
	1. Detention Time
	2. Liquid Depth
	3. BOD Removal %

***Define These Terms****:*

* Percolation Aeration Anaerobic
* Coliform
* BOD
* COD
* Soil horizons
* Mottles
* Karst topography
* Primary treatment
* Secondary Treatment
* Flow diversion valves
* Flow switching devices

***Additional Questions:***

1. What role does soil play in on-site sewage treatment systems?

1. What does a soil morphology tell us?
2. What does color tell us about a soil?
3. What % of clay in soil generally makes it unsuitable for a soil absorption system?
4. There are two types of clays: expandable clays and non-expandable clays. Which one is a provisionally suitable soil?
5. What is soil structure, and what does it affect?
6. In what soils is structure not important?
7. What soil colors indicate good soil aeration?
8. What is a seasonal high-water table?
9. If there is greater than 50% of rock fragments in a soil that overlays permeable bedrock, is that soil suitable for an absorption type system?
10. A grayish color soil indicates what?
11. What does a site plan tell us?
12. How are lagoons sized?
13. What is the property line setback distance for a lagoon?
14. If the lagoon is preceded by a properly sized septic tank, how much reduction in size is allowed?
15. What does seeding of lagoon berms with a hardy grass do?
16. If there is a neighboring home, how far does your lagoon have to be away from the home?
17. How far does a lagoon have to be from the residence it serves?
18. How do lagoons work?
19. How far from the property line does the effluent pipe have to be?
20. What is the minimum size allowable for a septic tank that serves a 4-bedroom residence?
21. If you have a 4-bedroom house and the soil loading rate is .5 gallons/ft2, how many square feet of soil absorption is required?
22. In a chamber system how much of a reduction is allowable by state law?
23. What is the purpose of a septic tank?
24. What is the purpose of a soil absorption system?
25. What is vertical separation (definition) and how much vertical separation is required between the trench bottom and a restrictive layer.
26. What are some of the restrictions that may require installation of an alternative system?
27. Why is it important to construct the absorption field when the ground is not saturated?
28. What is the maximum length that laterals may be?
29. What is a biomat and what function does it perform in an on-site system?
30. As a general rule, what is the % of slope that might make the site unsuitable?
31. What geographical areas of a site must be avoided?
32. What information does a site evaluation give us?
33. What is the minimum distance that a septic tank must be placed from a building foundation?
34. What gasses are found inside septic tanks, and what is the concern with them?
35. What must be submitted to the regulatory authority prior to issuance of a construction permit?
36. If you have a septic tank that is 7’ long, 5’ wide, and 12’ deep, what is the liquid capacity of that tank?
37. How far must the tank be from any property line?
38. What does the soil texture tell us?
39. What is the maximum depth of laterals in a septic system?
40. In what part of an on-site soil absorption system does limited primary treatment occur?
41. What does “limited” primary treatment entail?
42. What are the advantages of dosing a system?
43. In what situation would aeration units not be an acceptable option?
44. What is the difference between a chamber system and a standard absorption system?
45. What is an LPP system?
46. How do drip irrigation systems work?
47. How does a submerged flow wetland work?
48. How does a sand filter system work?

***Lesson 12***

## Principles of Food Sanitation: Marriott and Gravani, Sixth Edition

## Centers for Disease Control and Prevention – Food Safety Pages

## and Kentucky Core Training Food Manual

***Chapter 1 Page: 1-12 and Chapter 3 Page: 25-36***

1. What are psychotropic bacteria? Give 3 examples.
2. What makes Salmonella a unique foodborne pathogen?
3. Explain the difference between the terms substantive and advisory regulations and “should” and “shall.”
4. Products subject to seizure by FDA during interstate commerce include

 and .

1. FDA is under the jurisdiction of
2. The first HACCP regulation written by FDA required processors of

 to develop and implement HACCP systems for their operations.

1. The USDA had jurisdiction over three areas of food processing, they are

 , , and . The inspections are administered by .

1. The objective of the 1996 Pathogen Reduction: HACCP Final Rule was to reduce foodborne illness associated with and .
2. Two types of pathogenic microorganisms that grow in or are carried by foods are those that cause and .
3. The microorganisms most common to food are and .
4. Fungi consists of two major microbe groups, and .
5. Describe the morphology and appearance of molds.
6. Molds can survive a pH as low as and prefer a water activity of .
7. What are the pH and water activity requirements for yeasts?
8. A virus particle consists of
9. To what extent do viruses cause foodborne illness?

Define the following and give an example of each of these temperature related terms:

1. Mesophilic-
2. Thermophilic-
3. Microorganisms requiring free oxygen are called microbes, while those that thrive in the absence of oxygen are known as .
4. What are biofilms?
5. Define foodborne outbreak.
6. 66% of all foodborne outbreaks are caused by .
7. Explain the differences between food intoxications and food infections.
8. Evisceration and cold storage of chickens at 3 0C (37.4 0F) may permit an increase in this foodborne illness
9. Common symptoms of foodborne diseases are
10. Although anyone can get a foodborne illness, some people are more likely to develop one. Those 4 groups include:
11. The top five germs that cause illnesses from food eaten in the United States are:
12. Some other germs don’t cause as many illnesses, but when they do, the illnesses are more likely to lead to hospitalization. These 5 germs include:
13. Know temperatures for dishwashing.
14. Know the 6 factors for explains what allows foodborne pathogens to grow.
15. Know moisture levels that allows pathogens to grow.
16. Know pH levels that allows pathogens to grow.

**Lesson 13**

## Principles of Food Sanitation: Marriott and Gravani, Sixth Edition

## Centers for Disease Control and Prevention – Food Safety Pages

## and Kentucky Core Training Food Manual

***Note: the majority of the information regarding specific foodborne illnesses on page: 37- 50 are in Lesson 3***

***Following Questions are from Chapter 3 Page: 37-53, Chapter 4 Page: 70-75 and Chapter 16 Page: 283-286***

1. The foodborne illness, , is now recognized as one of the most frequent causes of bacterial diarrhea and there is mounting evidence that it causes ulcers.
2. What food preparation practice is generally the cause of Clostridium perfringins foodborne illness?
3. What food preparation practice is generally the cause of E-coli 0157:H7 foodborne illness?
4. What food preparation practice is generally the cause of Salmonellosis?
5. What food preparation practice is generally the cause of Shigellosis?
6. What food preparation practice is generally the cause of Trichinosis?
7. What are aflatoxins and what public health danger do they pose?
8. The most common cause of “traveler’s diarrhea, an illness frequently acquired during visits to developing nations is.

***Chapter 4 Food Allergens Page: 70-75***

1. What is an allergen?
2. What foods are more likely to contain allergens?
3. How is a food allergen triggered?
4. How many emergency room visits and deaths are attributed to food allergens in the U.S. each year?
5. % of adults and % of infants and young children are affected by food allergens.
6. What areas should a food allergen control program address?
7. What kinds of tests have been developed to give processors quick, accurate tools to check for traces of allergens in food items?

C***hapter 6 Personal Hygiene Page: 83-97***

1. Define “carrier”
2. Describe the difference between convalescent, chronic, and contact carriers.
3. The first line of defense against disease is frequent and effective
4. Approximately percent of food contamination is attributable to improper .
5. When describing methods of disease transmission, what is the difference between direct and indirect transmission.
6. Selection of food service employees should be predicated on 5 facts. What are they?
7. Hand washing for seconds with soap and water will remove transient bacteria from the hands.
8. How effective are alcohol-based sanitizers and which ones are best?
9. Milk and milk products have been identified as a vehicle for transmission in approximately per cent of salmonellosis cases.
10. Approximately five to ten percent of raw bovine milk is contaminated with the bacteria .
11. What illness and what foods were implicated in a 1983 outbreak in Massachusetts and a 1985 outbreak in Los Angeles?
12. based sanitizers should not be used on food contact surfaces or in cheese factories as lactic acid starter culture bacteria are inactivated by small residues of this sanitizer.

***The following are examples of questions that could appear on the exam:***

1. Food packaged in a food establishment shall be labeled as specified in what code?
2. Label information shall include what information?
3. Fruits and vegetables that are cooked for hot holding shall be cooked to what temperature?
4. Leftovers shall be heated to what temperature?
5. What are the correct ways to thaw frozen food?
6. How long do you have to cool cooked potentially hazardous food from 1350 F. to 70 0 F?
7. How long do you have to cool cooked potentially hazardous food from 700 F to 410 F?
8. What are the approved cooling methods?
9. What are the properties of potentially hazardous foods?
10. What is the proper method of tasting foods?
11. When should deliveries be scheduled?
12. If a can has a swollen head, what organism could be responsible?
13. In Modified atmosphere packaging and vacuum packaging what organism is of most concern?
14. What information does an MSDS form give you?
15. Are hard boiled eggs considered potentially hazardous?
16. What is the purpose of a shell stock tag?
17. What are service animals and are they allowed in restaurants?
18. What is a HACCP flow diagram?
19. What can hand sinks be used for?
20. Can freezers be used for cooling down hot foods?
21. What is pasteurization?
22. Where should in-use serving spoons be stored?
23. At buffets what is one method of preventing customer contamination of foods?
24. What responsibility does the person in charge have in regard to illnesses?
25. What is the optimum store-room temperature and humidity?
26. Why is a clear water rinse required between washing and sanitizing?
27. Where is the optimal placement of thermometers in refrigeration units?
28. Under what conditions are glass sensors on thermometers permissible?
29. What organism grows well at refrigeration temperatures?
30. What is the minimum hot water temperature allowable in food service facilities?
31. How long can you keep ready-to-eat potentially hazardous foods that are held in a refrigerator at 410 F?
32. When is a food handler required to wash their hands?
33. Shell eggs shall be received clean and sound and may not exceed the restricted egg tolerances for U.S. Consumer Grade B as specified in what code?
34. When may a food item be reserved?
35. What is the final rinse temperature in a heat sanitizing dishwashing machine?
36. The concentration of chlorine used in the final rinse of chemical dishwashing machine is what?
37. The bulk milk container dispensing tube shall be cut how and how far from the chilled dispensing head?
38. What does HACCP stand for?
39. What foods are associated with Salmonellosis?
40. What foods are associated with Botulism?
41. What foods are associated with Campylobacter?
42. What foods are associated with Listeria?
43. What foods are associated with C. perfringens?
44. What foods are associated with Shigellosis (bacillary dysentery)?
45. What foods are associated with Staphylococcal food poisoning?
46. What foods are associated with Vibrio vulnificus?
47. What foods are associated with Yersiniosis?
48. What foods are associated with B.cereus gastroenteritis?
49. What foods are associated with E. coli 0157:H7?
50. What foods are associated with Hepatitis A?
51. Give several examples of parasitic illnesses.
52. What is the fecal/oral route?
53. What are parasites?
54. What is a host?
55. What are viruses?
56. What are spores?
57. Describe the 4 phases that bacteria go through.
58. What is “FATTOM”?
59. Foods that can cause an allergic reaction are called what?
60. What are nitrates used for?
61. What are sulfites used for?
62. What is MSG used for?
63. What types of foods are considered non-potentially hazardous?
64. What types of foods are considered potentially hazardous?
65. What are the five risk factors for foodborne illness?
66. What are microorganisms?
67. What is a pathogen?
68. Define a foodborne disease outbreak.
69. What is the cause of ciguatera?
70. What is the cause of histamine production in fish?
71. What types of organisms comprise “microorganisms”?
72. What is the single greatest threat to food safety?
73. What 6 factors are associated with bacterial growth?
74. What is the difference between foodborne infection, foodborne intoxication and a foodborne toxin-mediated infection?
75. What is the difference between a vegetative bacterial cell and a spore?
76. Does cooking to the proper temperature destroy all bacterial cells? Why or why not?
77. Approximately how many foodborne illnesses occur each year in the United States?
78. What foods are most likely to cause foodborne illness?
79. What are the ways that food becomes contaminated?
80. What segments of the population are most susceptible to foodborne illness?
81. Why is it difficult to determine when a foodborne illness has occurred?
82. What are the required minimum cooking temperatures for the following foods? roast beef; turkey; casseroles; ground beef; pork sausage; and fish.
83. When reheating food what is the minimum temperature the food must reach?
84. Give some examples of physical hazards.
85. Give an example of a natural chemical hazard.
86. Describe how time can be used as a public health control.
87. When using time as a public health control how long can cold food items be held before discard?
88. What is the acceptable receiving temperature for eggs?

**Lesson 14**

## Principles of Food Sanitation: Marriott and Gravani, Sixth Edition

***Chapter 7, 10 and 13***

***Chapter 7 The Role of HACCP in Sanitation Page: 99-114***

1. The acronym HACCP stands for .
2. The two major thrusts of HACCP is to and .
3. The HACCP concept was developed in the 1950s by and .
4. What is a critical control point?
5. List the 7 principles of HACCP

***Chapter 10 Sanitizers Page: 165-189***

1. A is an agent that destroys or eliminates all forms of microbial life.
2. A is an agent that kills infectious bacteria and fungi only, though do not kill bacterial spores.
3. A is a substance that reduces, but not necessarily eliminates microbial contaminants on inanimate surfaces to levels that are considered safe from a public health standpoint.
4. The most active of the chlorine sanitizers and also the most widely used are

 .

10 Iodine sanitizers are effectively utilized at concentrations of ppm to

 ppm to sanitize surfaces.

1. The sanitizer that is most corrosive to stainless steel and other metals are

 compounds.

1. The sanitizer compounds that are more stable in the presence of organic matter are the compounds.
2. Because the sanitizer compounds are acidic, they are not affected by water hardness as the other types of sanitizers are.
3. The compounds are frequently used on floors, walls, furnishings and equipment because they are good penetrants.
4. Why are chemical sanitizers ineffective in killing microbes present in cracks and crevices?
5. The sanitizer most effective at killing viruses is

***Chapter 13 Pest Control Page: 235-255***

1. House flies lay an average of eggs within a week of mating.
2. What is the ideal environment for houseflies to lay and hatch their eggs with subsequent growth of the larvae?
3. The National Restaurant Association has estimated the loss from rodent damage could be as high as dollars annually.
4. Sewer rat, brown rat, wharf rat are common names for the rat.
5. The female rat can produce young per litter, times per year.
6. Rats can force entry through openings as small as a and can jump up to vertically and horizontally.
7. What is bromethalin and what are effects of its use?
8. The most common pests among food processing plants and food service facilities throughout the world are the
9. The first line of defense in the control of pests is \_
10. What is diazinon and dursban?
11. What diseases can potentially be spread by the housefly?
12. Which species of cockroach is more likely to found in food preparation areas?
13. Which species of cockroach found in the U.S. is the largest at approximately 40 to 60 mm in length?
14. The most abundant species of rat in the U.S. is the

.

1. What is IPM and what are its objectives?

**Lesson 15**

***Read State Pool and Spa Manual***

1. It has been well documented that and infections have been contracted from spa pools.
2. Why is pseudomonas of particular concern in spa pools?
3. If a pool is 30 feet long and 15 feet wide with a water depth of 6 feet, how many gallons of water does it hold?
4. The turnover rate required of wading pools is hours or less and for pools other than diving or water slide pools is hours or less.
5. Most pools should have percent of the water removed by the skimmer or scum gutter and percent removal by the drain during normal operation.
6. How often should spa pools be drained?
7. The skimmer works effectively at removing floating body oils and bacteria in a water level range of about inches.
8. What are the filter rates in a high-rate sand filter?
9. filters have limitations and for public pools, should not be used for indoor pools.
10. HTH and Sentry are two common brands of , other brands may be used if they contain .
11. What are the dangers inherent in using calcium hypochlorite?
12. The granular form of calcium hypochlorite has % available chlorine.
13. What effect does granular chlorine have on pH?
14. Due to convenience, chlorine has become more popular with pool operators.
15. Liquid chlorine has a pH of about , so the pH must be balanced by .
16. When chlorine gas is utilized as a swimming pool disinfectant, one must add

 pounds of soda ash for every pound of chlorine added to a pool to the pH.

1. Soda ash is a common name for .
2. If cyanuric acid is used, the cyanurate levels must not exceed ppm.
3. Under what circumstances is cyanuric acid used?
4. List 5 factors that affect the germ-killing powers of chlorine in swimming pools.
5. Perspiration and urine combine with chlorine forming a new chemical called .
6. When is super-chlorination necessary and how is it accomplished?
7. Spa pools are required to maintain a minimum free chlorine residual of ppm.
8. Bad odors associated with spa pools are often caused by .
9. Total chlorine minus equals combined chlorine.
10. The maximum allowable level of combined chlorine is ppm.

***Define These Terms:***

* Acid Demand
* Aggressive Water
* Ammonia
* Backwash
* Breakpoint chlorination
* Base Demand
* Buffer
* Calcification
* Calcium Hardness
* Channeling
* Chloramines
* Clarity
* Combined Chlorine
* Corrosion
* Free Chlorine
* Hardness
* Sodium Thiosulfate
* Spa Total
* Alkalinity
* Total Chlorine
* Total Dissolved Solids
* Total Hardness
* Trihalomethane
* Turbidity
* Turnover Rate
* Weir

***Additional Questions:***

1. What is the function of disinfectants in a swimming pool?
2. What types of disinfectants are found in swimming pools, and which one is the most common?
3. What is the purpose of alkalinity in a swimming pool?
4. Why is control of pH in a pool important?
5. What are the ideal levels of chlorine, pH, and alkalinity in swimming pools?
6. What is breakpoint chlorination?
7. What type of damage can chemicals cause in swimming pools?
8. What types of diseases can be transmitted from swimming pools?
9. What is the purpose of sodium thiosulfate in testing pool water?
10. What does brown colored water indicate?
11. What do black or green spots on pool walls or floors indicate?
12. What can cause pool water to turn green?
13. What causes “eye-burn” in pool water?
14. What swimming pool contaminant poses the greatest threat to swimmers?
15. What is the purpose of cyanuric acid in pool water?
16. What does the Langlier Saturation Index tell us?
17. What is the method for determining chloramines levels in swimming pools?
18. What are the benefits of use of ozone in swimming pools?
19. What is the Virginia Graham Baker Act?
20. How is chlorine produced in a swimming pool that uses salt?

**Lesson 16**

**Read Core Training for Tanning and Tattooing**

1. Which of the following bloodborne pathogens can be transferred during Tattooing:
2. Tattoo Parlor requirements for sanitation.

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