

## **8.L: Microbiology Unit Open Ended Questions**

1. How do mutagens cause disease in humans?
2. Two people have the same contact with the same chemical pollutant, what would cause one to get sick but not the other as a result of contact?
3. What is a doctor treating when he uses penicillin?
4. How is a virus cell different from a bacterial cell?
5. Certain diseases can be treated with antibiotics, what cant?
6. Mosquitoes are a \_\_\_\_\_ for malaria.
7. A virus is not alive because it can only reproduce in a
8. Why would a scientist most likely object to giving antibiotics to health livestock?
9. What diseases can be treated with antibiotics?
10. Which type of pathogen causes athletes foot?
11. What microbe reproduces by injecting its genetic material into a host cell?
12. What microbe has the morphology that is either spherical, rod-shaped or spiral shaped
13. An event in which a disease spreads to many regions of the world
14. A mosquito that transmits malaria from one person to another is
15. What is a vector?
16. What is a host?
17. What is a vaccine used for?
18. How does good hygiene help prevent spread of disease?

### **8.L.1.1: Viruses & Bacteria**

Open Ended Questions:

1. What are viruses?
2. What do viruses need to reproduce?
3. How are viral diseases transmitted?
4. What type of symbiotic relationship do a virus and a host cell have? Explain
5. \_\_\_\_\_ and \_\_\_\_\_ are used to control and prevent the spread of viral diseases.
6. Are bacteria prokaryotic or eukaryotic? Explain.
7. List some places where bacteria live and reproduce.
8. How do bacteria reproduce?
9. Describe the rate at which bacteria can reproduce and spread?
10. What is used to inhibit the growth of bacteria?
11. Define resistance.
12. Classify fungi as eukaryotic or prokaryotic; photosynthetic or non photosynthetic and unicellular or multicellular.
13. List some diseases caused by fungi?
14. Why are fungal diseases a major concern for humans?
15. What is a parasite?
16. Define host.
17. How are tapeworms specialized for a parasitic lifestyle?
18. Define infectious disease.

# Microbiology

## Virus

### 1) Viral Characteristics

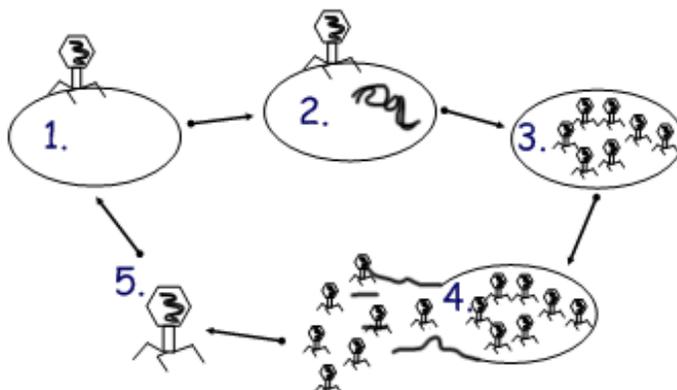
1. Prokaryotic
2. Not living – do not come from other cells
3. Why viruses are NOT considered living? Viruses do not come from existing cells; need a host to reproduce = not living.

### 2) Viral Morphology

1. DNA/RNA in protein shell
2. Needs host to reproduce
3. Smallest microorganism

### 3) Viral Reproduction

1. Attached to living host cells
2. Injects viral DNA or RNA
3. Viruses reproduce inside of cell
4. Host cell explodes
5. New viruses are released into body



### 4) Viral Diseases

1. AIDS, Common Cold, Influenza (Flu), Polio, Smallpox,
2. Chickenpox – airborne virus that creates a rash mostly affecting children. Remains dormant by Immune System in nerve tissues and can appear as an adult as Shingles. Shingles create a rash and night pain in the rash area. Prevented with vaccine; there is no treatment beyond lessening the symptoms.
3. Yellow Fever – Transmitted through mosquitoes and primates. Infected have fever, chills, anorexia, nausea, muscle pain, and headache. Liver damage often occurs (jaundice) = yellowness and bleeding can occur. Vaccine exist and most cases occur in Africa & South America.
4. Viral Meningitis – Viral disease that infects the brain & spinal cord. It is spread through contact with feces & not washing hands, and airborne. Can also be infected due to person having other viral disease. Infected have fever, headache, & stiff neck. There is no vaccine or treatment. It will clear up over time.
5. West Nile – First reported in East Africa near Uganda in 1937. Spread by mosquitoes and infected have fever, headache, fatigue, muscle pain, nausea, vomiting and rash. Can lead to meningitis. No vaccine exists and treatment is mosquito control. Infected can be supported at hospital with secondary treatments.
6. Ebola – Found in Ebola River in Republic of the Congo. Infected have flu like symptoms, fever, chills, & chest pain. Infected begin to hemorrhage internally. Disease occurs in poor, isolated areas without modern medical opportunities. Prevention occurs with avoiding the direct contact with blood or secretions of the infected. There is no vaccine or treatment beyond supportive measures.

### 5) Viral Spread

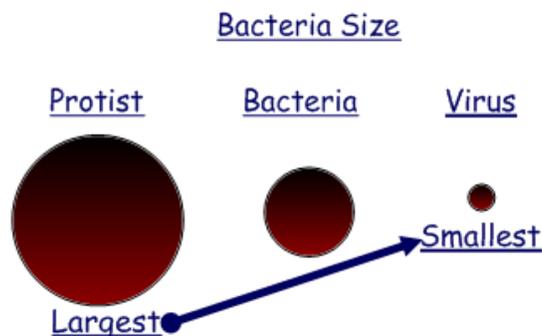
1. Invade host cells
2. Many varieties = catch many times
3. Direct & Indirect Contact (airborne)

### 6) Viral Prevention

1. Vaccines - dead or weakened viruses injected into a person that help Immune System fight off real disease.

### 7) Viral Treatment

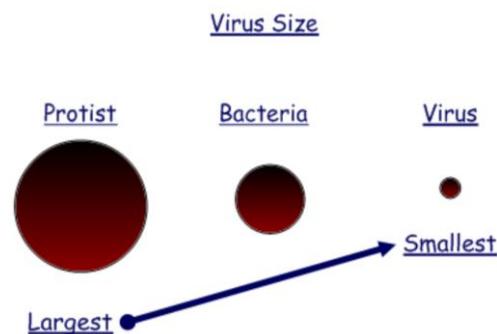
1. Antiviral – drug that is specific to the type of virus; used to stop their development.



# Microbiology

## Bacteria

- 1) Bacterial Characteristics
  1. Prokaryotic
  2. Unicellular
  3. Found in air, soil, water, inside body, & on skin.
- 2) Bacterial Morphology
  1. 4 Shapes: Spiral, Rod, Round/spherical, Corkscrew.
- 3) Bacterial Reproduction
  1. Binary Fission – one organism divides into two organisms.
  2. Living – comes from other cells
  3. Bacteria are medium size – Bacteria are bigger than virus
- 4) Bacterial Diseases -Lyme Disease, Bacterial Meningitis, & Leprosy
  1. Lyme Disease – Transmitted by infected ticks, causes fever, headache, fatigue, depression, & a circular skin rash. Antibiotics are used for treatment.
  2. Bacterial Meningitis – Causes inflammation of brain & spinal cords. Spread by direct contact, airborne particles from oral secretions, weak immune system or head trauma, or eating contaminated food. Treated with antibiotics. Vaccines are possible for prevention.
  3. Leprosy – Causes skin lesions, attacks nerves and upper respiratory tract. Spread by respiratory droplets and close contact. Treated with multiple rounds of antibiotics. Prevention is a dose of specific drugs and education.
- 5) Spread of Bacteria
  1. Endospore- a thick celled structure of cytoplasm & DNA, can withstand any conditions for years. Causes food poisoning.
- 6) Bacterial Prevention - Good hygiene practices, antimicrobial products (hand sanitizer), and avoid direct contact with infected.
- 7) Bacterial Treatment
  1. Antibiotics – Drugs that kill bacteria or prevent their reproduction.
  2. Antibiotic Resistance – When a bacteria develop a tolerance to & survive drugs that once killed them.



## Fungi

- 1) Characteristics
  1. Eukaryotic
  2. Ex: yeast, mold, mushrooms
  3. Heterotrophic – Must consume food
  4. No photosynthesis
  5. Live off dead matter
  6. Some live as parasite – live off of other organisms
- 2) Morphology
  1. Not a plant, animal, or bacteria
  2. Have cell walls
  3. Lack chloroplasts – can live in the dark
- 3) Fungi Reproduction
  1. Asexually: Spores – small, reproductive body that grows into a new organism.
  2. Sexually: combining DNA
  3. Some by budding – a piece breaks off and forms new organism
- 4) Fungi Diseases - Fungus compete with body for nutrients.

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1. Ringworm – Not caused by a worm; contagious fungal infection. It is passed by contact with infected skin area or sharing combs/brushes or clothing, contact with locker room or pool surfaces. Causes scaly, crusted round rash that may itch. Can be treated by topical antifungal medications or oral meds.
  2. Athlete's foot – Affects the toes and soles of the feet. Very contagious and can be spread by walking on contaminated objects and floors. Causes foot itching, burning, pain and scaling of skin. Can be cured by antifungal creams.
  3. Fungal allergies – People can be allergic to mold, mildew. Affected get sneezing, runny/itchy nose, itchy ears, congested sinuses, or dry/chapped skin. A skin allergy test is conducted to determine which fungi allergic to. Antihistamines (stop itching) and decongestants (unclog sinuses) can be taken to help, but there are no cures.
- 5) Spread
1. Spores
  2. Parasites
  3. Heat and moisture
  4. Walking barefoot on contaminated areas
- 6) Prevention
1. Keeping dry feet
  2. Cotton socks
  3. Breathable shoes
  4. Not walking on contaminated floors in bare feet
  5. Stay away from mold & mildew
- 7) Treatment
1. Antifungal creams
  2. Medication
  3. Surgery

## Parasites

- 1) Characteristics
  1. Lives on or in another organism
  2. Uses the host to gain nutrients
  3. Usually sickens & weakens host
  4. Resides in intestines, bloodstream, tissues.
- 2) Morphology
  1. Amoebas
  2. Tapeworm
  3. Mosquitoes
  4. Ticks
  5. Rats
- 3) Reproduction
  1. Release eggs into host – eggs exit in feces
  2. Use host cells
  3. Binary Fission

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- 4) Diseases
  1. Malaria – Mosquitoes
  2. West Nile - Mosquitoes
  3. Yellow Fever - Mosquitoes
  4. Lyme Disease – Ticks
  5. Black Plague – Rats
- 5) Spread
  1. Through bites
  2. Ingesting eggs
  3. Through contact
- 6) Prevention
  1. Mosquito repellent sprays & creams
  2. Sleep under nets
  3. Take medical drugs
  4. Wear socks/pants when hiking
- 7) Treatment
  1. Remove parasite
  2. Treat host with medications
  3. Antibiotics

## **8.L.1.1: Viruses & Bacteria Review**

1. Which is the easiest way for a person to prevent microbial infections?
  - A. Avoid contact with animals.
  - B. Isolate themselves at home.
  - C. Sterilize everything in the home.
  - D. Wash hands frequently with hot water and soap.
  
2. Which is the *best* method for preventing a parasitic disease?
  - A. Vaccination
  - B. wearing a mask
  - C. limiting physical contact with others
  - D. avoiding contaminated food and water

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3. Tooth decay is an infection that causes deterioration of the protective enamel on teeth, resulting in damage. Tooth decay is most likely caused by ...
- A. bacteria.
  - B. acidic food.
  - C. allergies.
  - D. genetic defects.
4. What parasite is *most* often responsible for the spread of Lyme disease?
- A. amoeba
  - B. crane fly
  - C. deer tick
  - D. mosquito
5. Given favorable conditions, which disease-causing agent could quickly multiply into colonies of billions of cells in the space of a drop of water?
- A. bacteria
  - B. fungi
  - C. protists
  - D. viruses
6. Which human disease is caused by a parasitic infection?
- A. cancer
  - B. influenza
  - C. athlete's foot
  - D. African sleeping sickness

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7. Which **best** explains why more than 300 million people in Asia are infected with malaria each year?
- A. There is no way to protect people against the disease.
  - B. The parasites that cause malaria lack the ability to resist antibiotics.
  - C. The house fly contaminates food with infectious bacteria that cause malaria.
  - D. Mosquitoes are becoming resistant to insecticides and continue to carry the disease.
8. Which **best** contrasts a bacterium and a virus?
- A. A bacterium can reproduce, whereas a virus will not reproduce.
  - B. A bacterium does not live in living things, whereas a virus does.
  - C. A bacterium is a one-celled living organism, whereas a virus is a nonliving organism.
9. Which would **most likely** contribute to antimicrobial resistance?
- A. an increased number of health care facilities
  - B. overcrowding and poor sanitation in urban areas
  - C. creation of new varieties of vaccinations and medicines
  - D. providing more education and training for medical professionals
10. Which leads to the conclusion that strep throat is a bacterial infection?
- A. Strep throat is treated with vaccines.
  - B. Strep throat is treated with antibiotics.
  - C. A strep infection will go away without being treated.
  - D. A person who has strep throat can never have it again.
11. Which treatment is **best** for bacterial infections?
- A. vaccines
  - B. antibiotics
  - C. rest and drinking liquids

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12. Which **best** describes the size of a virus compared to the size of bacteria?
- A. Bacteria are small, while viruses are larger.
  - B. Bacteria are large, while viruses are larger.
  - C. Bacteria are small, while viruses are smaller.
13. Which disease is caused by a virus?
- A. AIDS
  - B. rabies
  - C. small pox
14. Which characteristic makes it easy to spread, but difficult to treat and prevent certain fungal infections?
- A. Fungi are multicellular.
  - B. Fungi are heterotrophic.
  - C. Fungi reproduce by spores.
  - D. Fungi grow in dry environments.
15. In which organ system of the human body would a doctor **most likely** find a parasite?
- A. skeletal system
  - B. digestive system
  - C. muscular system
  - D. reproductive system
16. Which disease can be treated by doses of medicine made from the fungus, *Penicillum*?
- A. asthma
  - B. diabetes
  - C. chicken pox
  - D. strep throat

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17. How do viruses cause disease?
- A. by secreting toxins
  - B. by producing excess waste
  - C. by damaging or killing cells
  - D. by competing with healthy cells for nutrients
18. Which disease is caused by living organisms?
- A. cold
  - B. malaria
  - C. smallpox
  - D. influenza
19. Damp conditions *most* support the spread of which diseases?
- A. strep throat and AIDS
  - B. Lyme disease and polio
  - C. athlete's foot and malaria
  - D. tuberculosis and food poisoning
20. Which explains why a fungus attaches to a host?
- A. The fungus provides hydration to the host.
  - B. The fungus acquires nutrients from the host.
  - C. The fungus injects the host with a toxin when it attaches.
  - D. The fungus cannot survive without another living organism.
21. Which organisms require a host cell to reproduce?
- A. protozoans
  - B. bacteria
  - C. viruses

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22. Which *best* describes the treatment of a bacterial infection?
- A. vaccines
  - B. antibiotics
  - C. fungal creams
  - D. insulin injections
23. Alan noticed that his foot itched between his toes after coming home from the gym. He now believes he may have contracted athlete's foot. What type of pathogen *most likely* caused this possible infection of his foot?
- A. bacterium
  - B. fungus
  - C. virus
24. A tapeworm lives in the intestines of its host. Which example *best* describes the relationship between the tapeworm and its host?
- A. The tapeworm benefits from its host; however, the host is not affected.
  - B. The tapeworm does not benefit from its host, but the host does benefit.
  - C. The tapeworm benefits from its host, and the host is negatively affected.
25. Why can a person catch a cold many times?
- A. Changes in weather conditions can cause a person to get a cold.
  - B. People do not develop an immunity to viruses and can be infected by the same virus again and again.
  - C. There are many kinds of viruses that cause colds and the person may be infected by different viruses each time.

## 8.L.1.2: Epidemics & Pandemics

Open Ended Question:

1. What is an outbreak?
2. What are the two types of outbreaks?
3. What is an epidemic?
4. What is a pandemic?
5. Why has some influenza outbreaks become pandemics.
6. What are some preventative measures you can take to prevent the spread of influenza locally?

### Cell Theory

- 1) Pathogens - germs
- 2) Contagion – Infects human body & interferes with normal body function.
- 3) Unicellular Organism - made of 1 cell
- 4) Prokaryote – unicellular organism with NO nucleus or organelles. Pro – “before” & Eukaryote – “nucleus.”  
Ex: virus, bacteria...
- 5) Multicellular Organisms – made of more than 1 cell
- 6) Eukaryote – Multicellular organism whose cells contain a nucleus. Ex: humans, animals...
- 7) Cell Theory
  1. All living things are composed of cells.
  2. Cells provide structure & carry on major life functions.
  3. All cells come from existing cells
- 8) Carrier – Organism that has a disease, is sick with it, and CAN spread it. Ex: Humans...flu, common cold.
- 9) Vector – Organism that spreads disease w/o getting sick themselves. Ex: Rats, ticks, mosquitoes, & soil. Also Humans... British colonizers carried Small Pox with them to the Americas & Africa. Result: American Indians & Africans did not have immunity to Small Pox and it killed thousands who came in contact. Also physically scarred those who survived.
- 10) Infectious disease – Disease that can be passed from one organism to another.
- 11) Epidemic – Outbreak of a disease that affects large # of people within a population, community, or region at the same time.
  1. Ex: typhoid Transmitted through poor hygiene habits & public sanitation conditions. Prevented by washing hands after using the bathroom, before handling food, and adding chlorine to drinking water.
  2. - "Typhoid Mary" otherwise known as Mary Mallon, was a young cook who infected 53 people in 1907 with typhoid, 3 died, and was the first perfectly healthy person known to be responsible for a Typhoid Epidemic. Mary was isolated for the rest of her life.
- 12) Pandemic – Epidemic of an infectious disease that is spreading throughout population across a large region, continent, or worldwide. Ex: smallpox, tuberculosis, flu of 2009.
  1. Smallpox - - Spread through contact & the air. - Prevented and eradicated through the Smallpox vaccine (inoculation). Smallpox spread to Europe and then Europeans spread it over the Earth through colonization. 1507 Spanish settlers spread it to the Caribbean. - It spread all over the Americas and was important factor in the conquest of the Aztecs & Incas by the Conquistadors.

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Europeans colonizers in New England spread it to Native American populations with 80-90% mortality.

1. Tuberculosis - - Bacteria that affects the lungs and is spread through air. Still active in developing countries: Asian & African countries. World Health Organization declared TB a "global health emergency" due to HIV-associated TB and drug resistant strands.
2. Flu of 2009 (Swine Flu) - Started in Mexico and transmitted through contact & air then infecting European countries and into Asia. WHO stated that contamination was not possible and did not recommend countries to close their borders.

## **8.L.1.2: Epidemics & Pandemics Review**

1. Which term refers to the spread of disease in a small region?
  - A. antibiotic
  - B. epidemic
  - C. pandemic
  - D. parasitic
  
2. After World War I, an outbreak of the Spanish Flu killed 50 million to 100 million people around the world. Which *best* describes this occurrence?
  - A. Epidemic, because it happened within a relatively short time span.
  - B. Epidemic, because it affected many individuals in multiple countries.
  - C. Pandemic, because it happened within a relatively short time span.
  - D. Pandemic, because it affected many individuals in multiple countries.
  
3. How are an epidemic and pandemic alike?
  - A. Both involve a viral infection.
  - B. Both involve a bacterial infection.
  - C. Both involve an outbreak of a disease.
  - D. Both involve small numbers of infected individuals.

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4. On Monday, Kari exhibits no symptoms of a viral illness. She is sick on Tuesday and stays home from school. On Wednesday, her friends stay home with the same illness, despite having no contact with Kari when she was sick on Tuesday. Which is the **most likely** explanation of how the other students became sick?
- A. Kari was immune to the virus but infected the other students.
  - B. The virus mutated and infected the other students after Kari got sick.
  - C. Kari was infected with the virus before she experienced any symptoms.
  - D. The virus was a carrier, and the other students were infected after Kari got sick.
5. Which **best** distinguishes an infectious disease from a noninfectious disease?
- A. Infectious diseases can be cured with antibiotics; noninfectious diseases cannot.
  - B. Infectious diseases can be prevented with vaccines; noninfectious diseases cannot.
  - C. Infectious diseases can be spread from one organism to another; noninfectious diseases
  - D. Infectious diseases cannot be transmitted from one organism to another; noninfectious
6. A mosquito can spread the West Nile Virus but remains unaffected by the disease. Which **best** describes the mosquito?
- A. vector
  - B. parasite
  - C. mutagen
  - D. pathogen
7. The Black Plague killed about 100 million people in the fourteenth century. The bacteria that caused the plague was carried by fleas on rats and traveled great distances. Which would have **most directly** limited the spread of the disease?
- A. cleaner water sources
  - B. refrigeration of food and water
  - C. reduction in the rodent population
  - D. better medicines to treat infected individuals

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8. Scientists are trying to prevent an epidemic of a highly contagious disease. What information should the scientists study first?
- A. how the disease reproduces
  - B. the treatment of the disease
  - C. the symptoms of the disease
  - D. how the disease is transmitted
9. Which term refers to the spread of disease across a large region or sometimes worldwide?
- A. antibiotic
  - B. epidemic
  - C. pandemic
  - D. pathogenic
10. Which *best* compares an epidemic and a pandemic?
- A. An epidemic is caused by bacteria, while a pandemic is caused by viruses.
  - B. A pandemic is spread by humans, while an epidemic is spread by insects and rodents.
  - C. A pandemic occurs in a small region, while an epidemic occurs in a much larger region.
  - D. An epidemic affects a small population of humans, while a pandemic affects a large population of humans.
11. Which has had the *greatest* impact on preventing epidemics in the twenty-first century?
- A. immunizations
  - B. new medicines
  - C. good hygiene
12. Which *best* describes treatments for viral epidemics and viral pandemics?
- A. Both are easily treated using a combination of vaccination and antibiotics.
  - B. Epidemics are treated with vaccinations, while pandemics are treated with antibiotics.

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- C. Epidemics are treated with antibiotics, while pandemics are treated with vaccinations.
  - D. Neither is easily treated because viral infections are easier to prevent than they are to treat.
13. Which situation would **most** favor the spread of infectious disease?
- A. overcrowding
  - B. use of vaccines
  - C. small population
14. Which example **best** illustrates a pandemic?
- A. In the late 1400's, native populations were almost wiped out by European diseases.
  - B. In 1854, cholera spread through London, killing 12.5% of the population.
  - C. In 1918, the Spanish flu caused millions of deaths worldwide.
15. Which would **most likely** be spread as a pandemic infection?
- A. common cold
  - B. smallpox
  - C. rabies
16. Which **best** explains why a contagious disease is likely to become an epidemic?
- A. failure to follow safety rules when handling bacteria
  - B. lack of understanding as to how the disease is spread
  - C. creation of supergerms due to the overuse of antibiotics
17. Which would be the **most** beneficial method of preventing a malaria epidemic in Africa?
- A. water treatment
  - B. improved hygiene
  - C. increased vaccinations
  - D. increased use of pesticides

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18. A strain of influenza originates in Southeast Asia and spreads to countries including the United States and Europe, infecting millions of individuals worldwide. Which *best* describes the spread of this disease?
- A. Epidemic, then a pandemic because it did not originate in the United States.
  - B. Pandemic, then an epidemic because it affected citizens of the United States.
  - C. Epidemic, then a pandemic because it originated in one geographic area before spreading to others.
  - D. Pandemic, then an epidemic because it originated in one geographic area before spreading to others.
19. Which has made the possibility of an epidemic becoming a pandemic much *more likely* in the 20th century?
- A. increased deforestation
  - B. increased global travel
  - C. increased vaccinations
  - D. increased air pollution
20. In the midwestern United States, the occurrence of influenza was greater than expected. Which *best* describes the influenza outbreak?
- A. A pandemic, because influenza is an infectious disease.
  - B. An epidemic, because influenza is an infectious disease.
  - C. A pandemic, because it occurred in more than one state.
  - D. An epidemic, because it occurred in one region of the United States.

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21. Why is the prevention of epidemics usually easier than the prevention of a pandemic?
- A. The diseases in an epidemic are less severe than in a pandemic.
  - B. Diseases causing pandemics are more contagious than diseases in an epidemic.
  - C. Affected individuals in epidemics are usually more concentrated in one area than in pandemics.
22. How are quarantines used to slow the spread of an epidemic?
- A. Quarantines prevent individuals from eating food that is potentially contaminated.
  - B. Quarantines allow enough time for antibiotics to take effect in infected individuals.
  - C. Quarantines keep infected individuals separate so they cannot pass the disease to others.
  - D. Quarantines keep people inside their homes so that family members can provide care for each other.
23. Which will *most likely* lead to a disease outbreak being classified as a pandemic?
- A. A disease is contagious.
  - B. A disease originates in animals.
  - C. A disease affects more people than expected.
  - D. A disease spreads through humans across multiple continents.
24. Which is an example of an epidemic?
- A. dengue fever in an African village
  - B. smallpox outbreak on several continents
  - C. swine flu cases reported in multiple countries
  - D. many people affected by tuberculosis worldwide
25. Which epidemic could *best* be treated by antibiotics?
- A. flu
  - B. AIDS

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C. cholera