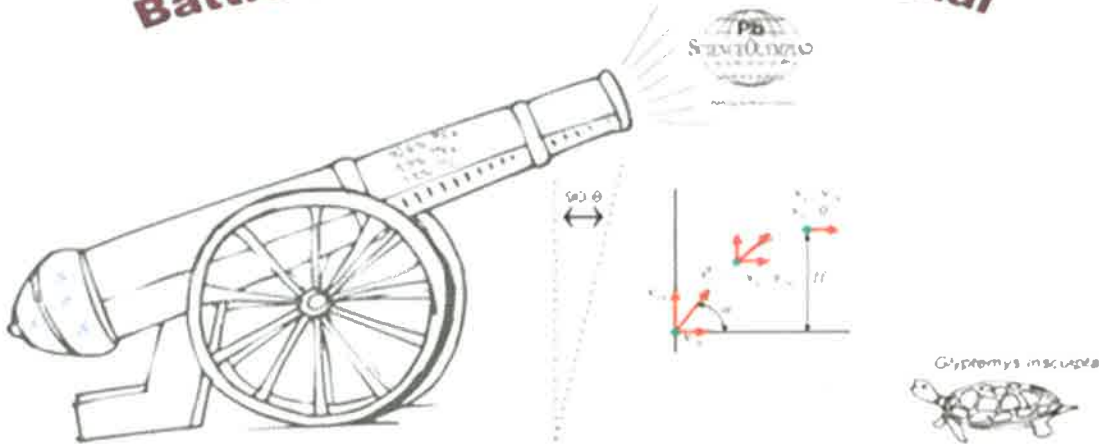


Science Olympiad Division C

Conestoga High School Battle at Valley Forge Invitational



Microbe Mission- Exam

Team Member Names: _____

Team #: _____

School: _____

Conestoga Science Olympiad 2017 Microbe Mission**Multiple Choice**

Identify the choice that best completes the statement or answers the question.

- _____ 1. *Escherichia coli* is classified as a(an)
- archaebacterium.
 - eubacterium.
 - eukaryote.
 - virus.
- _____ 2. A method called Gram staining is used to tell
- what shape a prokaryote has.
 - how a prokaryote obtains energy.
 - what kind of cell wall a prokaryote has.
 - whether a prokaryote has flagella.
- _____ 3. Humans use bacteria to
- clean up small oil spills.
 - mine minerals from the ground.
 - synthesize drugs.
 - all of the above
- _____ 4. The outer protein coat of a virus is called a
- DNA core.
 - capsid.
 - bacteriophage.
 - tail sheath.
- _____ 5. Which of the following characteristics of living things is NOT true about viruses?
- contain genetic material
 - evolve over time
 - obtain and use energy
 - able to reproduce
- _____ 6. A lytic infection concludes with the
- embedding of viral DNA into the host cell's DNA.
 - production of a prophage.
 - bursting of the host cell.
 - production of messenger RNA.
- _____ 7. Which of the following is a way that bacteria cause disease?
- by capsids
 - by nitrogen fixation
 - by conjugation
 - by releasing toxins
- _____ 8. Bacteria that cause disease are called
- viruses.
 - pathogens.
 - endospores.
 - antibiotics.
- _____ 9. A bacterial infection results when bacteria
- break down the body's tissues.
 - lyse following the lytic cycle.
 - live as obligate aerobes in the absence of oxygen.
 - undergo conjugation inside the body.

Name: _____

ID: A

- _____ 10. Which of the following diseases is NOT caused by a bacterium?
- a. tooth decay
 - b. tuberculosis
 - c. AIDS
 - d. Lyme disease
- _____ 11. Food stored in a refrigerator will keep longer because the bacteria that spoil food
- a. die at low temperatures.
 - b. take longer to multiply at low temperatures.
 - c. require light to live.
 - d. grow more slowly in the dark.
- _____ 12. According to Lynn Margulis, eukaryotic cells may have evolved from
- a. a symbiosis of several cells.
 - b. mitochondria that grew very large.
 - c. chloroplasts that grew very large.
 - d. plants, animals, and fungi.
- _____ 13. Though plants, fungi, and prokaryotes all have cell walls, we place them in different taxa. Which of these observations comes closest to explaining the basis for placing these organisms in different taxa, well before relevant data from molecular systematics became available?
- a. Their cell walls are composed of very different biochemicals.
 - b. Some have cell walls only for support.
 - c. Some closely resemble animals, which lack cell walls.
 - d. Some have cell walls only for protection from herbivores.
- _____ 14. Penicillin is an antibiotic that inhibits enzymes from catalyzing the synthesis of peptidoglycan, so which prokaryotes should be *most* vulnerable to inhibition by penicillin?
- a. endospore-bearing bacteria
 - b. mycoplasmas
 - c. gram-negative bacteria
 - d. gram-positive bacteria
- _____ 15. Jams, jellies, preserves, honey, and other foodstuffs with a high sugar content hardly ever become contaminated by bacteria, even when the food containers are left open at room temperature. This is because bacteria that encounter such an environment
- a. undergo death by lysis.
 - b. are unable to swim through these thick and viscous materials.
 - c. are unable to metabolize the glucose or fructose, and thus starve to death.
 - d. undergo death by plasmolysis.
- _____ 16. In a hypothetical situation, the genes for sex pilus construction and for tetracycline resistance are located together on the same plasmid within a particular bacterium. If this bacterium readily performs conjugation involving a copy of this plasmid, then the result should be
- a. the subsequent loss of tetracycline resistance from this bacterium.
 - b. a transformed bacterium.
 - c. the temporary possession by this bacterium of a completely diploid genome.
 - d. the rapid spread of tetracycline resistance to other bacteria in that habitat.

The following questions refer to Figure 27.1 below, which is the same as Figure 27.10 in the textbook.

In this 8-year experiment, 12 populations of *E. coli*, each begun from a single cell, were grown in low-glucose conditions for 20,000 generations. Each culture was introduced to fresh growth medium every 24 hours. Occasionally, samples were removed from the populations, and their fitness in low-glucose conditions was tested against that of members sampled from the ancestral (common ancestor) *E. coli* population.

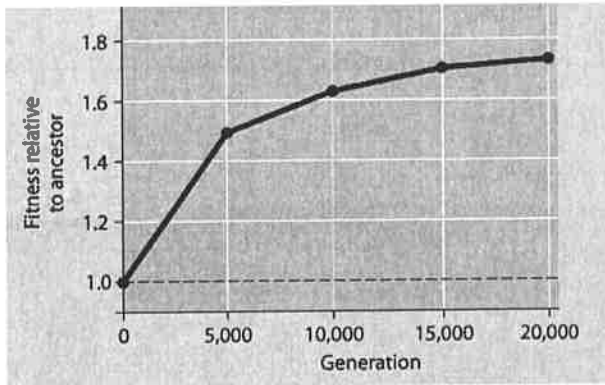


Figure 27.1

- _____ 17. Which term best describes what has occurred among the experimental populations of cells over this 8-year period?
- adaptive radiation
 - sexual selection
 - speciation
 - microevolution
- _____ 18. Which of the following are responsible for many human diseases?
- parasitic chemoheterotrophs
 - photoautotrophs
 - photoheterotrophs
 - chemoautotrophs
- _____ 19. Foods can be preserved in many ways by slowing or preventing bacterial growth. Which of these methods would *not* generally inhibit bacterial growth?
- Closing previously opened containers: Prevents more bacteria from entering, and excludes O_2 .
 - Pickling: Creates a pH at which most bacterial enzymes cannot function.
 - Canning in heavy sugar syrup: Creates osmotic conditions that remove water from most bacterial cells.
 - Irradiation: Kills bacteria by mutating their DNA to such an extent that their DNA-repair enzymes are overwhelmed.

- _____ 20. Many physicians administer antibiotics to patients at the first sign of any disease symptoms. Why can this practice cause more problems for these patients, and for others not yet infected?
- Antibiotics may cause other side effects in patients.
 - Overuse of antibiotics can select for antibiotic-resistant strains of bacteria.
 - The antibiotic administered may kill viruses that had been keeping the bacteria in check.
 - Antibiotics may interfere with the ability to identify the bacteria present.
- _____ 21. Broad-spectrum antibiotics inhibit the growth of most intestinal bacteria. Consequently, assuming that nothing is done to counter the reduction of intestinal bacteria, a hospital patient who is receiving broad-spectrum antibiotics is most likely to become
- deficient in certain vitamins.
 - unable to synthesize peptidoglycan.
 - unable to fix nitrogen.
 - antibiotic resistant.
- _____ 22. According to the endosymbiotic theory of the origin of eukaryotic cells, how did mitochondria originate?
- by secondary endosymbiosis
 - from the nuclear envelope folding outward and forming mitochondrial membranes
 - from engulfed, originally free-living prokaryotes
 - from infoldings of the plasma membrane, coupled with mutations of genes for proteins in energy-transfer reactions
- _____ 23. Which two genera have members that can evade the human immune system by frequently changing their surface proteins?
- Plasmodium*
 - Trichomonas*
 - Paramecium*
 - Trypanosoma*
 - Entamoeba*
- 1 and 4
 - 4 and 5
 - 1 and 2
 - 2 and 3
- _____ 24. Which of these taxa contains species that produce potent toxins that can cause extensive fish kills, contaminate shellfish, and poison humans?
- golden algae
 - euglenids
 - dinoflagellates
 - diplomonads

You are given five test tubes, each containing an unknown protist, and your task is to read the description below and match these five protists to the correct test tube.

In test tube 1, you observe an organism feeding. Your sketch of the organism looks very similar to Figure 28.1. When light, especially red and blue light, is shone on the tubes, oxygen bubbles accumulate on the inside of test tubes 2 and 3. Chemical analysis of test tube 3 indicates the presence of substantial amounts of silica. Chemical analysis of test tube 2 indicates the presence of a chemical that is toxic to fish and humans. Microscopic analysis of organisms in tubes 2, 4, and 5 reveals the presence of permanent, membrane-bounded sacs just under the plasma membrane. Microscopic analysis of organisms in tube 4 reveals the presence of an apicoplast in each. Microscopic analysis of the contents in tube 5 reveals the presence of one large nucleus and several small nuclei in each organism.

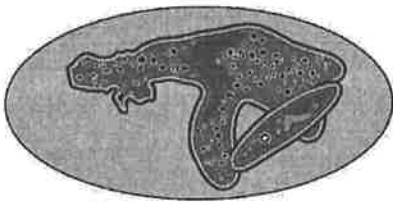


Figure 28.1

- _____ 25. Test tube 2 contains
- Plasmodium*
 - Entamoeba*
 - Pfiesteria* (dinoflagellate)
 - Navicula* (diatom)
- _____ 26. Test tube 4 contains
- Plasmodium*
 - Pfiesteria* (dinoflagellate)
 - Entamoeba*
 - Navicula* (diatom)
- _____ 27. Test tube 5 contains
- Navicula* (diatom)
 - Entamoeba*
 - Paramecium*
 - Pfiesteria* (dinoflagellate)
- _____ 28. Test tube 3 contains
- Plasmodium*
 - Paramecium*
 - Entamoeba*
 - Navicula* (diatom)

- _____ 29. Test tube 1 contains
- Pfiesteria* (dinoflagellate)
 - Entamoeba*
 - Plasmodium*
 - Paramecium*

Figure 31.1 below depicts the outline of a large fairy ring that has appeared overnight in an open meadow, as viewed from above. The fairy ring represents the furthest advance of this mycelium through the soil. Locations A—D are all 0.5 meters below the soil surface. Responses may be used once, more than once, or not at all.

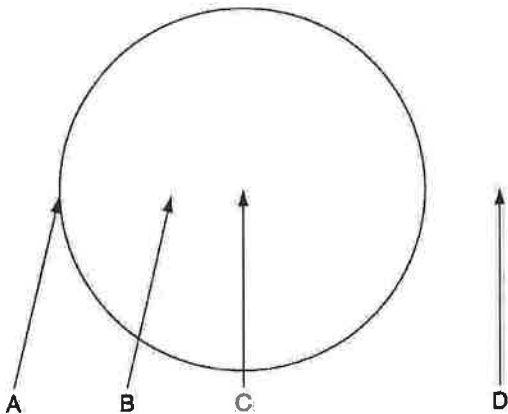


Figure 31.1

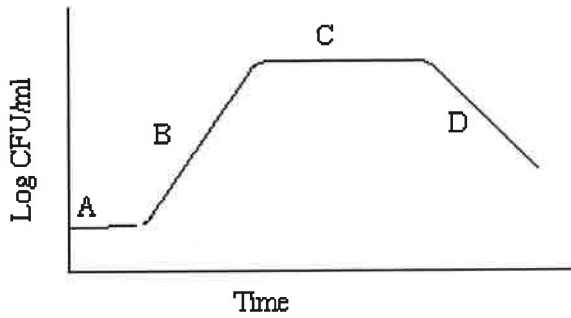
- _____ 30. In which of these human mycoses should one expect to find a growth pattern most similar to that of the mycelium that produced the fairy ring?
- systemic (blood-borne) *Candida* infection
 - coccidiomycosis (lung infection)
 - Sporothrix* infection of lymphatic vessels
 - skin mycoses
- _____ 31. Chemicals, secreted by soil fungi, that inhibit the growth of bacteria, are known as
- antigens.
 - antibiotics.
 - antibodies.
 - hallucinogens.
- _____ 32. Lichens are symbiotic associations of fungi and
- mosses.
 - cyanobacteria.
 - green algae.
 - either A or B
 - either B or C

- _____ 33. Which of the following conditions is caused by a fungus that is accidentally consumed along with rye flour?
- coccidioidomycosis
 - athlete's foot
 - ergotism
 - candidiasis (*Candida* yeast infection)

The following questions are based on the description below.

Rose-picker's disease is caused by the yeast, *Sporothrix schenckii*. The yeast grows on the exteriors of rose-bush thorns. If a human gets pricked by such a thorn, the yeasts can be introduced under the skin. The yeasts then assume a hyphal morphology and grow along the interiors of lymphatic vessels until they reach a lymph node. This often results in the accumulation of pus in the lymph node, which subsequently ulcerates through the skin surface, and drains.

- _____ 34. The answer to which of these questions would be of most assistance to one who is attempting to assign the genus *Sporothrix* to the correct fungal phylum?
- Being a yeast, does *S. schenckii* perform the process of budding?
 - Does *S. schenckii* rely on animal infection to complete some part of its life cycle, or is the infection merely opportunistic?
 - Are the hyphae in lymphatic vessels septate, or are they coenocytic?
 - Do these yeasts perform fermentation while growing on the rose-bush thorns, or do they wait until inside a human host?
- _____ 35. Humans have immune systems in which lymph nodes are important, because many phagocytes and lymphocytes reside therein. Given that a successful infection by *S. schenckii* damages lymph nodes themselves, which of these is most probable?
- Given that most fungal pathogens of humans infect only the skin, human defenses are not adapted to seek out and destroy systemic fungal infections.
 - Given that most fungal pathogens attack plants, human defenses are simply not adapted to seek out and destroy fungi.
 - The hyphae secrete antibiotics, which increases the ability of the infected human to tolerate the fungus.
 - Their conversion from yeast to hyphal morphology allows such fast growth that the body's defenses are at least temporarily overwhelmed.



36. Fig 2
What type of microbe growth is shown above?
- | | |
|-----------------------|----------------------------|
| a. continuous culture | c. semi-continuous culture |
| b. open culture | d. closed culture |

Matching Refercene the above figure 2 to answer 37-40

- | | |
|----------------------------|--------------------|
| a. decline | c. sationary phase |
| b. explontential log phase | d. lag phase |
37. What is "A" called in the microbial growth shown in figure 2?
38. . What is "B" called in the microbial growth shown in figure 2?
39. What is "C" called in the microbial growth shown in figure 2?
40. What is "D" called in the microbial growth shown in figure 2?

Match the disease with the type of pathogen it produces

- | | |
|--------------|--------------|
| a. bacterial | d. protozoan |
| b. viral | e. prion |
| c. fungal | |
41. mumps
42. botulism
43. tetanus
44. thrush
45. yellow fever
46. malaria
47. dental caries

Name: _____

ID: A

- ___ 48. strep throat
- ___ 49. ebola
- ___ 50. peptic ulcer
- ___ 51. mad cow disease
- ___ 52. ringworm
- ___ 53. chlamydia
- ___ 54. athlete's foot (tinea pedis)
- ___ 55. rocky mountain spotted fever

Put the following in order from LARGEST to smallest

- | | |
|----------------------|---------------|
| a. erythrocyte (RBC) | e. rhinovirus |
| b. amoeba | f. paramecium |
| c. E. coli | g. yeast |
| d. carbon atom | h. page |

- ___ 56. LARGEST
- ___ 57. ?
- ___ 58. ?
- ___ 59. ?
- ___ 60. ?
- ___ 61. ?
- ___ 62. ?
- ___ 63. SMALLEST

Match the human body system that is most frequently impacted by the following diseases

- | | |
|------------------|-------------|
| a. circulatory | e. nervous |
| b. digestive | f. immune |
| c. respiratory | g. muscular |
| d. integumentary | |

- ___ 64. polio
- ___ 65. MRSA
- ___ 66. tuberculosis
- ___ 67. pertussis
- ___ 68. cholera
- ___ 69. herpes

Name: _____

ID: A

- ___ 70. rabies
- ___ 71. salmonella
- ___ 72. tetanus
- ___ 73. botulism
- ___ 74. jock itch
- ___ 75. SARS

Science Olympiad Battle at Valley Forge Invitational- Microbe Mission Answer Key

- | | | | | | | | |
|-----|--------------|-----|--------------|-----|--------------|-----|--------------|
| 1) | <u> B </u> | 20) | <u> B </u> | 39) | <u> B </u> | 58) | <u> A </u> |
| 2) | <u> C </u> | 21) | <u> A </u> | 40) | <u> A </u> | 59) | <u> G </u> |
| 3) | <u> D </u> | 22) | <u> C </u> | 41) | <u> B </u> | 60) | <u> C </u> |
| 4) | <u> B </u> | 23) | <u> A </u> | 42) | <u> A </u> | 61) | <u> H </u> |
| 5) | <u> C </u> | 24) | <u> C </u> | 43) | <u> A </u> | 62) | <u> E </u> |
| 6) | <u> C </u> | 25) | <u> C </u> | 44) | <u> C </u> | 63) | <u> D </u> |
| 7) | <u> D </u> | 26) | <u> A </u> | 45) | <u> B </u> | 64) | <u> E </u> |
| 8) | <u> B </u> | 27) | <u> C </u> | 46) | <u> D </u> | 65) | <u> D </u> |
| 9) | <u> A </u> | 28) | <u> D </u> | 47) | <u> A </u> | 66) | <u> C </u> |
| 10) | <u> C </u> | 29) | <u> B </u> | 48) | <u> A </u> | 67) | <u> C </u> |
| 11) | <u> B </u> | 30) | <u> D </u> | 49) | <u> B </u> | 68) | <u> B </u> |
| 12) | <u> A </u> | 31) | <u> B </u> | 50) | <u> A </u> | 69) | <u> D </u> |
| 13) | <u> A </u> | 32) | <u> E </u> | 51) | <u> E </u> | 70) | <u> E </u> |
| 14) | <u> D </u> | 33) | <u> C </u> | 52) | <u> C </u> | 71) | <u> B </u> |
| 15) | <u> D </u> | 34) | <u> B </u> | 53) | <u> A </u> | 72) | <u> G </u> |
| 16) | <u> D </u> | 35) | <u> D </u> | 54) | <u> C </u> | 73) | <u> G </u> |
| 17) | <u> D </u> | 36) | <u> D </u> | 55) | <u> D </u> | 74) | <u> D </u> |
| 18) | <u> A </u> | 37) | <u> D </u> | 56) | <u> B </u> | 75) | <u> C </u> |
| 19) | <u> A </u> | 38) | <u> C </u> | 57) | <u> F </u> | | |