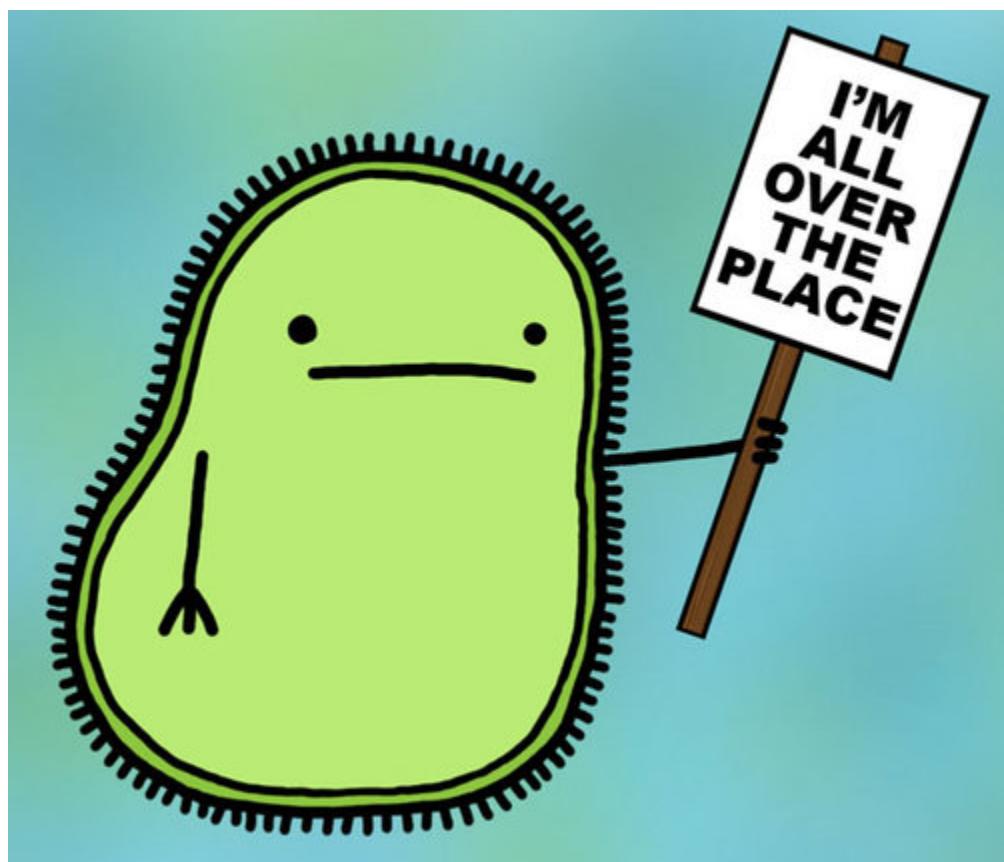


Golden Gopher Invitational Microbe Mission

*Please do not write on these tests.



Part A: Multiple Choice (1 pt each)

1. What objective magnification on a compound light microscope would use immersion oil?

- a. 4x
- b. 10x
- c. 40x
- d. 100x

2. What type of bacterial shape is this?



- a. Bacilli
- b. Cocci
- c. Spiral
- d. Box-shaped (Arcula)

3. How do spirochetes move?

- a. Pili
- b. Cilia
- c. Axial filaments
- d. They do not move

4. What does prion stand for?

- a. Preprogrammed infrastructure organism
- b. Proteinaceous infectious particle
- c. Preemptive inflammatory protein
- d. Prime information molecule

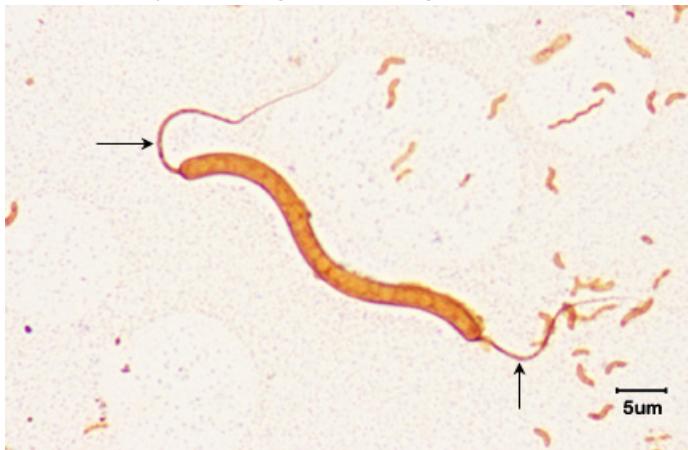
5. Under controlled conditions, bacteria are measured in....

- a. Colony-forming units (CFU)
- b. kiloDaltons (kDa)
- c. Angstroms (\AA)
- d. Joules (J)

6. What microbes are typically found in yogurt? (put all that apply)

- a. *Lactobacillus acidophilus*
- b. *Lactobacillus bulgaricus*
- c. *Streptococcus thermophilus*
- d. *Saccharomyces cerevisiae*

7. Unlike bacteria, fungi prefer a pH of...
- 7
 - 13
 - 5
 - 9
8. Which of the following are used in the production of soy sauce?
- Bacteria
 - Archaea
 - Fungi
 - Protists
9. What part of the microbe is important for the formation of biofilms?
- Cell wall
 - Cell membrane
 - Extracellular Matrix
 - Golgi Apparatus
10. How does penicillin work?
- Inhibit cell wall synthesis
 - Inhibit protein synthesis
 - Inhibit nucleic acid replication/transcription
 - Injure the plasma membrane
11. Which metabolic product of yeast limits bacterial growth in bread?
- Ethyl alcohol
 - Carbon Dioxide
 - Antibiotics
 - Lactic Acid
12. Name this type of flagellar arrangement



- Monotrichous
 - Amphitrichous
 - Lophotrichous
 - Peritrichous
13. In yogurt production, how do archaea affect the pH?
- Lower pH

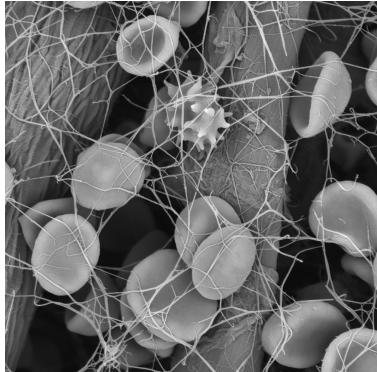
- b. Raise pH
 - c. Do not affect pH
 - d. Archaea are not used in yogurt production
14. Which of the following can be treated using antibiotics?
- a. Tuberculosis
 - b. Giardiasis
 - c. HIV
 - d. Zika
15. A virus has what kind of tail?
- a. Icosahedral
 - b. Complex
 - c. Helical
 - d. None of above
16. A _____ is a small protein complex on the outer membrane of the nucleus which allows ribosomes and RNA to enter the nucleus.
- a. Carbolipid
 - b. Porin
 - c. Nucleoid
 - d. Chromatin
17. In multicellular fungi, branching filaments called _____ make up the structure of the body, and collectively comprise the mycelium.
- a. Yeast
 - b. Fungelli
 - c. Hyphae
 - d. Flagella
18. _____ are hair-like protrusions from the body of a bacterial cell which are used in conjugation or movement.
- a. Fimbriae
 - b. Spirochete
 - c. Glycocalyx
 - d. Pili
19. Which of the following organelles is NOT double-membraned?
- a. Nucleus
 - b. Mitochondria
 - c. Vacuole
 - d. Chloroplast
20. A symbiotic relationship between an algae or cyanobacteria with a fungus is called a _____
- a. Moss
 - b. Seaweed
 - c. Lichen
 - d. Ascomycete

Part B: Matching/Ordering/Labeling

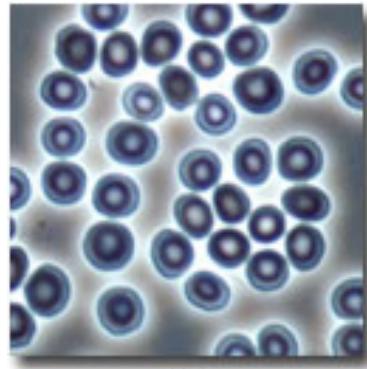
Questions 21- 26: Match the type of microscope with the following pictures. (1 pt each)

- G. transmission electron microscope
- H. phase contrast microscope
- I. differential interference contrast microscope
- J. scanning electron microscope
- K. dark field microscope
- L. confocal microscope

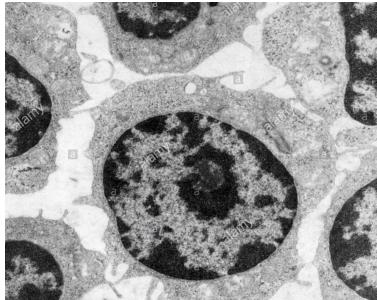
21.



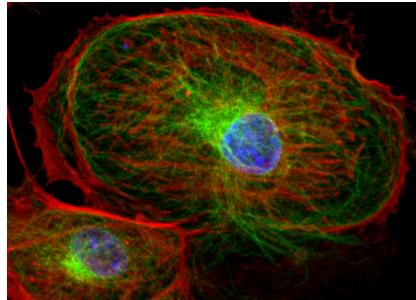
22.



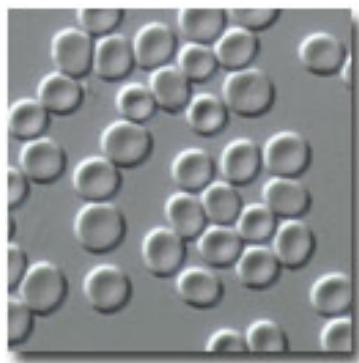
23.



24.



25.



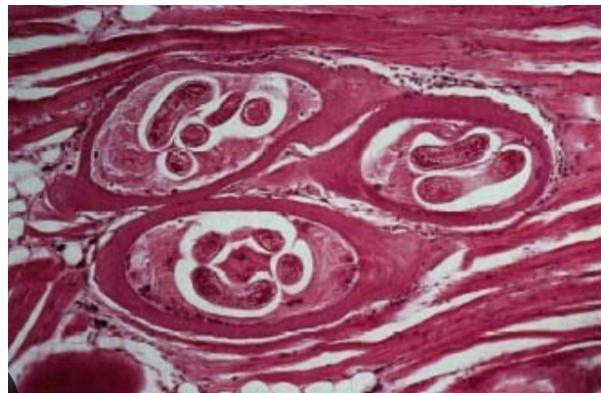
26.



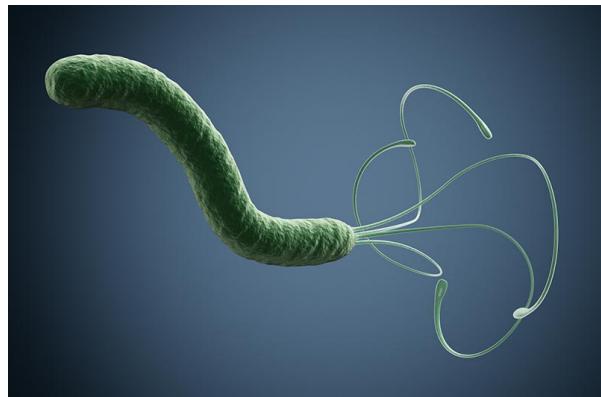
Questions 27- 32: Name the disease based off the picture of the organism or symptom.
(1 pt each)

27.

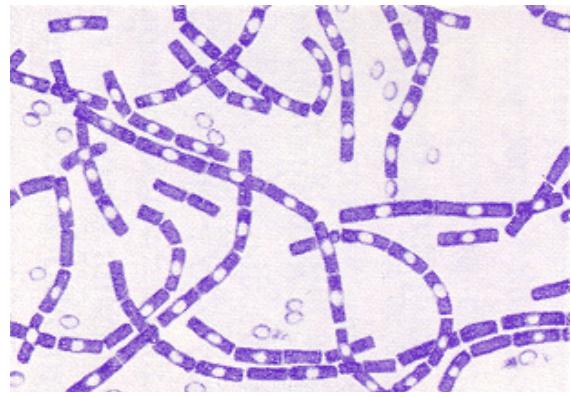
28.



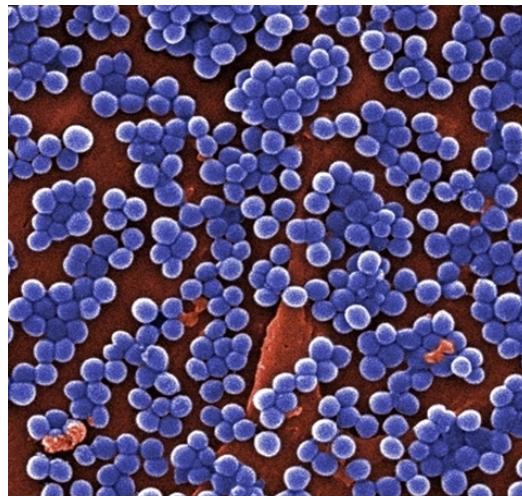
29.



30.



31.



32.



33. Order the steps in viral replication: (10 pts)

- A. late viral protein synthesis
- B. penetration
- C. early viral mRNA synthesis
- D. viral genome replication

- E. attachment and adsorption
- F. late viral mRNA synthesis
- G. assembly
- H. early viral protein synthesis
- I. release
- J. uncoating

34. Order the following objects in INCREASING size (6 pts)

- A. Ebola virus
- B. Ribosome
- C. *Staphylococcus aureus*
- D. Red blood cell
- E. Euglena
- F. Amoeba

35. Label the following nitrogen compounds on the cycle (see on answer sheet) (4 pts)

36. Label the following chart of the cross section of an animal cell (see answer sheet) (13 pts)

37. Fill in the chart regarding differences between prokaryotes and eukaryotes (see answer sheet) (6 pts)

Questions 38 - 50: Match the descriptions to the disease. (1 pt each)

- 38. AIDS
- 39. Botulism
- 40. Early Potato Blight
- 41. Giardia
- 42. Lyme Disease
- 43. MRSA
- 44. Naegleria
- 45. Norovirus
- 46. Ringworm
- 47. Shingles
- 48. Tetanus
- 49. Tuberculosis
- 50. Zika

- a. Most common cause of viral gastroenteritis in humans
- b. Treated by antitoxins and IV fluids
- c. Caused by the same virus as Chickenpox
- d. Also known as Tinea
- e. A bacteria that can appear either Gram-positive or Gram-negative
- f. Causes birth defects and is spread through mosquito bites
- g. *Alternaria solani*
- h. Causes Trismus
- i. Brain-eating Amoeba
- j. A tick-borne illness caused by the bacterium *Borrelia burgdorferi*
- k. Resistant to commonly used antibiotics
- l. Has no cure, but a "Cocktail" treatment can minimize symptoms
- m. Has two nuclei

Questions 51-60: Fill in the blank with a type of microbe. (1 pt per blank)

- 51. _____ and _____ are used in the production of synthetic insulin.
- 52. _____ are found in the stomach of cows and help them digest cellulose.
- 53. Enzymes from _____ are used in polymerase chain reaction.
- 54. _____ can be used to capture fertilizers in runoff from farms.
- 55. _____ can be used to deliver nucleic acid to cells in gene therapy.

56. Eutrophication causes explosive growth of _____.
57. Carbon dioxide released by _____ make bread rise.
58. _____ are used in toothpaste.
59. _____ are used in the production of yogurt.
60. Beer ferments in tanks with _____.

Part C: Short Answer

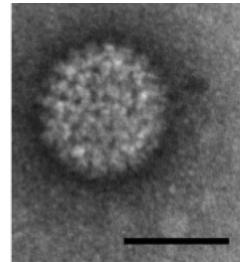
61. Calculate the diameter of the field of view at 40x magnification if the diameter at 10x is 2mm. Give answer in micrometers. (2 pts)

62. What is a viroid? How does it differ from a virus? (2 pts - Tiebreaker #2)

63. If a 1:100 dilution plate has fifty colonies, how many colonies were in the original culture? (1 pt)

64. In a direct microscopic count, what is the name of the etched glass slide used to count the microbes? (1 pt)

65. How big is the microbe shown to the right? (1 pt)



66. What type of microbe is it? (2 pt)

67. Name an autotrophic nitrifying bacteria. (2 pts - Tiebreaker #1)

68. Which step requires the enzyme *nitrogenase*? (2 pts)
hint: this enzyme is inactivated by oxygen

69. Given a stock protein solution with a concentration of 15 mg/ml, determine the protein concentration (in mg/ml) of a solution made by mixing 2 μ l of the stock with 8 μ l of a buffer. (2 pts)

70. Fill out the chart on the answer sheet. Then, explain two reasons why the third stage occurs. (6 pts)