Microbe Mission B - EXAM

2018 National Cathedral Invitational Tournament

Team Number (on your wristband): _____

Circle One: Varsity / JV Division: B

Team/School Name:_____

No abbreviations / PRINT LEGIBLY

Student Names (First & Last): PRINT LEGIBLY

1. _____

2. _____

Total Points Possible: **178**

Total Points Earned:_____

Rank: _____(1st on top, **ALL TIES MUST BE BROKEN**)

Exams must be placed in RANK order before score counseling.

Tiebreaker Needed (Circle): Y / N **Explain in detail**:

Rules violations (Circle): Y / N **Explain**:

STATION A: MICROSCOPY

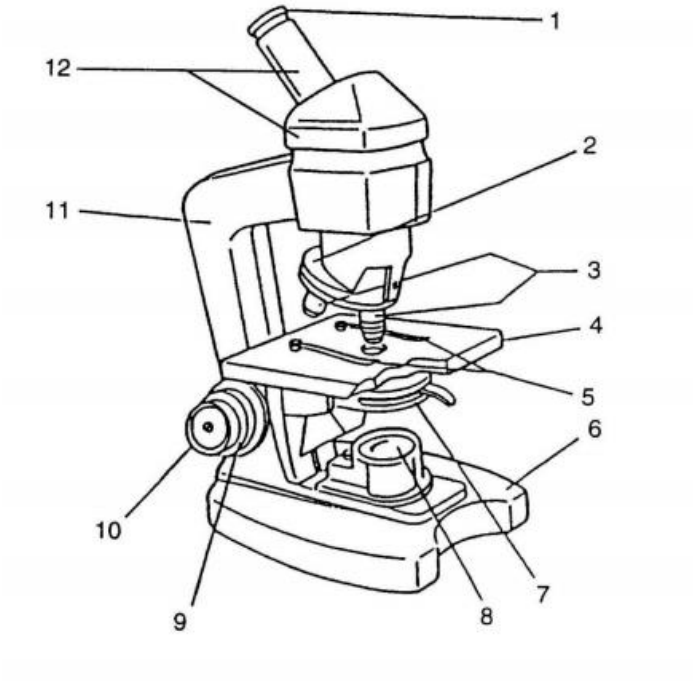
1. The diameter of a low-power field is 4000 μm. You're using a low-power objective of 10X and want to move to a higher power magnification of 40X. What is the diameter of the high-power field?
    a. 10000 μm
    b. 1000 μm
    c. 100 μm
    d. 10 μm
2. A physician is trying to diagnose a patient's infection. Which type of microscopy will be effective in determining the cause of the infection?
    a. Scanning Electron Microscope
    b. Fluorescence
    c. Dark Field
    d. Differential-Interference
3. To examine the internal details of a cell, which type of microscopy would you employ?
    a. Confocal
    b. Transmission Electron
    c. Phase Contrast
    d. Scanning Electron

A description of a microscope will be provided, answer what type of microscope it describes.

4. Can be created from a bright-field microscope by adding a stop to the condenser.
5. Provides an extremely detailed 3D view of the object.
6. Contrasts live specimens against a gray background.
7. Most common form of microscope.

STATION B: MICROSCOPIC IMAGES

8. Label the parts of the microscope shown below.



9. You are viewing an organism under the microscope that appears to be moving "↙". The organism is actually moving in which direction?

a. ↖ c. ↗

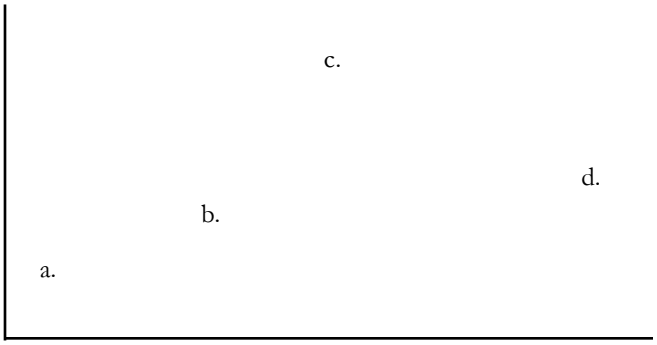
b. ↙ d. ↘

10. How does changing the objective from high power to low power on a microscope affect these properties? Write either increase or decrease.
    a. Resolution
    b. Working distance
    c. Size of the field of view
    d. Size of the image
    e. Depth of focus
11. Assume a student created a slide of the letter Y drawn sideways like this: ≺.
    Draw how this slide would look if you were observing it under a microscope.

STATION C: TYPES OF CELLS

12. Which of the following organelles belong to animal cells? Select all that apply.
    a. Cilia
    b. Golgi Apparatus
    c. Flagella
    d. Mitochondria
    e. Nucleus
    f. Cell Wall
13. Describe the major difference between eukaryotic and prokaryotic cells.
14. List two organelles that are unique to plant cells.
15. Which organelle is responsible for storage?
    a. Ribosome
    b. Endoplasmic Reticulum
    c. Vacuole
    d. Lysosome
16. Which type of organism cannot move using flagella?
    a. Archaea
    b. Bacteria
    c. Fungi
    d. Protozoa
17. A cell membrane is found in both plants and animal cells.
18. Prions are misfolded proteins that cause disease.
19. Lysosomes are the site of protein synthesis.
20. Viruses can survive without a host cell.
21. The cell walls of fungi contain chitin.
22. Mitochondria possess their own DNA, while chloroplasts do not.

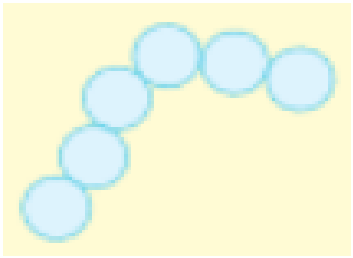
STATION D: GROWTH CURVE

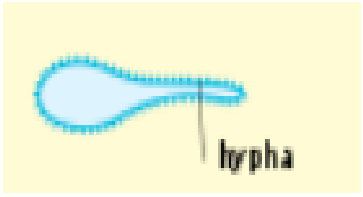


23. Label each of the stages for the bacteria growth curve in the above diagram. Describe what is happening at each stage next to the corresponding letter (8 points).
24. What would you label the x-axis?
25. What would you label the y-axis?
26. What factors cause cells to eventually die?
27. Which of the following form spores? Select all that apply.
    a. Bacteria
    b. Fungi
    c. Plants
    d. Animals
28. What organisms form cysts?

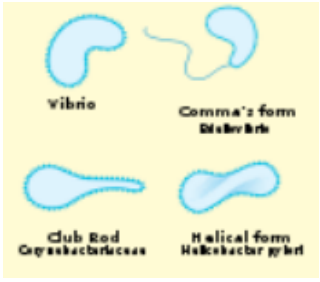
STATION E: BACTERIA

29. Categorize the following bacteria based on shape.

a. 

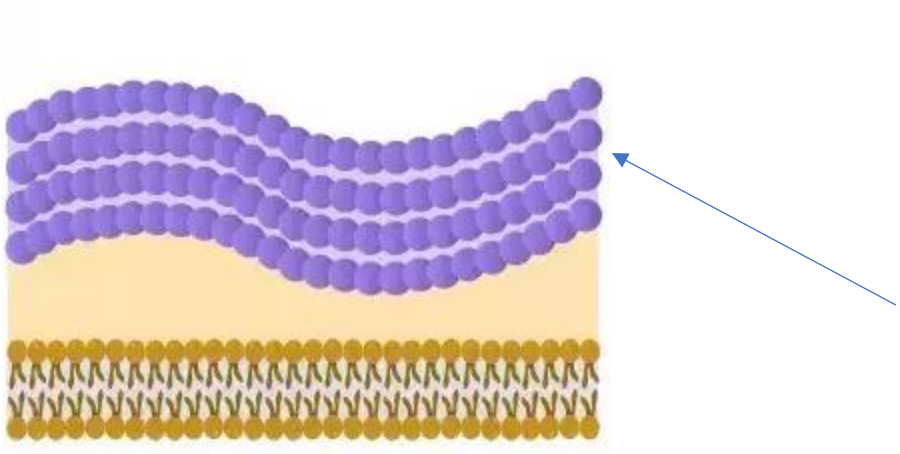
b. 

c. 

d. 

30. What shape are vibrio bacteria?

31. Would a bacterium with the cell wall shown below be Gram-positive or Gram-negative?



32. What color will the above cell wall stain?

33. What is the polymer denoted by the arrow?

34. Which of the following bacteria is Gram-positive? Select all that apply.

    a. *Salmonella*

    b. *Escherichia*

    c. *Streptococcus*

    d. *Shigella*

STATION F: MICROBES IN ECOLOGY

35. Which of the following steps in the nitrogen cycle involve prokaryotic activity? Select all that apply
    a. Nitrogen fixation
    b. Denitrification
    a. Nitrification
    b. Decomposition
36. Which of the following is not part of the carbon cycle?
    a. Cellular respiration
    b. Fungi and viral activity
    c. Photosynthesis from algae, plants, and cyanobacteria
    d. Breakdown of organic matter
37. How do microbes affect the environment in soil?
    a. Compete with plants for nutrients in the soil
    b. Allow for better access to moisture and nutrients through extended root systems
    c. Produce plant inhibitors like toxins to kill the competition
    d. Destroy soil aggregates to improve access to nutrients
38. What is the purpose of biofertilizers?
39. How does the decomposition of a dead organism affect the energy balance?
    a. It removes available energy to other living organisms
    b. It provides energy to bacteria in the soil
    c. It has no effect on the energy balance
    d. It allows for energy to be recycled
40. Briefly explain the role of mycorrhizae.
41. Lichens are formed from fungi and what other type of organisms?

The following questions will be true or false. Write T for true, F for false.

42. A *Staphylococcus* bacterium is used to kill problem pests like gypsy moths.
43. Bacteria that produce sulfur grow using oxygen.
44. A teaspoon of topsoil contains about 120,000 fungi.
45. Microbes can enhance the toxicity of certain metals like zinc.
46. Aphids and *Buchnera aphidicola* are an example of parasitic symbiosis.
47. Ferrous iron is used by some bacteria as an electron acceptor.
48. Primary treatment of sewage involves removal of phosphate and nitrate waste.

STATION G: DISEASES BY MICROBES

49. A disease will be given. Next to it, write what type of microorganism causes it. You must be specific. For example, pinworm is caused by a nematode. AIDS is caused by a virus.
    a. Thrush
    b. Mononucleosis
    c. Trichinosis
    d. Paralytic Shellfish Poisoning
    e. Malaria
    f. Rocky Mountain Spotted Fever
    g. Scrapie
    h. Dutch Elm Disease
    i. Yellow Fever
    j. Schistosomiasis
    k. MRSA
    l. Giradiasis
    m. Dental Caries
50. What is the term for the organism that carries infectious agents?
51. Select the correct order of disease progression.
    a. Infection -> Disease -> Contamination
    b. Disease -> Contamination -> Infection
    c. Contamination -> Infection -> Disease
    d. Contamination -> Disease -> Infection
52. Which is not a viable strategy for controlling infection and disease?
    a. Using antibiotics or other medications to eliminate the infectious agent
    b. Isolating still-healthy individuals
    c. Immunization
    d. Decreasing the number of potential vectors

STATION H: MICROBES IN FOOD AND INDUSTRY

53. Which of the following measurements does a data logger record? Select all that apply.
    a. Waste gas
    b. Oxygen concentration
    c. Temperature
    d. Amount of product
    e. Pressure
    f. pH
54. Which step of the water treatment process involves activated sludge?
    a. Primary
    b. Secondary
    c. Tertiary
55. A company has just discovered that the process to produce their most popular fruit gummy snacks is causing the production of a harmful pollutant. What is the name of the process that the company uses to remove this pollutant?
56. What are the two principles involved in the process described above (labeled A and B)?
57. What industry are microbes used in? Select all that apply.
    a. Biosensors
    b. Pharmacology
    c. Jet fuel
    d. Paper
58. Which of the following foods is not fermented?
    a. Kimchi
    b. Chocolate
    c. Rice
    d. Bread

The following questions are true or false. Write T for true, F for false.

59. Yogurt is made through a fermentation process involving ethanol.
60. A water jacket provides cold water to the fermenter to balance out respiration.
61. Mold grow easily in basic environments.
62. Microbes can be sprayed on plants as pesticides.

Tiebreakers:

63. Name which specific microorganism causes the diseases below. Ex. Strep Throat can be caused by *Streptococcus pyogenes*. *S. pyogenes is also acceptable.*
    a. Legionnaires' disease: ***Legionealla Pneumophila***
    b. Dental Caries: ***Streptococcus mutans***
    c. Tetanus: ***Clostridium Tetani***
    d. Pelptic Ulcer Disease: ***H. Prylori***
    e. Syphilis: ***T. pallidum***
    f. Lyme Disease: ***B. burgdorferi***
    g. Schistosomiasis: ***Trematodes, Flukes***
    h. Malaria: ***Plasmodium***
    i. Rabies: ***Rhabdovirus Lyssavirus***
64. Classify the following drugs as antibiotic, antiviral, antifungal, or antiprotozoal.
    a. Ketoconazole: **Antifungal**
    b. Enfuvirtide: **Antiviral**
    c. Amphotericin B: **Antifungal**
    d. Clindamycin: **Antibiotic**
    e. Artemisinin: **Antiprotozoal**
    f. Pyrimethamine: **Antiprotozoal**
    g. Simeprevir: **Antivirus**
    h. Ornidazole: **Antiprotozoal**
    i. Ganciclovir: **Antivirus**
    j. Praziquantel: **Antibiotic**
    k. Vancomycin: **Antibiotic**