

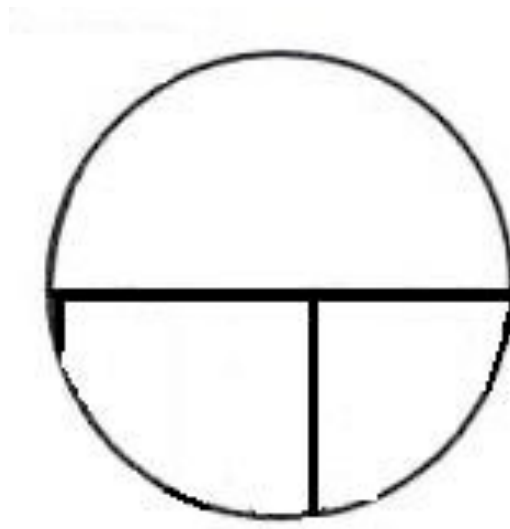
MICROBE MISSION - SAMPLE TOURNAMENT #1

by Karen L. Lancour

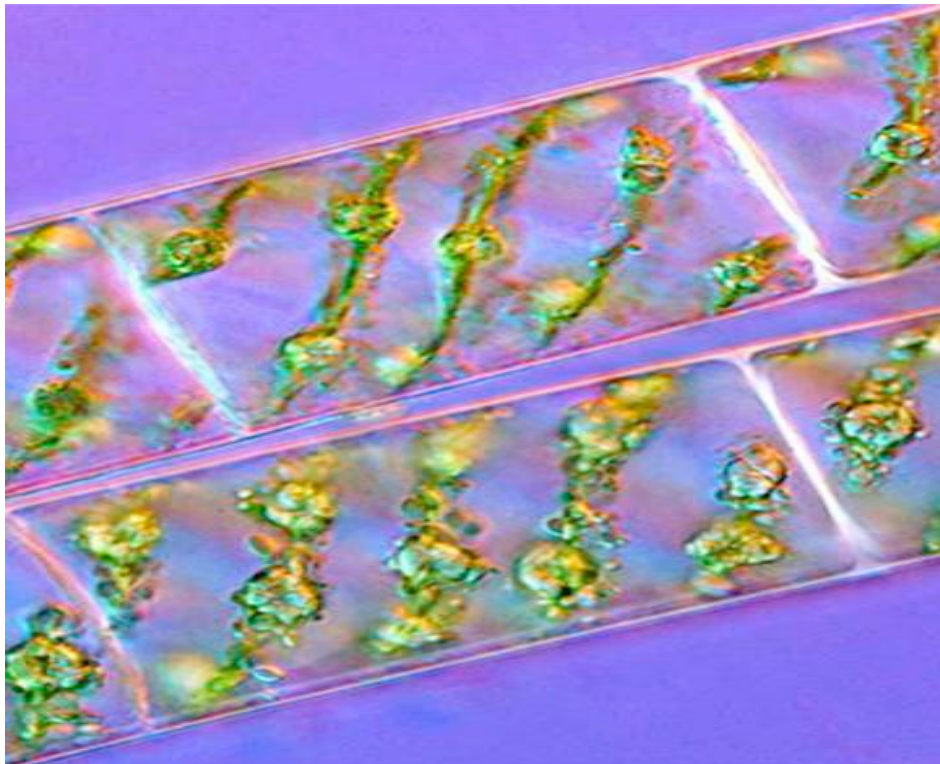
STATION A: MICROSCOPY

1. A microscope has an **10 objective and oculars of 4X, 10X, 40X and 100X**. What is the range of magnification for this microscope. (lowest to highest)
2. A student prepares a slide with the letters **"GR"** and positions it on the stage in the normal reading position. When viewed, how will the **"GR "** will appear?
Draw it on your answer sheet.
3. Examine the **diagram of the stage with the millimeter ruler** from a **10X objective**. What is the diameter of this field of view in millimeters? in micrometers or mcm?
4. What would be the diameter of the **40X field of view** based upon diameter of the 10X objective from question # 5 in millimeters? in micrometers or mcm?
(Remember: it must be calculated using the information from question # 4 and the ratio of magnification because it is less than one mm)
5. Examine the **Photo of *Spirogyra***. Assume that the length of the photo is the same as the diameter of the 40X field of view calculated in question 5, what is the length of the of a cell in **micrometers or mcm**?

STATION A: MICROSCOPY



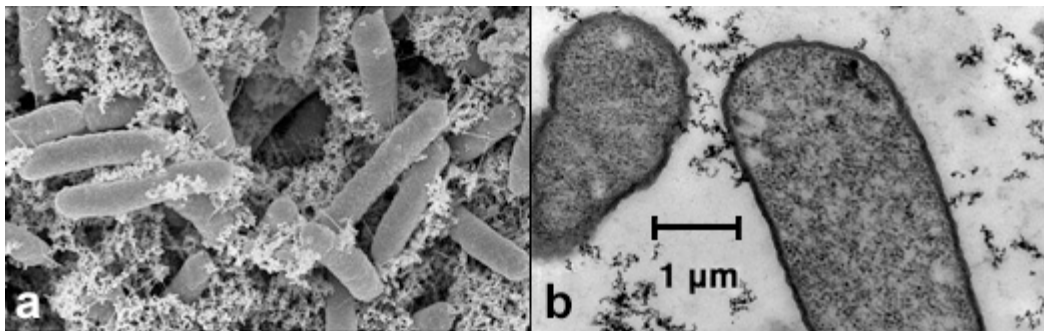
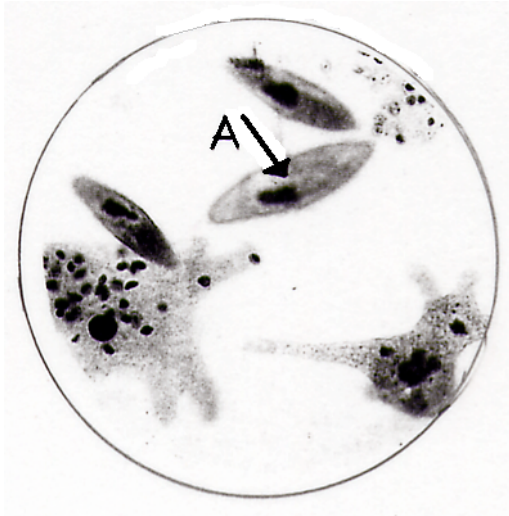
Stage with millimeter ruler (10X objective)



Spirogyra (40X objective)

STATION B: MICROSCOPE IMAGES

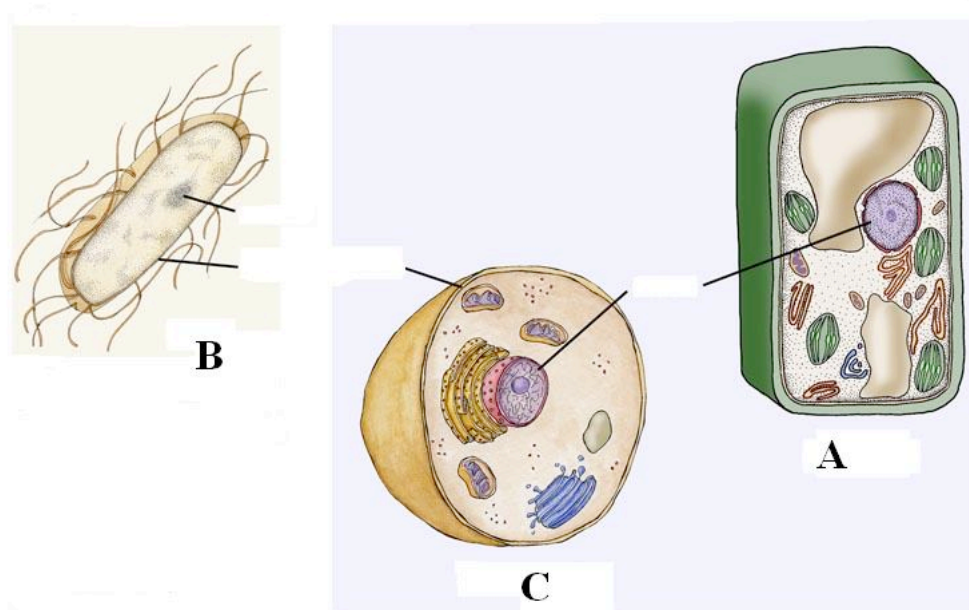
Light microscope



Electron Micrographs

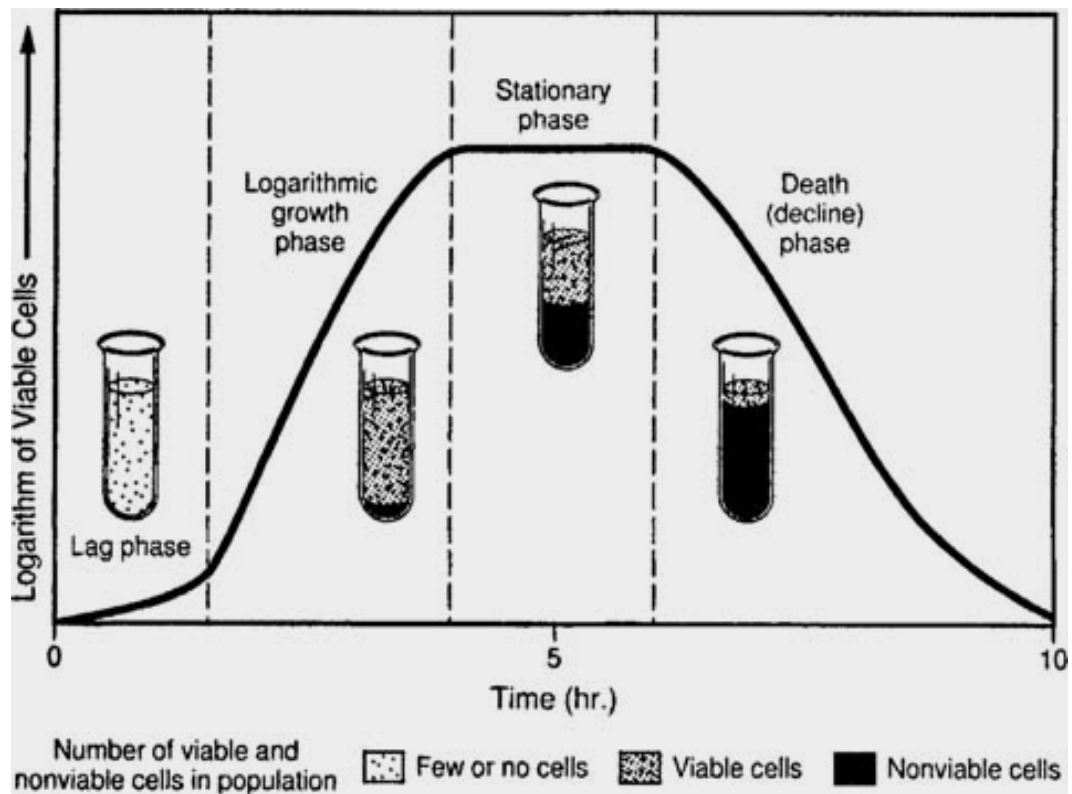
6. Organism A is being observed under a light microscope – its length is about 125 μm . What is the diameter of this field of view? Under what power is it being observed? (scanning power, low power, high power, or oil immersion?)
7. How would you determine the third dimension of the organism on the slide?
8. Which micrograph (A or B) is from a **scanning electron microscope**? How do you know?
9. Which diagram (A or B) is from a **transmission electron microscope**? How do you know?
10. What is the **approximate diameter of the microbes** in the micrograph labeled B?

STATION C: TYPES OF CELLS



11. Which cells (A, B, and/or C) are prokaryotic? How can you tell?
12. Which types of microbes are prokaryotic? (viruses, bacteria, Archea, algae, protozoa, fungi)
13. Which cells (A, B, and/or C) are eukaryotic? How can you tell?
14. Which types of microbes are eukaryotic? (viruses, bacteria, Archea, algae, protozoa, fungi)
15. Which structures are present in cell A that are not present in cell C ?

STATION D: GROWTH CURVE



16. What is the difference between viable and nonviable cells?
17. What is happening during the lag phase where there is little growth?
18. What is happening during the logarithmic growth phase?
19. What is happening during the stationary phase?
20. What is happening during the death (decline) phase and why is it happening?

STATION E: DICHOTOMOUS KEY

Use the dichotomous key to identify microbes A-E.

21. Identify specimen A.

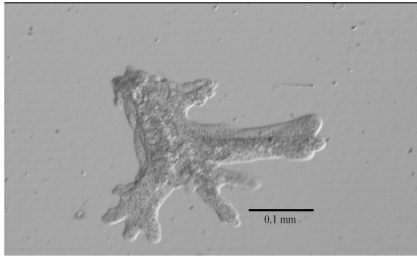
22. Identify specimen B.

23. Identify specimen C.

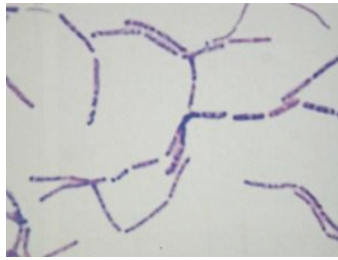
24. Identify specimen D.

25. Identify specimen E.

STATION E: DICHOTOMOUS KEY



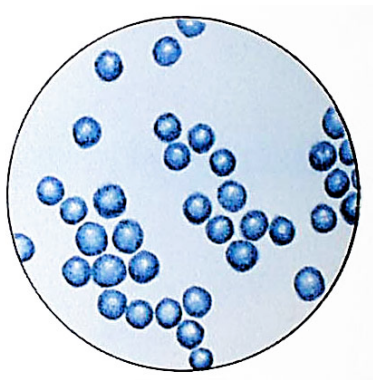
A



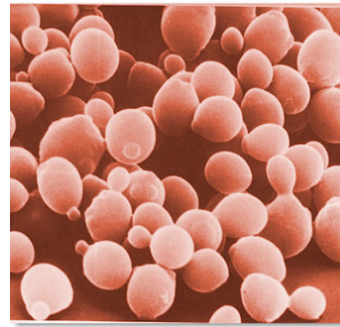
B



C



D



E

Photo's are not to scale

MICROBE KEY

1. Spherical or elliptical in shape3.
1. Not spherical or elliptical in shape2.
2. Irregular shaped with extending arm-like structures ameiboid protozoan
2. Rod shaped – many linked together bacillus bacteria
3. Has green chlorophyll and flagella *Clamydomonas*
3. Not chlorophyll or flagella4.
4. Spheres have small buds attached Baker's yeast
4. Spheres without buds coccus bacteria

STATION F: YEAST EXPERIMENT

Students performed the yeast experiment using the materials listed below:

- 1 packet of active dry yeast
- 1 cup very warm water (105° F–115° F)
- 2 tablespoons sugar
- a large rubber balloon
- a small (1-pint to 1-liter) empty water bottle



Answer the following questions:

26. What type of organism is the yeast? (algae, protozoan, fungi., bacteria, virus)
27. With the balloon over the jar – what type of environment does the yeast have? (aerobic or anaerobic)
28. What gas is being collected in the balloon?
29. What other waste product does the yeast make while breaking down sugar for energy?
What is the name of this type of respiration?
30. What are some of the commercial uses for this type of yeast?

STATION G: MICROBES IN ECOLOGY

Indicate whether the following statements are true or false.

- 31.** Lichens is a symbiotic relationship between an algae or cyanobacteria and a fungus.
- 32.** Certain microbes can break up and eat oil while others can produce petroleum.
- 33.** Viruses are considered living organisms and are found wherever there is a cell to invade.
- 34.** Bacteria and fungi are important as decomposers.
- 35.** In a teaspoon of topsoil there are a billion bacteria and 120,000 microscopic fungi.

STATION H: DISEASES BY MICROBES

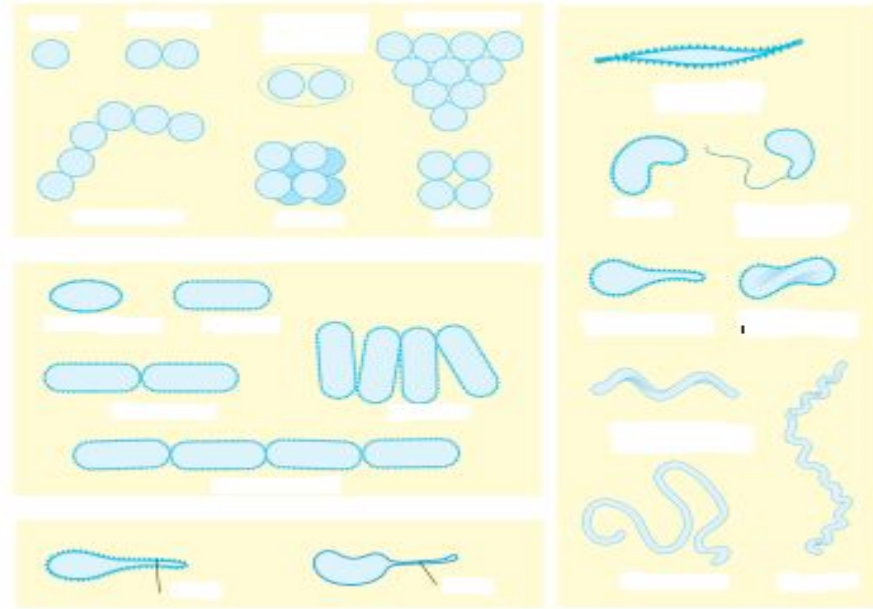
Use the key for “Type of Microbe” to answer questions 36-40.

Type of microbe

- A. virus**
- B. bacteria**
- C. protozoan**
- D. fungus**

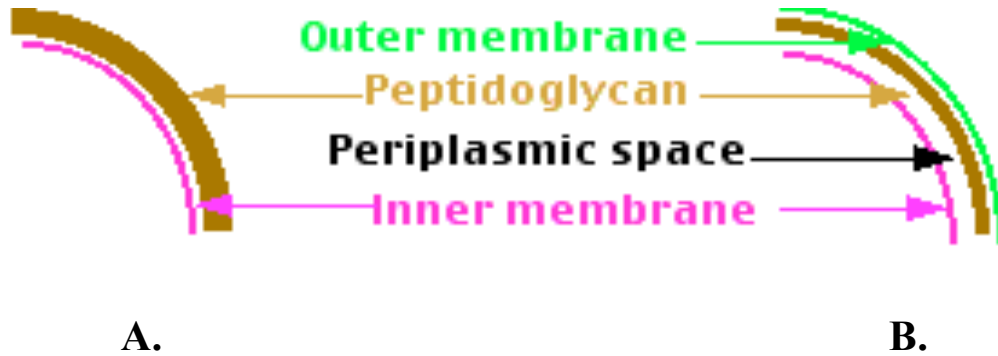
- 36.** Which type of microbe causes Malaria?
- 37.** Which type of microbe causes Athlete’s foot?
- 38.** Which type of microbe causes H1N1 influenza?
- 39.** Which type of microbe causes strep throat?
- 40.** For which type of microbe is an antibiotic an effective treatment?

STATION I: BACTERIAL SHAPES (Division C)



41. Which type of bacteria are rod shaped? A chain of rods is called what?
42. What type of bacteria are spherical shaped? Two spheres together is called?
43. Spirochetes are what shaped? (comma, spiral, filaments, club)
44. Vibrio is what shaped? (comma, spiral, filaments, club)
45. An oval shaped bacterium is termed what?

STATION J: GRAM + VS. GRAM – BACTERIA (Division C)



46. Which cell wall (A or B) is from a gram – bacterium?
47. What color will it appear when the gram stain process is completed?
48. Which cell wall (A or B) is from a gram + bacterium?
49. What color will it appear when the gram stain process is completed?
50. Which type of bacteria (Gram + or Gram -) produce endotoxins as Salmonella?

MICROBE MISSION - SAMPLE - ANSWER KEY

STATION A: MICROSCOPY

1. 40X to 1000X
2. GR is upside down and backwards or inverted and reversed
3. ~1.6 mm ~ 1600 micrometers
4. ~400 mcm
5. ~ 300 mcm

STATION B: MICROSCOPE IMAGES

6. ~ 400 mcm high power
7. focus up and down through it
8. A - because it is 3-dimensional
9. B - because it is 2-dimensional
10. ~ 2 micrometers

STATION C: TYPES OF CELLS

11. B – lacks organized membrane-bound nucleus or membrane-bound organelles
12. bacteria and Archaea
13. A & C - organized membrane-bound nucleus or membrane-bound organelles
14. algae, fungi, protozoa
15. cell wall and chloroplasts

STATION D: GROWTH CURVE

16. viable cells are living and nonviable cells are dead
17. cells are growing and producing materials needed to reproduce
18. binary fission – cells numbers are doubling each generation – logarithmic increases in numbers
19. equal numbers are reproducing and dying so numbers stay steady
20. many cells are dying – limited food and build up of cellular wastes

STATION E: DICHOTOMOUS KEY

21. ameboid protozoan
22. bacillus bacteria
23. *Clamydomonas* – “ a single celled green algae”
24. coccus bacteria
25. Baker’s yeast

STATION F: YEAST EXPERIMENT

26. fungi
27. anaerobic – without oxygen
28. carbon dioxide
29. ethyl alcohol – fermentation
30. Making bread products (carbon dioxide make dough rise) or making alcohol products as beer or wine

MICROBE MISSION - SAMPLE - ANSWER KEY

STATION G: MICROBES IN ECOLOGY

- 31. true - an important food source and producer in the tundra
- 32. true - bacteria eat oil and algae produce petroleum
- 33. false – because viruses are acellular – otherwise true
- 34. true - important for decay
- 35. true - essential for nutrient or recycling of matter in the ecosystem

STATION H: DISEASES BY MICROBES

- 36. C (protozoan)
- 37. D (fungus)
- 38. A (virus)
- 39. B (bacteria)
- 40. B (bacteria)

STATION I: BACTERIAL SHAPES (DIV. C)

- 41. bacillus streptobacillus
- 42. coccus (cocci) diplococcus
- 43. spiral
- 44. comma
- 45. cocco-bacillus

STATION J: GRAM + vs. GRAM – BACTERIA (DIV. C)

- 46. B is gram negative
- 47. red
- 48. A is gram positive
- 49. purple
- 50. gram negative