Mission Microbe
Sample Test 2010-2011
NC Science Olympiad

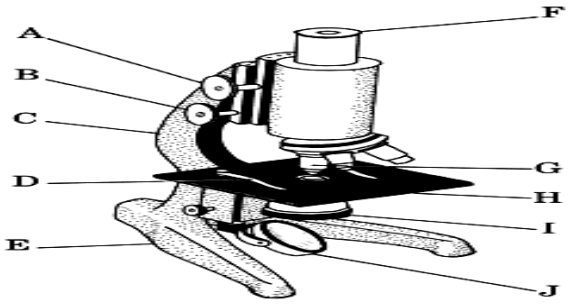
Created By: Rick Mencer

Station 1: Microscopes-Tools of the Trade

1. Match the microscope type with the definition.

I. simple microscope	A. Uses ambient light reflected off a mirror, and only has one lens.
II. Transmission electron microscope	B. Gives high resolution, 3 dimensional images, uses electrons instead of light
III. Compound microscope	C. Uses two different eyepieces and light to produce a three dimensional image
IV. dissecting microscope	D. Uses electrons to produce high resolution, 2-dimensional images
V. scanning electron microscope	E. Electricity provides light, has multiple lenses for different magnifications

2. Label all the parts of a microscope on the diagram.



3. On the table you should see a microscope with labels attached. Two of the parts are mislabeled. What two parts are mislabeled?
4. What is the greatest magnification, or power, available on this scope?
5. Is the lens in this microscope an objective or a convex lens? Explain how the lens magnifies the image of a sample.
6. Using the compund microscope in front of you as a model, explain how you would prepare and view a sample from start to finish. Be sure to use proper terminology.
7. There are several tools/objects in front of you. Which of these would NOT be used in the study of microbes?
   A. petri dish, tweezers, electron microscope, medicine dropper, gram stain, laser, scalpel, string
   8. If a sample is being viewed under 40x magnification, with a field of view of 2000 micrometers, and would fit across the viewing field 5 times, what is its actual length?
   9. As magnification increases, does the size of the field of view increase or decrease?
   9. Who was the first scientist to use a microscope?

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Station 2: Using Microscopes to Identify Samples as Bacterial, Fungal, or Viral

(This sample test uses images from sources on the internet (see the Works Cited page). The actual event may use sample on already prepared slides, which would require students to know how to set the slide on the microscope, adjust the lighting, magnification, and focus as necessary).

1. Identify each the two drawings below as eukarotic or prokaryotic cells. Label each part. (*images from www.phschool.com. Copyright Prentice Hall 2010.*

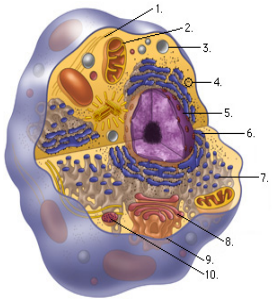


Illustration 1: Cell A

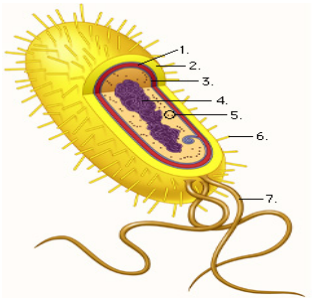
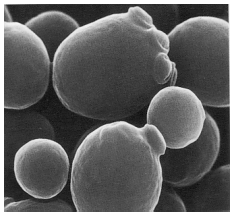
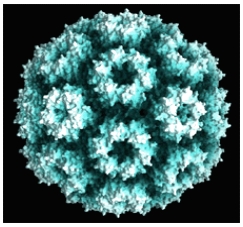


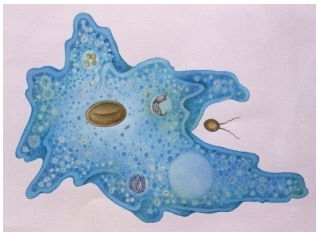
Illustration 2: Cell B

2. Give one example of a eukaryotic cell, and one example of a prokaryotic cell. Explain how the two are different.
3. List five main types of microbes.
4. The following examples are all different kinds of microbes. Identify each microbe as one of the five main types of microbes.

Images from www.soinc.com, from "Microbe Mission 2011, created by Karen Lancour, National Supervisor- National Rules committee, Chairman-Life Sciences unless otherwise noted.







5. Use the microscope to view the slide. Sketch what you see, and identify it as an amoeba, bacterium, or virus.

(*For information on calculating viewing fields and sample sizes, go to http://www.saskschools.ca/curr_content/biology20/unit1/. Click Lessons 2 and 4*

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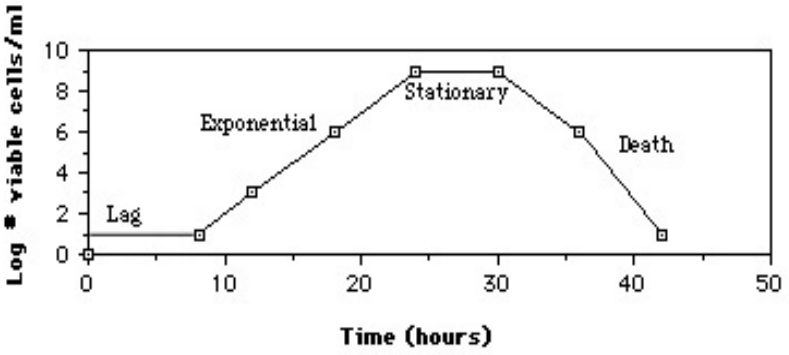
Population Growth

Answer the following questions using the graphs/charts below.



1. Which axis shows the number of viable cells?
2. At about what hour did exponential growth begin and end?
3. Explain why the population of cells increased exponetially.
4. Identify at least two reasons why the population of viable cells became stationary, then began to decline?
5. If more food source is added to the sample culture, predict how the population will change.
6. Would the population growth curve for the deer population in an area be exponential (as in the chart above) or linear?
7. Use the table below to sketch a graph showing the change in population over 5 hours for a colony of *Protozoa.* Assume no death occurs.

Time (Hours)	Population (thousands)
1	10
2	30
3	90
4	360
5	1080

8. Predict what the population will be in 7 hours, 10 hours, and 12 hours, assuming none of the organisms die.
9. Explain why unlimited population growth in microbes is very unlikely or impossible.

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Station 4: Microbes and Diseases

(*At a competition event, I would have these as matching flashcards: Five of them would be numbered 1-5, and show a specific kind of microbe- image and/or word. The next five would be labeled A-E, accompanied by a single specific disease/symptoms. Competitors would match these, and transfer the answers to the answer sheet. I give examples here in chart form due to time constraints.)*

Microbe	Disease
1.Protozoa	A. Influenza
2. Fungus	B Tubercolosis
3. Bacteria	C. Dysentery
4. Virus	D. Mad Cow Disease
5. Prions	E. Athletes Foot

2. Identify at least two symptoms for each kind of disease listed above.
3. Identify at least one mode of entry (one way the disease can be caught) for each example listed above.
4. Of the microbes and diseases listed above, which two are the most difficult to treat and why?

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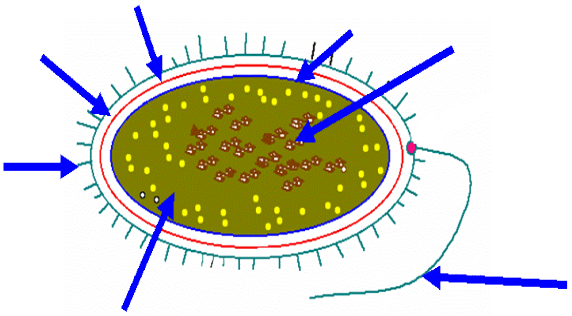
Station 5: Organelles and Cells

Part A

1. Label each organelle in the cell below.



2. Is this microbe a bacteria or a virus?

3. Label each organelle in the cell below.

(*Insert protozoa diagram for labeling)*

4. Is this microbe an fungus or a bacteria?

Part B

1. Set up the microscope to view the slide. Make a quick sketch of what you see.
2. Identify the sample as a protozoa or a fungus.
3. What organelles are visible?

Part C

1. Create a double Venn Diagram showing how protozoa and cyanobacteria.

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Station 6: Positive Uses of Microbes

Part A
Match the product or outcome with the associated microbe.

Product/Benefit	Associated Microbe
1. Petroleum	A. Saccharomyces cerevisiae
2. Penicillin	Lactobacillus bulgaricus
3.Yogurt	C. Clostridun
4 Bread	D.
5 Gene splicing	E. penecillium notatum
6. Intestinal Tract (Food digestion)	F. Botryococcus braunii

Part B

1. Why are people taking antibiotics often feel nauseus?
2. What organelle found in all human cells is thought to have evolved from a symbiotic relationship between host cells and a bacteria?
3. When BP applied oil-eating microbes to the recent Gulf Oil Spill, what were scientists concerned about? Were these microbes aerobic or anaerobic?

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