

**Microbiology 2400
Study Guide #5
Winter Semester 2008
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LABORATORY SECTION

MICROMETRY

Note: You will need to rely on class notes for this particular set of questions

1. You were very briefly introduced to the concept of measuring objects that you are viewing with your microscope. To determine the length of a *E. coli* cell, what two pieces of equipment do you need?
2. What is the principle reason that the size of a bacterial cell might have to be determined?
3. You should be able to determine the value of the smallest graduation on the ocular micrometer shown in the illustration below.

THE FUNGI—CONTINUED

1. You had the opportunity to view a prepared slide of *Candida albicans*. This microbe belongs to a group of fungi that are commonly called ____.
2. It was pointed out in class, that this microbe exhibits a dimorphic growth pattern. This really means that the microbe can exist in a _____ like state or one in which a _____ type growth can be observed.

3. While many healthy humans carry around this organism as part of the normal group of microbes which inhabit the body (the normal flora), it can on occasion “get out of control” and cause problems. If this occurs in the oral cavity a condition known as _____ can occur (see page 631). According to statistics provided by your text (page 801) infection of the _____ of the body has sent about 50% of all college women to the MDs for treatment.
4. What are the two principle situations which lead to this type of infection in the adult humans. Note: newborns can get into difficulty because they do not have a well established normal flora.

Chapter 4

1. Some time was spent discussing the bacterial cell wall.
 - a. What was noted as being the prime function of the wall?
 - b. What chemical substance was noted as playing the prime role in allowing the above mentioned function to be carried out?
 - c. The substance mentioned above is really constructed from two different classes of chemical substances. What are these?
 - d. Since this is a course in General Microbiology a few moments were spent on how free-living protozoans such as *Amoebae* and *Paramecium* manage to survive in hypotonic solutions. How do these organisms deal with the influx of water into their cytoplasm?

2. Cell walls of Gram (+) and (-) bacteria are really quite different. The wall of the Gram _____ bacteria is chemically homogenous and constructed largely from _____. The walls of the Gram _____ have a wide variety of chemical substances. One of the components of these walls has attracted significant attention from the medical community. What is that component and why has it received attention?

3. The possession of an “outer envelope” is a characteristic of the Gram (+ or -) wall. The outer membrane does play a very significant role in what cellular activity in this situation?

4. The mycoplasmas were touched on during the discussion of the cell wall. Describe the nature of their cell walls. These bacteria need to really pay attention to the presence of hypotonic solutions. Two different approaches were noted in class as being used by these organisms to “get protection” from the effects of hypotonic solutions. What were they? As was noted in class, what is the most common human medical problem caused by these bacteria (see also your textbook).

5. In discussing the plasma membrane of the bacterial cell, it was noted that the so-called Fluid Mosaic Model describes the architecture of the wall. This would imply that the two major components of these membranes are _____ and _____.

6. You were introduced to 3 separate functions for the plasma membrane of the bacterial cell. What were those functions? Which of those functions is restricted to the bacterial cell?
7. Some time was spent discussing inclusion bodies. These were described as being small ___ of fluid or small aggregations of ___ material. The chemicals, which are found in inclusion bodies, were described as being ___ in nature. These were illustrated by the overhead transparency, which showed the cells of a photosynthetic bacterium filled with sulfur granules. Another transparency was used to show the presence of PHB granule. This material is really ___ (organic or inorganic in nature). The function of the PHB granules is to serve as a storehouse of ___. Historically, the detection of the volutin granule has been important to the world of medical microbiology. What famous bacterium was identified by the presence of these granules? What human problem does it cause? Currently, this disease is almost never found in the United States. What is the approach which has virtually eliminated this disease in the USA?
8. The nucleoid or nuclear body of the bacterial cell is really the ___ of the cell. This structure usually has the shape of a ___ and usually is present in ___ within the bacterial cell.
9. Answer question 1 under the clinical application section located on page 113 (110 in the previous edition) **In attempting to answer this question, do it entirely on your own. Do not ask me for help. As a hint, it would be a good idea to look up the characteristics of this genus in your textbook**

Chapter 5—Metabolism

1. Bacteria such as *E. coli* have a metabolism. What does this term refer to?
2. In living organisms, including bacterial cells, the metabolic reactions of living organisms can be subdivided into 2 great groups. What are the names of each of the groups? You should be able to describe what generally happens to the molecules that participate in each of these reaction groups. In addition, the reactions of the ___ processes release ___ while those of the ___ processes consume ___.
3. In the discussion of the history of enzymes, you were introduced to the Nobel Prize winning work of Hans and Eduard Buchner that was conducted 1897. You should be able to describe this work. This work upset the concept of alcoholic fermentation that had been laid down by the famous French scientist, ___ who contended that ___ were necessary for the fermentation of sugar to occur.
4. Who is responsible for “coining” the term, enzyme? The term enzyme apparently resulted from the combining of two Greek words. What were those two words?
5. A man by the name of Sumner isolated the first enzyme in chemically pure fashion in 1926. The enzyme that he isolated was Urease, which he obtained from the Jack Bean Plant. This enzyme turned out to be a type of ___ (lipid, carbohydrate, etc.) and all enzymes to date have turned out to be constructed from this type of material.

6. You were introduced to the laboratory findings of Harden and Young that go all the way back to the early 1900s. These investigators determined that “yeast juice” that had been subjected to the process of ___ was incapable of causing the fermentation of ___ into ___.
7. The above findings led to an avenue of research in enzymology that led to the development of the idea of the coenzyme, apoenzyme, and holoenzyme. You should be able to briefly describe these kinds of molecules.
8. The so-called Lock and Key Theory of enzyme action contends that that an enzyme must ___ with the material that it normally interacts with (**its substrate**). If this occurs, then the theory predicts that the enzyme will be able to affect the molecule or molecules.
9. At the time the concept of the Lock and Key Theory was discussed, you were also introduced to the so-called Induced Fit Theory. This idea is somewhat similar to the above idea (question #4) but in this case both the enzyme and its substrate(s) are thought to have a limited ability to ___ to accommodate each other.
10. Enzymes are generally considered to be rather specific for their substrates. What does this imply about enzymes?
11. The Rack Theory is an attempt to explain what aspect of enzyme action? What is the central tenet of the Rack Theory?
12. Some time was spent discussing the concept of nitrogen fixation to illustrate the value of enzymes to living organisms, which would include microorganisms.
 - a. Generally speaking, what happens when an element such as nitrogen is “fixed”?
 - b. In discussing nitrogen fixation, you were introduced to a set of “chemistry” known as the Haber Process. It was noted that this chemistry employs rather high ___ and ___ to force nitrogen and hydrogen together to form ammonia, a fixed form of nitrogen.
 - c. Your attention was also directed towards a group of bacteria of the genus, *Azotobacter*. These bacteria live in the ___ and can fix nitrogen under far less rigorous conditions because they possess ___ that allow them to do this.
 - d. What was the major value, noted in class, of enzymes to living organisms?