Biology 175

Exam 1

February 11, 1999

Name_____

Soc. Sec. # _____

TA _____

Part	points
I.	_____
II.	_____
III.	_____
IV.	_____
total	_____

Part I. Multiple choice. Circle the best answer. (2 points each)

1. The fundamental unit of all living matter is the
   a. atom
   b. cell
   c. molecule
   d. organelle

2. The cells have one major function in life. It is to
   a. metabolize nutrients
   b. degrade organic material
   c. reproduce themselves exactly
   d. ingest nutrients

3. Which of the following statements are false
   a. Sterilization time depends on the number of organisms at the start of the treatment
   b. Different microorganisms respond differently to different control methods
   c. Disinfection kills all microorganisms
   d. Filtration cannot separate spores from liquid solutions

4. The process of using bacteria to chew up and detoxify pollutants is termed
   a. bioremidiation
   b. recycling
   c. biofeedback
   d. detoxification

5. The biological catalysts, which are responsible for regulating the rate of chemical reactions of cells, are
   a. vitamins
   b. hormones

c. enzymes
d. minerals

6. The process, which insures that after cell division, both cells will have the same genetic information, is termed
   a. RNA transcription
   b. DNA replication
   c. Protein synthesis
   d. Ribosome formation

7. DNA and RNA share many features but differ in a number of ways. Which of the following is true of DNA but not RNA
   a. contains nitrogen bases Adenine, Uracil, Guanine and Cytosine
   b. double stranded molecule
   c. functions in the cytoplasm of bacterial cells
   d. contains ribose sugar

8. The DNA site to which the repressor protein binds is the _____ region, and is part of the regulatory region of the gene.
   a. acceptor
   b. promotor
   c. repressor
   d. operator

9. The common type of gene transfer by gram- bacteria in which there must be cell-to cell contact is
   a. transduction
   b. transformation
   c. competency
   d. conjugation

10. In order to isolate an auxotrophic mutant you can use
   a. direct selection
   b. replica plating
   c. Ames test
   d. Pure culture technique

Part II. True/False Write true or false in space provided (2 pt each)

____ 1. Pili (fimbrae) are proteinaceous appendages usually involved in attachment of bacteria to surfaces or to themselves.

____ 2. All bacteria contain a cell wall.

____ 3. All prokaryotes are bacteria

____ 4. Proteins are composed of amino acids and vitamins.

____ 5. The gram-stain can be used to distinguish bacteria and eukaryotes.

____ 6. A light microscope can be used to observe viruses.

____ 7. Facultative anaerobic microorganisms die in the presence of oxygen.

____ 8. Genotypic changes are fixed and relatively stable in the population's environment.

____ 9. Plasmids are defined as extrachromosomal elements that contain antibiotic resistance genes.

____10. Antibiotic resistance among microorganisms develops as microbes mutate in response to increasingly sophisticated diseases.

____11. Ultraviolet radiation at the bacteriocidal wavelength destroy bacteria by denaturing proteins.

____ 12. Thermophilic microorganisms survive boiling temperatures because they form spores.

____ 13. Commercial sterilization cannot kill endospores.

____ 14.The origin of replication is where the mRNA polymerase binds

Part III. Short answer questions. Please answer in the space provided. Keep your answer brief and to the point!

1. Draw the structure of a flagellum anchored in the cell wall of a gram – bacterium. Name the major components of the flagellum as well as of the cell wall. (6 pt)

2. Why was the "pure culture technique", developed by Robert Koch, so crucial for curing many diseases? (3 pt)

3. 60% of the bacterial cytoplasmic membrane consists of proteins – name one major function for some of these proteins. (2 pt)
4. What is a major function of the cell wall and why can Mycoplasma survive without it? (3 pt)

5. Syphilis is caused by the spirochete *Treponema palidum*. Why were fevers induced in syphilis patients in order to the treatment of this disease? (2 pt)

6. Why is oxygen toxic to some organisms and what are these organisms called? (be specific) (4 pt)

7. Name three macromolecules that are present in all cells. (3 pt)

8. Why are viruses referred to as infectious agents? (2 pt)

9. Some organisms (bacteria) that are lacking flagella can move by _____.(2 pt)

10. What is the difference between an Hfr and an F^+ strain? (2 pt)

11. Why is it an advantage to have several genes under the same regulatory mechanism? (3 pt)

12. What is a frame shift mutation and why, if it is in an essential gene, is it more often lethal to the cells than a point mutation? (3 pt)

13. Why can translation and transcription not be coupled in eukaryotic cells? (2 pt)

Part IV. Thought questions:

1. In a laboratory a scientist is trying to identify the disease-causing agent from a sick mouse. He is culturing microorganisms from several parts of the body on rich agar medium plates under aerobic conditions, but when he reinfects healthy mice with pure cultures, none of them acquire the disease.

a. Propose at least three different possibilities why he is unsuccessful in identifying the right causative agent. (3 pt)

2. A doctor is treating a coughing patient with antibiotics after very superficial check-up. The treatment does not work. Name three possible reasons why the antibiotic treatment might have failed. (3 pt)

3. A scientist tries to understand the role pili play in the invasion of bacteria into eukaryotic cells. He has bacteria, which have a mutation in one of the genes that encode a pilus protein and which do not confer the disease. When he mixes these mutant cells with heat killed cells that produced pili he again gets invasion of the cells. Describe what happened using scientific terms. (5 pt)

4. For a laboratory exercise you get a mixed culture containing photoautotrophic, chemoautotrophic, and chemoheterotrophic microorganisms. How would you identify and isolate the individual cultures? (7 pt)