BioSc221/325 Exam 1 Name _____

**Multiple choice.** (1 point each) Choose the one best answer to each of the following questions.

____ Which of the following are made up of prokaryotic cells?

A. Bacteria and fungi
B. Archaea and fungi
C. Protozoa and animals
D. Bacteria and archaea

____ The ultimate limit of what we are able to see with a microscope is defined by __.

A. magnification
B. resolution
C. light intensity
D. visual acuity

____ When the oil-immersion lens is used __.

A. light rays are scattered so unnecessary background material is not seen.
B. light rays are concentrated by minimizing refraction to increase clarify
C. objects are held in place on the microscope slide
D. magnification of objects is increased about ten-fold

____ In general, eukaryotic cells are __.

A. larger than prokaryotic cells
B. smaller than prokaryotic cells
C. about the same size a prokaryotic cells
D. not physiologically comparable to prokaryotic cells and therefore eukaryotic and prokaryotic cell sizes should not be compared either

____ Which of the following statements accurately describes membrane linkages?

A. Eubacteria have ester linkages; Archaea have ether linkages.
B. Archaea have ester linkages; Eukarya have ether linkages.
C. Eukarya have ester linkages; Eubacteria have ether linkages.
D. Eubacteria and Eukarya have ester linkages; Archaea linkages are not known.

____ The periplasm is a(n) __.

A. Part of the outer cell membrane of gram negative organisms.
B. Part of the inner cell membrane of gram negative organisms.
C. Space between the cytoplasmic membrane and the outer membrane layers.
D. Alternate names for the inner cell membrane of any prokaryotic cell.

____ Pseudopeptidoglycan is a characteristic of the walls of __.

A. Eubacterial prokaryotic cells.
B. Eukaryotic cells.
C. Archaean prokaryotic cells.
D. Eubacterial and Archaean prokaryotic cells.

____ Which of the following statements is false?

A. The flagellar protein subunit is flagellin.
B. In flagellar motion, the basal body acts as a motor.
C. Flagella rotate at a constant speed and in a constant direction.
D. The hook is the wider region between the basal body and the filament.

____ The membrane of a gas vesicle is composed of __.

A. various phospholipids
B. both glycoproteins and phospholipids
C. carbohydrate
D. protein

_____ __ is found only in the cell wall of gram-positive bacteria.

A. porins
B. *N*-acetyltalosaminuronic acid
C. lipopolysaccharide
D. teichoic acid

_____ Penicillin can kill bacteria because it interferes with __.

A. transpeptidation
B. integrity of the β-1,4 linkage between NAM and NAG
C. cell membrane selective permeability
D. all of the above

_____ Which of the following types of optics would provide the greatest contrast and best reveal the sub-cellular structural detail for observing the bacterial cell?

A. bright field
B. dark field
C. phase contrast

____ Bacteria in which the flagella are distributed as tufts at one end of the cell are described as __ .

A. lophotrichously flagellated.
B. peritrichously flagellated.
C. polarly flagellated.
D. amphitrichously flagellated

_____ Which of the following is a component of pseudomurein?

A. *N*-acetylmuramic acid
B. *N*-acetyltalosaminuronic acit
C. Diaminopimelic acid
D. Lysine

_____ Which of the following discovered that medical students were responsible for many cases of child-bed fever due to the fact that they did not wash their hands between their dissection class and their work in the maternity ward?

A. John Snow
B. Robert Koch
C. Joseph Lister
D. Ignaz Semmelweis

_____ Which of the following was one of the first to use an epidemiological approach to solving a disease outbreak when he identified a specific water pump as the source of a cholera epidemic in London?

A. John Snow
B. Robert Koch
C. Joseph Lister
D. Ignaz Semmelweis

_____ Which of the following identified the causative agents of such deadly diseases as anthrax and tuberculosis?

A. John Snow
B. Robert Koch
C. Joseph Lister
D. Ignaz Semmelweis

_____ Which of the following used carbolic acid to disinfect surgical wounds and made surgery a much safer procedure due to the decrease in patients dying of infected surgical wounds.

A. John Snow
B. Robert Koch
C. Joseph Lister
D. Ignaz Semmelweis

_____ Which of the following areas of microbiology was <u>not</u> a major research interest of Louis Pasteur?

A. fermentation
B. vaccine production
C. nitrogen fixation
D. sterilization

____ Cocci arranged in "grape-like" clusters are known as __ .

A. streptococci
B. staphylococci
C. sarcinae
D. micrococci

____ Lipopolysaccharide (LPS) is associated with __ .

A. The outer membrane of Gram positive bacteria.
B. The outer membrane of Gram negative bacteria.
C. The cytoplasmic membrane of Gram positive bacteria.
D. The cytoplasmic membrane of Gram negative bacteria.

____ Which of the following genera consists of endospore forming bacteria?

A. *Bacillus*
B. *Streptococcus*
C. *Saccharomyces*
D. *Escherichia*

____ Which of the following is <u>not</u> a characteristic of certain thermophilic bacteria that enables them to survive growth at high temperatures.

A. heat stable enzymes
B. extra thick peptidoglycan layer
C. high G+C content of chromosomal DNA
D. lipids rich in saturated fatty acids
E. membranes containing $C_{40}$ hydrocarbons instead of fatty acids

____ When doing a colony count __.

A. It is assumed that each colony arose from only one organism.
B. Only viable cells are counted
C. The medium must be suitable for colonial growth
D. All of the above

____ When water activity is low, an organism must __

A. Increase its internal solute concentration.
B. Increase its external solute concentration.
C. Decrease its internal solute concentration.
D. Decrease its external solute concentration.

____ ____ are applied to living tissues; ____ are used on inanimate objects.

A. Disinfectants / sterilants
B. Antiseptics / steriliants
C. Antiseptics / disinfectants
D. Disinfectants / sterilants

**Matching.** (1 point each) Match the definition in the left column with the appropriate term in the right column. Note, not all terms will be used.

| | |
|---|---|
| ____ Structures that provide buoyancy for prokaryotic cells | A. Autolysin |
| ____ Process which involves several cycles of gentle heating ($65^{o}$C) and cooling. | B. Catalase |
| ____ Chemist who ultimately disproved spontaneous generation. | C. Compatible solutes |
| ____ Another name for peptidoglycan | D. Diaminopimelic acid |
| ____ Molecule found in high concentrations in endospores | E. Dipicolinic acid |
| ____ Proteins that form channels in the outer membranes of gram-negative bacteria. | F. Gas vesicles |
| ____ Fiber like structures on the surface of bacteria that aid in attachment to surfaces. | G. Generation time |
| ____ Amino acid found in the pentapeptide of the peptidoglycan of all gram-negative bacteria. | H. Loewenhook |
| ____ Bacterial carbon and energy storage polymer used to make biodegradable plastics | I. Lysine |
| ____ Bacterial cell which has lost its peptidoglycan layer but remains intact | J. Lysozyme |
| ____ Enzyme found in saliva that cleaves the β-1,4 linkage of the peptidoglycan layer. | K. Murein |
| ____ The wall formed during prokaryotic cellular division | L. Niedham |
| ____ The time required for the formation of two cells from one. | M. Pasteur |
| ____ Molecules found in halophiles that protect them from the low water activity of their environment. | N. Pasteurization |
| ____ Enzyme that protects bacteria from damage caused by hydrogen peroxide. | O. Periplasm |
| ____ Molecules found associated with the peptidoglycan of gram-positive bacteria. | P. Pili |
| | Q. Poly-β-hydroxyalkanoates |
| | R. Porins |
| | S. Protoplast |
| | T. Septum |
| | U. Superoxide dismutase |
| | V. Teichoic acids |
| | W. Tyndalization |

**Short answer.** (1 point each)

What is chemotaxis?

How does a random-walk lead to movement in a general direction such as toward oxygen as seen during chemotaxis?

What is the difference between a psychrophilic and a psychrotolerant organism?

The _____ stain is an example of a differential stain.

A bacterium that has an optimal growth temperature of 30$^{o}$C would be described as a _____.

A _____ antibiotic would inhibit the growth of a bacterium but not kill it.

The _____ antibiotics are the most important clinical antibiotics.

Name two forms of oxygen that are toxic to living organisms.

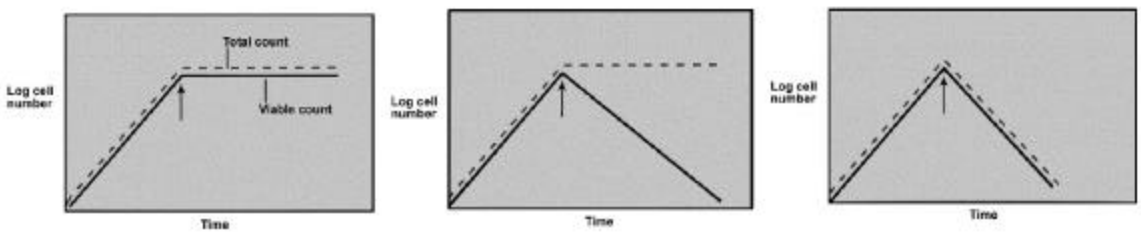
Microbes such as *Deinococcus radiodurams* that are able to survive high levels of radiation exposure probably possess what type of protective mechanism?

List two characteristics of endospores that make them resistant to normally deadly environmental conditions.

What are the three stages of regeneration of a vegetative cell from an endospore?

List two ways in which bacterial growth and death are similar?

Indicate which of the following curves illustrates the activity of a bacteriocidal, bacteriostatic and bacteriolytic agent.




_____ _____ _____

**Short Essay Questions.** Please answer 3 of the following 4 short essay questions (5 points each - 5 bonus points possible for answering all 4 questions)

Draw a bacterial growth curve that plots optical density (Absorbance at 600 nm) versus time over a period of several days. Assume that a bacterial culture was allowed to grow to saturation and for several days and then inoculated into fresh medium. Be sure to label the axis, indicate the phases of the growth curve and explain what is happening during each phase.

Describe the process of peptidoglycan synthesis.

Describe how thioglycolate medium is used to determine the relationship of an organism to oxygen. Explain the function of the various key ingredients of the thioglycolate medium. Describe the growth pattern you would expect to observe for a strict aerobe, strict anaerobe, facultative and microaerophilic organism (a drawing would be sufficient).

Explain the difference between sterilization, disinfection and sanitization. Give one example of each type of treatment and how each treatment affects bacteria (if at all).