Name: _____ Last 4 of WSU ID #: ___ ___ ___ ___

General Instructions:

- On this question packet, please fill out your name and the last 4 digits of your WSU ID # above. **If either of these is missing, you will lose 2 points.**
- On your Scantron sheet, please fill out the name portion, starting with your "**last**" name, followed by a space, followed by your "**first**" name. Please fill in the corresponding marks for each letter of your name. In the "Identification Number" field, fill in the **last 4 digits** of your numerical WSU ID number and the corresponding marks. **If any of these is incorrect, you will lose 2 points.**
- In the "K" column under "Special Codes", fill in the number (both in writing and the appropriate mark) corresponding to your version of the exam. **Your exam version number is: #1.**
- This exam has **95** possible points using **58** points from **29** multiple choice questions and **37** points from fill-in/short answer questions. **5 "extra"** points are available.
- You have 75 minutes to complete the exam. **Make sure you read every page.**
- Read the **entire** question and **all** the answers. Select the **best** possible multiple choice answer and mark your Scantron sheet. These scanned sheets will be graded separately from the fill-in answers on your question pages. Answers to multiple choice questions on your question packet **do not** count – sorry! **If you are still filling in your Scantron sheet when the class period is over, you will earn a zero on the Scantron portion.**
- For fill-in and short answer questions, please **write legibly** on the question pages. If we cannot read it, you cannot get credit for it. Use only the space available.
- When you complete the exam, place your Scantron sheet inside the exam question packet. Turn in your Scantron sheet within these question pages. We will sort the exam accordingly for grading.
- Exam keys and grades will be posted on the course's Blackboard site after all students have completed the exam. Please uphold academic integrity and do not discuss the exam with students who have not taken it.

I. Multiple Choice: Each question is worth 2 points (58 points total).

For multiple choice questions, answer on your Scantron sheet, beginning with #1.

1. The second in-class activity asked you to group microbes on the basis of shared characteristics. Which of the following represents a "correct" grouping?
   a. *Penicillium chrysogenum* and Strain 121 (*Geogemma barossii*) can be grouped together because neither is a bacterium.
   b. *Clostridium perfringens* and *Bacillus anthracis* can be grouped together because they do not form endospores.
   c. *Bacillus anthracis* and Strain 121 can be grouped together because they are both cocci.
   d. All of (a.), (b.), and (c.) above are correct.
   e. Only (b.) and (c.) above are correct.

2. Under ideal conditions, the doubling time of *Clostridium perfrigens* is as little as 10 minutes. If you start a liquid culture of *C. perfringens* under ideal conditions at 8 AM, you will have approximately 8 times the number of colony-forming units (CFU) at:
   a. 8:10 AM.
   b. 8:30 AM.
   c. 9:00 AM.
   d. 8:20 AM.
   e. 8:40 AM.

3. Diseases believed to be caused by prions include:
   a. Bovine spongiform encephalopathy (BSE).
   b. Chronic wasting disease (CWD).
   c. Pneumonia.
   d. All of (a.), (b.), and (c.) above are correct.
   e. Only (a.) and (b.) above are correct.

4. In prokaryotes:
   a. Chromosomal DNA is found in the nucleus while plasmid DNA is not.
   b. Plasmids are generally thousands of bases in size while genomic DNA is generally millions of bases in size.
   c. Plasmids are always present while chromosomal DNA is only sometimes present.
   d. Plasmids are always linear while chromosomal DNA is not linear.
   e. Plasmids contain prophages while chromosomal DNA does not contain prophages.

5. Pili/fimbriae may be used for:
   a. Photosynthesis.
   b. Motility.
   c. Prophage formation.
   d. Sticking to surfaces.
   e. Only (b.) and (d.) above are correct.

6. John Tyndall experienced major difficulties when he tried to repeat Louis Pasteur's experiments with the swan-necked flask. The microbes contaminating Tyndall's media that were not present in Pasteur's media could have included:
   a. Strain 121 (*Geogemma barossii*).
   b. *Bacillus anthracis*.
   c. *Treponema pallidum*.
   d. *Anabaena spiroides*.
   e. Maggots.

7. Of the following, ____ will resolve the smallest objects.
   a. The human eye.
   b. Scanning electron microscopy (SEM).
   c. Bright-field light microscopy.
   d. Robert Hooke's microscope.
   e. Atomic force microscopy (AFM).

8. A drawback of spectrophotometry is that you normally need at least ___ colony-forming units (CFU)/mL of culture for detection.
   a. 0.1
   b. 10^8
   c. 10^7
   d. 1
   e. 1000

9. Viroids:
   a. Are usually associated with plants.
   b. Spread by misfolding other viroids.
   c. Can be enveloped or non-enveloped (naked).
   d. Cause neurological diseases including Alzheimer's.
   e. Are made of a protein coat and nucleic acid.

10. In a closed system of bacterial growth, ___ phase occurs before ___ phase.
   a. Death; late log (exponential).
   b. Stationary; early log (exponential).
   c. Early log (exponential); lag.
   d. Lag; death.
   e. Late log (exponential); lag.

11. Thylakoid membranes are most likely to be found in:
   a. Some phototrophs.
   b. All chemotrophs.
   c. Fungi.
   d. Viroids.
   e. Pathogens.

12. Reactive oxygen species (ROS) include:
   a. Molecular oxygen (O_2).
   b. Hydroxyl radical (HO·).
   c. Water.
   d. Superoxide radical (O_2^{-}).
   e. Only (b.) and (d.) above are correct.

13. Samples treated only with simple stains are usually viewed using:
   a. Nuclear magnetic resonance (NMR) spectroscopy.
   b. Transmission electron microscopy (TEM).
   c. Scanning electron microscopy (SEM).
   d. Atomic force microscopy (AFM).
   e. Bright-field microscopy.

14. ___ is found as part of the cellular envelope in ____.
   a. Lipopolysaccharide (LPS); Gram-positive bacteria.
   b. Porins; archaea.
   c. N-acetylmuramic acid (NAM); some archaea.
   d. Teichoic acids; Gram-positive bacteria.
   e. Both (c.) and (d.) are correct.

15. One disadvantage of electron microscopy is:
   a. It requires very large, very expensive magnets.
   b. It can only be used to observe the outside of a microbe of interest.
   c. Of the technologies discussed in class, it has the worst (lowest) resolving power/resolution.
   d. It cannot be used to view live samples.
   e. It can only be used to obtain structures for relatively small items such as proteins.