

Name: _____

Last 4 Digits of WSU ID #: _____

**General Instructions:**

- If you do **NOT** follow instructions located **ANYWHERE** on this exam, you will **LOSE** five points.
- On this question packet, please fill out your first and last name and the last 4 digits of your WSU ID # above.
- On your Scantron sheet, please fill out the name portion ("Last name," followed by a space, followed by "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. It does not matter whether you align your ID to the left or right.
- 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: #3.**
- This exam has **99** possible points using 64 points from 32 multiple choice questions (2 points each) and 35 points from fill-in/short answer questions.
- 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. The scanned sheet 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!** **If you are still filling in your Scantron after the exam has ended, you will earn a ZERO for the Scantron portion.** Please write legibly. If I cannot read it, you will not earn credit for it. Use only the space available.
- When you complete the exam, place your Scantron inside the exam question sheets and turn in the entire packet. 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. **Make-ups are scheduled.**

I. Multiple Choice: 32 questions worth a total of 64 points. Please answer on your Scantron sheet beginning with #1.

1. Antibiotics are usually recommended to treat infections caused by:
 - A. Influenza.
 - B. *Escherichia coli* O157:H7.
 - C. Ebola.
 - D. *Treponema pallidum*.
 - E. All of (a.) – (d.) above are correct; antibiotics are usually used to treat all of these infections.
2. The correct order of bacterial growth phases in a closed system from beginning to end is:
 - A. Lag, early log/exponential, stationary, death, late log/exponential.
 - B. Early log/exponential, late log/exponential, stationary, lag, death.
 - C. Death, stationary, late log/exponential, early log/exponential, lag.
 - D. Lag, early log/exponential, late log/exponential, stationary, death.
 - E. Early log/exponential, late log/exponential, lag, death, stationary.
3. Many lactic acid bacteria such as *Lactobacilli*, *Lactococci*, and *Streptococci* are:
 - A. Aerotolerant anaerobes.
 - B. Obligate fermenters.
 - C. Normal human flora.
 - D. All of (A.), (B.), and (C.) above are correct.
 - E. Only (A.) and (C.) above are correct.

4. Facultative anaerobes:
 - A. Cannot tolerate environmental levels of oxygen but need to respire aerobically.
 - B. Are able to respire anaerobically and/or ferment.
 - C. Include *Bacillus anthracis*, *Escherichia coli*, and *Staphylococcus aureus*.
 - D. Both (A.) and (C.) above are correct.
 - E. Both (B.) and (C.) above are correct.

5. ___ is an obligate aerobe because _____.
 - A. *Mycobacterium tuberculosis*; it produces oxygen during photosynthesis.
 - B. *Neisseria gonorrhoeae*; it only respire aerobically.
 - C. *Prochlorococcus marinus*; it produces oxygen during photosynthesis.
 - D. All of (A.), (B.), and (C.) above are correct.
 - E. Only (B.) and (C.) above are correct.

6. ___ contributed to microbiology by _____.
 - A. John Snow; using arsenic to treat syphilis patients.
 - B. Sergei Winogradsky; discovering penicillin.
 - C. Alexander Fleming; working with aquatic microbes.
 - D. Paul Ehrlich; testing antibiotics on his children.
 - E. Tu You-You; isolating artemisinin.

7. *Lactobacillus acidophilus* is an extremeophile with respect to:
 - A. Optimal pH.
 - B. Optimal temperature.
 - C. Use of and response to oxygen.
 - D. All of (A.), (B.), and (C.) above are correct.
 - E. Only (A.) and (C.) above are correct.

8. Strict/obligate anaerobes:
 - A. Have high levels of superoxide dismutase (SOD), catalase, and/or peroxidase.
 - B. Always form endospores.
 - C. Either ferment or respire anaerobically.
 - D. Include many *Clostridia* species.
 - E. Both (C.) and (D.) above are correct.

9. Quorum sensing:
 - A. Begins during lag phase.
 - B. Is important for biofilm formation.
 - C. Is a mechanism for destroying reactive oxygen species (ROS).
 - D. Only occurs among Gram-positive bacteria.
 - E. Is a mechanism that allows microbes to elect a new leader.

10. The typical minimum infectious dose (MID) of:
 - A. *Escherichia coli* O157:H7 is less than *Bacillus anthracis*.
 - B. *Treponema pallidum* is less than *Escherichia coli* O157:H7.
 - C. *Vibrio cholerae* is greater than *Treponema pallidum*.
 - D. All of (A.), (B.), and (C.) above are correct.
 - E. Only (A.) and (C.) above are correct.

11. When an agricultural worker spreads viroids among his crops using farming tools, the worker can be considered a(n) _____, and the tools can be considered _____.
 - A. Biological vector; fomites.
 - B. Zoonotic reservoir; environmental reservoirs.
 - C. Asymptomatic carrier; mechanical vectors.
 - D. Mechanical vector; fomites.
 - E. Opportunistic pathogen; mechanical vectors.
12. Liquid water was recently found on Mars. Considering in-class discussion about this discovery, which of the following classifications of microbes are likely to (have) live(d) on Mars?
 - A. Mesophilic neutralophiles.
 - B. Cryophilic/psychrophilic chemoautolithotrophs.
 - C. Obligate aerobes.
 - D. All of (A.), (B.), and (C.) above are correct.
 - E. Only (A.) and (C.) above are correct.
13. Some alkaliphilic soil Gram-positive bacilli use _____, which allow(s) them to _____.
 - A. Annamox; assimilate nitrate (NO_3^-).
 - B. Nitrogenase; fix carbon dioxide (CO_2).
 - C. Ureases; precipitate calcium carbonate (CaCO_3).
 - D. Flagella; form biofilms.
 - E. Flavonoids; differentiate into bacteroids within plant root cells.
14. Within the termite gut:
 - A. Methanotrophs make methane.
 - B. Large and small Gram-positive spirochetes provide *Mixotricha paradoxa* with motility.
 - C. Bacterial endosymbionts catabolize cellulose, forming carbon dioxide (CO_2) and hydrogen gas (H_2) that allow termites to respire anaerobically.
 - D. *Mixotricha paradoxa*, bacteria, and archaea interact in mutualistic syntrophy to catabolize cellulose.
 - E. The termite supplies acetate to aerobically-respiring bacteria.
15. Which of the following statements about antigenic shift is correct?
 - A. Antigenic shift only occurs in non-enveloped viruses.
 - B. Antigenic shift results from the lack of fidelity of the ribosome.
 - C. Antigenic shift involves the reassortment and recombination of genome segments from different strains to form new strains.
 - D. Antigenic shift involves the packaging of fewer or more genome segments compared with the original strain to form new strains.
 - E. Antigenic shift occurs in rhinovirus (the "common cold").
16. Reactive oxygen species (ROS) include:
 - A. Molecular oxygen (O_2).
 - B. Hydroxyl radical ($\cdot\text{OH}$).
 - C. Hydrogen peroxide (H_2O_2).
 - D. All of (A.), (B.), and (C.) above are correct.
 - E. Only (B.) and (C.) above are correct.