# TABLE OF CONTENTS

I. Introduction
   ........................................................................................................................................ 3

II. The Job
   ........................................................................................................................................ 3

   The Examination .................................................................................................................. 3

   How The Written Examination Was Developed .................................................................. 3

V. What To Do Before You Come To Take The Examination .............................................. 5

I. How To Prepare Using This Guide .................................................................................... 6

VII. Sample Test Questions .................................................................................................... 7

Section I. Ability to Perform Scientific Calculations/Knowledge of Algebra/Metric System .... 7

Section II. Read and Comprehend Technical Documents .................................................... 8

Section III. Knowledge of Biology/Microbiology/Biochemistry ........................................ 10

Section IV. Knowledge of Serology .................................................................................... 11

Section V. Knowledge of Virology .................................................................................... 12

Section VI. Knowledge of Microscopy .............................................................................. 13

Section VII. Knowledge of Basic Lab Procedures/Protocols ............................................. 14

VIII. Banded Scoring ........................................................................................................... 16

IX. Frequently Asked Questions ......................................................................................... 18
I. Introduction

A written examination is being given in order to establish a register for the classification of Microbiologist. The purpose of this booklet is to help you prepare for the written exam. Since all the material you will need to take the exam will be provided at test administration, you will not be allowed to bring this booklet to the exam with you.

II. The Job

Microbiologist positions are with the Department of Public Health, Bureau of Clinical Laboratories and Department of Agriculture and Industries, Animal Industry Division Diagnostic Laboratories.

The Department of Public Health Bureau of Clinical Laboratories provides testing for diseases of public health significance; offer diagnostic capabilities unavailable in the private sector; provide private laboratories with reference services; administer regulations; provide education services; institute new testing procedures; and provide data to agencies. The clinical laboratory system consists of the central laboratory at Montgomery and a regional laboratory at Mobile.

Positions with the Department of Agriculture and Industries are part of the Animal Industry Division Diagnostic Laboratories. The diagnostic laboratories identify and investigate diseases of livestock, poultry, wildlife, and companion animals. The laboratories perform special tests not provided at most veterinary practices. The diagnostic laboratory system comprises a central reference laboratory at Auburn and satellite laboratories at Elba, Boaz, and Hanceville.

Positions within this classification perform a variety of standard microbiology and chemical tests and microscopic examinations according to established procedures. Entry-level employees work under direct supervision but as employees gain knowledge and greater expertise, they are assigned progressively more complex duties and are afforded greater independence. Work is usually performed under general supervision from a lab supervisor or manager.

III. The Examination

The examination for this classification is a multiple-choice exam. A multiple-choice exam is designed to measure specific knowledges and abilities. The test is divided into seven sections with each section measuring a different knowledge or ability. Applicants are presented with a test question and four possible responses to that question. Applicants then select the BEST possible response to the question.

During the exam, you will be required to respond to approximately 76 questions regarding seven topics. These topics include scientific calculations/algebra/metric system, reading and comprehending technical documents, biology/microbiology/biochemistry, serology, virology, microscopy, and basic lab procedures/protocols. You will have 3 hours to respond to the items.

IV. How The Written Examination Was Developed

A study of the Microbiologist classification was conducted before developing the examination. A number of employees who work in this position and their supervisors participated in this study. Incumbents and supervisors determined what job duties are performed by Microbiologists and what knowledges and abilities a Microbiologist must possess in order to perform these job duties.

When the study was completed, the results showed that a new employee in the position of Microbiologist must be able to perform the activity listed below.
• Prepares materials needed for testing using autoclave, hot water bath, filter sterilization, pH meter, media plates, test tubes, volumetric and graduated cylinders following procedures manuals and manufacturers inserts in order to ensure quality and quantity of materials for testing

The study also showed that the following abilities are associated with the above activity. A newly hired Microbiologist must possess the knowledges and abilities listed below on their first day of work before training.

• **Knowledge of the principles, practices, and equipment in the field of biochemistry to include safety practices as needed to conduct examinations and tests, provide technical assistance, and assist in training laboratory personnel**

• **Knowledge of the principles, practices, and equipment in the field of biology to include safety practices as needed to conduct examinations and tests, provide technical assistance, and assist in training laboratory personnel**

• **Knowledge of the principles, practices, and equipment in the field of microbiology to include safety practices as needed to conduct examinations and tests, provide technical assistance, and assist in training laboratory personnel**

• **Knowledge of the principles, practices, and equipment in the field of serology to include safety practices as needed to conduct examinations and tests, provide technical assistance, and assist in training laboratory personnel**

• **Knowledge of the principles, practices, and equipment in the field of virology to include safety practices as needed to conduct examinations and tests, provide technical assistance, and assist in training laboratory personnel**

• **Knowledge of microscopy to include safe handling operations as needed to observe laboratory specimens**

• **Knowledge of basic lab procedures/protocols such as inoculation, thermometer, aseptic techniques, centrifuge, balance, and sterile practices as needed to examine, observe, and test laboratory specimens**

• **Knowledge of algebra as needed to conduct tests and examinations and provide technical assistance**

• **Knowledge of the metric system as needed to perform assigned laboratory tasks that require the use of volume, capacity, and mass measurements**

• **Ability to make judgements as needed to draw conclusions, interpret results, and determine quality of sample**

• **Ability to operate basic growth apparatuses such as an incubator as needed to prepare and process specimens for testing**

• **Ability to operate basic laboratory mixing apparatuses such as blender/stomacher, sonicator, and vortex as needed to prepare and process specimens for testing**

• **Ability to operate basic laboratory separation apparatuses such as centrifuges as needed to prepare and process specimens for testing**
• Ability to operate various microscopes such as bright field, dark field, fluorescent, phase contrast, and dissection as needed to conduct examinations of laboratory specimens

• Ability to perform scientific calculations such as conversions, percentage, and statistical analysis as needed in preparation testing and analysis of specimens

• Ability to read and comprehend technical documents such as laboratory workshop manuals, laboratories protocols as needed to conduct laboratory test and examinations, interpret test results, ensure compliance with rules and regulations, and gain knowledge and understanding

The examination for Microbiologist will measure the two abilities and nine knowledge statements that appear in bold print at the beginning of this list on the previous page. The remaining abilities cannot be measured by a written test and must be demonstrated during the probationary period if you are hired as a Microbiologist.

V. What To Do Before You Come To Take The Examination

Here are some suggestions for what to do before the examination and for getting to the exam location on the correct day, on time, and with the proper materials that you will need to take the examination.

➢ Get there early. Give yourself plenty of extra time to get to the test center and to park. If you are rushed and late, you will be upset when you get there. Plan to get there before the scheduled exam time.

➢ Do not bring this booklet or any study materials with you to the exam location. This includes notes and any manuals and source documents that you may have used to prepare for the examination. All test materials needed for the examination will be provided.

➢ You must bring the test-scheduling card that you received from the State of Alabama Personnel Department. This card lists the examination title, location of exam, and date, day, and time of examination.

➢ You must bring two sharpened #2 lead pencils.

➢ You must also bring picture identification to the exam location. This may be your driver's license, a military identification card, or a passport.

➢ You may use a calculator for the Microbiologist examination. Small solar powered or battery operated calculators that perform basic functions such as addition, subtraction, multiplication, division, square roots, or percentages are allowed. Calculators that plug-in, utilize tape, have word processing, spelling, thesauruses, or other storage and retrieval capabilities (except basic memory functions), are not allowed. Calculators that are a feature on a cell phone are not permitted. Calculators are subject to inspection by exam monitors. Applicants may not borrow or share calculators at the exam site.
TEST TAKING TIPS

- **Listen** to the test monitors and follow their instructions carefully.
- **If you are not sure of an answer, go with your first choice.**
- Work through the test **without spending too much time on any one item.**
- If you cannot decide on the best answer to a question, **skip it and go back to it later.**
- Use your watch or the clock in the room to **keep track of your time** during the test.
- It's to your advantage to **answer as many questions as possible,** even if you must guess.
- **Mark your answers on the answer sheet and NOT in the test booklet.** Only answers clearly marked on the answer sheet can be given credit.
- **If at any time before or during the exam, you have a question, ask the monitor for assistance.**

VI. **How To Prepare Using This Guide**

This Pretest Booklet can be used as a practice guide. The questions contained in the booklet are a representation of questions that will be similar to those on the actual examination. Familiarize yourself with the sample questions that begin on page 9. You would be well-advised to read the instructions and answer each question carefully. Like the examination questions (all of which are multiple choice), the sample items are presented in the following categories:

- **Section I.** Ability to Perform Scientific Calculations
  - Knowledge of Algebra
  - Knowledge of Metric System
- **Section II.** Ability to Read and Comprehend Technical Documents
- **Section III.** Knowledge of Biology
  - Knowledge of Microbiology
  - Knowledge of Biochemistry
- **Section IV.** Knowledge of Serology
- **Section V.** Knowledge of Virology
- **Section VI.** Knowledge of Microscopy
- **Section VII.** Knowledge of Basic Lab Procedures/Protocols

The sample items which follow are representative of each type of item that will appear on the exam. They are not necessarily based on the same information, diagrams, etc., as the actual exam. All questions will be multiple choice.

In addition, please review the **General Instructions to Candidates Taking Written Examinations** provided at the exam site on the day of the test.
VII. Sample Test Questions

Section I. Ability to Perform Scientific Calculations/Knowledge of Algebra/Metric System

Use the following conversion formula to answer question 1
2.54 centimeters = 1 inch
1 kilogram = 2.205 pounds

1. How would a man who is 200 cm tall and weighs 90 kg most accurately be classified?
   A. Fat
   B. Short
   C. Tall
   D. Skinny

2. To dilute 10X wash concentrate 1:10 with distilled water, what amounts should be used?
   A. 30 ml of concentrate and 270 ml distilled water
   B. 50 ml of concentrate and 300 ml distilled water
   C. 40 ml of concentrate and 250 ml distilled water
   D. 100 ml of concentrate and 100 ml distilled water

3. In a multiple dilution series, 20 mL of antisera and 80 ml of diluent are mixed in tube 1. From tube 1, 10 mL is taken and placed into 40 mL of diluent in tube 2. What is the final dilution in tube 2?
   A. 1/5
   B. 1/25
   C. 1/20
   D. 1/30

4. 20.0 mL of a 2.00 M solution are diluted to 100 mL in a 100 mL volumetric flask. What is the concentration of the new solution?
   A. 0.4 M
   B. 1.0 M
   C. 1.6 M
   D. 0.2 M

5. Fifty milliliters of pond H\textsubscript{2}O is filtered through a sterile 0.45 μm pore filter. The filter is incubated on media and 7 colonies are present the next day. The standard method for reporting Water Quality counts is Colony Forming Units (CFUs) per 100 ml. How many colonies will be reported in this instance?
   A. 50 CFU/mL
   B. 7 CFU/100 mL
   C. 0.45 CFU/100 mL
   D. 14 CFU/100 mL
Section II. Read and Comprehend Technical Documents

Laboratory Safety

One of the basic prerequisites to working safely in the lab is to know as much as possible about the substances, processes and equipment being used. In fact, you have a right to know, under the Laboratory Safety Standard about the hazardous substances you use. There are a variety of resources available to you for lab safety information, including:

• Bench Supervisor - Should inform you about the Chemical Hygiene Plan, and the hazards/safety precautions for all lab activities you will be conducting or supervising.

Chemical Hygiene Plan - Each lab supervisor (Chemical Hygiene Officer) must have and share with their employees their lab-specific Chemical Hygiene Plan. It should provide the basic procedures and resources necessary for effective chemical safety information and training.

• Hazard Communication Coordinator (HCC) - Each department has an HCC to assist you in answering general safety questions about your department, obtaining MSDS and acting as liaison to EH&S.

Material Safety Data Sheets (MSDS) - are chemical information forms which manufacturers of hazardous substances must make available to those who purchase their products.

• Reference Books/Videos - a list of recommended safety references and videos are available from your supervisor. The reference books may be available in your department or the library, or they can be used by employees for research at the EH&S office. The videos listed are available on a free five-day rental basis from EH&S (x3766).

• EH&S Staff - Environmental Health & Safety can provide information or help answer questions about many safety-related issues. Call x7534 for further information.

The Occupational Safety and Training Division can provide educational materials and other training aids/courses. A summary of the regular training programs provided by EH&S is available upon request. Some courses/materials are already prepared or on hand and can be obtained by calling EH&S. Other needs may not be available through EH&S, but can typically be arranged through this office. Special rates may also be available through EH&S. Call x3766 for additional information.

6. According to the above passage, the Hazard Communication Coordinator is responsible for

A. Responding to safety questions, obtaining Material Safety Data Sheets and acting as liaison to EH&S.
B. Communicating procedures and sharing resources on chemical protection information and training.
C. Providing laboratory safety educational materials and other training aids/courses.
D. Coordinating the activities of the Occupational Safety and Training Division.

7. Safety videos are available from the

A. Environmental Health & Safety Staff.
B. bench supervisor.
C. Occupational Safety and Training Division.
D. Hazard Communication Coordinator.
8. According to the above passage, general safety questions can be answered by

A. a member of the Environmental Health & Safety Staff.
B. the Hazard Communication Coordinator (HCC) for your department.
C. the Chemical Safety Officer of the Occupational Safety and Training Division.
D. the Laboratory’s Chemical Hygiene Officer.

9. Material Safety Data Sheets (MSDS) are distributed by the

A. Chemical Hygiene Officer.
B. manufacturer of the hazardous substance.
C. laboratory safety standard library.
D. Environmental Health & Safety office.

A question or statement follows two italicized sentences. Read each pair of sentences and then choose the best answer to the question or the best completion of the statement.

10. Personal protective equipment (PPE) is identified as the last means to achieve control due to the problem of accounting for human behavior and the inadequacy of the control itself.

Respirators will only be issued when it has been demonstrated that engineering controls are not feasible, effective, or appropriate, and all administrative controls have been evaluated and implemented or abandoned.

How are the two sentences related?

A. The first sentence contradicts the second.
B. The second sentence presents an event and the first sentence its consequences.
C. The second sentence illustrates the point made by the first sentence.
D. The first sentence explains the meaning of the second.

11. Plasma concentrations are monitored during drug therapy to optimize the dosage regimen of a drug in a patient.

The establishment of effective plasma concentrations (within the therapeutic range) will in most cases result in effective drug response.

What does the second sentence do?

A. It analyzes the statement made in the first.
B. It gives an example.
C. It restates the idea found in the first.
D. It states an effect.
Section III. Knowledge of Biology/Microbiology/Biochemistry

12. The organisms commonly used by public health workers to indicate the presence of intestinal pathogens in water are

A. bacillus.
B. parasites.
C. coliforms.
D. amoeba.

13. A solution containing nitric acid is inadvertently spilled on the laboratory countertop. Which would be best for a clean up?

A. neutral solution
B. acidic solution
C. salt solution
D. basic solution

14. The most prominent structure in the nucleus is

A. nucleolus.
B. nuclear pore.
C. nuclear membrane.
D. chromosome.

15. The branch of biology dealing with the identification and naming of organisms is called

A. Biological Diversity.
B. Taxonomy.
C. Binomial Nomenclature.
D. Phylogeny.

16. The highest category in the Linnaean system of classification is

A. class.
B. family.
C. phylum.
D. kingdom.
Section IV. Knowledge of Serology

17. A basic principle of serology is that for every antigen there is a specific
   A. antibody.
   B. antiserum.
   C. serum.
   D. enzyme.

18. In some serologic tests, the patient's blood is diluted several times, and each dilution tested. This procedure is commonly called
   A. agglutination.
   B. titration.
   C. complement fixation.
   D. serum neutralization.

19. A serologic test may detect the presence of
   A. antibodies (Ab) in a sample.
   B. antigens (Ag) in a sample.
   C. Both A and B
   D. Neither A nor B
Section V. Knowledge of Virology

20. What divisions in a Clinical Laboratory would HIV, Influenza, and Infectious Mononucleosis testing be performed?
   A. Microbiology, serology, and virology  
   B. Immunology, mycology, and serology  
   C. Microbiology, parasitology, and virology  
   D. Immunology, mycology, and parasitology

21. What is one component of all mammalian viruses?
   A. the envelope  
   B. the polymerase  
   C. the lipid  
   D. the nucleic acid

22. The following test determines the presence of infectious virus particles in a sample:
   A. hemagglutination Inhibition (HAI)  
   B. immunofluorescence or Fluorescence assays (IFA)  
   C. neutralization Test (NT)  
   D. complement Fixation Test (CF)

23. Which of the following conditions is caused by a virus?
   A. Tuberculosis  
   B. Lead Poisoning  
   C. Rabies  
   D. Phenylketonuria (PKU)
24. The magnification of objects observed through a 100x objective using a 7.5x eyepiece is
   A. 7.5x
   B. 750x
   C. 75x
   D. 7500x

25. You are studying an electron micrograph containing chloroplasts and mitochondria magnified 1,000 times. You use a metric ruler to determine the lengths of three chloroplasts to be 2.4, 2.6, and 2.8 mm. What is the average actual length of the chloroplasts?
   A. 26,000mm
   B. 0.026mm
   C. 0.0026mm
   D. 0.00026mm

26. Ordinary stained slides, such as the Gram stain, are enhanced by all of the following EXCEPT a
   A. 100x objective lens.
   B. fluorescence microscope.
   C. drop of oil.
   D. bright-field microscope.
Section VII. Knowledge of Basic Lab Procedures/Protocols

27. The substance used to rehydrate culture media is
   A. water.
   B. saline.
   C. milk.
   D. blood.

28. The average medium should be stored in the refrigerator to
   A. maintain an acid pH.
   B. avoid deterioration and dehydration.
   C. test for sterility.
   D. keep the medium sterile.

29. An autoclave is an instrument generally used in bacteriological laboratories for
   A. washing.
   B. staining.
   C. sterilization.
   D. growing of cultures.

30. The most effective way of cleaning the top of a laboratory table after finishing work with infectious bacteria is
   A. to wash it with warm water and a disinfectant.
   B. to scrub it with a wire brush and hot water.
   C. to flush it with clear water.
   D. to rub it well with an oiled cloth.
ANSWERS

Section I. Ability to Perform Scientific Calculations
Knowledge of Algebra
Knowledge of Metric System
1. C
2. A
3. B
4. A
5. D

Section II. Ability to Read and Comprehend Technical Documents
6. A
7. A
8. B
9. B
10. C
11. D

Section III. Knowledge of Biology, Microbiology, and Biochemistry
12. C
13. D
14. A
15. B
16. D

Section IV. Knowledge of Serology
17. A
18. B
19. C

Section V. Knowledge of Virology
20. A
21. D
22. C
23. C

Section VI. Knowledge of Microscopy
24. B
25. C
26. B

Section VII. Knowledge of Basic Lab Procedures/Protocols
27. A
28. B
29. C
30. A
VIII. Banded Scoring

When the written exam for Microbiologist is graded, the scores will be grouped into bands. When you receive notification of how you performed on the exam, you will not be given a numerical score (i.e., 67 out of 80, 93 out of 100). Rather, you will be informed into which band (i.e., 1, 3, 6, 10) your score fell. The following information is provided to help you understand the banding procedure.

What is banding?
Banding is one way to reduce the impact of fluctuations in test scores that do not provide meaningful information about differences in the ability to perform the job. One important purpose of testing is to identify the differences in test scores that reflect real differences among candidates. Banded scoring is a statistical procedure for grouping raw test scores that statistically are not meaningfully different from one another. In banded scoring, bands are set objectively and statistically. They are not manipulated arbitrarily.

Misconceptions about banding.
There are many misconceptions about banding and the use of banded scores. Some of the most common misconceptions are listed below. Each misconception is followed by a clarification.

Misconception: Each band should have the same number of people.
We do not force bands to be a certain size. The people in a band are similar to each other in that statistically there is no meaningful difference in their scores. Sometimes Band 1 may be very large, and at other times it may be small. People’s scores determine the size of the bands. We never know how many people will be in each band until we receive the test scores.

Misconception: Band numbers have no meaning. I don’t have a score.
Band numbers do have meaning. Think of a band as a group of tied scores. Consider that in school two students with average grades of 94.5 and 94.3 would both be grouped into the same band. Just because one student made a 94.5 and one student made a 94.3, the teacher cannot be sure that 0.2 of a point means that the student who scored 94.5 is smarter or is a better student. The scores are so close to each other that they are basically the same.

For example, think of the achievement tests that children take in school. The fine print on these tests always informs you not to focus on the numerical score but rather on the comparative score, which uses some type of grouping technique such as percentiles, stanines, standard deviations, grade levels, etc. These grouping techniques are considered forms of banding. Banding compares your performance on the test to the other test takers’ performance and groups your score with others that are statistically the same.

Misconception: Band numbers are the same as letter grades.
Band numbers are not the same as letter grades. Band 1 does not equate to an “A,” Band 2 to a “B,” and so on. In school, a predetermined numerical range of scores (i.e., 90-100, 80-90, 70-80) equals an alphabetical value (i.e., A, B, C). This grading system is a form of banding. In this case, unlike grade school, the width of bands is not set in advance. Scores are banded only in relation to one another, so you compete against other test takers. The scores of all test takers determine the width of the bands, and your score is set in relation to the scores of your peers.
**Misconception:** A banded score on one test has the same value as a banded score on another test.

Banded scores are test specific and cannot be compared from test to test. Consider that a test taker scored 88 on one test, and the highest score of all test takers was 89. It is likely for this exam that the test taker who scored 88 would be in Band 1. However, if the same person scored the same grade on another test, and the highest score of all test takers was 100, he/she may be in Band 2 or Band 3. Candidates’ scores vary on each test, and since candidate scores determine the width of bands and into which band test takers fall, the value of a banded score varies from test to test.

**Misconception:** People with the most seniority who have been on the job longest should be in the top bands.

People with the most experience do not always fall into the top bands. Time spent in a job may not be the same as possessing a knowledge, skill, or ability needed to perform the job. The people with the strongest knowledges, skills, and abilities (or who did best on the exam) will be in the top bands. Some of the people in the top bands will have been in similar jobs for a long period of time, and others will have been in similar jobs for a short period of time. Years of service do not always equal proficiency. Candidates with seniority or experience do not automatically perform best on the test. Regardless of seniority, candidates who display the appropriate knowledges, skills, and abilities perform best on the test.

**Misconception:** A standing in Band 4 or below automatically indicates failure or ineligibility for jobs.

A band number of 4 or lower is not automatically equated with failure. For one test, there may only be 4 bands, and for another test, there may be 14 bands. So, your success on the test based on your position in a band varies from test to test. Your standing in a band does not indicate whether or not you pass or fail the test. The true test of success in your employment opportunities is whether or not you can be certified and considered for a job vacancy.

**Misconception:** Banding replaced the “Rule of 10.”

Banding did not replace the “Rule of 10.” The “Rule of 10” determines the number of bands to be certified. In the past, tied scores referred to an actual numerical score (e.g., two candidates with a score of 98.98 were considered tied) while now all of the scores within a band are considered tied.

**Misconception:** People in a band do not differ.

When several people are placed in the same band, it does not mean that those people do not differ at all. Instead, it means that their scores on the exam do not differ enough to be separate scores.
IX. Frequenty Asked Questions

Are there any vacancies for the Microbiologist?
The State Personnel Department administers the Microbiologist exam on a continuous basis. Continuous means that applications are always accepted for that job class in order to fill expected or recurring vacancies. However, you may contact the personnel office of the Department of Public Health or Department of Agriculture and Industries to determine current or future vacancies.

How are vacancies filled for the Microbiologist?
The top ten applicants on the register are sent to the Department of Public Health or Department of Agriculture and Industries for consideration. Since the banded scoring process is used, all of the scores within a band are considered tied. Therefore, all names within a band are certified out to the agency, which may include more than 10 names. The names of people not selected stay on the register to be considered for future jobs. Persons are usually hired at the minimum of the pay range.

How long must I wait before I can take the examination again?
You may reapply for this job classification nine months from the date you were placed on the register.

How long will I remain eligible for appointment?
Since this is a continuous job classification, you will remain on the employment register for two years from the date you were placed on the register.

What is my rank on the employment register?
You may request your standing on-line. Our web address is www.personnel.alabama.gov.

How do I request reasonable accommodations?
If you would like to request special testing accommodations or have any questions concerning the test site or testing conditions, please contact the State Personnel Department at (334) 242-3389.

What do I do if I have a scheduling conflict?
If there is a conflict in your schedule, and you are unable to attend the written exam at the time and date for which you have been scheduled, you must resubmit your Application for Examination. The State Personnel Department will schedule you for the next available administration of this written test.

When will I get my score?
Four to six weeks after completing the exam, you will receive a Notice of Examination Results postcard in the mail. This postcard will identify your score or Band placement for the written exam. If you have not received your score within four to six weeks, you should call the State Personnel Department.