Multiple Choice Questions

1. The Six I's of studying microorganisms include all of the following except
   A. inoculation.
   B. incubation.
   C. infection.
   D. isolation.
   E. identification.

ASM Objective: 07.01b Ability to apply the process of science: Analyze and interpret results from a variety of microbiological methods and apply these methods to analogous situations.
ASM Topic: Module 07 Scientific Thinking
Learning Outcome: 03.02 Briefly outline the processes and purposes of the six types of procedures that are used in handling, maintaining, and studying microorganisms.
Topic: Culturing Microorganisms
Topic: Identifying Microorganisms
2. All of the following are examples of different types of microbiological media *except*
   A. broth.
   B. enriched.
   C. agar.
   **D.** petri dish.
   E. gelatin.

*ASM Objective: 08.03 Use appropriate methods to identify microorganisms (media-based, molecular and serological).*
*ASM Topic: Module 08 Microbiology Skills*
*Learning Outcome: 03.14 Define inoculation, media, and culture, and describe sampling methods and instruments, and what events must be controlled.*
*Topic: Culturing Microorganisms*
3. The term that refers to the purposeful addition of microorganisms into a laboratory nutrient medium is
A. isolation.
B. inoculation.
C. immunization.
D. infection.
E. contamination.

ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Objective: 08.03 Use appropriate methods to identify microorganisms (media-based, molecular and serological).
ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.02 Briefly outline the processes and purposes of the six types of procedures that are used in handling, maintaining, and studying microorganisms.
Learning Outcome: 03.14 Define inoculation, media, and culture, and describe sampling methods and instruments, and what events must be controlled.
Topic: Culturing Microorganisms

4. Which of the following is essential for development of discrete, isolated colonies?
A. broth medium
B. differential medium
C. selective medium
D. solid medium
E. assay medium

ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.15 Describe three basic techniques for isolation, including tools, media, incubation, and outcome.
Learning Outcome: 03.22 Compare and contrast liquid, solid, and semisolid media, giving examples.
Topic: Culturing Microorganisms

5. A pure culture contains only
A. one species of microorganism.
B. bacteria.
C. a variety of microbes from one source.
D. All of the choices are correct.
E. None of the choices are correct.

ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.17 Differentiate between a pure culture, subculture, mixed culture, and contaminated culture. Define contaminant.
Topic: Culturing Microorganisms
6. Which of the following will result when 1% to 5% agar is added to nutrient broth, boiled and cooled?
A. a pure culture
B. a mixed culture
C. a solid medium
D. a liquid medium
E. a contaminated medium

6. Which of the following will result when 1% to 5% agar is added to nutrient broth, boiled and cooled?
A. a pure culture
B. a mixed culture
C. a solid medium
D. a liquid medium
E. a contaminated medium

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.22 Compare and contrast liquid, solid, and semisolid media, giving examples.
Topic: Culturing Microorganisms

7. A microbiologist inoculates *Staphylococcus aureus* into a culture medium. Following incubation, both *Staphylococcus aureus* and *Staphylococcus epidermidis* are determined to be growing in this culture. What is the most likely explanation?
A. The microbiologist used too much inoculum.
B. The culture is contaminated.
C. The incubation temperature was incorrect.
D. The culture medium must be selective.
E. The culture medium must be differential.

7. A microbiologist inoculates *Staphylococcus aureus* into a culture medium. Following incubation, both *Staphylococcus aureus* and *Staphylococcus epidermidis* are determined to be growing in this culture. What is the most likely explanation?
A. The microbiologist used too much inoculum.
B. The culture is contaminated.
C. The incubation temperature was incorrect.
D. The culture medium must be selective.
E. The culture medium must be differential.

ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.17 Differentiate between a pure culture, subculture, mixed culture, and contaminated culture. Define contaminant.
Topic: Culturing Microorganisms
8. A microbiologist inoculates *Staphylococcus epidermidis* and *Escherichia coli* into a culture medium. Following incubation, only the *E. coli* grows in the culture. What is the most likely explanation?
   A. The microbiologist used too much inoculum.
   B. The culture is contaminated.
   C. The incubation temperature was incorrect.
   **D. The culture medium must be selective.**
   E. The culture medium must be differential.

ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Objective: 08.03 Use appropriate methods to identify microorganisms (media-based, molecular and serological).
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.24 Describe functional media; list several different categories, and explain what characterizes each type of functional media.
Learning Outcome: 03.25 Identify the qualities of enriched, selective, and differential media; use examples to explain their content and purposes.
Topic: Culturing Microorganisms

9. Which method often results in colonies developing down throughout the agar and some colonies on the surface?
   A. streak plate
   B. spread plate
   **C. pour plate**
   D. All of the choices are correct
   E. None of the choices are correct

ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.15 Describe three basic techniques for isolation, including tools, media, incubation, and outcome.
Topic: Culturing Microorganisms
Chapter 03 - Tools of the Laboratory: Methods of Studying Microorganisms

10. A common medium used for growing fastidious bacteria is
   A. blood agar.
   B. trypticase soy agar.
   C. mannitol salt agar.
   D. MacConkey medium.
   E. a reducing medium.

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.
ASM Objective: 03.04 The growth of microorganisms can be controlled by physical, chemical, mechanical, or biological means.
ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Topic: Module 03 Metabolic Pathways
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.24 Describe functional media; list several different categories, and explain what characterizes each type of functional media.
Learning Outcome: 03.25 Identify the qualities of enriched, selective, and differential media; use examples to explain their content and purposes.
Topic: Culturing Microorganisms

11. A nutrient medium that has all of its chemical components identified and their precise concentrations known and reproducible would be termed
   A. complex.
   B. reducing.
   C. enriched.
   D. enumeration.
   E. synthetic.

ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.23 Analyze chemically defined and complex media, describing their basic differences and content.
Topic: Culturing Microorganisms
12. A reducing medium contains
   A. sugars that can be fermented.
   B. extra oxygen.
   C. hemoglobin, vitamins, or other growth factors.
   D. substances that remove oxygen.
   E. inhibiting agents.

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).
ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.
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ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 03 Metabolic Pathways
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.24 Describe functional media; list several different categories, and explain what characterizes each type of functional media.

13. Which type of medium is able to distinguish different species or types of microorganisms based on an observable change in the colonies or in the medium?
   A. differential
   B. selective
   C. enumeration
   D. enriched
   E. reducing

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Topic: Culturing Microorganisms
14. A microbiologist decides to use a nutrient medium that contains thioglycolic acid. What type of microbe is she attempting to culture?
A. fastidious  
B. gram positive  
C. anaerobe  
D. gram negative  
E. virus

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Learning Outcome: 03.24 Describe functional media; list several different categories, and explain what characterizes each type of functional media.

15. Mannitol salt agar is selective for which bacterial genus?
A. Salmonella  
B. Streptococcus  
C. Neisseria  
D. Staphylococcus  
E. Escherichia

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Topic: Culturing Microorganisms
16. A microbiologist must culture a patient's feces for intestinal pathogens. Which of the following would likely be present in selective media for analyzing this fecal specimen?
A. NaCl  
B. sheep red blood cells  
C. bile salts  
D. thioglycolic acid  
E. peptone

17. Which of the following characteristics refers to the microscope's ability to show two separate entities as separate and distinct?
A. resolving power  
B. magnification  
C. refraction  
D. All of the choices are correct  
E. None of the choices are correct
18. Which of the following magnifies the specimen to produce the real image of the specimen?
A. condenser  
B. objective lens  
C. ocular lens  
D. body  
E. nosepiece

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.04 Explain how the images are formed, along with the role of light and the different powers of lenses.
Topic: Microscopy

19. If a microbiologist is studying a specimen at a total magnification of 950X, what is the magnifying power of the objective lens if the ocular lens is 10X?
A. 100X  
B. 950X  
C. 85X  
D. 850X  
E. 95X

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.03 Describe the basic plan of an optical microscope, and differentiate between magnification and resolution.
Topic: Microscopy

20. All of the following are diameters of cells that would be resolved in a microscope with a limit of resolution of 0.2 µm except
A. 0.2 µm.  
B. 0.2 mm.  
C. 0.1 µm.  
D. 0.3 µm.  
E. 2.0 µm.

ASM Objective: 07.02 Ability to use quantitative reasoning: Use mathematical reasoning and graphing skills to solve problems in microbiology.
ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 07 Scientific Thinking
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.05 Indicate how the resolving power is determined and how resolution affects image visibility.
Topic: Microscopy
21. The wavelength of light used plus the numerical aperture governs
   A. illumination.
   B. resolution.
   C. magnification.
   D. size of the field.
   E. All of the choices are correct.

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.05 Indicate how the resolving power is determined and how resolution affects image visibility.
Topic: Microscopy

22. The type of microscope in which you would see brightly illuminated specimens against a black background is
   A. bright-field.
   B. dark-field.
   C. phase-contrast.
   D. fluorescence.
   E. electron.

ASM Objective: 02.01 The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron).
ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 02 Structure and Function
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.06 Differentiate between the major types of optical microscopes, their illumination sources, image appearance, and uses.

23. Which microscope does not use light in forming the specimen image?
   A. bright-field
   B. dark-field
   C. phase-contrast
   D. fluorescence
   E. electron

ASM Objective: 02.01 The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron).
ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 02 Structure and Function
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.07 Describe the operating features of electron microscopes and how they differ from optical microscopes in illumination source, magnification, resolution, and image appearance.
Topic: Microscopy
24. Which microscope achieves the greatest resolution and highest magnification?
A. bright-field
B. dark-field
C. phase-contrast
D. fluorescence
E. electron

ASM Objective: 02.01 The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron).
ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 02 Structure and Function
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.07 Describe the operating features of electron microscopes and how they differ from optical microscopes in illumination source, magnification, resolution, and image appearance.
Topic: Microscopy

25. Which microscope shows cells against a bright background and the intracellular structures of unstained cells based on their varying densities?
A. bright-field
B. dark-field
C. phase-contrast
D. fluorescence
E. electron

ASM Objective: 02.01 The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron).
ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 02 Structure and Function
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.06 Differentiate between the major types of optical microscopes, their illumination sources, image appearance, and uses.
Topic: Microscopy
26. Which microscope is the most widely used to show stained cells against a bright background?
   A. bright-field
   B. dark-field
   C. phase-contrast
   D. fluorescence
   E. electron

ASM Objective: 02.01 The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron).
ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 02 Structure and Function
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.06 Differentiate between the major types of optical microscopes, their illumination sources, image appearance, and uses.
Topic: Microscopy

27. All of the following pertain to the fluorescence microscope except it
   A. uses electron's to produce a specimen image.
   B. is a type of compound microscope.
   C. requires the use of dyes like acridine and fluorescein.
   D. is commonly used to diagnose certain infections.
   E. requires an ultraviolet radiation source.

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ASM Topic: Module 02 Structure and Function
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Topic: Microscopy
Chapter 03 - Tools of the Laboratory: Methods of Studying Microorganisms

28. Which is incorrect about chocolate agar?
   A. It can be used to cultivate Neisseria.
   B. It usually uses sheep blood that has been heated.
   C. It has chocolate extract in it.
   D. It is an enriched medium.
   E. It is used to grow fastidious bacteria.

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.
ASM Objective: 03.04 The growth of microorganisms can be controlled by physical, chemical, mechanical, or biological means.
ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Topic: Module 03 Metabolic Pathways
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Learning Outcome: 03.24 Describe functional media; list several different categories, and explain what characterizes each type of functional media.
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Topic: Culturing Microorganisms

29. Which microscope bombards a whole, metal-coated specimen with electrons moving back and forth over it?
   A. fluorescence
   B. differential interference contrast
   C. scanning electron
   D. transmission electron
   E. phase-contrast

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.08 Differentiate between transmission and scanning electron microscopes in image formation and appearance.
Topic: Microscopy

30. The specimen preparation that is best for viewing cell motility is
   A. hanging drop.
   B. fixed stained smear.
   C. Gram stain.
   D. negative stain.
   E. flagellar stain.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.09 Explain the basic differences between fresh and fixed preparations for microscopy and how they are used.
Topic: Preparing Microscopy Specimens
31. The primary purpose of staining cells on a microscope slide is to
A. kill them.
B. secure them to the slide.
C. enlarge the cells.
D. add contrast in order to see them better.
E. see motility.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.09 Explain the basic differences between fresh and fixed preparations for microscopy and how they are used.
Learning Outcome: 03.12 Distinguish between simple, differential, and structural stains, including their applications.
Topic: Preparing Microscopy Specimens

32. The Gram stain, acid-fast stain, and endospore stain ____________.
A. are used on a wet mount of the specimen
B. use heat to force the dye into cell structures
C. have outcomes based on cell wall differences
D. use a negative stain technique
E. are differential stains

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.12 Distinguish between simple, differential, and structural stains, including their applications.
Topic: Preparing Microscopy Specimens

33. Basic dyes are
A. attracted to the acidic substances of bacterial cells.
B. anionic.
C. used in negative staining.
D. repelled by cells.
E. dyes such as India ink and nigrosin.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.10 Define dyes and describe the basic chemistry behind the process of staining.
Topic: Preparing Microscopy Specimens
34. A microbiologist makes a fixed smear of bacterial cells and stains them with Loeffler's methylene blue. All the cells appear blue under the oil lens. This is an example of
A. negative staining.
B. using an acidic dye.
C. simple staining.
D. using the acid-fast stain.
E. capsule staining.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.12 Distinguish between simple, differential, and structural stains, including their applications.
Topic: Preparing Microscopy Specimens

35. Media that contains extracts from plants, animals, or yeasts are
A. synthetic.
B. complex.
C. reducing.
D. enriched.
E. All of the choices are correct.

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.23 Analyze chemically defined and complex media, describing their basic differences and content.
Topic: Culturing Microorganisms

36. Brain-heart infusion, trypticase soy agar (TSA), and nutrient agar are all examples of which type of media?
A. synthetic
B. reducing
C. enriched
D. nonsynthetic
E. selective

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.23 Analyze chemically defined and complex media, describing their basic differences and content.
Topic: Culturing Microorganisms
37. Bacteria that require special growth factors and complex organic substances are called

A. fastidious.
B. pathogenic.
C. harmless.
D. anaerobic.
E. aerobic.

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.
ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 03 Metabolic Pathways
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.24 Describe functional media; list several different categories, and explain what characterizes each type of functional media.
Topic: Culturing Microorganisms

38. A media is designed that allows only staphylococci to grow. In addition, S. aureus colonies have a yellow halo around them and other staphylococci appear white. This type of media is:

A. selective only.
B. differential only.
C. both selective and differential.
D. a reducing media.
E. enriched.

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.
ASM Objective: 03.04 The growth of microorganisms can be controlled by physical, chemical, mechanical, or biological means.
ASM Objective: 08.03 Use appropriate methods to identify microorganisms (media-based, molecular and serological).
ASM Topic: Module 03 Metabolic Pathways
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Learning Outcome: 03.25 Identify the qualities of enriched, selective, and differential media; use examples to explain their content and purposes.
Topic: Culturing Microorganisms
39. All of the following are examples of basic dyes except
   A. Methylene Blue.
   B. Nigrosin.
   C. Crystal Violet.
   D. Safranin.
   E. Carbol Fuchsin.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.10 Define dyes and describe the basic chemistry behind the process of staining.
Topic: Preparing Microscopy Specimens

40. Which type of media can be used to determine if a bacteria is motile?
   A. SIM
   B. MacConkey
   C. Enriched media
   D. Thayer-Martin media
   E. Chocolate agar

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.22 Compare and contrast liquid, solid, and semisolid media, giving examples.
Learning Outcome: 03.24 Describe functional media; list several different categories, and explain what characterizes each type of functional media.
Topic: Culturing Microorganisms

41. All of the following are correct about agar except
   A. it is flexible.
   B. it melts at the boiling point of water (100°C).
   C. it is a source of nutrition for bacteria.
   D. it solidifies below 42°C.
   E. it is solid at room temperature.

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.21 Name the three general categories of media, based on their inherent properties and uses.
Learning Outcome: 03.22 Compare and contrast liquid, solid, and semisolid media, giving examples.
Topic: Culturing Microorganisms
Chapter 03 - Tools of the Laboratory: Methods of Studying Microorganisms

42. Which of the following media is useful for cultivating fungi?
   A. Sabouraud's agar
   B. MacConkey agar
   C. Tomato juice agar
   D. Phenylethanol agar
   E. Mueller tellurite

   ASM Objective: 02.04 While microscopic eukaryotes (for example, fungi, protozoa, and algae) carry out some of the same processes as bacteria, many of the cellular properties are fundamentally different.
   ASM Objective: 08.03 Use appropriate methods to identify microorganisms (media-based, molecular and serological).
   ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
   ASM Topic: Module 02 Structure and Function
   ASM Topic: Module 08 Microbiology Skills
   Learning Outcome: 03.24 Describe functional media; list several different categories, and explain what characterizes each type of functional media.
   Topic: Culturing Microorganisms

43. Which of the following puts the Six "I"s in their correct order?
   A. inoculation, incubation, isolation, inspection, identification
   B. isolation, inspection, inoculation, incubation, identification
   C. incubation, inspection, isolation, identification, inoculation
   D. inspection, identification, isolation, incubation, inoculation
   E. inspection, isolation, incubation, inoculation, identification

   ASM Objective: 07.01d Ability to apply the process of science: Analyze and interpret results from a variety of microbiological methods and apply these methods to analogous situations.
   ASM Objective: 08.03 Use appropriate methods to identify microorganisms (media-based, molecular and serological).
   ASM Topic: Module 07 Scientific Thinking
   ASM Topic: Module 08 Microbiology Skills
   Learning Outcome: 03.02 Briefly outline the processes and purposes of the six types of procedures that are used in handling, maintaining, and studying microorganisms.
   Topic: Culturing Microorganisms
   Topic: Identifying Microorganisms
44. Why is immersion oil often used when viewing specimens under the microscope?
A. to stain the cells blue
B. to prevent the smear from drying out
C. to slow bacterial movement so you can see cells better
D. to increase the resolution
E. to reduce the amount of heat reaching the slide from the light source

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.05 Indicate how the resolving power is determined and how resolution affects image visibility.
Topic: Microscopy

True / False Questions

45. The procedure for culturing a microorganism requires the use of a microscope.
FALSE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.14 Define inoculation, media, and culture, and describe sampling methods and instruments, and what events must be controlled.
Learning Outcome: 03.20 Explain the importance of media for culturing microbes in the laboratory.
Topic: Culturing Microorganisms

46. One colony typically develops from the growth of several parent bacterial cells.
FALSE

ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Objective: 08.04 Estimate the number of microorganisms in a sample (using, for example, direct count, viable plate count, and spectrophotometric methods).
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.16 Explain what an isolated colony is and indicate how it forms.
Topic: Culturing Microorganisms
47. Some microbes are not capable of growing on artificial media.  
**TRUE**

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.  
ASM Topic: Module 03 Metabolic Pathways  
Learning Outcome: 03.20 Explain the importance of media for culturing microbes in the laboratory.  
Learning Outcome: 03.26 Explain what it means to say that microorganisms are not culturable.  
Topic: Culturing Microorganisms

48. Mixed cultures are also referred to as contaminated cultures.  
**FALSE**

ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.  
ASM Topic: Module 08 Microbiology Skills  
Learning Outcome: 03.17 Differentiate between a pure culture, subculture, mixed culture, and contaminated culture. Define contaminant.  
Topic: Culturing Microorganisms

49. A medium that is gel-like has less agar in it compared to a solid medium.  
**TRUE**

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.  
ASM Topic: Module 08 Microbiology Skills  
Learning Outcome: 03.22 Compare and contrast liquid, solid, and semisolid media, giving examples.  
Topic: Culturing Microorganisms

50. A selective medium contains one or more substances that inhibit growth of certain microbes in order to facilitate the growth of other microbes.  
**TRUE**

ASM Objective: 03.03 The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.  
ASM Objective: 03.04 The growth of microorganisms can be controlled by physical, chemical, mechanical, or biological means.  
ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.  
ASM Topic: Module 03 Metabolic Pathways  
ASM Topic: Module 08 Microbiology Skills  
Learning Outcome: 03.24 Describe functional media; list several different categories, and explain what characterizes each type of functional media.  
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Topic: Culturing Microorganisms
Chapter 03 - Tools of the Laboratory: Methods of Studying Microorganisms

51. A bacterial species that grows on blood agar but will not grow on trypticase soy agar is termed an anaerobe.  
FALSE

ASM Objective: 03.02 The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).
ASM Objective: 08.03 Use appropriate methods to identify microorganisms (media-based, molecular and serological).
ASM Topic: Module 03 Metabolic Pathways
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.24 Describe functional media; list several different categories, and explain what characterizes each type of functional media.
Learning Outcome: 03.25 Identify the qualities of enriched, selective, and differential media; use examples to explain their content and purposes.
Topic: Culturing Microorganisms

52. Fixed smears of specimens are required in order to perform the Gram stain and endospore stain on the specimens. 
TRUE

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.13 Describe the process of Gram staining and how its results can aid the identification process.
Topic: Preparing Microscopy Specimens

53. The bending of light rays as they pass from one medium to another is called refraction. 
TRUE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.04 Explain how the images are formed, along with the role of light and the different powers of lenses.
Topic: Microscopy

54. At the end of the Gram stain, gram-positive bacteria will be seen as purple cells. 
TRUE

ASM Objective: 07.01b Ability to apply the process of science: Analyze and interpret results from a variety of microbiological methods and apply these methods to analogous situations.
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
ASM Topic: Module 07 Scientific Thinking
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.13 Describe the process of Gram staining and how its results can aid the identification process.
Topic: Preparing Microscopy Specimens
55. Scanning tunneling and atomic force microscopes are used to image the detailed structure of biological molecules. **TRUE**

**ASM Objective:** 02.01 The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron).

**ASM Topic:** Module 02 Structure and Function

**Learning Outcome:** 03.07 Describe the operating features of electron microscopes and how they differ from optical microscopes in illumination source, magnification, resolution, and image appearance.

**Topic:** Microscopy

**Fill in the Blank Questions**

56. The correct microbiological term for the tiny sample of specimen that is put into a nutrient medium in order to produce a culture is the _____. **inoculum**

**ASM Objective:** 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.

**ASM Topic:** Module 08 Microbiology Skills

**Learning Outcome:** 03.14 Define inoculation, media, and culture, and describe sampling methods and instruments, and what events must be controlled.

**Topic:** Culturing Microorganisms

57. The three physical forms of laboratory media are: solid, semisolid, and _____. **liquid**

**ASM Objective:** 08.05 Use appropriate microbiological and molecular lab equipment and methods.

**ASM Topic:** Module 08 Microbiology Skills

**Learning Outcome:** 03.22 Compare and contrast liquid, solid, and semisolid media, giving examples.

**Topic:** Culturing Microorganisms
58. Bacteria that require special growth factors and complex nutrients are termed _____.

**fastidious**

59. _____ is the term for a culture made from one isolated colony.

**subculture**

60. Newly inoculated cultures must be _____ at a specific temperature and time to encourage growth.

**incubated**
Chapter 03 - Tools of the Laboratory: Methods of Studying Microorganisms

61. Magnification is achieved in a compound microscope through the initial magnification of the specimen by the ____ lens. This image is then projected to the ____ lens that will further magnify the specimen to form a virtual image received by the eye.

**objective, ocular**

62. The ____ of the microscope holds and allows selection of the objective lenses.

**nosepiece**

63. ____ dyes have a negative charge on the chromophore and are repelled by bacterial cells.

**acidic**

64. ____ has the same optical qualities as glass and thus prevents refractive loss of light as it passes from the slide to the objective lens.

**immersion oil**

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**Short Answer Questions**
65. Compare and contrast the reagents and functions of negative staining versus positive staining.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.11 Differentiate between negative and positive staining, giving examples.
Topic: Preparing Microscopy Specimens

66. Explain the difference and significance between a contaminated culture and a mixed culture.

ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.17 Differentiate between a pure culture, subculture, mixed culture, and contaminated culture. Define contaminant.
Topic: Culturing Microorganisms

67. A contaminated food sample contains several different species of bacteria. A food microbiologist is interested in studying just one of these species. Describe the sequence of procedures that the microbiologist must perform in order to obtain a pure culture of the bacterial species of interest from this food sample. Detail all the necessary media and equipment.

ASM Objective: 07.01b Ability to apply the process of science: Analyze and interpret results from a variety of microbiological methods and apply these methods to analogous situations.
ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Objective: 08.03 Use appropriate methods to identify microorganisms (media-based, molecular and serological).
ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 07 Scientific Thinking
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.02 Briefly outline the processes and purposes of the six types of procedures that are used in handling, maintaining, and studying microorganisms.
Learning Outcome: 03.14 Define inoculation, media, and culture, and describe sampling methods and instruments, and what events must be controlled.
Learning Outcome: 03.15 Describe three basic techniques for isolation, including tools, media, incubation, and outcome.
Learning Outcome: 03.19 Describe some of the processes involved in identifying microbes from samples.
Topic: Culturing Microorganisms
Topic: Identifying Microorganisms
68. Explain how and why immersion oil increases resolution but not magnification when using the 100X objective.

Multiple Choice Questions

69. Which of the following reagents reacts with crystal violet as the mordant?
   A. Crystal violet
   B. Gram’s iodine
   C. 95% ethyl alcohol
   D. Safranin

70. How will *E. coli* appear if the mordant is not applied?
   A. Gram-positive
   B. Gram-negative
   C. Gram-variable
   D. Colorless
   E. None of these
71. Observing and characterizing colonial growth for size, shape, edge, elevation, color, odor, and texture is part of ___.
   A. Specimen collection  
   B. Inoculation  
   C. Incubation  
   D. Isolation  
   E. Inspection

ASM Objective: 07.01b Ability to apply the process of science: Analyze and interpret results from a variety of microbiological methods and apply these methods to analogous situations.
ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Objective: 08.03 Use appropriate methods to identify microorganisms (media-based, molecular and serological).
ASM Topic: Module 07 Scientific Thinking
ASM Topic: Module 08 Microbiology Skills
ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.18 What kinds of data are collected during information gathering?
Learning Outcome: 03.19 Describe some of the processes involved in identifying microbes from samples.
Learning Outcome: 03.20 Explain the importance of media for culturing microbes in the laboratory.
Learning Outcome: 03.21 Name the three general categories of media, based on their inherent properties and uses.
Topic: Identifying Microorganisms

72. In lab, Tom was given a mixed culture. His objective is to isolate single colonies. What should be used to accomplish this goal?
   A. Sterile swab, loop dilution, TSB  
   B. Hockey stick, spread plate technique, and 4 degree Celsius incubation temperature  
   C. Loop dilution, TSA, hockey stick, 37 degree Celsius incubator  
   D. Inoculating loop, incinerator, streak plate method, 37 degree Celsius incubator  
   E. Sterile swab, streak plate method, 37 degree Celsius incubator

ASM Objective: 08.02 Use pure culture and selective techniques to enrich for and isolate microorganisms.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.15 Describe three basic techniques for isolation, including tools, media, incubation, and outcome.
Topic: Culturing Microorganisms
73. Sally had a throat sample taken at a satellite lab within her health care provider’s office. What kind of media would be best suited for this specimen?
   A. TSA plate
   B. TSB tube
   C. Transport media
   D. Pour plate
   E. Quadrant streak plate

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment and methods.
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.24 Describe functional media; list several different categories, and explain what characterizes each type of functional media.

True / False Questions

74. Identification relies entirely on biochemical test results.
   FALSE

ASM Objective: 08.03 Use appropriate methods to identify microorganisms (media-based, molecular and serological).
ASM Topic: Module 08 Microbiology Skills
Learning Outcome: 03.18 What kinds of data are collected during information gathering?
Learning Outcome: 03.19 Describe some of the processes involved in identifying microbes from samples.
Topic: Identifying Microorganisms

Worksheet Questions

75. Using the numbers 1-4, label the correct chronological sequence of events for the Gram staining procedure.

2 Apply iodine for 1 minute to the smear and rinse
1 Add crystal violet for 60 seconds and rinse
3 Add 95% ethanol for 10-20 seconds and rinse
4 Apply safranin for 60 seconds and rinse

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