# In the name of God

Hamadan University of Medical Sciences and Health Services

Educational Deputy of the University

Center for Studies and Development of Medical Sciences Education

## Theory/Practical Lesson Plan Form

Dear Colleagues,

As the teaching-learning process is one that requires careful planning to achieve its objectives, it is essential to develop a lesson plan at the beginning of the educational process. This plan serves as a map and guide for both instructors and students, making it one of the primary tools for educational activities.

Therefore, we kindly ask all instructors to exercise utmost care in completing the lesson plan.

- **Course Title**: Medical Bacteriology
- **Instructors**:
    - Dr. Mohammad Youssef Alikhani
    - Dr. Rasool Yousofi Mashhoof
    - Dr. Mohammad Reza Arabestani
- **Course Coordinator**: Dr. Mohammad Youssef Alikhani
- **Department Head**: Dr. Mohammad Youssef Alikhani
- **Credit Hours**:
    - **Theoretical**: 2.4 units
    - **Practical**: 0.6 units
- **Student Major and Level**: Medicine - General Doctorate
- **Course Timing**: First Semester

- **Teaching Location**: Medical School / Classroom No. 5

باکتری شناسی پزشکی (نظری)

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| 1 | History, Classification, and Basics of Microbiology | 1. Explain the science of microbiology<br>2. Name the discoverers of the microbial world<br>3. List the activities of Louis Pasteur<br>4. Describe Joseph Lister's role in surgical | Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Understanding<br>Cognitive - Analysis | Lecture and Group Discussion Film Screening | 120 minutes | PowerPoint and Projector | Question and Answer |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | disinfection<br>5. Enumerate the reasons for the need for disinfection in the operating room<br>6. Draw the classification algorithm of microorganisms<br>7. Distinguish prokaryotic cells from eukaryotic cells by illustration<br>8. Show the importance of microbiology in medicine through questions and develop belief in it | Cognitive - Application<br>Cognitive - Application<br>Affective - Valuing | | | | |
| 2 | Structural Anatomy of Bacteria (Main and Accessory Appendages) | 1. Name the main appendages of bacterial structure<br>2. Name the accessory | Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - | Lecture and Group Discussion Film and Multimedia | 120 minutes | PowerPoint and Projector | Question and Answer and |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | appendages of bacteria<br>3. Draw the shape of bacteria<br>4. Distinguish the cell wall of Gram-positive bacteria from Gram-negative | Application<br>Cognitive - Application<br>Cognitive - Analysis<br>Cognitive - Understanding<br>Cognitive - Application<br>Cognitive - Knowledge | Presentation | | | Student Seminar |
| 3 | Metabolism, Growth, and Reproduction of Bacteria | 1. Explain bacterial metabolism<br>2. Draw the bacterial growth curve<br>3. Describe physical and chemical factors affecting bacterial growth<br>4. Explain methods of bacterial reproduction | Cognitive - Understanding<br>Cognitive - Application<br>Cognitive - Understanding<br>Cognitive - Understanding<br>Cognitive - Understanding | Lecture, Group Discussion | 120 minutes | PowerPoint, Articles | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | 5. Describe methods of energy production in bacteria<br>6. Calculate the division time of bacteria during logarithmic growth | Cognitive - Application | | | | |
| 4 | Genetics of Microorganisms | 1. Define genotypic changes in bacteria<br>2. Define mutation<br>3. List types of mutations in bacteria<br>4. Explain the process of mutation in bacteria<br>5. Explain genetic exchanges in bacteria<br>6. Name types of | Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Understanding<br>Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Understanding | Lecture, Group Discussion | 120 minutes | PowerPoint, Articles | Question and Answer |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | genetic exchanges in bacteria<br>7. Explain conjugation in bacteria<br>8. List stages of transformation in bacteria<br>9. Explain transduction in bacteria<br>10. Explain drug resistance in bacteria | Cognitive - Knowledge<br>Cognitive - Understanding<br>Cognitive - Understanding | | | | |
| 5 | Pathogenicity, Microbial Flora of the Body, and Epidemiology of Pathogenic Bacteria | 1. Explain the mechanisms of bacterial pathogenicity<br>2. Name the microbial flora of various body organs<br>3. Explain the epidemiology of pathogenic bacteria | Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Understanding<br>Cognitive - Analysis | Lecture, Group Discussion | 120 minutes | PowerPoint, Articles | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | 4. Analyze the relationship between bacterial endotoxin and symptoms like fever, chills, and shock | | | | | |
| 6 | Antimicrobial Agents (Antibiotics) | 1. Explain the properties of antibiotics<br>2. Name the mechanisms of antibiotics affecting bacterial cells<br>3. Name competitive antibiotics<br>4. Explain the side effects of antibiotics<br>5. Name antibiotics affecting protein synthesis in bacteria<br>6. Name | Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Analysis<br>Psychomotor<br>Affective - Valuing | Lecture and Group Discussion Film Screening | 120 minutes | PowerPoint and Projector | Question and Answer and Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | antibiotics affecting the nucleus of bacteria<br>7. Analyze the causes of increased drug resistance in bacteria in society<br>8. Demonstrate how to perform an antibiogram<br>9. Collaboratively show the importance of performing antibiograms in treating infectious diseases | | | | | |
| 7 | Disinfectants (Physical and Chemical Agents) | 1. Explain the principles of sterilization<br>2. Calculate the temperature required for sterilization in an autoclave | Cognitive - Knowledge<br>Cognitive - Application<br>Cognitive - Understanding<br>Cognitive - | Lecture and Group Discussion<br>Film Screening | 120 minutes | PowerPoint and Projector | Question and Answer and Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | 3. Explain the principles of working with a furnace<br>4. Explain the mechanism of the water bath<br>5. Describe how to work with an incubator<br>6. Explain working with UV light<br>7. Name common disinfectants<br>8. Draw a flowchart of the disinfection process levels<br>9. Explain the importance of disinfection in preventing infectious diseases | Understanding<br>Cognitive - Understanding<br>Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Analysis<br>Cognitive - Understanding | | | | |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| 8 | Gram-Positive Cocci (Staphylococcus and Micrococcus) | 1. Explain the general characteristics of staphylococci and their types<br>2. Name factors affecting the pathogenicity of this bacterium<br>3. Name the toxins and exoenzymes secreted by this bacterium<br>4. Describe the diseases and clinical findings caused by this bacterium<br>5. Explain the epidemiology and transmission of this bacterium in society<br>6. Illustrate methods of bacterial sampling | Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Understanding<br>Cognitive - Understanding<br>Cognitive - Analysis<br>Cognitive - Understanding<br>Cognitive - Application | Lecture and Group Discussion | 120 minutes | PowerPoint and Projector | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | 7. Explain treatment and effective antibiotics for this bacterium<br>8. Describe methods of preventing diseases caused by this bacterium<br>9. Distinguish this bacterium's morphology from other bacteria | | | | | |
| 9 | Gram-Positive Cocci (Streptococci and Enterococci) | 1. Explain the general characteristics of streptococci and their types<br>2. Name factors affecting the pathogenicity of this bacterium<br>3. Name the toxins and exoenzymes secreted by this | Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Understanding<br>Cognitive - Understanding | Lecture and Group Discussion | 120 minutes | PowerPoint and Projector | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | bacterium<br>4. Describe the diseases and clinical findings caused by this bacterium<br>5. Explain the epidemiology and transmission of this bacterium in society<br>6. Illustrate methods of bacterial sampling<br>7. Explain treatment and effective antibiotics for this bacterium<br>8. Describe methods of preventing diseases caused by this bacterium<br>9. Explain the general characteristics of | Cognitive - Analysis<br>Cognitive - Understanding<br>Cognitive - Understanding | | | | |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | enterococci and their types | | | | | |
| 10 | Gram-Negative Cocci (Neisseriaceae) | 1. Explain the general characteristics of Neisseria<br>2. List important pathogenic types of this family<br>3. Name factors affecting the pathogenicity of Neisseria<br>4. Name important antigens of Neisseria<br>5. Name the toxins and exoenzymes secreted by this bacterium<br>6. Explain the structural characteristics of Neisseria<br>7. Explain the | Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Understanding<br>Cognitive - Understanding<br>Cognitive - Understanding<br>Cognitive - Analysis | Lecture and Group Discussion | 120 minutes | PowerPoint and Articles | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | physiological characteristics of Neisseria<br>8. Describe the diseases and findings caused by Neisseria<br>9. Explain the pathogenic mechanisms of Neisseria<br>10. Explain the epidemiology and transmission of Neisseria in society<br>11. Illustrate methods of bacterial sampling and identification of Neisseria<br>12. Explain treatment and prevention methods for diseases caused by Neisseria | Cognitive - Understanding | | | | |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| 11 | Enterobacteriaceae (Lactose Positive) | 1. Explain the characteristics of the Enterobacteriaceae family<br>2. Classify and compare members of the Enterobacteriaceae family<br>3. Explain the epidemiology of lactose-positive bacteria<br>4. Explain the virulence factors of lactose-positive bacteria<br>5. Illustrate methods of bacterial sampling<br>6. Distinguish the morphology of these bacteria from similar bacteria<br>7. Explain | Cognitive - Understanding<br>Cognitive - Synthesis<br>Cognitive - Understanding<br>Cognitive - Understanding<br>Cognitive - Analysis<br>Cognitive - Application<br>Cognitive - Understanding | Lecture and Group Discussion | 120 minutes | PowerPoint and Articles | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | identification, prevention, and treatment methods for lactose-positive bacteria | | | | | |
| 12 | Midterm Exam (35 points out of 100) | Testing Center | Faculty Group | | | | |
| 13 | Enterobacteriaceae (Lactose Negative) | 1. Explain the epidemiology of lactose-negative bacteria<br>2. Describe how these bacteria grow and reproduce in culture media<br>3. Distinguish the morphology of these bacteria from similar bacteria<br>4. Name the virulence factors of lactose- | Cognitive - Understanding<br>Cognitive - Understanding<br>Cognitive - Application<br>Cognitive - Knowledge<br>Cognitive - Understanding | Lecture and Group Discussion | 120 minutes | PowerPoint and Articles | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | negative bacteria<br>5. Explain identification, prevention, and treatment methods for lactose-negative bacteria | | | | | |
| 14 | Clostridia | 1. Explain the general characteristics of Clostridia<br>2. List the important pathogenic types of this family<br>3. Name factors affecting the pathogenicity of Clostridia<br>4. Name important antigens of Clostridia<br>5. Name the exotoxins secreted by | Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Understanding<br>Cognitive - Understanding<br>Cognitive - Understandin | Lecture and Group Discussion | 120 minutes | PowerPoint and Articles | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | Clostridia<br>6. Explain the structural characteristics of Clostridia<br>7. Explain the physiological characteristics of Clostridia<br>8. Describe the diseases and findings caused by Clostridia<br>9. Explain the pathogenic mechanisms of Clostridia<br>10. Explain the epidemiology and transmission of Clostridia in society<br>11. Illustrate methods of bacterial sampling and identification of Clostridia | g<br>Cognitive - Understanding<br>Cognitive - Analysis<br>Cognitive - Understanding | | | | |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| 15 | Vibrionaceae, Campylobacter, and Helicobacter | 1. Explain the characteristics of the genera Vibrio, Campylobacter, and Helicobacter<br>2. Compare and classify members of these genera<br>3. Explain the epidemiology of members of these genera<br>4. Name the virulence factors of members of these genera<br>5. Distinguish the morphology of these bacteria from similar bacteria<br>6. Explain identification, prevention, and treatment methods for | Cognitive - Understanding<br>Cognitive - Synthesis<br>Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Application<br>Cognitive - Understanding | Lecture and Group Discussion | 120 minutes | PowerPoint and Articles | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | members of these genera | | | | | |
| 16 | Mycobacterium tuberculosis, Mycobacterium (leprae), and Legionella | 1. Explain the general characteristics of mycobacteria<br>2. List important types of mycobacteria<br>3. Illustrate the shape and structure of mycobacteria<br>4. Name factors affecting the pathogenicity of mycobacteria<br>5. Explain the antigenic properties of mycobacteria<br>6. Explain the physiological characteristics of mycobacteria<br>7. Describe the pathogenic | Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Application<br>Cognitive - Knowledge<br>Cognitive - Understanding<br>Cognitive - Understanding<br>Cognitive - Understanding<br>Cognitive - Analysis<br>Cognitive - | Lecture and Group Discussion | 120 minutes | PowerPoint and Articles | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | mechanisms of mycobacteria<br>8. Explain the epidemiology and transmission of mycobacteria in society<br>9. Illustrate methods of bacterial sampling and identification of mycobacteria<br>10. Explain treatment and prevention methods for diseases caused by mycobacteria | Understanding | | | | |
| 17 | Corynebacterium, Listeria, and Bacillus | 1. Explain the characteristics of the genera Corynebacterium, Listeria, and Bacillus<br>2. Classify and compare members of these | Cognitive - Understanding<br>Cognitive - Application<br>Cognitive - Understanding<br>Cognitive - | Lecture and Group Discussion | 120 minutes | PowerPoint and Articles | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | genera<br>3. Explain the epidemiology of members of these genera<br>4. Name the virulence factors of members of these genera<br>5. Distinguish the morphology of these bacteria from similar bacteria<br>6. Explain identification, prevention, and treatment methods for members of these genera | Knowledge<br>Cognitive - Application<br>Cognitive - Understanding | | | | |
| 18 | Spirochetes (Treponema, Borrelia, and Leptospira) | 1. Explain the general characteristics of spirochetes<br>2. List important types of | Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - | Lecture and Group Discussion | 120 minutes | PowerPoint and Articles | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | spirochetes<br>3. Illustrate the shape and structure of spirochetes<br>4. Name factors affecting the pathogenicity of spirochetes<br>5. Explain the antigenic properties of spirochetes<br>6. Explain the physiological characteristics of spirochetes<br>7. Describe the pathogenic mechanisms of spirochetes<br>8. Explain the epidemiology and transmission of spirochetes in society<br>9. Illustrate | Application<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Knowledge<br>Cognitive - Understanding<br>Cognitive - Understanding<br>Cognitive - Analysis<br>Cognitive - Understanding | | | | |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | methods of bacterial sampling and identification of spirochetes<br>10. Explain treatment and prevention methods for diseases caused by spirochetes | | | | | |
| 19 | Brucella, Haemophilus, and Bordetella | 1. Explain the characteristics of the genera Brucella, Haemophilus, and Bordetella<br>2. Compare and classify members of these genera<br>3. Explain the epidemiology of members of these genera<br>4. Name the virulence factors of members of these genera | Cognitive - Understanding<br>Cognitive - Synthesis<br>Cognitive - Understanding<br>Cognitive - Knowledge<br>Cognitive - Application<br>Cognitive - Understanding | Lecture and Group Discussion | 120 minutes | PowerPoint and Articles | Question and Answer, Student Seminar |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | 5. Distinguish the morphology of these bacteria from similar bacteria<br>6. Explain identification, prevention, and treatment methods for members of these genera | | | | | |
| 20 | Mycoplasma, Rickettsia, and Chlamydia | 1. Explain the general characteristics of Mycoplasma, Rickettsia, and Chlamydia<br>2. List important types of Mycoplasma, Rickettsia, and Chlamydia<br>3. Illustrate the shape and structure of Mycoplasma, | | | | | |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | Rickettsia, and Chlamydia<br>4. Name factors affecting the pathogenicity of Mycoplasma, Rickettsia, and Chlamydia<br>5. Explain the antigenic properties of Mycoplasma, Rickettsia, and Chlamydia<br>6. Explain the physiological characteristics of Mycoplasma, Rickettsia, and Chlamydia<br>7. Describe the pathogenic mechanisms of Mycoplasma, Rickettsia, and Chlamydia<br>8. Explain the | | | | | |

| Session | Topic | Learning Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | epidemiology and transmission of | | | | | |

**Evaluation Methods**

| Type of Evaluation | Date | Evaluation Tool | Points out of Total |
|---|---|---|---|
| Quiz | | Class Q&A | 1 point |
| Project Presentation | | Student Seminar Presentation | 1 point |
| Midterm Exam | | Answering multiple-choice test questions | 6 points |
| Final Exam | | Answering multiple-choice test questions | 12 points |
| Other | | - | - |
| **Total** | | | **20 points** |

## Medical Bacteriology (Practical) Program

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| 1 | Introduction to the Laboratory and Sterilization | 1. Name basic laboratory equipment. 2. Name specific bacteriology lab | Cognitive-Knowledge, Cognitive-Comprehension, Psychomotor | Lecture, Demonstration by Instructor | 4 hours | PowerPoint, animations, video presentation | Active class participation, written test, observation, imitation (checklist) |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | equipment.<br>3. Describe loop and swab use.<br>4. Explain automatic pipette use.<br>5. Identify specialized equipment for culture.<br>6. Describe safety principles in bacteriology lab.<br>7. Explain sterilization and disinfection principles.<br>8. Operate and set up autoclave.<br>9. Operate and set up oven. | | | | | |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | 10. Operate and set up UV light.<br>11. Operate and set up water bath.<br>12. Operate and set up laboratory hood. | | | | | |
| 2 | Culture Media Preparation and Proper Culturing Methods | 1. Name necessary lab items for culturing.<br>2. Name types of bacterial culture media.<br>3. Describe bacterial culturing methods.<br>4. Demonstrate | Cognitive-Knowledge, Cognitive-Comprehension, Psychomotor | Lecture, Demonstration by Instructor | 4 hours | PowerPoint, animations, video presentation | Active class participation, written test, observation, imitation (checklist) |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | preparation of various culture media.<br>5. Set up and adjust incubator.<br>6. Adhere to disinfection principles during culturing.<br>7. Explain proper bacterial culturing methods.<br>8. Correctly culture patient samples on suitable media. | | | | | |
| 3 | Gram Staining | 1. Explain the mechanism | Cognitive-Comprehensio | Demonstration by Instructor | 4 hours | PowerPoint, animations | Active class participation, written |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | of bacterial staining.<br>2. Describe classification based on staining.<br>3. Name materials required for staining.<br>4. Prepare a slide.<br>5. Illustrate steps of bacterial staining.<br>6. Demonstrate microscope use.<br>7. Identify stained slides using a properly adjusted microscope. | n, Psychomotor | | | | test, observation, imitation (checklist) |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| 4 | Microbial Sensitivity Testing (Antibiogram) | 1. Name equipment for microbial sensitivity testing.<br>2. Identify suitable culture media for sensitivity testing.<br>3. Describe methods for microbial sensitivity testing.<br>4. Demonstrate preparation of microbial samples for testing.<br>5. Count bacteria using | Cognitive-Knowledge, Cognitive-Comprehension, Psychomotor | Lecture, Demonstration by Instructor | 4 hours | PowerPoint, animations, video presentation | Active class participation, written test, observation, imitation (checklist) |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | McFarland solution.<br>6. Correctly place antibiotic disks on culture media.<br>7. Interpret and report sensitivity test results accurately. | | | | | |
| 5 | Identification of Staphylococcus and Neisseria | 1. Perform appropriate staining for microscopy.<br>2. Prepare relevant culture media.<br>3. Execute suitable culturing methods.<br>4. Conduct incubation | Psychomotor, Cognitive-Application | Demonstration by Instructor | 4 hours | PowerPoint, animations | Active class participation, written test, observation, imitation (checklist) |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | of cultured bacteria.<br>5. Distinguish cultured bacteria.<br>6. Conduct relevant biochemical tests.<br>7. Identify relevant bacteria using suitable tests. | | | | | |
| 6 | Identification of Streptococcus and Pneumococcus | 1. Perform appropriate staining for microscopy.<br>2. Prepare relevant culture media.<br>3. Execute suitable culturing | Psychomotor, Cognitive-Application | Lecture, Demonstration by Instructor | 4 hours | PowerPoint, animations, video presentation | Active class participation, written test, observation, imitation (checklist) |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | methods.<br>4. Conduct incubation of cultured bacteria.<br>5. Distinguish cultured bacteria.<br>6. Conduct relevant biochemical tests.<br>7. Identify relevant bacteria using suitable tests. | | | | | |
| 7 | Enterobacteriaceae (Lactose Positive and Negative) | 1. Perform appropriate staining for microscopy.<br>2. Prepare relevant culture media. | Psychomotor, Cognitive-Application | Lecture, Demonstration by Instructor | 4 hours | PowerPoint, animations | Active class participation, written test, observation, imitation (checklist) |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | 3. Execute suitable culturing methods.<br>4. Conduct incubation of cultured bacteria.<br>5. Distinguish cultured bacteria.<br>6. Conduct relevant biochemical tests.<br>7. Identify relevant bacteria using suitable tests. | | | | | |
| 8 | Pseudomonas, Vibrio, and Brucella | 1. Perform appropriate staining for microscopy.<br>2. Prepare | Psychomotor, Cognitive-Application | Lecture, Demonstration by Instructor | 4 hours | PowerPoint, animations | Active class participation, written test, observation, |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | relevant culture media.<br>3. Execute suitable culturing methods.<br>4. Conduct incubation of cultured bacteria.<br>5. Distinguish cultured bacteria.<br>6. Conduct relevant biochemical tests.<br>7. Identify relevant bacteria using suitable tests. | | | | | imitation (checklist) |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| 9 | Corynebacterium and Bacillus | 1. Perform appropriate staining for microscopy.<br>2. Prepare relevant culture media.<br>3. Execute suitable culturing methods.<br>4. Conduct incubation of cultured bacteria.<br>5. Distinguish cultured bacteria.<br>6. Conduct relevant biochemical tests.<br>7. Identify relevant bacteria | Psychomotor, Cognitive-Application | Lecture, Demonstration by Instructor | 4 hours | PowerPoint, animations, video presentation | Active class participation, written test, observation, imitation (checklist) |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | using suitable tests. | | | | | |
| 10 | Identification of Clostridium Group | 1. Perform appropriate staining for microscopy.<br>2. Prepare relevant culture media.<br>3. Execute suitable culturing methods.<br>4. Conduct incubation of cultured bacteria.<br>5. Distinguish cultured bacteria.<br>6. Conduct relevant biochemical tests. | Psychomotor, Cognitive-Application | Lecture, Demonstration by Instructor | 4 hours | PowerPoint, animations | Active class participation, written test, observation, imitation (checklist) |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | 7. Identify relevant bacteria using suitable tests. | | | | | |
| 11 | Identification of Mycobacterium and Spirochetes | 1. Perform appropriate staining for microscopy.<br>2. Prepare relevant culture media.<br>3. Execute suitable culturing methods.<br>4. Conduct incubation of cultured bacteria.<br>5. Distinguish cultured bacteria.<br>6. Conduct | Psychomotor, Cognitive-Application, Cognitive-Comprehension | Lecture, Demonstration by Instructor | 4 hours | PowerPoint, animations | Active class participation, written test, observation, imitation (checklist) |

| Session | Topic | Behavioral Objectives | Learning Domain | Teaching Method | Duration | Teaching Aids | Evaluation Method |
|---|---|---|---|---|---|---|---|
| | | relevant biochemical tests.<br>7. Identify relevant bacteria using suitable tests.<br>8. Explain the steps of the tuberculin test. | | | | | |
| **Final Exam** | Medical School – Microbiology Laboratory | Group of Instructors | | | | | MCQ and Short Answer Test, Observation (checklist) |

| Type of Evaluation | Date | Evaluation Tool | Total Points |
|---|---|---|---|
| **Class Activity** | | Level of participation in class discussions | 2 points |

| Type of Evaluation | Date | Evaluation Tool | Total Points |
|---|---|---|---|
| **Attendance** | | Active presence in the laboratory and participation in experiments | 2 points |
| **Written Test** | | Multiple choice and short answer | 6 points |
| **Final Exam** | | Station-based final exam (OSCE) and practical demonstration (observation, imitation, checklist) | 10 points |

1. Medical Microbiology; PATRICK R. MURRAY; last Edition
2. Medical Microbiology; Jawetz, Melnick, & Adelberg's; last Edition

1. Text book of Diagnostic Microbiology; Mahon CR; Elsevier, 2020

2. Diagnostic Microbiology (Isolation and Identification of Pathogenic Microorganisms)
Authors:
Dr. Mohammad Youssef Ali Khani, Dr. Mohammad Reza Arabestani, Dr. Abbas Bahador, Reza Kamali, Seyyed Masoud Mousavi