



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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## University Examinations 2023/2024

THIRD YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR  
OF SCIENCE IN MEDICAL MICROBIOLOGY

SECOND YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF  
BACHELOR OF SCIENCE IN MEDICAL LABORATORY

### HMM 3326/HML 3227: IMMUNOLOGICAL TECHNIQUES

DATE: APRIL 2024

TIME: 2 HOURS

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#### INSTRUCTIONS:

- (i) The paper consists of **Three** Sections
  - (ii) Section A: Multiple Choice Questions
  - (iii) Section B: Short Answer Questions
  - (iv) Section C: Long Answer Questions
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#### SECTION A: MCQS (20 MARKS)

1. What is the principle behind immunofluorescence testing?
    - a) Detection of antigens using radioactive isotopes
    - b) Visualization of antibodies labeled with fluorescent dyes binding to specific antigens
    - c) Measurement of enzyme activity linked to antigen-antibody complexes
    - d) Detection of antigen-antibody complexes using colorimetric substrates
  
  2. Which of the following is NOT an advantage of ELISA?
    - a. High sensitivity
    - b. High specificity
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- c. Rapid results
  - d. Quantitative measurement
3. Which of the following techniques utilizes precipitation reactions for antigen detection?
- a. Western blotting
  - b. Immunofluorescence
  - c. Radial immunodiffusion
  - d. ELISA
4. What is immunodiffusion?
- a. A technique for cell culture
  - b. A method to study antibody-antigen interactions
  - c. A process of immune cell migration
  - d. A method for bacterial identification
5. In which of the following case a large lattice is formed?
- a) Antibody is in excess
  - b) Antigen is in excess
  - c) Antigens and antibodies are in optimal proportion
  - d) None of these
6. Which immunodiffusion technique involves the diffusion of antigen and antibody in a gel medium to form a visible line of precipitation?
- a) Ouchterlony double immunodiffusion
  - b) Western blotting
  - c) ELISA
  - d) Immunoelectrophoresis
7. Which of the following is NOT a type of agglutination reaction?
- a. Direct agglutination
  - b. Indirect agglutination
  - c. Reverse agglutination
  - d. Immunoelectrophoresis
8. What is the purpose of the washing steps in ELISA?
- a. To remove unbound substances

- b. To amplify the signal
  - c. To activate the enzyme
  - d. To degrade the substrate
9. What is the major advantage of agglutination tests in immunology?
- a. High sensitivity
  - b. Rapid and simple to perform
  - c. Quantitative results
  - d. Detection of specific antibodies only
10. What is the main mechanism of acute rejection in transplantation?
- a) Activation of complement system
  - b) Antibody-mediated destruction of the graft
  - c) Production of cytotoxic T cells
  - d) Activation of natural killer (NK) cells
11. In immunodiffusion, what physical property is utilized to separate antigen and antibody complexes?
- a) Diffusion
  - b) Electrophoretic mobility
  - c) Solubility
  - d) Viscosity
12. Which immune response is primarily responsible for organ rejection in transplantation?
- a) Humoral immunity
  - b) Cell-mediated immunity
  - c) Innate immunity
  - d) Autoimmunity

13. In direct immunofluorescence, what directly emits fluorescence upon binding to the target antigen?
- a) The primary antibody
  - b) The secondary antibody
  - c) The fluorophore
  - d) The antigen
14. Which ELISA format is more sensitive, direct or indirect?
- a) Indirect ELISA
  - b) Direct ELISA
  - c) Both have similar sensitivity
  - d) It depends on the antigen concentration
15. Weil-Felix reaction is based on sharing of antigens between
- a) Sheep RBCs and EB virus
  - b) Mycoplasma and human O group RBCs
  - c) Rickettsial antigens and antigens of certain strains of *Proteus*
  - d) None of these
16. Which of the following is a strategy to minimize graft rejection in transplantation?
- a) ABO blood group matching
  - b) Removal of the recipient's immune system
  - c) Cold ischemia time optimization
  - d) All of the above
17. Which immunoglobulin appears first in the primary immune response?
- a) IgG
  - b) IgM
  - c) IgA
  - d) IgE
18. How complement activity is destroyed in vitro?

- a) Heating serum at 56<sup>0</sup>C for 30 min
- b) Keeping serum at room temperature of 22<sup>0</sup>C for 1 hour
- c) Heating serum at 37<sup>o</sup>c for 45 min
- d) Freezing serum at 0<sup>0</sup>C for 24 hours

19. Which of the following is NOT involved in the antigen-antibody interaction?

- a) Electrostatic interactions between charged side-chains
- b) Hydrophobic interactions
- c) Van der Waals forces
- d) Peptide bonds

20. Which fluorophore is commonly used in immunofluorescence due to its bright green fluorescence?

- a) Alexa Fluor 488
- b) Rhodamine
- c) FITC (Fluorescein isothiocyanate)
- d) Texas Red

**SECTION B: ANSWER ALL QUESTIONS (40 MARKS)**

1. Describe the applications of Immunofluorescence testing (5 marks)
2. Describe the various types of transplant graft rejections (5 marks)
3. Outline the factors that affecting the measurement of antigen and antibody Reactions. (5 marks)
4. Discuss the comparative efficiency of Immunoglobulin classes in different serological reactions. (5marks)
5. Describe the applications of Indirect Coombs test (5marks)
  - 6) Outline the Indirect ELISA methodology and state its application (5 marks)
  - 7) Describe the principle and applications of Radioimmunoassay (5marks)
  - 8) Outline the Quality control considerations for different serological tests. (5marks)

**SECTION C: ANSWER ANY TWO QUESTIONS (40 MARKS)**

1. Discuss the types and Applications of Precipitation Reactions (20 marks)
2. Discuss the principles, applications, and significance of agglutination reactions in Immunology (20 marks)
3. Explain the definition -classification and types of transplantation (20 marks)