UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION

OCTOBER 2025 SEMESTER

COURSE CODE	:	HDD20703
COURSE TITLE	:	DIAGNOSTIC IMMUNOLOGY
PROGRAMME NAME	:	DIPLOMA OF MEDICAL LABORATORY TECHNOLOGY
DATE	:	30 JANUARY 2026
TIME	:	3:00PM - 6:00PM
DURATION	:	3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of TWO sections.
4. Section A consist 25 MCQ or EMQ questions. Answer ALL questions.
5. Section B consist of four questions. Answer THREE (3) questions only.
6. Please write your answer on the answer booklet provided.
7. Please answer all questions in English only.
8. Please answer MCQ/EMQ questions using OMR sheet. ☐ *Tick if applicable*
9. Refer to the attached Formula/ Appendies. ☐ *Tick if applicable*

THERE ARE 10 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 25 marks)

Answer ALL questions.

Please use the objective answer sheet provided.

1. Which enzymes are most commonly used in enzyme-based immunoassays?

   A. Lactase and amylase.

   B. Catalase and urease.

   C. Lipase and protease.

   D. Horseradish peroxidase (HRP) and alkaline phosphatase (AP).

2. Why is radioimmunoassay (RIA) highly sensitive?

   A. Detects only high concentrations of analytes using enzymes.

   B. Uses non-radioactive materials.

   C. Does not require instrumentation.

   D. Detect extremely low analyte concentrations using radioactive isotopes.

3. Why must blood intended for cryoglobulin analysis be maintained at body temperature until serum separation?

   A. Prevent accidental freezing.

   B. To accelerate precipitation.

   C. Avoid falsely negative results.

   D. To increase immunoglobulin concentration.

4. What principle underlies detection in enzyme-labeled immunoassays?

   A. Enzymes convert a colorless substrate into a colored product measurable by spectrophotometry.

   B. Enzymes alter the pH of the solution, making it acidic.

   C. Enzymes bind antigens and emit light.

   D. Enzymes degrade substrate into smaller molecules.

5. What is the primary purpose of immunohistochemistry (IHC)?

   A. Assessment of carbohydrate metabolism

   B. Detection of specific proteins within tissue sections using antibodies

   C. Measurement of circulating DNA

   D. Identification of chromosomal abnormalities

6. What is the function of antifade mounting medium in immunofluorescence?

   A. Extend incubation time.

   B. Stain nuclei.

   C. Preserve fluorescence.

   D. Remove unbound antibodies.

7. What is the main purpose of fixation in immunofluorescence?

   A. To stain the surrounding tissues.

   B. To thicken the sample.

   C. Block nonspecific binding due to endogenous antibody.

   D. Preserve cellular architecture while maintaining antigen accessibility.

8. What is the core principle of Direct Immunofluorescence (DIF)?

   A. Radioactive labeling is used

   B. Colorimetric substrates are used

   C. Fluorophore is conjugated directly to the primary antibody

   D. Fluorophore is conjugated to the secondary antibody

9. Why is Direct Immunofluorescence generally less sensitive than Indirect Immunofluorescence?

   A. Absence of signal amplification

   B. Microscope quality

   C. Less stable fluorophore

   D. More extensive sample preparation

10. What is the standard method for detecting temperature-sensitive immunoglobulins?

    A. Heating or cooling serum and observing for precipitation

    B. Adding chemicals to induce color change

    C. Centrifugation and layer inspection

    D. Exposure to UV light

11. What is the underlying principle of nephelometry involving antigen–antibody reactions?

    A. Formation of insoluble immune complexes that scatter light

    B. Measurement of heat generation

    C. Formation of soluble complexes that absorb light

    D. Separation of particles by size

12. Why are fluorometric labels safer than radioimmunoassay (RIA)?

    A. Require minimal sample preparation

    B. Does not involve radioactive materials.

    C. They do not require detection instruments

    D. They are inexpensive

13. What principle defines the double-diffusion technique?

    A. Antigen and antibody are separated by a membrane

    B. Antigen and antibody are mixed and heated

    C. Antigen and antibody are placed in the same well

    D. Antigen and antibody diffuse from separate wells toward one another to form precipitin lines

14. What primary limitation affects samples with low antigen concentrations in radial immunodiffusion (RID)?

    A. Requires complex instrumentation

    B. Provides instantaneous results

    C. Cannot calculate antigen concentration

    D. Limited sensitivity to very low antigen levels

15. Why is double diffusion unsuitable for rapid analysis of complex antigen mixtures?

    A. It is slow and requires purified antigens

    B. It is quantitative

    C. It is fast and well-suited for mixtures

    D. It does not involve antigens

16. Which technique is NOT categorized under immunochemical or physicochemical methods?

    A. Nephelometry

    B. DNA sequencing

    C. Serum viscosity

    D. Chromatography

17. What is the outcome when multivalent antigens bind with multiple antibodies to form a repetitive network?

    A. Dissolution

    B. Evaporation

    C. Filtration

    D. Precipitation

18. How does the antigen-to-antibody ratio influence precipitation in an immunologic reaction?

    A. Excess antigen or antibody prevents cross-linking and inhibits precipitation

    B. Only antigen excess produces precipitation

    C. Only antibody excess produces precipitation

    D. Any ratio yields precipitation

19. What is the fundamental distinction between immunoelectrophoresis and immunodiffusion?

    A. Immunoelectrophoresis employs an electric field, whereas immunodiffusion does not

    B. Both techniques utilize an electric field

    C. Immunodiffusion employs an electric field, whereas immunoelectrophoresis does not

    D. Neither technique utilizes an electric field

20. Why is immunodiffusion widely utilized in laboratory settings?

A. It is simple, cost-effective, and broadly applicable

B. It is complex and not commonly employed

C. It requires advanced instrumentation and is rarely used

D. It is restricted to research applications

21. Why is radial immunodiffusion considered a quantitative technique?

A. It requires advanced automation

B. It permits determination of antigen concentration

C. It forms rings instantaneously

D. It differentiates multiple antigens

22. What principle forms the basis of immunodiffusion assays?

A. Binding occurs on a solid phase to generate fluorescence

B. Antigen and antibody react in solution to produce a color change

C. Antigen and antibody diffuse within a gel to form a visible precipitate

D. Antigen and antibody are separated by centrifugation

23. In Nitro Blue Function Test (NBT), positive reaction will give_____colour.

A. blue

B. black

C. green

D. white

24. In radial immunodiffusion, what does an increase in precipitin ring diameter indicate?

A. Higher antigen concentration

B. No change in protein content

C. Higher antibody concentration

D. Lower antigen concentration

25. Hemagglutination involves reaction using _____.

A. platelet only

B. serum only

C. red blood cells

D. white blood cells

SECTION B (Total: 75 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

Describe the principle of the Nitroblue Tetrazolium (NBT) test, including its procedure, advantages, limitations, and clinical significance.

(25 marks)

Question 2

Evaluate modern quantitative immunoassay techniques and their applications in clinical immunology.

(a) Describe the principle, procedure, applications, and disadvantages of radioimmunoassay (RIA).

(15 marks)

(b) Explain the working principle of nephelometry and provide an example of its use.

(10 marks)

Question 3

Discuss immunological diagnostic techniques used to assess cellular and humoral responses, highlighting their principles, methodologies, and clinical relevance.

(a) Compare direct and indirect immunofluorescence in terms of principle, procedure, sensitivity, and applications.

(10 marks)

(b) Describe the principle of the delayed-type hypersensitivity (DTH) test, its interpretation, and clinical usage. Include criteria for positive and negative reactions.

(15 marks)

Question 4

Critically evaluate immunodiffusion and immunoelectrophoretic techniques used in immunology, highlighting their principles, methodologies, and applications

(a) Describe the technique of radial immunodiffusion, including its principle, advantages, limitations, and provide an example of its use in immunology

(15 marks)

(b) Compare immunoelectrophoresis and electroimmunodiffusion in terms of principle, procedure, and application.

(10 marks)

END OF EXAMINATION PAPER