

CANDIDATE NUMBER.....



**"Investing in Africa's future"**

**COLLEGE OF HEALTH, AGRICULTURE AND NATURAL  
SCIENCES**

**DEPARTMENT OF BIOMEDICAL AND LABORATORY SCIENCES**

**BACHELOR OF MEDICAL LABORATORY SCIENCES HONOURS**

**END OF SECOND SEMESTER EXAMINATIONS**

**NSLS208: IMMUNOLOGY**

**APRIL 2025**

**LECTURER: Mr Z Chiwodza**

**DURATION: 3 HOURS**

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***INSTRUCTIONS***

1. Write your candidate number in the space provided on top of each page
  2. Answer **all** questions in section A on the question paper.
  3. Answer **all** questions in section B on separate answer sheets provided.
  4. Answer any 3 questions in section C on separate answer sheets provided
  5. The mark allocation for each question is indicated at the end of the question
  6. Credit will be given for logical, systematic and neat presentations in sections B and C
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**SECTION A: MULTIPLE CHOICE [40 MARKS]**

- **Answer all questions by encircling the correct response T for TRUE or F for FALSE for each statement in all the questions**
- **Each correct response is allocated half a mark.**

1. **Primary Lymphoid organs include**

- T F a) Spleen
- T F b) Tonsils
- T F c) Bone Marrow
- T F d) Thymus

2. **Regarding the mucosal surfaces**

- T F a) They consist of cells lining the gut, lungs, and nasal tract
- T F b) They have an increased number of lymphocytes
- T F c) They can contain commensals that live symbiotically with the rest of the body
- T F d) pH imbalances in the mucosal surfaces can affect the microbiome associated with the mucosa and this can lead to disease.

3. **Cells of the cell mediated immunity include**

- T F a) Macrophages
- T F b) NK cells
- T F c) T<sub>h</sub> cells
- T F d) Neutrophils

4. **Are the following cells correctly matched with their use in the immune system?**

- T F a) Phagocytes – engulf invading viruses
- T F b) B cells – produce immunogens
- T F c) Natural killer cells – kill viruses by directly releasing autoantibodies
- T F d) T helper cells – help Cytotoxic T cells via cytokines

5. **Palesa ate improperly cooked seafood and developed symptoms of food poisoning. Which immunological events may occur in response?**

- T F a) The gastrointestinal tract may activate its mucosal immune defenses, including secretory IgA.
- T F b) Pattern Recognition Receptors (PRRs) in the gut can detect bacterial toxins and initiate an immune response.
- T F c) Inflammation in the intestinal lining can cause diarrhea as a way to expel the pathogen.
- T F d) The liver plays no role in clearing toxins from the bloodstream in such cases.

**6. Functions of Macrophages in Immunity include**

- T F a) Phagocytosis of pathogens and cellular debris.
- T F b) Presentation of antigens to T cells to initiate adaptive immunity.
- T F c) Direct production of antibodies to neutralize pathogens.
- T F d) Secretion of cytokines to regulate immune responses.

**7. Features of inflammation include**

- T F a) Increased blood flow leads to redness and warmth at the site of injury.
- T F b) Swelling results from increased vascular permeability and fluid accumulation.
- T F c) Inflammation always indicates an infection is present.
- T F d) Chemical mediators such as histamine and cytokines play key roles in inflammation.

**8. The role of dendritic cells in immunity are**

- T F a) Dendritic cells are the main antigen-presenting cells for T-cell activation.
- T F b) They capture antigens in tissues and migrate to lymph nodes to initiate adaptive immunity.
- T F c) Dendritic cells only function in innate immunity and have no role in adaptive immunity.
- T F d) They express both MHC class I and II molecules to present antigens to CD4+ and CD8+ T cells.

**9. Brian has a bacterial infection and is given antibiotics. How does the immune system contribute to recovery?**

- T F a) Neutrophils and macrophages help eliminate the bacteria.
- T F b) Complement activation can enhance bacterial clearance.
- T F c) B cells can produce antibodies that aid in bacterial neutralization.
- T F d) Antibiotics completely replace the immune system's role in fighting infections.

**10. Regarding immune evasion by pathogens**

- T F a) Some viruses downregulate MHC molecules to evade CD8+ cells.
- T F b) Bacterial capsules can inhibit phagocytosis by immune cells.
- T F c) Antigenic variation allows some pathogens to escape immune recognition.
- T F d) Pathogens are unable to interfere with cytokine signaling during infection.

11. **Regarding vaccination**

- T F a) Live attenuated vaccines generally provide longer-lasting immunity than inactivated vaccines.
- T F b) Subunit vaccines contain whole killed pathogens to stimulate the immune system.
- T F c) Herd immunity protects individuals who are not vaccinated.
- T F d) mRNA vaccines work by encoding viral proteins that are expressed in host cells.

12. **Regarding Cancer Immunology**

- T F a) Tumor cells can evade the immune system by downregulating tumor antigens.
- T F b) Checkpoint inhibitors block immune checkpoints to enhance T-cell activation.
- T F c) CAR-T cell therapy involves genetically modifying a patient's T cells to target cancer cells.
- T F d) Natural Killer (NK) cells play no role in anti-tumor immunity.

13. **Regarding the Rapid Plasma Reagin (RPR) test for Syphilis**

- T F a) It measures IgD antibodies found in the sick patient
- T F b) It tests for Cardiolipin found in the sick patient
- T F c) It is a useful Lateral flow assay with high accuracy
- T F d) If antibodies are not present, the charcoal reacts with the commercial antigen to form small clumps.

14. **Factors to consider when performing gel electrophoresis include**

- T F a) ionic strength of buffer
- T F b) gel pore size
- T F c) general Molecular weight of the analytes and their charge
- T F d) strength of electrical current

15. **Regarding the complement**

- T F a) C5b is an important opsonizing molecule
- T F b) C3a has chemotactic function
- T F c) C4a may cause mast cell degranulation
- T F d) cytolysis of bacteria can occur in the absence of immune complexes

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16. **Polio is a vaccine preventable disease. What immunological principles does the vaccination process rest upon?**
- T F a) Adaptive immunity has memory
  - T F b) Adaptive immunity develops more strength with each encounter with a pathogen
  - T F c) A weak version of the virus is enough to boost the immune system
  - T F d) Once the body makes antibodies against measles, the virus will never attack again.
17. **Chenai received a kidney transplant. What immunological challenges may arise?**
- T F a) The recipient's immune system may recognize the donor kidney as foreign and attempt to reject it.
  - T F b) Immunosuppressive drugs may be required to prevent organ rejection.
  - T F c) T-cell-mediated immunity plays a role in transplant rejection.
  - T F d) The immune system ignores all transplanted organs, making rejection unlikely.
18. **Amina has been exposed to Mycobacterium tuberculosis (TB). What immune mechanisms may be involved?**
- T F a) Interferon Gamma.
  - T F b) Hydrogen Peroxide  $H_2O_2$
  - T F c)  $ONOO^-$  (peroxynitrite)- a reactive nitrogen species
  - T F d) B-cell activating factor
19. **Sibusiso has an allergic reaction after eating peanuts. What immune events may explain this?**
- T F a) Mast cells degranulate and release histamine, causing symptoms like swelling and itching.
  - T F b) The reaction is mediated by IgG antibodies.
  - T F c) The response involves a Type I hypersensitivity reaction.
  - T F d) Epinephrine can be used to counteract severe allergic symptoms.
20. **Diseases that can be caused by cytokine abnormalities include**
- T F a) Cytokine Release Syndrome
  - T F b) Overproduction of IL-6 and TNF-beta causes septic shock in bacterial bloodstream infections.
  - T F c) Under expression of IL-6 in Chaga's disease
  - T F d) IL12 overproduced by cancer cells and further increases proliferation of the cancer cells

**SECTION B [20 MARKS]**

**Answer all questions on separate answer sheets provided**

1. State 2 advantages and 2 limitations of using monoclonal antibodies in diagnostic immunology **[4 marks]**
2. Give 5 examples of an auto immune disease and the immunology based tests to diagnose them **[5 marks]**
3. State the function of the following molecules as they are used in immunology
  - a) IgG **[1mark]**
  - b) MHC II **[1mark]**
  - c) Tumor Necrosis Factor Alpha **[1mark]**
  - d) Interleukin 1 **[1mark]**
  - e) Histamine **[1mark]**
  - f) Properdin **[1mark]**
4. Which diseases are associated with an increase in the following molecules
  - a) Antinuclear Antibodies
  - b) C-reactive Protein
  - c) IgE
  - d) Eosinophils
  - e) T – Helper 2

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**SECTION C [75 marks]**

**Answer any 3 questions from this section on separate answer sheets provided**

1. Explain in detail, the mechanisms of phagocytosis, including recognition, engulfment, and destruction of bacterial pathogens. **[25 marks]**
2. Patient **B**, who is HIV positive, presents with, low-grade fevers, and night sweats. A Ziehl-Neelsen (ZN) assay was performed on ascitic fluid brought to the laboratory produced > 20 fields with pink bacilli against a blue background. Discuss the immunological events underlying these clinical and laboratory findings. **[25 marks]**
3. Patient **C**, a recently diagnosed HIV-positive individual with a CD4 count of 30 cells/ $\mu$ L, was started on antiretroviral therapy (ART) two weeks after being treated for cryptococcal meningitis. The patient now presents with worsening headaches, neck stiffness, and vomiting. Lumbar puncture reveals increased intracranial pressure but sterile cerebrospinal fluid cultures. Discuss the immunopathogenesis of the clinical and laboratory findings in this patient. **[25 marks]**
4. Discuss a tried and tested method of curing HIV from an immunological perspective. In your discussion highlight the challenges associated with the procedures and ways to overcome them. **[25 marks]**
5. Discuss the immunological principles behind vaccine development, using two different vaccine types as examples. **[25 marks]**