P

NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES

DEPARTMENT OF CLINICAL HEALTH SCIENCES

QUALIFICATION : MEDICAL LABORATORY SCIENCES	
QUALIFICATION CODE: 08BMLS	**LEVEL:** 5
COURSE CODE: IMY521S	**COURSE NAME:** IMMUNOLOGY
SESSION: **JANUARY 2025**	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

SECOND OPPORTUNITY EXAMINATION PAPER	
EXAMINER(S)	**MR FILIPPUS TSHAVUKA**
MODERATOR:	**Ms FREDRIKA ENGELBRECHT**

INSTRUCTIONS
1. Answer ALL the questions. 2. Write clearly and neatly. 3. Number the answers clearly. 4. For SECTION A, use ZIP-Grade answer sheet provided

THIS QUESTION PAPER CONSISTS OF 9 PAGES (Including this front page)

SECTION A: MULTIPLE CHOICE QUESTIONS [20 MARKS]

QUESTION 1 [20]

Evaluate the statements in each numbered section and select the most appropriate answer or phrase from the given possibilities. **Answer all your questions on the ZiP-grade answer sheet attached to the back of this question paper.**

1.1. Which of the following correctly describes Koch's postulates in determining the cause of a disease? [1]

A. The microorganism must be present in healthy individuals but absent from all diseased individuals.
B. The microorganism must be isolated from a diseased organism and grown in pure culture, and it should cause disease when introduced into a healthy, susceptible host.
C. The microorganism must always be present in the environment of the infected individual to be classified as a causative agent.
D. The microorganism must induce an immune response in the host before being isolated.

1.2. Antigen-recognizing receptors differ in their affinity for antigens, which can be expressed in terms of their dissociation constant (Kd). higher Kd values indicate lower affinity for antigens. Given the following dissociation constants (Kd) for different receptors, which one demonstrates the highest affinity for its antigen? [1]

A. Antibody (IgG): Kd = 10^{-9} M
B. T-cell receptor (TCR): Kd = 10^{-6} M
C. MHC Class I molecule: Kd = 10^{-5} M
D. MHC Class II molecule: Kd = 10^{-4} M

1.3. MHC class I molecules are found on: [1]

A. Virtually all cells in the body.
B. B cells, dendritic cells and macrophages.
C. Virtually all nucleated cells in the body.
D. Only on virally infected cells.

1.4. The following statements about cell markers are true EXCEPT: [1]

A. CD4 is expressed on T-helper cells.
B. CD8 is a marker for cytotoxic T cells.
C. CD19 is expressed on B cells.
D. CD3 is found on natural killer (NK) cells.

1.5. Examples of Major histocompatibility complex (MHC) class I is: [1]

A. HLA-F
B. HLA-DR
C. HLA-DQ
D. CD8

1.6. An epitope: [1]

A. Is the area on an antigen which contacts antibody.
B. Is the area on an antibody which contacts antigen.
C. Requires both antigen-binding sites (Fab) of the antibody molecule for its recognition.
D. Is usually composed of a linear sequence of amino acids.

1.7. The binding of antigen to antibody: [1]

A. Is irreversible
B. Depends on covalent interactions.
C. Occurs solely by hydrophobic bonding.
D. Depends on spatial complementarity.

1.8. Peptides produced by processing of cytosolic proteins largely: [1]

A. Are generated in late endosomal vacuoles.
B. Enter the endoplasmic reticulum by diffusion
C. Are presented at the cell surface with MHC class II to CD4 T-helpers.
D. Are presented at the cell surface with MHC class I to CD8 cytotoxic T-cells.

1.9. Antigenic peptides in the MHC class II groove: [1]

A. Are usually over 12 residues in length.
B. Are usually under 12 residues in length.
C. Extend beyond the groove.
D. Usually have 3 or more invariant anchor residues.

1.10. Vaccines are meant to induce which type of immunity? [1]

A. Innate immunity
B. Both innate and adaptive
C. Adaptive immunity
D. Neither. Vaccines use a different immune pathway.

1.11. What cytokine property refers to two or more cytokines working together to produce an amplified effect? [1]

A. Pleiotropism

B. Synergy

C. Redundancy

D. Antagonism

1.12. Which cytokine receptor family shares the common gamma chain (γc) and includes receptors for IL-2, IL-4, IL-7, IL-9, and IL-15? [1]

A. Chemokine receptors

B. TNF receptor family

C. Class I receptors

D. IL-1 receptor family

1.13. Which cytokine signaling pathway is primarily activated by TNF receptors? [1]

A. JAK-STAT pathway

B. NF-κB pathway

C. Complement pathway

D. Signal transduction

1.14. What is the primary structural feature that distinguishes Type I from Type II cytokine receptors? [1]

A. Both have identical structures.

B. Type I receptors have conserved cysteine residues and a WSXWS motif, while Type II receptors lack the WSXWS motif.

C. Type II receptors have a transmembrane domain, but Type I does not have.

D. Type I receptors lack any conserved motifs.

1.15. How do we call macrophages that are known as guardians of the lungs? [1]

A. Kupffer cells

B. Alveolar macrophages

C. Microglial cells

D. Monocytes

STATE WHETHER THE FOLLLOWING STATEMENTS ARE TRUE OR FALSE, USING THE ATTACHED ZIP-GRADE ANSWER SHEET.

1.16. Innate immunity has a slower response time but provides long-lasting protection, whereas adaptive immunity is immediate but lacks memory. [1]

A. True

B. False

1.17. Antibodies, major histocompatibility complex (MHC) and T cell receptor (TCR) are antigen recognition receptors. Both Antibodies and MHC recognise linear and conformational epitopes while TCR only recognizes linear epitopes. [1]

A. True

B. False

1.18. Actively acquired immunity is transferred from mother to foetus through the placenta, while passively acquired immunity is developed after vaccination. [1]

A. True
B. False

1.19. Passively acquired immunity involves the direct introduction of antibodies, whereas actively acquired immunity involves the body generating its own antibodies in response to an infection or vaccination. [1]

A. True
B. False

1.20. An example of a pathogen-associated molecular pattern (PAMP) is the unmethylated CpG DNA sequences found in bacteria. [1]

A. True
B. False

SECTION B: STRUCTURED QUESTIONS [80 MARKS]

QUESTION 2

Indicate whether the following cells form part of the innate or adaptive system: **[8 MARKS]**

2.1. Natural killer cells [1]
2.2. Neutrophils [1]
2.3. B lymphocytes [1]
2.4. Microglial cells [1]
2.5. Alveolar macrophages [1]

2.6. T helper 2 [1]

2.7. Monocytes [1]

2.8. Eosinophils [1]

QUESTION 3 **[10]**

Provide explanations on the following terms:

3.1. Pleiotropism of cytokines [2]

3.2. Synergy of cytokines [2]

3.3. Bare lymphocyte syndrome [2]

3.4. An effective adaptive immune response [2]

3.5. The structure of IgA antibody [2]

QUESTION 4 **[24]**

The T cell receptor complex interact with the major histocompatibility complex on Antigen presenting cells. The TCR complex consists of many molecules which aids in antigen recognition and consequent phosphorylation of ITAM regions, generation of signal transduction and activation of lymphocyte.

4.1. Name the four molecules/proteins which form part of this complex when interacting with the antigen presenting cells. [4]

4.2. Discuss the different subtypes of T lymphocytes, their functions, the type of pathogens they help remove (intracellular or extracellular) and examples of principal cytokine they produce. [20]

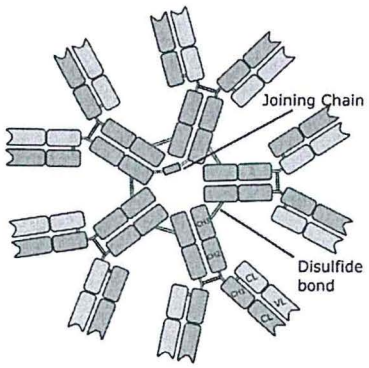
QUESTION 5 **[6]**

Compare the major structural and functional differences between class I MHC molecules and class II MHC molecules. Present your answers in a table. [6]

MHC I	MCH II

QUESTION 6 **[16]**

Immunoglobins (Ig), known as antibodies are glycoproteins that are produced by the plasma cells and form part of the humoral immunity. Use the image below to describe the basic and molecular structure of each of the 5 different classes of antibodies. [16]



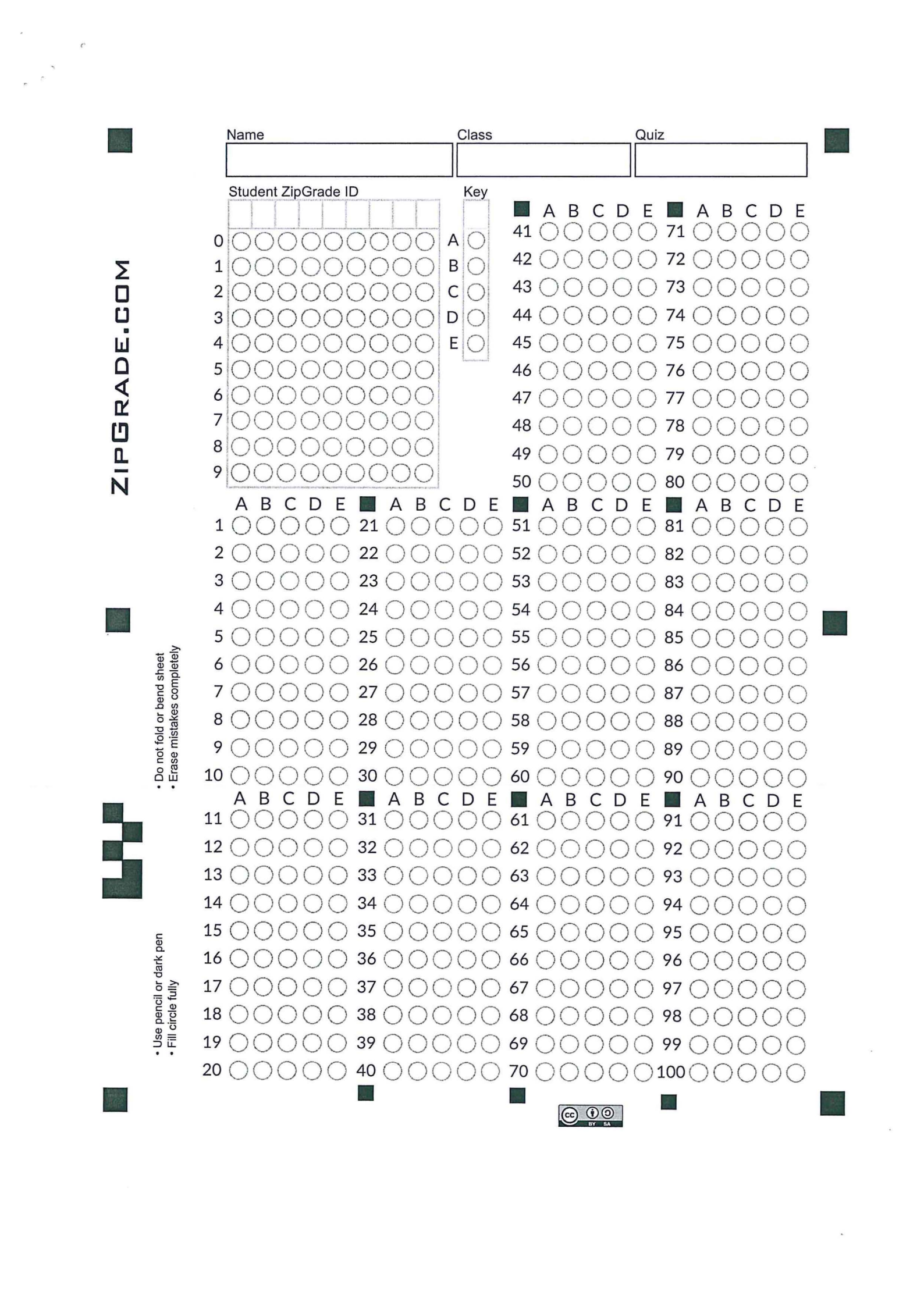
QUESTION 7 **[8]**

Explain how lymphoid organs are classified according to their function and further subclassified based on their morphological characteristics. Provide an example for each classification or category. [8]

QUESTION 8 **[8]**

Discuss how antigen is processed and expressed by major histocompatibility complex class I to the T lymphocytes. [8]

THE END [100 MARKS TOTAL]


Name
Class
Quiz
Student ZipGrade ID
Key
ZIPGRADE.COM
• Do not fold or bend sheet
• Erase mistakes completely
• Use pencil or dark pen
• Fill circle fully