



UNIVERSITY EXAMINATIONS

**FIRST YEAR EXAMINATION FOR THE AWARD OF THE
DEGREE OF BACHELOR OF SCIENCE IN CLINICAL MEDICINE
AND COMMUNITY HEALTH
SECOND TERM 2022/2023
[JANUARY-APRIL, 2023]**

PATH 111: IMMUNOLOGY

STREAM: Y1T2

TIME: 2 HOURS

DAY: THURSDAY, 2:00 – 5:00 PM

DATE: 30/03/2023

INSTRUCTIONS

1. Do not write anything on this question paper.

Section A: Answer ALL question

1. Which one of these is true about the variable region domain?
 - A. Needed to bind complement to initiate
 - B. Located at the N-terminal of light chain and heavy chain
 - C. Necessary for specific recognition of Ag
 - D. Both B and C
2. The two types of light chains of the antibodies are distinguished
 - A. By their variable region domains
 - B. As kappa or lambda types
 - C. By the J-chains that bind to them
 - D. Both B and C
3. The J-chain
 - A. Is present in monomeric forms of immunoglobulin
 - B. Is made only by epithelial cells
 - C. Is responsible for immunoglobulin multimer formation
 - D. None of the above
4. Immunoglobulin class switching is a phenomenon that
 - A. Changes the heavy chain constant region without changing the variable region
 - B. Always goes from IgM to another immunoglobulin class
 - C. Is influenced in part by cytokines produced by T-cells following a booster immunization
 - D. All of the above
5. The Fc receptors
 - A. Occur on the cell surface of cells of the immune system
 - B. Recognize the variable region domains of the immunoglobulin heavy chain
 - C. Recognize the constant region domains of the immunoglobulin heavy chain
 - D. A and C

6. The T-cell receptor
 - A. Is composed of four polypeptide chains
 - B. Is secreted into the plasma by the T –cell
 - C. Recognizes antigen fragments via the al[ha and beta chains
 - D. Is the recognition element of the humoral arm of the immune system
7. Killer T-cells effect their killing
 - A. By antibodies with specific recognition capabilities
 - B. By inserting the complement components , C5 and C9, into the target cell membrane
 - C. By the T-cell antigen receptor and class MHC proteins
 - D. By inserting a pore forming protein called perforin into the target cell membrane
8. Target cell lysis and destruction can be achieved by
 - A. Cytotoxic t-cells recognizing specific epitopes on the target cell surface
 - B. Perforin released from antigen-specific cytotoxic T-cells
 - C. Complement binding to IgM and IgG type antibodies which have bound to epitope on the target cell
 - D. All of the above
9. What distinguished helper T-cells from cytotoxic T-Cells
 - A. Helper cells recognize antigen complexed with MHC classII molecule
 - B. Cytotoxic cells recognize antigens complexed with MHCclass molecules
 - C. Cytotoxic recognize antigen complexed with MHC class molecules
 - D. Both A and B
10. Cytokines are
 - A. Produced by cells of the immune system in response to vaious physiological stimuli
 - B. Able to stimulate an increase in antibody production
 - C. Able to activate T- cells and increase b-cell proliferation
 - D. All of the above
11. The major purpose of lymphokines is to
 - A. bind to class I major histocompatibility molecules for cytotoxic function
 - B. specifically recognize antigens or their fragments
 - C. stimulate the production of complement
 - D. help control and regulate the cells of the Immune system
12. Immediate hypersensitivity reactions
 - A. Are experienced if the antigen is an allergen
 - B. result from histamine and other chemical mediator release
 - C. mediated through antigen specific IgE and mast cells
 - A. All of the above
13. Which of the followings are TRUE regarding an Immune response
 - A. the principal function of the T3 complex is signal transduction to the cell's interior after recognition of the molecular complex with antigen
 - B. the T8 protein serves an auxiliary role with MHC class I proteins in cytotoxic reactions
 - C. the T4 protein serves an auxiliary role with MHC class II proteins in helper cell reactions
 - D. All of the above
14. The T3 or CD3 component of the T-cell receptor
 - A. Is composed of three polypeptide chains
 - B. specifically recognizes antigen bound to class 1 and class ii MHO proteins
 - C. participates in transducing the antigen recognition signal to the Tcells interior
 - D. A and C

15. Domains of immunoglobulins are
 - A. units of approximately 110 amino acids in length
 - B. found in constant regions and variable regions
 - C. A and B
 - D. None of the above
16. Antigen-antibody reactions can result in the following:
 - A. Agglutination
 - B. complement fixation
 - C. virus neutralization
 - D. All the above
17. Effector functions of immunoglobulins are
 - A. The property of the constant region domains of L-chains
 - B. The property of the constant region domains of J-chains
 - C. The property of the variable region domains of H-chains
 - D. The property of the constant region domains of H-chains
18. Effector functions of Immunoglobulins are all of these except
 - A. Involved in complement fixation by IgM and IgG
 - B. The property of constant region domains of heavy chains
 - C. Illustrated by placental transfer of IgG to the fetus
 - D. The property of constant region domains of the light chains
19. Domains of immunoglobulins are EXCEPT
 - A. units of approximately 110 amino acids in length
 - B. found in constant regions and variable regions
 - C. compact globular units of heavy and light polypeptide chains
 - D. the carbohydrate side chain
20. Antibodies are distinct from antigens in all of these EXCEPT
 - A. because they can only be proteins
 - B. because they are only produced by B-cells
 - C. because they are not normally recognized as "foreign"
 - D. because they are only produced by T-cells
21. The following are closely related to each other except
 - A. Antigen
 - B. Allergen
 - C. Epitope
 - D. Antibody
22. The domain unit of an immunoglobulin or T-cell antigen receptor
 - A. only include the variable regions
 - B. only recognizes the paratope
 - C. only fixes complement
 - D. is typically about 110 amino acids long
23. The specific type of functional activity of a T-cell following antigen recognition is determined by the
 - A. antigen receptor
 - B. Type of MHC class protein presenting the antigen fragment
 - C. T4 (CD4) or T8 (CD8) associated polypeptides
 - D. B and C
24. The antigen combining site of the T-cell receptor and antibody constitute the following EXCEPT
 - A. located at the amino terminal of the structures

- B.** a pocket complementary' to the epitope
 - C.** capable of combining with a single antigenic determinant
 - D.** identified by light chain kinase
25. Which Is TRUE for BOTH the T-cell antigen receptor and the antibody
- A. They undergo class switching
 - B. They can be secreted
 - C. They possess J-chains
 - D. They can exist as cell surface receptor, integral membrane proteins.
26. The major histocompatibility complex proteins function to
- A. degrade T4 and T8 polypeptides
 - B. bind antibody for lymphokine production
 - C. bind complement for cell lysis
 - D. bind antigen fragments for presentation to T-cells
27. Antibodies
- A. are carbohydrates
 - B. are made from alpha and beta chains
 - C. contain no carbohydrate
 - D. contain heavy and light chains
28. An antigenic determinant is
- A. a small topological feature of a large macromolecule such as A protein or carbohydrate
 - B. specifically recognized by an epitope
 - C. specifically recognized by a paratope
 - D. A and C
29. The following are true statements EXCEPT
- A.** IgM and IgG can fix complement
 - B.** IgA is a secretory immunoglobulin
 - C.** IgE mediates immediate hypersensitivity
 - D.** IgD provides most passively acquired maternal immunity
30. Which of the following is NOT true of T4 and T8 cell markers?
- A. These are both surface glycoproteins expressed on T-cells.
 - B. These serve to distinguish different types of T-cells, e.g., helper, suppressor and cytotoxic, from each other.
 - C. The T4 proteins serve both to mediate T-cell helper function as well as the receptor for the AIDS virus.
 - D. Both of the markers are present on ALL T-cells.
31. Which of the following is NOT true of interleukins?
- A. They are cytokines which can be produced by various cells of the immune system.
 - B. They are hormones which allow one cell to communicate with another cell.
 - C. They are in need of receptors on the target cell in order to mediate their effects.
 - D. They are able bind antigen with a high level of specificity.
32. Which of the following uniquely distinguishes the T-cell receptor (TCR) from an antibody?
- A. The TCR can bind an antigen fragment only in a trimolecular complex with either the class I or class II surface proteins of the major histocompatibility complex
 - B. The TCR can function as a cell surface antigen receptor
 - C. The TCR is composed of two different types of polypeptide chains
 - D. The TCR is capable of participating in a cytotoxic reaction.
33. Cytokines are produced by cells of the immune system in response to various physiological stimuli

- A. modulate cell function through subsequent cell differentiation or cell proliferation
 - B. cause glycosylation of Immunoglobins
 - C. facilitate perforin release
 - D. All of the above
34. Membrane attack complex (MAC) is
- A. C5b6789 complex
 - B. C5b5678 complex
 - C. C5b5789 complex
 - D. Protein polysaccharide complex
35. Each of the following is a characteristic of antibodies, EXCEPT which one?
- A. they are proteins with variable and constant regions
 - B. they contain carbohydrates
 - C. they are only secreted by T-cells
 - D. they can combine very specifically with antigen
36. Light chains are
- A. specific for each class of antibody
 - B. not specific for each class of antibody
 - C. reactive with antigen
 - D. have only a constant region
37. The class of an immunoglobulin is determined by
- A. the J-chain
 - B. the heavy chain
 - C. the carbohydrate
 - D. the T3 polypeptide complex
38. All of the following are true with respect to IgM antibodies EXCEPT which one
- A. they fix complement
 - B. they occur on the surface of lymphocytes
 - C. they predominate in the primary response to antigen
 - D. they are glycoproteins
 - E. they mediate allergic reaction
39. One principal function of complement is to
- A. inactivate perforins
 - B. mediate the release of histamine
 - C. Bind antibodies attached to cell surfaces and to lyse these cells
 - D. phagocytize antigens
40. One principal function of the Class I and Class II major histocompatibility complex S proteins is to
- A. transduce the signal to the T-cell interior following antigen binding
 - B. mediate immunoglobulin class switching
 - C. present antigen for recognition by the T-cell antigen receptor
 - D. stimulate production of interleukins
41. T-cell antigen receptors are distinguished from antibodies by which of the following
- A. T-Cell receptors are glycosylated
 - B. T-cell receptors must interact with antigen uniquely presented by other cells but not with free antigen
 - C. T-Cell receptors bind various cytokines
 - D. T-Cell receptors bind complement to lyse cells
42. T-cell receptors or antibodies react with antigens
- A. because both are made by lymphocytes

- B. because of complementary of molecular fit of both with antigen
 - C. because both have light chain and heavy chain polypeptides
 - D. cause histamine release
43. All of the following are true of antigen EXCEPT which one of the following?
- A. They contain epitopes.
 - B. They contain antigenic determinants.
 - C. They can elicit an immune response.
 - D. They contain paratopes.
44. Which of the following immunoglobulins is present normally in plasma at the highest concentration?
- A. IgG
 - B. IgM
 - C. IgA
 - D. IgD
45. All of the following are true about antibodies, EXCEPT which one?
- A. They fix complement.
 - B. They predominate the primary immune response to antigen.
 - C. They are glycoproteins.
 - D. They are molecule with a single, defined amino acid sequence
46. The major immunoglobulin family to which a particular immunoglobulin belongs can be determined by sequential analysis of the 110 amino acids beginning from the
- A. Amino terminus of the light chain.
 - B. Carboxy terminus of the light chain.
 - C. Amino terminus of the heavy chain.
 - D. Carboxy terminus of the heavy chain
47. The immunoglobulin Joining chain (J-chain) is
- A. only produced by T-Cells
 - B. only produced by neutrophils
 - C. associated with only multimeric forms of IgM and IgA
 - D. only produced by mast cells
48. All of the following are true EXCEPT
- A. An epitope is a small portion of a macromolecule
 - B. the variable region domains contain the antigen recognition site
 - C. an antigenic determinant is a paratope
 - D. The class of an immunoglobulin is determined by its heavy chain
49. Which of the following statements best characterizes an antibody?
- A. An antibody contains high molecular weight RNA as its basic structure.
 - B. An antibody is composed of protein and cannot be distinguished from the albumin fraction of the serum proteins.
 - C. An antibody is composed of four identical protein subunits which may be caused to dissociate by treatment with urea.
 - D. An antibody contains protein as its major chemical component and its synthesis may be elicited by the administration of a foreign protein or polysaccharide.
50. When a B-cell undergoes immunoglobulin class switching
- A. the variable region of the light chain changes, but its constant region remains the same
 - B. the variable region of the light chain remains the same, but its constant region changes
 - C. the variable region of the heavy chain remains the same but its constant region changes

- D. the variable region of the heavy chain changes but its constant region remains the same
51. The class of an immunoglobulin
 - A. is determined by Class I and Class II major histocompatibility complex proteins
 - B. is determined by the carbohydrate attached to the light chain is
 - C. determined by the antigen
 - D. is determined by the heavy chain type
 52. Hyper IgE results from
 - A. Lack of Th2
 - B. Lack of TNF γ production
 - C. Lack of IL-3 production
 - D. Lack of TH1 or IFN γ production
 53. The T3 complex of the T-cell receptor
 - A. probably functions to transduce a signal to the cell's interior following binding of complexed antigen
 - B. binds complement
 - C. causes the histamine
 - D. mediates Immunoglobulin class switching
 54. Which of the followings is NOT TRUE regarding an Immune response
 - A. the principal function of the T3 complex is signal transduction to the cell's interior after recognition of the molecular complex with antigen
 - B. the T8 protein serves an auxiliary role with MHC class I proteins in cytotoxic reactions
 - C. the T4 protein serves an auxiliary role with MHC class II proteins in helper cell reactions
 - D. lymphokines are produced by T-cells in response to antigen presentation by Ig molecules
 55. One of the following is NOT TRUE about Immediate hypersensitivity reactions
 - A. Are experienced if the antigen is an allergen
 - B. result from histamine and other chemical mediator release
 - C. mediated through antigen specific IgE and mast cells
 - D. help control and regulate the cells of the Immune system
 56. The light and heavy chains of an IgG molecule are held to each other by:
 - A. Covalent bonds
 - B. Non-covalent bonds
 - C. Both
 - D. Neither
 57. Immunological memory is a feature exhibited by:
 - A. cell-mediated immunity
 - B. Adaptive immunity
 - C. Humoral immunity
 - D. Innate immunity
 58. The major “anaphylotoxic” component(s) of complement, which increase(s) Capillary permeability and contribute to the heat, redness and swelling associated With inflammation, are:
 - A. C3b
 - B. C4b
 - C. C3a, C5a
 - D. C5b6789

59. Which of the following cytokines promote Th2 differentiation?
- A. IL-1
 - B. IL-2
 - C. IL-4
 - D. IL-6
60. A molecule that reacts with a specific antibody but it is not immunogenic by itself is called
- A. Carrier
 - B. Antigen
 - C. Hapten
 - D. Immunogen

SECTION B: Answer ALL questions: (60 marks)

1. A) What is a TCR/ T cell antigen receptor? (2 marks)
B) Draw a well labelled diagram of a TCR and indicate the antigen binding site. (8 marks)
2. A) state three types of MHC genes and their roles. (4marks)
B) Explain the functions of MHC molecules. (6 Marks)
3. A) Explain what activates the pathways of the complement system. (6 marks)
B) Explain the functions of the complement system. (4 Marks)
4. A) Explain the properties of cytokines. (5 marks)
B) Explain the physiological responses which require the involvement of cytokines. (5 Marks)
5. Explain the different types of vaccines. (10 Marks)
6. A) explain the factors which will determine whether the type of immune response will be either T_H1 or T_H2 . (5 Marks)
B) Explain how the secondary immune response differs from the primary immune response. (5 marks)

SECTION C: Answer any TWO questions

1. During an infection, the immune response is properly regulated by several factors. Explain (20 marks)
2. Describe the mechanisms which are involved in maintaining immunological tolerance in peripheral lymphoid organs. (20 marks)
3. Describe the mechanisms involved in immune evasion mechanisms. (20 marks)