



**PAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES**

**DEPARTMENT OF CLINICAL HEALTH SCIENCES**

<b>QUALIFICATION : BACHELOR OF MEDICAL LABORATORY SCIENCES</b>	
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<b>COURSE CODE:</b> IMY521S	<b>COURSE NAME:</b> IMMUNOLOGY
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<b>DURATION:</b> 3 HOURS	<b>MARKS:</b> 100

<b>FIRST OPPORTUNITY EXAMINATION PAPER</b>	
<b>EXAMINER(S)</b>	<b>MR. HERBERT. MAPIRA</b>
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<b>INSTRUCTIONS</b>
ANSWER ALL THE QUESTIONS
<b>PERMISSIBLE MATERIALS</b>
PEN

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

<b>SECTION A MULTIPLE CHOICE QUESTIONS</b>		<b>[30 MARKS]</b>
<b>QUESTION 1</b>		<b>(30)</b>
<b>Choose the correct answer and report only the suitable letter next to the relevant question number.</b>		
1.1	Macrophages are characterized by: A. Surface receptors for C3b complement B. Surface CD3 expression C. In vitro synthesis of immunoglobulin D. Large amounts of rough endoplasmic reticulum	(1)
1.2	Which of the following is most likely to activate the alternate pathway of complement activation? A. Lipopolysacchirides B. Glycoproteins C. Haptens D. IgG complexed with antigen	(1)
1.3	Which of the following activities is associated with C3b? A. Opsonization B. Anaphylaxis C. Vasoconstriction D. Chemotaxis	(1)
1.4	Which of the following is the "recognition unit" in the classical complement pathway? A. C1q B. C3a C. C4 D. C5	(1)
1.5	Which of the following is the "membrane attack complex" of complement activation? A. C3 C2, C1, C5 ,C6 B. C4, C2, C3, C5, C6 C. C5b, C6, C7, C8, C9 D. C1, C2, C3, C4, C5	(1)

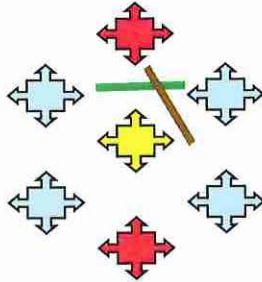
1.6	Which of the following is a recognized theory of the origin of auto immunity?	(1)
	<ul style="list-style-type: none"> <li>A. Enhanced regulatory T cell function</li> <li>B. Diminished helper T cell activity</li> <li>C. Production of antibodies that cross-react with tissue components</li> <li>D. Deficient B cell activation</li> </ul>	(1)
1.7	C3b and Fc receptors are present on:	(1)
	<ul style="list-style-type: none"> <li>A. B lymphocytes</li> <li>B. Monocytes</li> <li>C. B lymphocytes and monocytes</li> <li>D. Neither B lymphocytes and monocytes</li> </ul>	(1)
1.8	T lymphocytes that possess the CD8 surface marker mediate which of the following T cell functions?	(1)
	<ul style="list-style-type: none"> <li>A. Delayed type hypersensitivity</li> <li>B. Regulatory</li> <li>C. Cytotoxic</li> <li>D. Helper</li> </ul>	(1)
1.9	Which of the following is <b>NOT</b> a type of antigen?	(1)
	<ul style="list-style-type: none"> <li>A. Exogenous</li> <li>B. Endogenous</li> <li>C. Autoantigen</li> <li>D. Immunogen</li> </ul>	(1)
1.10	Which MHC class is found on all nucleated cells?	(1)
	<ul style="list-style-type: none"> <li>A. Class I</li> <li>B. Class II</li> <li>C. Class III</li> <li>D. Class IV</li> </ul>	(1)
1.11	Which lymphoid organ undergoes involution with age?	(1)
	<ul style="list-style-type: none"> <li>A. Bone marrow</li> <li>B. Spleen</li> <li>C. Thymus</li> <li>D. Lymph node</li> </ul>	(1)

1.12	<p>Which cells are found in the paracortex of lymph nodes?</p> <p>A. B cells          B. T cells          C. Plasma cells          D. Macrophages</p>	(1)
1.13	<p>What is the function of the red pulp in the spleen?</p> <p>A. Antigen presentation          B. RBC breakdown          C. Lymphocyte activation          D. Antibody production</p>	(1)
1.14	<p>Which of the following is a secondary lymphoid organ?</p> <p>A. Thymus          B. Bone marrow          C. Peyer's patches          D. Liver</p>	(1)
1.15	<p>Positive selection of T cells occurs in the:</p> <p>A. Bone marrow          B. Thymic medulla          C. Thymic cortex          D. Lymph node</p>	(1)
1.16	<p>Which lymphoid tissue protects mucosal surfaces?</p> <p>A. Spleen          B. MALT          C. Thymus          D. Bone marrow</p>	(1)
1.17	<p>Which stage of T cell development expresses both CD4 and CD8 markers?</p> <p>A. Pro-T cell          B. Pre-T cell          C. Double positive          D. Single positive</p>	(1)
1.18	<p>Which cytokine is essential for T cell proliferation?</p> <p>A. IL-4          B. IL-2          C. IFN-<math>\gamma</math>          D. IL-10</p>	(1)

1.19	<p>Which molecule on T cells binds to B7 on APCs for co-stimulation?</p> <p>A. CD40          B. CD28          C. CD3          D. CD8</p>	(1)
1.20	<p>Which T helper subset activates macrophages?</p> <p>A. Th1          B. Th2          C. Th17          D. Treg</p>	(1)
1.21	<p>Latex is frequently used as a carrier particle to which an antigen or antibody can be attached to convert the system to an agglutination test. Characteristics of latex which permit this to be done include:</p> <p>A. Latex being a highly charged particle          B. Latex's tendency to react with human immunoglobulins          C. Latex's tendency to readily agglutinate in a protein suspension          D. Latex's tendency to be an inert particle</p>	(1)
1.22	<p>A latex agglutination test procedure says to add 1 drop of the latex and 1 drop of the patient serum to a well on a slide. The two drops are to be mixed well over the entire area of the slide and rotated in a figure 8 for 2 minutes. The individual performing the test gently mixes the 2 drops in a small circle within the well and rotates for 2 minutes. The most likely result of this will be the:</p> <p>A. Material will not have the whole well area to mix in and the result may be a false negative          B. Material will react appropriately and give the correct results          C. Material will aggregate in the small area in which it is mixed          D. Time will need to be adjusted to permit sufficient mixing</p>	(1)

1.23 The following reaction was obtained on a double diffusion test. These results should be interpreted as:

(1)



- A. Identity
- B. Partial identity
- C. Non-identity
- D. Normal identity

1.24 Which of the following is NOT an acute phase reactant?

(1)

- A. C-reactive protein
- B. Albumin
- C. Serum amyloid A
- D. Fibrinogen

1.25 The antigen being used in a test is lipid rich and only soluble in alcohol. The antigen is pieces of cell wall. The unknown is Patient Ab. This briefly describes:

(1)

- A. Direct agglutination
- B. Flocculation
- C. Passive agglutination
- D. Reverse passive agglutination

1.26 Coombs Control cells (check Cells) are:

(1)

- A. Fresh group O positive cells
- B. Group AB negative cells
- C. Rh negative cells coated with anti-D
- D. Rh positive cells coated with anti-D

1.27 The following is characteristic of the definition of direct agglutination:

(1)

- A. Uses particulate Ag such as red cells or bacteria that react with the Pt. Ab
- B. Requires use of a particulate Ag on a slide to which Pt. Ab can attach
- C. Needs for the Ag to be bound directly to a latex particle
- D. Involves any reaction that can be see with the naked eye

<p>1.28 Indirect immunofluorescence involves:</p> <ul style="list-style-type: none"> <li>A. Uses specific antiserum complexed with a fluorescein to detect the Pt. Ag.</li> <li>B. Testing for the presence of a particulate Ag from the patient</li> <li>C. Rabies fluorescing indirectly via the antisera complexed with a fluorescein</li> <li>D. Having the unknown Pt. Ab. sandwiched between a known particulate Ag and the anti- human Ig conjugate</li> </ul>	(1)
<p>1.29 A test is performed as follows: Latex to which a known Streptococcal exotoxin is attached is applied to a well. Patient serum is added to this slide and the latex/serum are mixed thoroughly. The slide is rotated in a figure 8 for 2 minutes and the reaction is read. This is an example of:</p> <ul style="list-style-type: none"> <li>A. Direct agglutination</li> <li>B. Flocculation</li> <li>C. Passive agglutination</li> <li>D. Reverse passive agglutination</li> </ul>	(1)
<p>1.30 In terms of immunofluorescence, all of the following statements are correct <b>EXCEPT</b>:</p> <ul style="list-style-type: none"> <li>A. Direct immunofluorescence usually detects a particulate Unknown Ag</li> <li>B. Direct immunofluorescence can use the same antisera regardless of the Ag being detected</li> <li>C. Indirect immunofluorescence frequently detects a soluble Unknown Ab</li> <li>D. Indirect immunofluorescence frequently uses anti-human IgG + fluorescein as the conjugate</li> </ul>	(1)
<p><b>SECTION B TRUE OR FALSE QUESTIONS</b> <span style="float: right;"><b>[30 MARKS]</b></span></p>	
<p><b>QUESTION 2</b></p> <p>Assess the following statements and decide whether they are <u>true or false</u>.</p> <p>Write only the number of the question and next to it <b>TRUE</b> for a true statement or <b>False</b> for a false statement.</p> <ul style="list-style-type: none"> <li>2.1 CD8<sup>+</sup> T cells recognize antigens presented by MHC Class I.</li> <li>2.2 MHC Class III is directly involved in antigen presentation.</li> <li>2.3 Each individual expresses a unique combination of MHC alleles.</li> <li>2.4 Tumor antigens are expressed on cancer cells.</li> <li>2.5 The endogenous pathway involves antigen uptake by endocytosis.</li> <li>2.6 MHC molecules are encoded by genes located on chromosome 6.</li> <li>2.7 Antigenic determinants are also called epitopes.</li> </ul>	(30)

2.8	MHC polymorphism has no impact on disease susceptibility.	(1)
2.9	CD4 <sup>+</sup> T cells require co-stimulatory signals for activation.	(1)
2.10	MHC molecules are involved in self/non-self recognition.	(1)
2.11	The cortex of the thymus contains mature T cells.	(1)
2.12	Splenectomy increases the risk of infection.	(1)
2.13	HIV targets lymphoid tissues.	(1)
2.14	The medulla of lymph nodes contains plasma cells and macrophages.	(1)
2.15	Lymphadenopathy refers to enlarged lymph nodes.	(1)
2.16	The thymus is a secondary lymphoid organ.	(1)
2.17	Lymph nodes filter blood.	(1)
2.18	Positive selection ensures T cells can recognize self-MHC.	(1)
2.19	The complement system is only activated by antibodies.	(1)
2.20	CD4 is found on helper T cells, not cytotoxic T cells.	(1)
2.21	Flow cytometry uses fluorescent dyes for multi-parameter analysis.	(1)
2.22	CD4 count is not diagnostic for HIV; it's used for monitoring.	(1)
2.23	Hepatitis B is a DNA virus; others are RNA viruses.	(1)
2.24	Anti-HBs indicates recovery or successful vaccination.	(1)
2.25	Hepatitis A is transmitted via fecal-oral route, not blood.	(1)
2.26	CD4 levels vary with time of day; consistent timing is important.	(1)
2.27	CD3 is a marker for all mature T cells.	(1)
2.28	Reference ranges vary by population and must be locally validated.	(1)
2.29	CD8 is found on cytotoxic T cells and some NK cells.	(1)
2.30	CD4 <200/ $\mu$ L increases risk for opportunistic infections.	(1)

**SECTION C SHORT ANSWER QUESTIONS**

**[40 MARKS]**

**QUESTION 3**

**(40)**

- |     |   |     |
|-----|---|-----|
| 3.1 | Describe the endogenous antigen processing pathway.         | (2) |
| 3.2 | List the three main classes of MHC molecules.               | (3) |
| 3.3 | Describe the role of germinal centers in B cell activation. | (3) |

- |      |  |     |
|------|--|-----|
| 3.4  | Explain the difference between maturation and activation.                            | (2) |
| 3.5  | Describe the type of antigens that are presented by MHC Class II.                    | (2) |
| 3.6  | Briefly describe a hapten  | (2) |
| 3.7  | Describe the role of co-stimulation in T cell activation.                            | (2) |
| 3.8  | State the function of IL-2 in immune activation.                                     | (2) |
| 3.9  | Differentiate between T-dependent and T-independent B cell activation.               | (3) |
| 3.10 | Describe the process of negative and positive T-cell selection in the thymus.        | (4) |
| 3.11 | Name three antigen-presenting cells.   | (3) |
| 3.11 | Summarize the applications of ELISA in clinical diagnostics.                         | (3) |
| 3.13 | Explain the difference between maturation and activation.                            | (4) |
| 3.14 | Describe the following by the types of interactions between antigens and antibodies: |     |
| a.   | Direct immunofluorescence:   | (2) |
| b.   | Immunofluorescence:  | (3) |

**END OF EXAMINATION**