

IMMUNOLOGY
(BIOT 3201)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Complement component C3 is cleaved by
 - (a) Factor D
 - (b) Factor B
 - (c) C3bBb
 - (d) None of the above.
- (ii) Clonal selection occurs when antigen is encountered by
 - (a) Basophil
 - (b) Neutrophil
 - (c) T-cells
 - (d) Mast cells.
- (iii) A hapten is best defined as being
 - (a) a small chemical grouping that reacts with preformed antibodies
 - (b) an immunogen
 - (c) a paratope
 - (d) one of the above.
- (iv) The association constant (k_a) at equilibrium is represented by
 - (a) $\frac{[\text{AgAb complex}]}{[\text{free Ag}][\text{free Ab}]}$
 - (b) $[\text{AgAb complex}]$
 - (c) $\frac{[\text{free Ag}]}{[\text{free Ab}]}$
 - (d) $[\text{free Ag}][\text{free Ab}]$
- (v) The following is characteristic of B- but not T-cells
 - (a) Class-I MHC
 - (b) CD3
 - (c) Measles virus receptor
 - (d) Surface immunoglobulin.
- (vi) IgE
 - (a) is abundant in saliva
 - (b) binds strongly to Mast cells
 - (c) activates the complement cascade
 - (d) cannot bind to macrophages.
- (vii) What is a graft between different members of the same species termed?
 - (a) Autograft
 - (b) Allograft
 - (c) Isograft
 - (d) Xenograft.

- (viii) Antibodies of which of the following specificities can trigger antibody-mediated rejection?
 (a) Antibodies to HLA antigens
 (b) Antibodies to non- MHC molecules
 (c) Antibodies to ABO blood group antibodies
 (d) All of the above.
- (ix) Which of the following diseases has been completely eradicated worldwide?
 (a) Measles (b) Cowpox
 (c) Smallpox (d) Tuberculosis
- (x) Of the following, the single best defining description of a Type IV hypersensitivity reaction is that it involves
 (a) Allergen (b) A delayed type hypersensitivity
 (c) Antigen (d) Cytokine release.

Fill in the blanks with the correct word

- (xi) Cleavage of IgG by _____ enzyme produces Fab segment.
- (xii) Using only random VDJ recombination, from 40 V, 30 D and 6 J gene segments, the number of possible variable regions of an antigen receptor molecule would be ____.
- (xiii) _____ is an example of an enzyme labelled with antibodies in ELISA.
- (xiv) Class I MHC are expressed on _____ cells while class II MHC are restricted to _____ cells.
- (xv) Monocytes differentiate into which kind of phagocytic cells _____.

Group - B

2. (a) Compare and contrast between innate and adaptive immunity. [[C01](Apply/IOCQ)]
 (b) Describe with the help of a diagram the process of phagocytosis. [[C01](Remember/LOCQ)]
 (c) What are interferons and describe its mode of action with respect to natural killer cells? [[C01](Remember/LOCQ)]
4 + 4 + 4 = 12
3. (a) What is the principle behind Hybridoma technology? [[C01](Understand/LOCQ)]
 (b) Distinguish between monoclonal and polyclonal antibodies. [[C01](Apply/IOCQ)]
 (c) How is monoclonal antibody produced? [[C01](Remember/LOCQ)]
2 + 4 + 6 = 12

Group - C

4. (a) Compare the functions of the different classes of antibodies. [[C02](Compare/HOCQ)]
 (b) What will be fate of antibodies after digestion with Pepsin and Papain? [[C02](Remember/LOCQ)]
 (c) What do you mean by Immunogen and Hapten. [[C02](Apply/IOCQ)]
4 + (2 + 2) + 4 = 12

5. (a) Describe the structure of a typical antibody molecule with a labelled diagram. [[CO2](Describe/LOCQ)]
- (b) What do you mean by Antibody Affinity and Antibody Avidity? Mention the forces acting on antigen-antibody binding. [[CO2](Remember/LOCQ)]
- (c) An ELISA designed to test for the presence of serum antibody for a new strain of pathogenic bacteria is under development. Initially, a monoclonal antibody specific for a single epitope of the organism was used both to sensitize the wells of the ELISA plate and as the enzyme-labeled detecting antibody in a conventional sandwich ELISA. The ELISA failed to detect the antigen despite the use of a wide range of antibody concentrations. What is the most probable cause of this problem? Justify with reason. [[CO3](Justify/HOCQ)]
- 4 + (2 + 2) + 4 = 12**

Group - D

6. (a) Compare the antigen processing and presentation by MHC Class I and Class II. [[CO3](Compare/IOCQ)]
- (b) Define: Autograft, Xenograft, Isograft, Allograft. [[CO4](Remember/LOCQ)]
- 8 + (1 × 4) = 12**
7. (a) Define: Isograft, Allograft, Autograft, Xenograft. [[CO4](Understand/LOCQ)]
- (b) Evaluate the role of immunosuppressive drugs in organ transplantation. [[CO4](Evaluate/HOCQ)]
- (c) Justify with reasons the advantage of the MHC gene polymorphism from the immunological perspective. [[CO4](Justify/HOCQ)]
- 4 + 4 + 4 = 12**

Group - E

8. (a) What do you mean by active and passive immunization? Give examples. (CO6)(Understand/LOCQ)]
- (b) Site an example how you can use cytokines for cancer immunotherapy. [[CO6](Apply/IOCQ)]
- (c) What are subunit vaccines? Give an example. [[CO6](Remember/LOCQ)]
- 4 + 4 + (3 + 1) = 12**
9. (a) What do you mean by peptide vaccines? [[CO6](Analyze/IOCQ)]
- (b) Mention the advantages and disadvantages of DNA vaccines. [[CO6](Remember/LOCQ)]
- (c) Analyze the immunological basis of ABO blood grouping. [[CO5](Apply/IOCQ)]
- 4 + 4 + 4 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	50	33.33	16.67

