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Total No. of printed pages = 17

63/2 (SEM-4) ZOO 403 (C,F,W)

2023

ZOOLOGY

(Theory Paper)

Paper Code : ZOO 403 (C)

(Molecular Immunology)

Full Marks – 80

Pass Marks – 32

Time – Three hours

The figures in the margin indicate full marks
for the questions.

1. Answer the following multiple choice type
questions (*all* compulsory) : 1×6=6

(a) In thymus-dependent antigen-activated T-cell,
which among these properties will be seen ?

(i) Affinity maturation

(ii) Isotype switching

(iii) Immunological memory

(iv) Polyclonal activation

[Turn over

- (b) Kappa and Lambda light-chain genes
- (i) are located on the same chromosome
 - (ii) associate with only one type of heavy chain
 - (iii) can be expressed by the same B cell
 - (iv) undergo separate splicing
- (c) The mechanism that permits immunoglobulins to be synthesized in either a membrane bound or secreted form is
- (i) Allelic exclusion
 - (ii) Class switching
 - (iii) Differential RNA processing
 - (iv) the one-turn/two-turn rule
- (d) The TH₁ subset cell development is favoured in the presence of the following cytokine.
- (i) IL-4
 - (ii) IL-6
 - (iii) IL-10
 - (iv) IL-12

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- (e) Which among these sub-classes of IgG is not capable of activating complement at all
- (i) IgG4
 - (ii) IgG3
 - (iii) IgG2
 - (iv) IgG1
- (f) Which of the following cytoplasmic tail of T-cell co-receptor is required for phosphorylation of ITAM present in CD3 molecules ?
- (i) LCK
 - (ii) LAD
 - (iii) LAT
 - (iv) ZAP 70.

2. Answer the following very short type questions
(all compulsory) : 2×5=10

- (a) Define allotype and idiotype immunoglobulin.
- (b) What are the functions of secondary lymphoid organ in the immune system.
- (c) Define Autoimmunity.
- (d) What are the terms 'clonal selection' and 'clonal expansion' refer to concerning B-lymphocytes ?
- (e) What are the causes that lead to chronic rejection of the graft ?

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3. Answer any *six* of the following short types questions : $5 \times 6 = 30$

- (a) Explain why the presence of both IgM and IgD on the membrane of the same B cell does not violate the unispecificity implied by Clonal selection theory.
- (b) Briefly describe the similarities and differences among cytokines, growth factors and hormones.
- (c) Write about the oxygen-dependent and oxygen-independent mechanism of killing ingested pathogens.
- (d) Write about the different factors that regulate the assembly of Membrane-attack-Complex (MAC) formation.
- (e) What are the advantages and disadvantages of using attenuated organisms as vaccines ?
- (f) Describe the pathway of complement activation through the classical pathway.
- (g) Describe the immune-complex mediated hypersensitivity.
- (h) Distinguish between active and passive immunity.

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- (i) What type of immune response is mediated by the TH_2 subset ? What type of antigen challenge is likely to induce a TH_1 mediated response ? $3+2=5$

4. Answer any *two* of the following descriptive / analytical type questions : $10 \times 2 = 20$

- (a) How does MHC Class-I differ from Class-II molecules in terms of its structure and antigenic peptide ? Explain the pathway of processing and presentation of endogenous antigen by MHC Class-I. $4+6=10$
- (b) What are superantigens ? What are its types and properties ? How do they induce damage in host ? $2+4+4=10$
- (c) Draw the basic structure of the $\alpha\beta$ T-cell receptor and compare it with the basic structure of membrane-bound immunoglobulin. $5+5=10$

5. Answer any *one* of the following advanced-type questions : $14 \times 1 = 14$

- (a) How does immune surveillance screen the infected cell ? What are the different types

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of antigens found in tumor cells ? How does the tumor cell escape the immune surveillance and form cancer ? $4+5+5=14$

- (b) How does autoimmunity develop in an individual ? What do you mean by central and peripheral tolerance ? Describe the symptoms and mechanism of any one autoimmune disease. $3+5+6=14$