2022 2/BIT C 202

(July)

BIOTECHNOLOGY & BIOINFORMATICS

(Immunology)

Course No: BIT C 202

Full Marks: 75

Time: 3 hours

The figures in the margin indicate full marks for the questions
*Answer **Question No. 1** and **any four** from the rest*

1.

A. Choose the best answer: 1x5=5

(a) X-linked hyper IgM syndrome is primarily due to

(i) A lack of B cell help by NK cells

(ii) A lack of B cell numbers due to inadequate development in the bone marrow.

(iii) A lack of T cell help via CD40 ligand

(iv) A lack of follicular dendritic cells needed for B cell maturation in the germinal centre

(b) Interleukin 12 is a key inducer of the cell-mediated immunity in response to infection by intracellular pathogens.
Interleukin activate cell-mediated immune response by increasing the synthesis of which of the following cytokines?

(i) TNF

(ii) Interferon-beta

(iii) Interferon-gamma

(iv) Interleukin 1

(c) The sexual life cycle of *Plasmodium falciparum* is completed in

(i) The gut of mosquito

(ii) RBC

(iii) Liver tissue

(iv) The salivary gland of the mosquito

(d) In the preparation of myeloma cells in hybridoma technology they are cultured with

(i) Mercaptopurine

(ii) 8-Azaguanine

(iii) 5-Hydroxyguanine

(iv) Aminopterin

(e) Which of the following statement is incorrect

(i) B-cell epitopes are of two types: linear and conformational

(ii) Conformational B-cell epitopes are considered sequential
(iii) Linear B-cell epitopes are considered sequential
(iv) Conformational B-cell epitopes are also known as discontinuous B-cell epitopes

B. Tick True (√) or False (x): 1x5=5

(a) Hapten when injected with adjuvant can raise immune response against it.
(b) The composition of the interstitial fluid and lymph are basically same.
(c) In humans, high endothelial venules are found in all secondary lymphoid organs except spleen.
(d) C2 and C4 complement deficiency predisposes to systemic lupus erythematosus (SLE).
(e) Histocytes are the tissue-specific macrophages present in kidney.

C.How are dendritic cells different from follicular dendritic cells (give one point)? 1

D. Schematically draw the basic structures of IgM molecules. 2

E. Why T cell receptor (TCR) needs CD3 complex? Where can we find ITAM motif? 2

2. (a) Discuss briefly the evolution of the adaptive immune system among the vertebrates. 4
(b) What are the criteria to call lymphoid organ a primary, secondary or tertiary? 3
(c) Explain in detail the effector mechanisms of innate immune system. 8

3. (a) Differentiate between superantigens and conventional antigens. What makes the B-cell superantigen different from T-dependent and T-independent antigens? 5+2=7
(b) Explain with the help of a diagram the steps in extravasation of naïve T cells to inflammatory sites. 5
(c) Briefly describe the clonal selection theory. 3

4. (a) Differentiate between immunogen and antigen. What are the properties that immunogen must have that lead to immunogenicity? 2+3=6
(b) What are the different mechanisms that generate Antibody Diversity? What role does AID play in antibody diversity? 6+1=7
(c) Describe similarities and dissimilarities between cytokines and hormones. 2

5. (a) What role does β_2-microglobulin play in MHC class I molecule? Enumerate the differences between Class I and Class II MHC molecules. 2+4=6
(b) How will you show the 'Self-MHC Restriction of T cells'? 4
(c) Describe how endogenous antigens are presented with MHC molecules. 5

6. (a) Discuss the advantages of mRNA vaccines over other vaccine strategies? 5
(b) What is co-stimulatory signals and what's their role in T-cell? What have we learnt from CTLA-4 knockout mice? 1+2+2=5

c) What kind of subpopulation of T-cells negatively regulates immune responses? What is the role of ITIM on B-cell co-receptor? 1+4=5

7. (a) In a table form, write the similarities and differences between the types of hypersensitivity. With the help of an example, explain the role of immune cells in anyone type of hypersensitivity. 8+3=11

(b) Describe the lifecycle of HIV-1 virus. Why AIDS caused by HIV-1 is considered to be a secondary immunodeficiency condition. 3+1=4

OR

What are the various anti-cytokine strategies used by viruses? 4

8. (a) Explain briefly the phases of cancer immunosurveillance. Characterize the type of tumor antigens and how these tumor antigens can be useful targets for cancer immunotherapy? 4+3+3=10

(b) What are the common strategies used by pathogenic microorganisms to evade the immune system. 5

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