



Name :

Roll No. :

Invigilator's Signature :

CS/MBT, PHMB, PHMC/SEM-1/MBT, PHMB, PHMC-105/2009-10

2009

IMMUNOLOGY & VIROLOGY

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

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

Question No. 1 and 7 are compulsory. Answer other *three* questions from each Module.

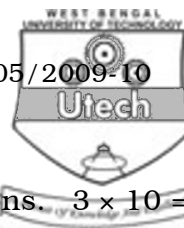
1. State whether the following statements in Yes or No :

5 × 1 = 5

- i) Do antibody molecules play any role in innate immunity ?
- ii) Could an endocytosed antigenic peptide be presented by MHC I ?
- iii) Are proteasomes essential for MHC II antigenic peptide presentation ?
- iv) Is apoptosis an integral component of cell mediated immunity ?
- v) Is blood group match/mismatch an immunological phenomenon ?

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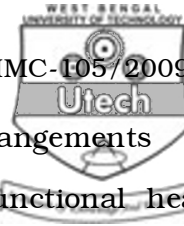
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IMMUNOLOGY MODULE

Answer any *three* of the following questions. $3 \times 10 = 30$

2.
 - a) List three features of smallpox that has enabled its eradication by vaccination.
 - b) What prevents the complete eradication of polio today ?
List one suggestion that will solve this challenge.
 - c) Why (from an immunology perspective) is HIV AIDS currently incurable ? What in your opinion could be two specific improvements over current therapy strategies ?
 - d) Define autoimmunity citing two specific short examples of autoimmune disease ? $3 + (1 + 1) + (1 + 2) + 2$
3.
 - a) Define immunological hypersensitivity. List the four types of hypersensitivity reactions.
 - b) Mention the stages, molecules and cells associated with Type I hypersensitivity ? Why is it fatal ?
 - c) Illustrate clearly with labels how $CD4^{+}$ and $CD8^{+}$ T cells get activated.
 - d) Draw an immunological synapse clearly labelling all the associated molecules. $(1 + 2) + (3 + 1) + (1 + 1) + 1$
4.
 - a) List the IgH constant gene segment mentioning each isotype and subclass of Ab.



- b) What (chronological) gene rearrangements are associated with the formation of a functional heavy chain (IgH) gene ? (use a diagram)
- c) Illustrate with clearly labelled figures the role of heptamers, nonamers and 12-23 rule associated with genetic recombination during *B* cell development.
- d) Explain with figures the mechanism of generating membrane immunoglobulin (mIg) versus secreted or soluble Ig molecules. 2 + 3 + 2 + 3
5. a) What are complements (in immunology) and why were they named so ? List four complement actions.
- b) Illustrate as a flow diagram the various stages and components of complement activation cascade by the classical pathway. Delineate the connection of the above activation with components of the alternate pathway.
- c) Describe four mechanistic strategies of regulating complement activation pathways. (1 + 2) + (3 + 1) + 3
6. a) Describe with clearly labelled illustrations the 'signalling hypothesis' on development of $\alpha : \beta$ versus $\gamma : \delta$ *T* cells.



- b) In a flow diagram illustrate the geographical location of as well as the developmental stage transitions of a stem cell into a $CD4^+ CD8^-$ or a $CD4^- CD8^+$ T cells.
- c) Illustrate how the α chain of the T cell receptor gene undergoes rearrangement to assume maturity clearly labelling its constituent regions.
- d) Define immunological tolerance citing one example.

3 + 3 + 3 + 1

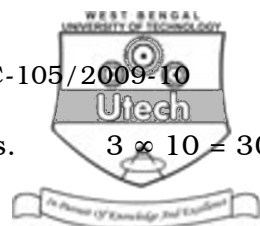
VIROLOGY MODULE

7. Answer any *five* of the following questions. $5 \times 1 = 5$

- a) HIV attaches to
- i) $CD4^+$ T cells
 - ii) $CD8^+$ T cells.
- b) Lambda is a phage.
- i) lytic
 - ii) lysogenic
 - iii) both lytic and lysogenic.



- c) Antigenic shift occurs while
- within infected cell
 - infecting across species.
- d) Antigenic drift occurs while
- within infected cell
 - infecting across species.
- e) Human cytomegalovirus evades the host immune system by down-regulating the amount of molecules on the infected cell surface.
- host MHC I
 - host MHC II.
- f) Epstein-Barr virus cause cancer.
- does
 - does not.
- g) Human Immunodeficiency Virus cause cancer.
- does
 - does not.



Answer any *three* of the following questions.

3 × 10 = 30

8. a) List Koch's postulates.
- b) Describe a feature of poliovirus which led to the discovery of a novel mode of translation.
- c) Briefly state the activities of the National Polio Eradication Program. 4 + 4 + 2
9. a) What observation(s) led prions to be interpreted as slow reactive virus(es) ?
- b) Define the prion hypothesis. Explain briefly the uniqueness of such mode of disease transmission.
- c) Explain how eating parts of a BSE animal may lead to CZD in humans. 2 + 5 + 3
10. a) Illustrate (stepwise) the adsorption of HIV on the host cell surface identifying the molecules associated with the process.
- b) What is the sub-cellular location of reverse transcription of the HI Viral genome ?
- c) What class (their chemical nature) of drugs has been most effective against HIV ? 5 + 2 + 3



11. a) How are warts on human palms and feet caused by human papilloma viruses ?
- b) Show the replication of papilloma virus in the context of epidermis differentiation.
- c) How are sores formed on lips by herpes viridae different from the warts above ?
- 4 + 4 + 2
