

## JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

## TEST -2 EXAMINATION- 2026

## MSc-II Semester (BT)

Course Code (Credits):20MS1BT212 (3)

Max. Marks: 25

Course Name: Immunology

Course Instructor: Dr. Abhishek Chaudhary

Max. Time: 1.5 Hour

**Note:** (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of calculators is not allowed

| Q.No | Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Marks |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Q1   | For several decades, immunologists sought to imagine a genetic mechanism that could explain the tremendous diversity of antibody structure. Tonegawa and Hozumi design an experiment to explain the genetic mechanism of antibody diversity.<br>1. What were the Tonegawa and Hozumi?<br>2. How did Tonegawa and Hozumi demonstrate that antibody genes are not inherited as continuous genes in germline DNA, but are rearranged in somatic cells?<br>3. Before Tonegawa's discovery, what was the major problem in explaining antibody diversity, and how did his work solve it?                                                                                                                                                                                                         | 1+3+2 |
| Q2   | Discuss how the intrinsic properties of an immunogen determine its immunogenicity. Why are some substances highly immunogenic and others are weakly immunogenic or non-immunogenic?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2     |
| Q3   | Because immunoglobulin molecules possess antigenic determinants, they themselves can function as immunogens, inducing formation of antibody. For each of the following immunization scenarios, indicate whether anti-immunoglobulin antibodies would be formed to isotypic (IS), allotypic (AL), or idiotypic (ID) determinants:<br>a. Anti-DNP antibodies produced in a BALB/c mouse are injected into a C57BL/6 mouse.<br>b. Anti-BGG monoclonal antibodies from a BALB/c mouse are injected into another BALB/c mouse.<br>c. Anti-BGG antibodies produced in a BALB/c mouse are injected into a rabbit.<br>d. Anti-DNP antibodies produced in a BALB/c mouse are injected into an outbred mouse.<br>e. Anti-BGG antibodies produced in a BALB/c mouse are injected into the same mouse. | 5     |

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|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Q 4 | <p>For each of the following situations, indicate which type(s) of lymphocyte(s), if any, would be expected to proliferate rapidly in lymph nodes and why?</p> <ol style="list-style-type: none"> <li>Normal mouse immunized with a soluble protein antigen</li> <li>Normal mouse with a viral infection</li> <li>Neonatally thymectomized mouse immunized with a protein antigen</li> <li>Neonatally thymectomized mouse immunized with the thymus-independent antigen bacterial lipopolysaccharide (LPS), which does not require the aid of TH cells to activate B cells</li> </ol> | 1.5*4 |
| Q 5 | <p>Monoclonal antibodies (mAbs) are lab-made proteins that mimic the immune system's ability to fight pathogens or target specific cells, such as cancer. Describe the production of monoclonal antibodies (mAbs) by hybridoma technology. In your answer, discuss the major steps involved, including cell fusion, selection, screening, and cloning of antibody-producing hybrid cells. Further, evaluate the significance of monoclonal antibodies in diagnostic and therapeutic applications.</p>                                                                                 | 4+2   |