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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2026

M.Sc-II Semester (BT)

Course Code (Credits): 20MS1BT212 (3)

Max. Marks: 35

Course Name: Immunology

Course Instructor: Dr. Abhishek Chaudhary

Max. Time: 2.0 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   | Discuss the clinical manifestations, diagnostic approaches, and management of Myasthenia Gravis. In your answer, explain the autoimmune mechanisms involved, including the role of antibodies against acetylcholine receptors at the neuromuscular junction.                                                                                                                                                                                                                                                                                                                                             | 5     |
| Q2   | <p>a. A young girl who had never been immunized to tetanus stepped on a rusty nail and got a deep puncture wound. The doctor cleaned out the wound and gave the child an injection of tetanus antitoxin.</p> <p>I. Why was antitoxin given instead of a booster shot of tetanus toxoid?</p> <p>II. If the girl receives no further treatment and steps on a rusty nail again 3 years later, will she be immune to tetanus?</p> <p>b. What are the advantages of the Sabin polio vaccine compared with the Salk vaccine? Why the Sabin vaccine is no longer recommended for use in the United States?</p> | 2+2+2 |
| Q3   | <p>a. Considering only combinatorial joining of gene segments and association of light and heavy chains, how many different antibody molecules potentially could be generated from germ-line DNA containing 500 VL and 4 JL gene segments and 300 VH, 15 DH, and 4 JH gene segments?</p> <p>b. Explain why a VH segment cannot join directly with a JH segment in heavy-chain gene rearrangement, Also Signify the importance of RSS sequence in gene rearrangement</p>                                                                                                                                  | 4+2   |
| Q4   | <p>a. Patients with Di-George syndrome are born with either no thymus or a severely defective thymus. In the severe form, the patient cannot develop mature helper, cytotoxic, or regulatory T cells. If an adult suffers loss of the thymus due to accident or injury, little or no T-cell deficiency is seen. Explain this discrepancy.</p> <p>b. Explain the phenomenon of herd immunity. How does it relate to the appearance of certain epidemics?</p> <p>c. List any two types of purified macromolecules that are currently used as vaccines</p>                                                  | 3+2+1 |

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| Q5 | <p>a. A mother has an Rh<sup>+</sup> blood type and the father has an Rh<sup>-</sup> blood type. Under these circumstances, the family pediatrician is not worried about the possibility of a type II hypersensitivity reaction. However, if the converse is true, and the mother is Rh<sup>-</sup> and the father Rh<sup>+</sup>, the pediatrician does worry and asks the obstetrician to inject the mother with antibodies toward the end of her first pregnancy. Explain his reasoning in both cases.</p> <p>b. A mother has an Rh<sup>-</sup> and the father an Rh<sup>+</sup> blood type. The first baby born to the parents was Rh<sup>+</sup>. However, the parents select for the mother not to receive Rhogam. Are all future babies of this couple at risk for type II hypersensitivity reactions? Why?/Why not?</p> | 3+2 |
| Q6 | <p>Provide a comprehensive account of the Complement System as a crucial component of host defense. In your answer,</p> <p>a. Critically describe the molecular mechanisms and sequential activation of the classical, alternative, and lectin pathways, highlighting the role of key complement components and major difference among all the three pathway.</p> <p>b. Explain how complement activation leads to effector functions such as opsonization, chemotaxis, inflammation, and membrane attack complex (MAC)-mediated cell lysis.</p>                                                                                                                                                                                                                                                                                | 4+3 |