JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3 EXAMINATION-2022
B.Tech-V Semester (Biotechnology)

Course Code (Credits): 18B11BT513 (4) Max. Marks: 35
Course Name: Immunology
Course Instructors: Dr. Abhishek Max. Time: 2 Hours

Note: *All questions are compulsory. Marks are indicated against each question in square brackets.*

1. Complement activation can occur via the classical, alternative, or lectin pathway. [1.5+1.5+2] [CO-3]
   a. How do the three pathways differ in the substances that can initiate activation?
   b. Which portion of the overall activation sequence differs in the three pathways? Which portion is similar?
   c. How do the biological consequences of complement activation via these pathways differ?

2. An immune response mobilizes a battery of effector molecules that act to remove antigen by various mechanisms. Generally, these effector molecules induce a localized inflammatory response that eliminates antigen without extensively damaging the host's tissue under certain circumstances, however, this inflammatory response can have deleterious effects, resulting in significant tissue damage or even death and lead to hypersensitivity state. Several forms of hypersensitive reaction can be distinguished, reflecting differences in the effector molecules generated in the course of the reaction. Detail out the different type of hypersensitive reaction and how do the different hypersensitive reaction pathways differ in the substances or immune complex that can initiate activation of hypersensitive reaction [6] [CO-5]

3. Molecular mimicry is one mechanism proposed to account for the development of autoimmunity. How has induction of EAE (Experimental autoimmune encephalitis (EAE)) with myelin basic protein contributed to the understanding of molecular mimicry in autoimmune disease? [5] [CO-4]

4. Two vaccines are described below. Would you expect either or both of them to activate TC cells? Explain your answer. [5] [CO-5]
   a. A UV-inactivated ("killed") viral preparation that has retained its antigenic properties but can not replicate.
   b. An attenuated viral preparation that has low virulence but can still replicate within host cells

5. .In an experiment, two solutions are given to you, one containing Antigen X and the other containing antibody to Antigen X. When you add 1 ml of anti-X to 1 ml of Antigen X, a precipitate forms. But when you dilute the antibody solution 100-fold and then mix 1 ml of the diluted anti-X with 1 ml of Antigen X, no precipitate forms. [5] [CO-2]
   a. Explain why no precipitate formed with the diluted antibody.
   b. Which species (Antigen X or anti-X) would likely be present in the supernatant of the antibody-antigen mixture in each case?

6. How might an arthropod, such as a cockroach or beetle, protect itself from infection? In what ways might the innate immune responses of an arthropod be similar to those of a plant and how might they differ? Also comment on the disadvantages of having only an adaptive immune system in vertebrate [4] [CO-1]

7. You have identified a bacterial protein antigen that confers protective immunity to a pathogenic bacterium and have cloned the gene that encodes it. The choices are either to express the protein in yeast and use this recombinant protein as a vaccine, or to use the gene for the protein to prepare a DNA vaccine. Which approach would you take and why? Also write down the advantages and disadvantages of using attenuated organisms as vaccines [5] [CO-5]