

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST - 3 EXAMINATIONS - 2024

M.Sc. (Microbiology) - III Semester

COURSE CODE (CREDITS): 21MS1MB312 (3)

MAX. MARKS: 35

COURSE NAME: DIAGNOSTIC MICROBIOLOGY AND VACCINES

COURSE INSTRUCTORS: Dr. Rahul Shrivastava

MAX. TIME: 2 Hours

Note:(a) All questions are compulsory.

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

| Q. No. | Question | Marks |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Q1. | <p>A. You are using the Restriction Fragment Length Polymorphism (RFLP) technique to detect a genetic variation (SNP) at a specific locus in a population. The region of interest contains an EcoRI site. EcoRI cuts the DNA into fragments of two possible sizes: 800 bp and 200 bp. RFLP analysis on DNA samples from three individuals (A, B, and C) was performed and run on an agarose gel. After performing the electrophoresis, you observe the following banding patterns:</p> <div style="text-align: center;"> <p style="text-align: center;">samples Marker A B C</p> </div> <p>Based on the RFLP banding patterns, determine whether each individual is homozygous or heterozygous for the genetic variant at the restriction enzyme site. Explain how the observed banding patterns in individuals A, B, and C are related to their genotypes at the locus, and describe what each pattern indicates about the genetic variation at this restriction enzyme site.</p> <p>B. Restriction profile of Wild type and Mutant strains of an organism are provided. Suggest with reason which restriction sites can be used as RFLP marker site(s) for detection of SNP in the strains.</p> | <p>[3]</p> <p>[2]</p> <p>[3]</p> |

| | EcoRI | BamHI | NotI | TaqI | HindIII | PstI |
|-----------|-------|-------|------|------|---------|------|
| Wild Type | + | - | + | + | + | + |
| Mutant | - | - | - | + | + | - |

C. What are the advantages and limitations of RFLP as a genetic marker for detecting polymorphisms?

| | | |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Q2. | <i>Experimental Design:</i> Design an ELISA based strategy for assay of a human enzyme in blood serum. Draw a flow chart for the steps you would use and describe checker-board ELISA method for standardization of the assay. | [5] |
| Q3. | What is Agglutination reaction? Elaborate the method to identify Blood group of a person. | [3] |
| Q4. | Differentiate between primary and secondary response development when a pathogen infects a host. Speculate how an antibody response may protect the host against future infections with graphical Illustrations. | [4] |
| Q5. | Tuberculosis is one of the most lethal infectious disease causing mortality to human population, yet a global vaccine which may provide protection to the entire human population is not available. A. Discuss the reasons for variable efficacy of BCG vaccine in human population. B. Illustrate the molecular mechanism for disease progression and pathogenesis of Tuberculosis. C. Suggest important strategies which may be used for Vaccine development against Tuberculosis. | [2.5 X 3 = 7.5] |
| Q6. | A person is suffering from an infection with symptoms of 'hydrophobia' and 'hallucinations'. i. Illustrate the transmission and pathogenesis of the infection. ii. Why are both pre and post exposure vaccines recommended for such infections? Give details of such vaccines and their utility. iii. Provide details on Nerve Tissue and Cell Culture methods for production of such vaccines. | [2.5 X 3 = 7.5] |