

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3 EXAMINATION - 2026

B.Tech - VIII Semester (BT)

MAX. MARKS: 35

COURSE CODE (CREDITS): 18B1WBT833 (3)

COURSE NAME: DIAGNOSTICS AND VACCINE MANUFACTURE

MAX. TIME: 2 Hour

COURSE INSTRUCTORS: Dr. Rahul Shrivastava

Note: (a) All questions are compulsory. (b) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems

Q. No	Question	CO	Marks																					
Q1	Consider the following case studies related to Antibiotic Susceptibility Testing: Case 1: The bacterial culture that was not adjusted to the recommended optical density standard. After incubation, unusually small zones of inhibition were observed for most antibiotics. Analyze how inoculum density can influence AST results and predict the possible consequences of reporting such inaccurate findings in clinical practice. Case 2: antibiotic discs were placed very close to each other on the Mueller-Hinton agar plate, resulting in overlapping zones of inhibition after incubation. Critically evaluate how improper disc placement affects interpretation of susceptibility results and suggest modifications to ensure standardization and reliable data analysis. Case 3: A bacterial isolate obtained from a patient with a urinary tract infection, was tested against multiple antibiotics. The isolate showed large zones of inhibition around ciprofloxacin and gentamicin discs, but no clear zone around ampicillin. Analyze the antibiotic susceptibility pattern and justify which antibiotic would be most appropriate for treatment. Explain the scientific basis behind your interpretation.	V	[2 X 3 = 6]																					
Q2	Compare and Differentiate between the Inactivated Polio Vaccine (IPV) and the Oral Polio Vaccine (OPV) based on their composition, route of administration, and type of immunity produced.	III	[2]																					
Q3	A. Restriction profile of Wild type and Mutant strains of a eukaryotic organism are provided. Suggest with reason which restriction sites can be used as RFLP marker site(s) for detection of SNP in the strains. <table border="1"><thead><tr><th></th><th>TaqI</th><th>SmaI</th><th>XbaI</th><th>HindIII</th><th>PstI</th><th>KpnI</th></tr></thead><tbody><tr><td>Mutant</td><td>+</td><td>-</td><td>-</td><td>+</td><td>+</td><td>-</td></tr><tr><td>Wild Type</td><td>-</td><td>-</td><td>+</td><td>+</td><td>+</td><td>-</td></tr></tbody></table> B. List steps used for RFLP analysis of a sample, taking the above example.		TaqI	SmaI	XbaI	HindIII	PstI	KpnI	Mutant	+	-	-	+	+	-	Wild Type	-	-	+	+	+	-	IV	[2] [3]
	TaqI	SmaI	XbaI	HindIII	PstI	KpnI																		
Mutant	+	-	-	+	+	-																		
Wild Type	-	-	+	+	+	-																		

Q4	A. Analyze the clinical symptoms of a patient presenting with persistent cough, blood-stained sputum, chest pain, fever, weight loss, and loss of appetite for 2–3 weeks, and infer the most probable disease condition. Further, evaluate the different diagnostic approaches used for confirming the disease and identifying its causative organism. B. Differentiate between Latent Tuberculosis and Active Tuberculosis by comparing their pathological features, symptoms, transmission potential, diagnostic findings, and clinical significance.	III, IV	[3 X 2 = 6]
Q5	Experimental Design: A scientist wants to develop a vaccine for a rapidly spreading new viral outbreak. a. Which vaccine platform would be more suitable between mRNA vaccines and inactivated vaccines? Compare and justify your answer based on development speed, immune response, and storage requirements. b. Why do mRNA vaccines not alter human DNA even though they introduce genetic material into the human body?	III	[3 + 2 = 5]
Q6	Case Study: A cholera outbreak occurs in a refugee camp with poor sanitation and unsafe drinking water. a. Compare the types of cholera vaccines available, which vaccine would be most suitable for rapid public health intervention, and why? 3 b. Identify and explain the functional roles of the A and B subunits of cholera toxin, causing 'rice-water stool.'	III	[3 X 2 = 6]
Q7	Human Papillomavirus (HPV) Vaccines answer the following i. Evaluate how Human Papillomavirus (HPV) vaccines based on L1 protein virus-like particles (VLPs) stimulate immunity without causing infection. ii. Given that India accounts for approximately 25% of global cervical cancer deaths, assess and evaluate the importance of the recommended vaccination age (9–14 years) for HPV vaccines in reducing this global burden.	III	[3 + 2 = 5]