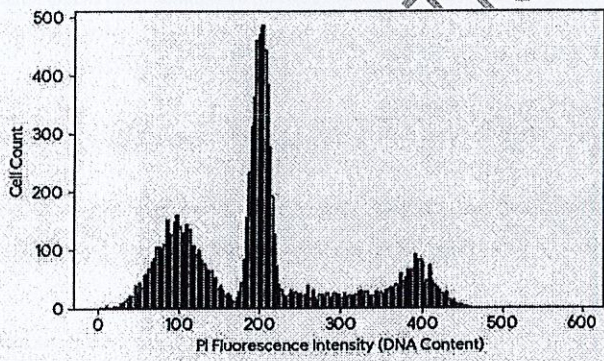


Note: (a) All questions are compulsory.

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

(c) Use of calculator is not allowed

Q.No	Question	CO	Marks
Q1	India reported its first Covid-19 case in Kerala on January 30, 2020, and subsequently saw a massive rise in infections. Devise and propose a multi-tiered Public Health Strategy, incorporating diagnostic testing, vaccination, and provide possible measures for controlling the spread of COVID-19.	V	[6]
Q2	A researcher analysed a population of healthy mammalian cells using flow cytometry employing Propidium Iodide (PI), a fluorescent dye that intercalates into DNA. Answer the following questions related to information represented in the figure.  a. Identify and label which peak (corresponds to the G0/G1 phase and which corresponds to the G2/M phase. Justify your answer based on the relative DNA content. b. The area between the two main peaks represents cells in the S-phase. Explain why these cells do not form a distinct peak but rather a "bridge" of varying intensities. c. What does the presence of a Sub-G0-G1 peak represent? Elaborate with reason. d. What is 'Gating', how can you use a dot plot to exclude debris or dead cells from your analysis? e. In a dot plot of FSC vs SSC, what cellular properties do these parameters represent?	IV	[2+1.5+1.5+1+1=7]
Q3	a) Differentiate between HIV accessory proteins (Nef, Vif, Vpu, Vpr) based on their roles in immune evasion and viral replication. b) Analyze how HIV integrates into host DNA and the implications for lifelong infection.	IV	[2] [2]

	c) Assess the role of reverse transcriptase as a drug target in HIV therapy. Evaluate the challenges in developing an effective HIV vaccine. d) A 32-year-old male presents with fever, weight loss, and recurrent infections. He reports unprotected sexual exposure 3 months ago. Laboratory findings ✓ ELISA: Positive ✓ Western blot: Positive ✓ Viral load: High ✓ CD4 count: 180 cells/mm³ Questions: i. Interpret the diagnostic findings. ii. Explain the stage of HIV infection. iii. Recommend appropriate management.		[3]
			[3]
Q4	a) A 60-year-old patient presents with fever, hypotension (BP 80/50 mmHg), tachycardia, and confusion. Lactate = 5 mmol/L. a) Diagnose the condition. b) Explain underlying mechanisms. c) Propose management strategy. b) Analyze the molecular mechanisms behind "Antigenic Shift" versus "Antigenic Drift." Explain why only Influenza A is capable of causing global pandemics while Influenza B typically causes seasonal epidemics. Evaluate current influenza vaccination strategies and their limitations.	III	[3]
Q5	a) Analyze the molecular mechanism of antibody-dependent enhancement (ADE) in viral infections. b) Antimicrobial Resistance (AMR) Mechanism adopted by pathogens c) Analyze the mechanism of prion propagation and neurodegeneration. Evaluate the challenges in diagnosing prion diseases	V	[2]
			[2] [3]