Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, May 2025

Course: Virology **Semester : II**

Program: MSc. Microbiology **Duration : 3 hours**

Course Code: HSMB7004 **Max. Marks: 100**

Instructions:

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	What is the correct order of the viral infectious cycle? a. Entry → Uncoating → Replication → Release b. Uncoating → Entry → Release → Replication c. Entry → Replication → Uncoating → Release d. Replication → Entry → Uncoating → Release	**1.5**	**CO2**
Q 2	The concept of metastability in viruses refers to: a. Stability of host cells b. Temperature resistance of the virus c. Stable yet primed to undergo conformational change d. Ability to avoid immune system detection	**1.5**	**CO2**
Q 3	Which of the following viruses contains gapped DNA genomes? a. Herpesvirus b. Retrovirus c. Hepatitis B virus d. Rotavirus	**1.5**	**CO2**
Q 4	Icosahedral symmetry in viruses is best described by: a. Helical coils forming a shell b. A 20-sided polygon with equilateral triangles c. Spherical structure made of hexagons d. Random protein arrangements	**1.5**	**CO1**
Q 5	Which tool is primarily used for studying viral structures? a. ELISA b. RT-PCR c. Cryo-Electron Microscopy d. Gram staining	**1.5**	**CO1**
Q 6	Which genome type is typical for influenza virus? a. ssDNA b. dsRNA c. (+)ssRNA d. (-)ssRNA	**1.5**	**CO1**
Q 7	The function of reverse transcriptase is: a. To replicate RNA strands b. To convert RNA into DNA	**1.5**	**CO2**

	c. To splice viral genes d. To synthesize proteins		
Q 8	A viral receptor is: a. Host's immune cell b. Viral entry protein c. Host surface molecule that virus binds d. Enzyme used for replication	**1.5**	**CO2**
Q 9	Triangulation number is related to: a. Viral genome size b. Helical virus entry c. Surface area of viral envelope d. Arrangement of subunits in icosahedral virus	**1.5**	**CO2**
Q 10	Which RNA virus has a DNA intermediate? a) Poliovirus b) HIV c) Influenza d) Adenovirus	**1.5**	**CO1**
Q11	Koch's postulates are used to: a) Identify bacterial morphology b) Classify viruses c) Prove causality between pathogen and disease d) Culture viruses in lab	**1.5**	
Q12	In retroviruses, DNA synthesis is initiated by: a) RNA polymerase b) DNA ligase c) Reverse transcriptase d) Integrase	**1.5**	**CO2**
Q13	The genome of SARS-CoV-2 is: a) ssRNA (+) sense b) ssRNA (-) sense c) dsRNA d) dsDNA	**1.5**	**CO2**
Q14	The key feature of ambisense RNA is: a) No coding regions b) Contains both (+) and (-) sense regions c) Double-stranded structure d) Replicates in nucleus only	**1.5**	**CO2**
Q15	Which enzyme is required for RNA-directed RNA synthesis? a) RNA polymerase b) DNA polymerase c) Integrase d) Protease	**1.5**	**CO1**
Q16	What does "quasi-equivalence" refer to in virus structure? a) Irregular shell formation b) Genetic drift in populations c) Similar but not identical bonding in capsomers d) RNA folding patterns	**1.5**	**CO1**
Q17	Which of these is a feature of DNA virus replication? a) Random priming b) RNA splicing c) Use of viral or host DNA polymerase d) Use of reverse transcriptase	**1.5**	**CO1**
Q18	Virus coded transcriptional regulators function to: a) Translate viral proteins	**1.5**	**CO1**

	b) Degrade host mRNA c) Promote viral gene expression d) Suppress immune signaling		
Q19	Packaging of segmented genomes requires: a) Ribosomes b) Packaging signals c) Capsid proteins only d) Envelope proteins	**1.5**	**CO1**
Q20	Quasi-species concept highlights: a) Virus taxonomy b) Viral replication fidelity c) Population of mutants within a virus population d) Viral envelope stability	**1.5**	**CO2**
Section B (4Qx5M=20 Marks)			
Q 1	Explain the concept of quasi-equivalence and triangulation number in virus structure.	**5**	**CO2**
Q 2	Differentiate between (+) sense RNA viruses and (−) sense RNA viruses (life cycle) with suitable examples.	**5**	**CO1**
Q 3	Outline the sequential and concerted strategies of virus assembly with suitable examples.	**5**	**CO2**
Q 4	Describe cytopathic effects and where are they observed in virology. Cite examples.	**5**	**CO1**
Section C (2Qx15M=30 Marks)			
Q 1	'A drug has selectivity index of 1 and the other has of 0.5.' Based on this answer the following: 1. Define 'Selectivity index' of an anti-viral drug. (2) 2. Discuss which of the two is a better antiviral drug as per the indices in question? Reason why (3) 3. Define nucleoside analogues. (2) 4. Name two nucleoside analogues and cite their mode of action and target viruses. (4) 5. Classify and enlist two different kinds of Reverse transcriptase inhibitors. Where are they used? (4)	**15**	**CO2**
Q 2	A patient diagnosed with a chronic viral infection which resulted in sever immune suppression was started on an antiviral drug targeting reverse transcriptase. Initially, the patient responded well, but after 6 months, viral load increased despite adherence to the treatment. Further analysis revealed mutations in the viral genome, especially in the reverse transcriptase gene. a. Identify the most probable virus involved. (1) b. Identify the Baltimore class it belongs to. (1) c. Explain the structure, genome and life cycle of this virus. (5) d. Analyse how resistance may develop in this case. (2) e. Describe the concept of quasi-species and its role in antiviral drug resistance. (2)	**15**	**CO2**

	f. Propose an alternative approach for managing this patient's infection and which is routinely followed in patient management. (4)		
Section D **(2Qx10M=20 Marks)**			
Q 1	a) Describe Baltimore classification. (8) b) Write the central molecule around which this classification is based. (1) c) Is there any other way of classifying viruses/any other scheme that you are aware of. (1)	**10**	**CO1**
Q 2	Outline the steps in replication of a virus. One can use a type centric or general life cycle approach to answer this.	**10**	**CO1**