Department of Biosciences and Bioengineering
Indian Institute of Technology Guwahati
Guwahati 781039 Assam, India

Course: BT-616 Moleclar Virology (MidSem) **Date:** 24/02/2025
Total marks-29 **Total time:** 2 hrs

1. A virus infection caused the production of three different viral proteins from the same ORF. The virus genome contains only one ATG codon to produce three proteins: p45, p60, and p75.
   a) How could you prove this phenomenon at a genomic level using available molecular tools? (2 marks)
   b) The half-life of p45 is 2 hr in the infected cell. How do we prove this experimentally? (2 marks)

2. A newly identified virus with an infectious RNA was used to see its effect on the lung epithelial cells.
   a) Predict its replication cycle in the cell based on the existing knowledge. (2 marks)
   b) One of the viral proteins, VP5, is known to interact with Iκβ. Design an experiment to prove it. (2 marks)
   c) Predict the outcome of the infection. (2 marks)

3. Two separate artificial mRNAs of the same length are made with poly-AC and poly-GA sequences. Both mRNAs can produce the polypeptide chains separately into a cell-free system. (Annexure on the back side of the question paper)
   a) How are these two polypeptides different from each other? (2 marks)
   b) Considering the length of each mRNA is 99 nucleotides. What could be its approximate molecular weight? (1 mark)
   c) Predict the amino acid sequence if there is -1 ribosomal framshifting. (1 mark)

4. A newly identified virus carrying the dsDNA genome is known to cause lysogenic infection. The virus encodes an oncogene (***OG***) and a virokines (***VK***).
   a) Design an experiment to prove that ***OG*** protein can bind to **Rb** protein. (2 marks)
   b) ***VK*** protein is known to inhibit the class-switching phenomenon in infected animals. Discuss the outcome. (2 marks)

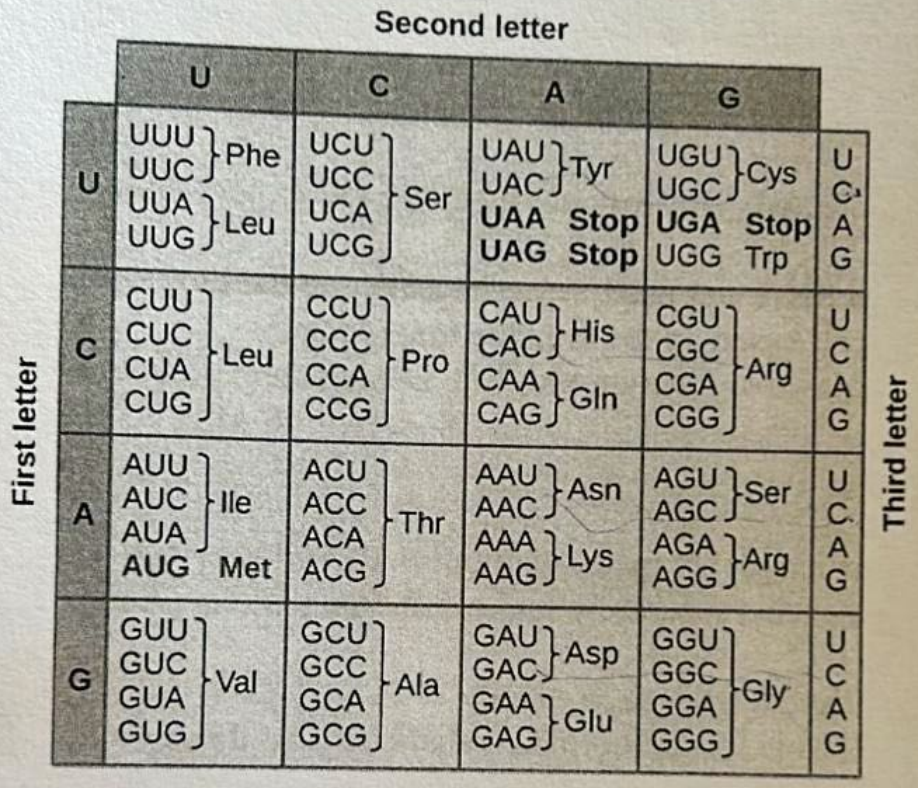
5. A newly identified ROTAVIRUS encodes a nonstructural viral protein (NSP) similar to what was reported for a MERS virus. The NSP is known to cause diarrhea in young individuals and vomiting in adults. Discuss the odd biology of the protein. (3 marks)

6. How are the viruses classified other than the Baltimore classification? What was ***Michael Houghton's*** contribution to discovering ***the hepatitis C*** virus? How can his experiments be repeated using modern molecular biology tools? (3 marks)

7. A newly identified bacteria is known to encode a host protein CD155/PVR. The scientists are trying to use this as a tool for human medicine. How could this be hypothesized? (2 marks)

8. A newly identified virus is known to cause ***Myelitis.*** The nucleic acid of the virus is known to interact with caspase I. Predict the type of nucleic acid in the virus and how it could regulate the cellular process. (3 marks)

Annexure I


Second letter
First letter
Third letter
U
C
A
G
UUU UUC Phe
UUA UUG Leu
UCU UCC UCA UCG Ser
UAU UAC Tyr
UAA Stop
UAG Stop
UGU UGC Cys
UGA Stop
UGG Trp
CUU CUC CUA CUG Leu
CCU CCC CCA CCG Pro
CAU CAC His
CAA CAG Gln
CGU CGC CGA CGG Arg
AUU AUC AUA Ile
AUG Met
ACU ACC ACA ACG Thr
AAU AAC Asn
AAA AAG Lys
AGU AGC Ser
AGA AGG Arg
GUU GUC GUA GUG Val
GCU GCC GCA GCG Ala
GAU GAC Asp
GAA GAG Glu
GGU GGC GGA GGG Gly