



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

**Course:** BT-605 (ENDSEM)  
**Total marks-**30

**Date:** 18/11/2024  
**Total time:** 180 mins

Q1. Melanoma is known to produce an antigen named **MELO**. It is a 48kDa protein and is reported to bind with  $\beta$ -actin. Based on these facts, plan the experiments below.

- a) Discuss how MELO could be identified as a biomarker for melanoma. **(3 marks)**
- b) How do we express the MELO protein in normal fibroblast cells and prove that it inhibits the dimerization of the  $\beta$ -actin protein? **(3 marks)**
2. A person reported to have a chronic knee pain. The patient's serum showed high **IgG** against a viral protein '**V**'. A very high amino acid similarity between '**V**' and synovial fluid antigen '**S**' exists. Considering there is no relation between virus infection and knee pain. Discuss the unique immunopathology of the event. **(3 marks)**
3. The **VP2** protein of a newly identified adeno-associated virus is shown to activate the intrinsic apoptotic pathway in hepatoma cells. How could this biology be explored using the **MARABA** virus as a vector? **(3 marks)**
4. A newly identified autosomal genetic disorder can cause **stress** to young age group students (18-24 yrs). Discuss the possible candidate genes and design a gene therapy experiment to cure the disease. **(3 marks)**
5. A newly identified tool, **INDIA** (INternal DNA-directed Inhibition of Alzheimer's), was developed by IITG students. Discuss the possible mechanism of this newly identified technique. **(3 marks)**
6. A recently identified RNA virus encodes the gene that antagonizes the **interferon**. Design an experiment to prove this hypothesis. **(3 marks)**
7. A newly isolated RNA virus isolated from a dog is known to encode **blood clotting factor VIII** and also an **oncogene**. Scientists modified the virus to be used as a vector for hemophilia A. How could it be possible? **(3 marks)**
8. A newly identified **cas** protein is shown to cleave foreign proteins. Considering the biology of **cas13** and **12**, how could this be utilized to detect AAV entry into a cell? **(3 marks)**
9. A host enzyme '**eALPHA**' is shown to inhibit the production of alphavirus in neurons. If the '**eALPHA**' has a phosphatase activity, predict its possible mechanism of action. **(3 marks)**