

2015

**BIOCHEMISTRY**

**Paper – BCT – 105**

**( Biomolecules )**

**Full Marks – 25**

*The figures in the margin indicate full marks*

*Candidates are required to give their answers in their own words as far as practicable*

**Group – A**

Answer **Question No. 1** and **any one** from **Q.2** and **Q.3**

1. Indicate which **one** of the given option is true ? Justify your answer. 3×2
- A. The tertiary structure of tRNA
- i involves extensive base stacking interactions
  - ii. Contains large number of modified bases
  - iii. is maintained mostly by non-Watson-Crick base pairing
  - iv. all of the above
- B. Retroviruses replicate via \_\_\_\_\_ intermediate
- i. RNA
  - ii mRNA
  - iii. DNA
  - iv. rDNA
- C. RNA instability in alkaline solutions is due to
- i. adenine
  - ii. ribose
  - iii. uracil
  - iv. single strand nature
2. (a) If a double stranded RNA virus infects a cell which is completely devoid of all kind of nucleases, what will happen to the viral RNA ? Explain. 2
- (b) What is nonsense mediated mRNA decay ? 2
3. (a) Given the following sequence of a RNA, propose the potential hairpin structure for this RNA. Indicate the base pairing with a dotted line. 2
- 5'-AGGACCCUUCGGGGUUCU-3'
- (b) Explain why the helical structure of DNA differs from the helical structure of RNA and how that difference in structure affects the ability of proteins to interact with helical RNA. 2

[ Turn Over ]

## Group – B

Answer *any six* questions

2½×6

4. Fill in the blanks :  
When \_\_\_\_\_ structural elements pack against each other in folded proteins, they bring together the \_\_\_\_\_ sidechains that form the \_\_\_\_\_ core. The \_\_\_\_\_ effect and not the \_\_\_\_\_ bond formation is the dominant factor that drives the folding of protein molecules.
5. How can you describe the helix propensity scale ? Name two members at the top and two members at the bottom of this scale.
6. Design an experiment to demonstrate the folding of some proteins involves the formation of transiently stable intermediates.
7. How can you illustrate the protein folding as funneled movement on a multidimensional free energy landscape ?
8. Design an experiment to prove, Repetitive DNA components consist of families of sequences that are not exactly the same but are related.
9. Compare the structures of  $\alpha$  helix,  $\pi$  helix and  $3_{10}$  helix.
10. What happens if,  
A supercoiled DNA with Linking number = 5000  
Twisting number = 5200  
and Writhing number = - 200  
(a) is incubated at pH 1.8  
(b) is heated from 25°C to 95°C  
(c) is treated with Topoisomerase I
11. Suppose, the gastrula embryo of sea urchin has a genome of  $8.1 \times 10^8$  bp of DNA, the non repetitive DNA represents 75% of the genome.  
(a) Calculate the chemical complexity of the non repetitive component.  
(b) 2.70% of the total sequence of non repetitive DNA is represented in the mRNA. Calculate the complexity of DNA represented in the RNA population.
12. Cite examples and describe in one sentence : Palindromic sequence, chaperon.
13. How protein misfolding can be destined to different diseases ? How chaperons can prevent aggregation of polypeptide chains ?
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